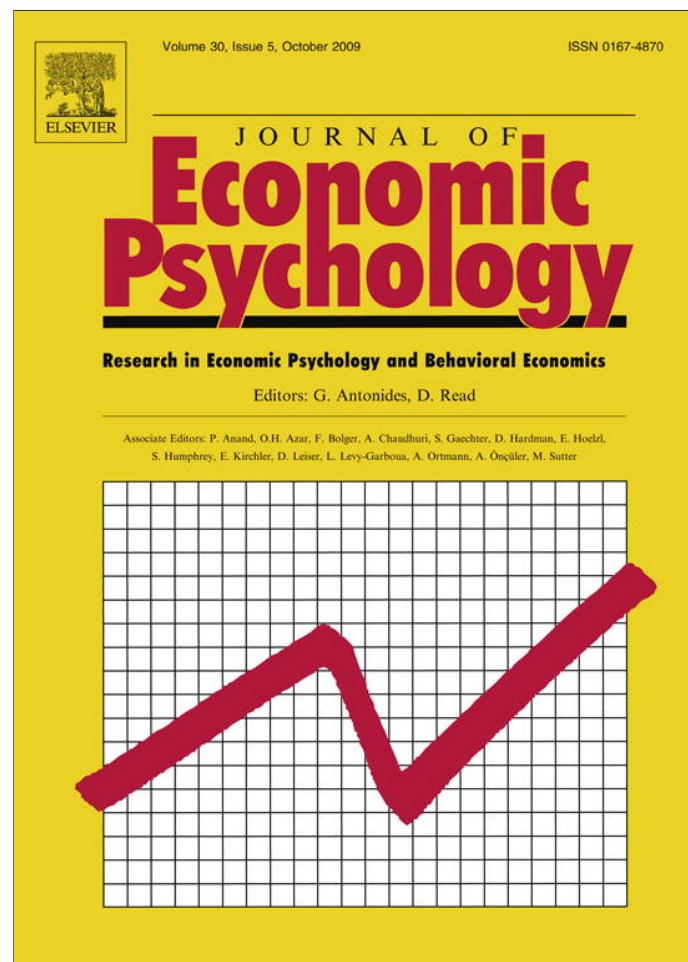


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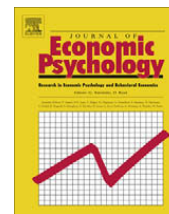
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Determinants of in-group bias: Is group affiliation mediated by guilt-aversion?

Werner Güth^a, Matteo Ploner^{a,b,*}, Tobias Regner^a

^aMax Planck Institute of Economics, Strategic Interaction Group, Jena, Germany

^bUniversity of Trento, Department of Economics, Italy

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ABSTRACT

In-group favoritism in social dilemma situations is one of Social Identity Theory's main findings. We investigate what causes the in-group bias: is it merely due to group affiliation or, alternatively, is guilt-aversion moderating the strength of in-group favoring? We induce group membership in a minimal group setting, observe in-/out-group transfers and elicit corresponding beliefs. According to our experimental data group affiliation affects beliefs and explains a substantial part of the bias. Evidence for guilt-aversion is found only when beliefs are elicited before actions.

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1. Introduction

Individual decision making is often influenced by a group context. In inter-group situations individuals strive to achieve or maintain a positive social identity. Personal and collective goals may become interchangeable. Social Identity Theory (Tajfel & Turner, 1986) proposes that such a group context causes in-group favoritism, the preferential treatment of one's in-group compared to a relevant out-group. Empirical evidence starts with the pioneering study of Tajfel (1970) and extends to a great number of follow-up studies in social psychology.¹ More recently the effect of social identity in dilemma games has

* Corresponding author. Address: Computable and Experimental Economics Laboratory, University of Trento, Via Inama 5, 38100 Trento, Italy. Tel.: +39 0461 883139; fax: +39 0461 882222.

E-mail address: matteo.ploner@unitn.it (M. Ploner).

URL: <http://sites.google.com/site/mploner/> (M. Ploner).

¹ See Brown (2000) for an overview. Laboratory studies employing the Minimal Group Paradigm (Tajfel, 1970) show that an arbitrary in-group/out-group classification of other participants in the experiments suffices to induce a more favorable behavior towards the in-group participants.

also been studied in economics, both in the laboratory and in the field (e.g., Bernhard, Fehr, & Fischbacher, 2006; Charness, Rigotti, & Rustichini, 2007; Efferson, Lalive, & Fehr, 2008; Goette, Huffman, & Meier, 2006; Ruffle & Sosis, 2006), so that in-group favoritism in social dilemma situations is well-established across disciplines. Yet, evidence for what precisely motivates people to favor an in-group member is not very conclusive.²

The aim of this paper is to test, whether the positive effect on the self of a common group identity is indeed the main driving force of increased other-regarding behavior towards in-group members. In the experiment, group identity is induced by combining mere labeling and sharing a “common fate”.³ The procedure employed here follows Güth, Levati, and Ploner (2008) and, while differing from the standard procedure employed in the psychological literature, aims at capturing the essence of payoff-interdependence as a function of group boundaries. After groups have been formed to play a dictator game variant, participants decide how much of an endowment they want to send to an in-group member and to an out-group member. The dictators can share 10 ECU with each. In the main treatment recipients can choose whether they prefer the transfer of the in-group or, alternatively, of the out-group dictator. Since by chance only one is realized, they will be informed which dictator (in-group or out-group) sent the money. In a second treatment recipients are not aware of the origin of the transfer. Yet dictators still know whether they send to an in-group or an out-group member; and they know that the recipients will not learn whether the transfer came from within the group or not.

This design allows us to test whether in-group favoritism is motivated purely by the common group identity, that is whether group identity alone explains the difference in behavior, no matter if individuals know about their common group identity fully (main treatment) or only partially (random treatment).

If varying the knowledge about the common group identity affects in-group favoritism, an alternative underlying motivation could play a role. Behavior could be expectations-based. With full knowledge about the common group identity, dictators may expect recipients to expect more from in-group (and less from out-group) dictators and will tend to consider this in their decision. They send more to the in-group member and less to the out-group member. On the other hand, when in-group recipients cannot have raised expectations, because they are not informed about the group affiliation of the dictator, dictators would tend to consider this as well. In this case they would not discriminate between the in-group and out-group member, even though they know about the respective group identity.

Motives based on such first- and second-order action beliefs (what dictators are expected to send, respectively, think others expect them to send) are the basis of psychological games (Geanakoplos, Pearce, & Stacchetti, 1989). More specifically, we appeal to *guilt-aversion* as, for instance, discussed by Charness and Dufwenberg (2006). Anticipating the higher expectations of the in-group recipient under full knowledge of the common group identity, a guilt-averse dictator will be more generous. She does this in order to avoid the guilt he would experience, if she had disappointed the expectations of the recipient. In contrast, this same dictator would not give so generously if her in-group fellow is not aware of the same group identity. A lower transfer will be sufficient to not experience guilt, because the dictator's expectation of what the recipient believes to get is lower. Psychological game theory requires that such first- and second-order beliefs (expectations about transfers) have to be in line with actual transfers. We elicit first- and second-order action beliefs in our experiment in order to relate the data to such *guilt-aversion*. Hopefully this will improve our understanding of the actual underlying motives.⁴

Our study is related to Dufwenberg, Gächter, and Hennig-Schmidt (2006) who analyze how framing affects beliefs. Without sorting, like in our experiment groups and group affiliation are interchangeable and merely framed as different. In spite of the attention paid to framing effects (as an example see, Tversky & Kahneman (1986)) there is still no concluding evidence about the interplay between frames, action beliefs, and actions. In contrast to previous studies (de Cremer et al., 2008; Yamagishi et al., 1999) we elicit expectations in an incentivized manner and distinguish between two motivational factors (group affiliation and guilt-aversion). In line with the existing literature we observe (i) other-regarding behavior to in-/out-group members alike (explainable by social preferences) and (ii) increased other-regarding behavior towards in-group members (in-group favoritism). In addition, we find (iii) that in-group favoritism partly disappears when recipients are not aware of the senders' identity and senders know this (suggesting expectations-based guilt-aversion). Our results confirm Social Identity Theory, but shed new light on what causes in-group favoritism.

The paper is organized as follows: in Section 2 we describe our methodological approach. Results of the experiment are presented in Sections 3 and discussed in 4.

² The Social Identity Theory literature makes a clear distinction between an identity and an instrumental function of in-group bias (Scheepers, Doosje, Spears, & Manstead, 2006). While this distinguishes between symbolic measures (identity approach) and instrumental motives, the literature on a further decomposition of the instrumental motives is sparse and not consistent in its results. de Cremer, van Knippenberg, van Dijk, and van Leeuwen (2008) find that the effect of in-group favoritism is caused by mere group identity. In contrast, Yamagishi, Jin, and Kiyonari (1999) present evidence that in-group favoritism is based on the expectation of reciprocal preferential treatment.

³ Labeling is the key aspect in the Minimal Group Paradigm tradition and is implemented here via membership to differently labeled groups (i.e., X or Y). Sharing an outcome that is heavily affected by the behavior of in-group members, and only marginally so by the behavior of out-group members, is likely to strengthen the in-group bias (see, for instance, Gaertner et al., 1999).

⁴ Throughout the paper we maintain that beliefs cause behavior. However, what we can observe is just the existence of a correlation between beliefs and behavior. Empirical evidence about the actual causal relationship linking beliefs and choices is quite mixed. While some works show the relevance of beliefs in shaping choices (e.g., Fischbacher & Gächter, in press), other works question the causal relationship between second-order beliefs and choices (e.g., Ellingsen, Johannesson, Tjøtta, & Torsvik, in press). Given this we will approach evidence about beliefs in a cautious manner and will employ the joint analysis of beliefs and choices as a complement to our main analysis about choices in the game.

2. Method

2.1. Experimental design

The experiment is composed of two independent stages. In the first, group identity is induced via a regional public good game. In the second, choices in a modified dictator game are collected and respective beliefs are elicited.

2.1.1. Regional public good

We consider societies consisting of four members: X, x, Y and y . For the sake of specificity let us align group affiliation with living in the same region. In this sense we assume that

- X and x live in the same region \mathbf{X} and
- Y and y live in the neighboring region \mathbf{Y} .

Participants are told their group membership at the beginning of the experiment. We sometimes will refer to X and x , respectively, Y and y , as partners.

In the first phase all four agents engage in regional public good provision with spillover effects. More specifically, assume that c_i with $0 \leq c_i \leq e$ for positive endowment e defines agent i 's contribution. The \mathbf{X} -public good is then produced in amount $c_X + c_x$ and the \mathbf{Y} -public good in amount $c_Y + c_y$. Thus, the payoffs from the first stage are $U_i^1 = e - c_i + \alpha(c_X + c_x) + \beta(c_Y + c_y)$ for $i = X, x$ and $U_j^1 = e - c_j + \alpha(c_Y + c_y) + \beta(c_X + c_x)$ for $j = Y, y$ where we assume $0 < \beta < \alpha < 1 < 2\alpha$.

Thus, due to $\alpha < 1$, freeriding (i.e., $c_i = 0$) is dominant whereas, due to $2\alpha > 1$, efficiency requires full contributions (i.e., $c_i = e$) as in usual (linear) public goods games. Furthermore, the inclination of an efficiency-concerned player to fully contribute does not depend on the existence of the other region since the local returns of the public good suffice in triggering full cooperation. The two regions can be unified by letting $\alpha - \beta$ shrink to 0 (Güth et al., 2008, vary $\alpha - \beta$ systematically). Here we rely on strong in-group/out-group discrepancies by assuming $\alpha - \beta$ to be large. In the experiment we use values of $\beta = 0.3$ and $\alpha = 0.9$.

The main purpose of phase 1 is to implicitly induce strong group affiliations so that X and x consider themselves as an in-group and perceive Y and y as belonging to their out-group and vice versa for Y and y . We thus add to the pure labeling of regions (X and Y) a structural relationship distinguishing in-group agents from out-group agents. Since we do not provide any feedback about phase 1 between phases 1 and 2, any in-group favoring has to stem from labeling, the structural discrepancy $\alpha - \beta$ and possibly the own contribution.

2.1.2. Modified dictator game

The second phase of the experiment is a modified dictator game. X and Y both get an additional monetary endowment $E > 0$ which they can keep entirely or share with x and y who both are not additionally endowed. More specifically, X can choose transfers $x_x, x_y \geq 0$ with $x_x, x_y \leq E/2$; similarly, Y decides on $y_x, y_y \geq 0$ with $y_x, y_y \leq E/2$. While both dictators X and Y are asked to name their transfers to x and y , only one of these two allocations (the choices of dictator X , $T_X = (x_x, x_y)$, or the choices of dictator Y , $T_Y = (y_x, y_y)$), is implemented. The consequences of either allocation on the payoffs of phase 2 which agents earn additionally to what they collected in phase 1 are the following. If $T_X = (x_x, x_y)$ is implemented, X earns $U_X^2 = E - x_x - x_y$ whereas Y earns nothing. Concerning the recipients, x receives $U_x^2 = x_x$ and y the transfer $U_y^2 = x_y$. Similarly, when $T_Y = (y_x, y_y)$ is implemented, the second phase payoffs are $U_Y^2 = E - y_x - y_y$ for Y , $U_X^2 = 0$ for X , $U_x^2 = y_x$, and $U_y^2 = y_y$. In total, the payoffs are, of course, $U_i^1 + U_i^2$ for all the agents $i = X, x, Y, y$.

How is it decided whether the transfers of X or Y are implemented? In the control condition (R) this is simply determined by chance, i.e., either T_X or T_Y are implemented with probability 1/2 each. Moreover, the recipients x and y are not informed whether their received transfer comes from X or Y . In the main condition (M) the transfers are determined by x or y . More specifically, both agents x and y choose whether they prefer to receive the transfer from X or Y , knowing that either their own or the other recipient's decision will actually determine the result. Chance (probability 1/2) decides which recipient's decision will be implemented. In other words, both x and y determine with probability 1/2 each whether T_X or T_Y is implemented. Finally, x and y are informed, whether their own choice or the choice of the other recipient has been implemented and the dictators (X and Y) are aware of that.

What is the rationale for condition M ? In-group favoring and/or out-group discrimination suggests that x prefers T_X over T_Y and that y prefers T_Y over T_X since x (y) expects X (Y) to treat her preferentially. In the control condition R there is no such conscious selection between T_X and T_Y by the recipients x and y and no possibility to trace back the observed offer to one of the two "dictators" (with certainty). Hence, in R the intrinsic generosity of "dictators" X and Y does not interfere with group-specific expectations and beliefs of recipients x and y .

2.1.3. Beliefs

In order to elicit first-order and second-order beliefs each dictator K in the modified dictator game is asked about her first-order belief (namely, how likely – in her view – the recipient κ will choose the IN or the OUT offer (i.e., b_κ^K)), and about her second-order belief (i.e., what she thinks that the partner expects concerning the size of the two transfers (i.e., $b_\kappa^{K^K}$)). The recipient in the modified game will be asked about the size of the IN and OUT transfer (i.e., b_κ^K) and which beliefs of the

Table 1
Experimental treatments in the modified dictator game.

Source	Timing of belief elicitation	Group membership	
		IN	OUT
M	a	M.a.IN	M.a.OUT
	b	M.b.IN	M.b.OUT
R	a	R.a.IN	R.a.OUT
	b	R.b.IN	R.b.OUT

- Source:
 - M: the recipient is informed about the source of the transfer (in-group/out-group).
 - R: the recipient is not informed about the source of the transfer.
- Timing of belief elicitation:
 - a: beliefs are elicited after the choices.
 - b: beliefs are elicited before the choices.
- Group membership:
 - IN: the dictator and the recipient belong to the same group.
 - OUT: the dictator and the recipient belong to distinct groups.

partner concerning her choice she expects (i.e., b_k^{kk}). Beliefs are collected as vectors of probabilities for the alternative choices with b_k measuring the average belief of a player k .

The “correctness” of the first-order beliefs will emerge from the comparison between beliefs and actual actions of the partner. Concerning the second-order beliefs their accuracy will emerge from the comparison between second-order beliefs and first-order beliefs of the partner (e.g., b_k^{kk} vs. b_k^k).⁵ Only dictators’ second-order beliefs and recipients’ first-order beliefs were elicited in an incentive compatible fashion using a quadratic scoring rule (for an example, see Schotter & Sopher, 2007). Recipients’ second-order beliefs (with which probabilities recipients expect the first-order beliefs of dictators) and dictators’ first-order beliefs (how likely dictators expect recipients to choose the in- or out-transfer) were asked for in the post-experimental questionnaire and were not incentivized.⁶

2.1.4. Treatments

Choices of dictators and recipients in the modified dictator game are collected under eight different experimental treatments that result from the combination of three distinct two-level factors. The three factors are group membership, the offer source, and the timing of belief elicitation.

The factor *group membership* captures group affiliation of the counterpart in the experiment. The composition of groups is defined in the regional public goods stage (Section 2.1.1). In the *IN* condition the dictator and the recipient belong to the same group. In the *OUT* condition the dictator and the recipient belong to distinct groups.

The *offer source* captures the information about the source of the offer that is provided to the recipient. In the control condition (*R*) the recipient is not informed whether the transfer received comes from an in-group offer or from an out-group offer. In the alternative condition (*M*) the recipient knows whether the offer has been made by an in-group member or by an out-group fellow (see Section 2.1.2 for more details).

Belief elicitation refers to the temporal sequence of choices and beliefs. In condition *a* beliefs are elicited after the choices, while in condition *b* beliefs are elicited before the choices to control for potential interactions between belief elicitation and choices in the game. Previous contributions have shown that eliciting beliefs before actions may affect subsequent actions in a public goods game (Croson, 2000).⁷ We want to explore whether asking for behavioral expectations before choices are made induces more equilibrium play. This may seem reasonable in a “guilt” context where beliefs play an important role. Our manipulation can be seen as a robustness check with respect to the timing of choices and beliefs.

Table 1 provides a summary of the labels employed to identify the distinct experimental treatments. When analyzing the experimental outcomes in Section 3 the following convention is adopted: when data are pooled irrespectively of a factor, then this factor is dropped from the name of the treatment. As an example, *M.IN* represents the data set obtained from pooling the data obtained in treatments *M.a.IN* and *M.b.IN*.

2.1.5. Manipulation check

We checked the effectiveness of inducing group identity in the post-experimental questionnaire. Participants were asked to give several evaluative ratings (on a scale of 1 (not at all) to 7 (very much) of in- and out-group member(s)). Participants

⁵ See Appendix A for a detailed explanation of the procedure employed.

⁶ Belief elicitation requires quite some additional instructions, especially when incentivizing belief statements (see the translated instructions in Appendix B) and even more so when allowing beliefs to be probabilistic. The fact that we experimentally enforce belief statements of course does not mean that participants naturally form such beliefs and are guided by them.

⁷ Another study, Gächter and Renner (2006), asks for beliefs and choices simultaneously. Beliefs and choices appear highly correlated. Contributions do not decay much over time and are significantly higher than in a treatment without beliefs.

were asked, both for the in-group and the out-group counterpart, how much they liked the other, how honest, cooperative and valuable the other was, and whether they identified with the other.

When these items are taken together,⁸ the average evaluation of the in-group partner is 3.812 and that of the out-group partner is 3.592. According to a non-parametric test the two distributions are statistically different (two-sided Wilcoxon signed rank test, p -value = 0.015). The discriminatory pattern captured by the post-experimental questionnaire suggests that the experimental design was effective in inducing alternative representations of the counterpart in association to their group affiliation.

2.2. Research hypotheses

Similarly to what happens in the original dictator game, standard goal-oriented economic reasoning leads to no transfers in our modified dictator game. In particular, group affiliation of the recipient should not matter when dictators maximize their own profit. However, the social psychology literature reports strong discrimination in transfers across group boundaries. Our first hypothesis originates from this evidence.

Hypothesis 1 (In-Group Bias). In the main treatment (M), dictator participants offer more to the in-group than to the out-group recipient and recipients choose more often the in-group than the out-group offer.

We distinguish between two behavioral explanations of **Hypothesis 1**. The higher in-group offer may be mere *in-group favoring* due to the group status (one gives more, when the recipient is an in-group and not an out-group participant). Recipients may correctly anticipate this and hence choose the offer of the in-group fellow.

The other hand, the higher in-group offer may be motivated by *guilt-aversion*. If dictators think that recipients expect more from an in-group than from an out-group dictator, then a guilt-averse dictator will offer more to the in-group than to the out-group recipient in order to equalize the feeling of guilt across recipients. In turn, recipients will anticipate this and choose the in-group offer. Eliciting beliefs and varying their impact on guilt feelings via treatments M and R allows us to assess the relevance of expectations-based motivation for transfers within and across groups. However, in order to univocally discriminate between the two distinct behavioral determinants under investigation we need to implement a control treatment (R).

In condition R the dictators are asked to state their conditional transfers like in the main treatment. In contrast to condition M only 1/2 of the dictators become relevant players in the game. The offers made by the relevant dictators are transferred to the matched recipients, but these are not told, whether the transfer comes from an in-group fellow or from an out-group fellow. For the sake of simplicity assume to have only two groups, $\{X, x\}$ and $\{Y, y\}$. Assume that the relevant dictator is X . The payoffs of the participants in the two groups will then be defined as follows, $\{U_x = x_x, U_y = x_y, U_x = E - x_x - y_y, U_y = 0\}$. It is important to stress that in this setting, differently from what happens in the main treatment, players x and y do not know with certainty whether the offer was made by X or by Y (i.e., whether the transfer comes from within the group or from outside the group). Moreover, the dictators (X or Y) are aware of this. X knows the group status of x (they are in-group) and y (they are out-group), but also knows that x and y are unaware whose offer is implemented. Now an intrinsically motivated but nonetheless discriminating dictator would not change her behavior between condition R and M what suggests the following research hypothesis.

Hypothesis 2 (Group Affiliation). IN/OUT transfers in R will roughly correspond to IN/OUT transfers in M .

If **Hypothesis 2** is rejected we postulate that in-group favoring is moderated by guilt-aversion. In R the recipient can either be matched with an in-group or with an out-group dictator. Moreover, the type of the matched dictator is never disclosed. It follows that the expected payoff of a recipient x in condition R is $\hat{b}_x = \frac{1}{2}E[x_x] + \frac{1}{2}E[y_x]$. For $E[x_x] > E[y_x]$ we have that $\hat{b}_x < b_x^X = E[x_x]$ and $\hat{b}_x > b_x^Y = E[y_x]$. Thus, such expectations of the recipients in condition R may induce a guilt-averse dictator to balance what she gives to the in-group and out-group recipient. She would suffer when disappointing what is expected from her. Recipients aware of dictators' guilt-aversion may anticipate that the transfer sent to the two matched recipients will be equal to \hat{b}_x , then assuming such guilt-driven preferences of the dictators can induce the first-order beliefs of the recipients and the second-order beliefs of the dictators to converge (i.e., $\hat{b}_x \rightarrow b_x$).

Hypothesis 3 (Guilt-Aversion). Transfers in R will roughly correspond to the average of in-group and out-group transfers in M . In R , second-order beliefs of dictators will not significantly differ for the in-group and out-group transfers.

2.3. Participants and procedures

The experiment took place at the laboratory of the Max Planck Institute of Economics in Jena, Germany. Participants (128) were recruited among students from various disciplines at the University of Jena. In each session gender composition was approximately balanced and participants took part only in one session. Participants were recruited using the ORSEE software

⁸ The Cronbach's reliability coefficient alpha is equal to 0.866 for the in-group evaluations and equal to 0.850 for the out-group evaluations. This suggests that the items under investigation measure a single latent dimension. Given this, the 5 items are pooled in the analysis here reported.

(Greiner, 2004). The experiment was programmed and conducted with the software z-tree (Fischbacher, 2007) and took, on average, 80 min. The average earnings in the experiment have been €13.56. The show-up fee for the experiment amounted to €2.5.

At their arrival at the laboratory participants were randomly assigned to one of the computer terminals. Each computer terminal is in a cubicle that does not allow communication or visual interaction among the participants. Participants were given time to read the instructions and to privately ask for clarifications. Participants had to pass several control questions before each phase of the experiment to make sure that they understood the instructions properly. After the experiment participants were paid in cash according to their performance. Privacy was warranted during the payment phase.

3. Results

For the sake of clarity, the analysis is mainly conducted by pooling observations irrespectively of the timing of beliefs elicitation. Differences associated to the two modes of elicitation are discussed separately. The analysis of the results is structured as follows. First, choices of dictators and recipients in the modified Dictator Game are considered. Second, an assessment of beliefs in the game is provided. Third, a check of the consistency between choices and beliefs is presented. Fourth, outcomes of the robustness check provided by the timing of beliefs elicitation are discussed. Fifth, a regression analysis identifies the factors affecting choices and beliefs of the participants.

3.1. Choices in the Dictator Game

3.1.1. Dictators

Table 2 reports some descriptive statistics of the behavior of dictators in the game. This is complemented by Fig. 1 illustrating the distributions of choices (boxplots) together with individual observations (square dots) and distributional means (cross dots).

Table 2 shows that the average amount transferred to the in-group members is higher than that sent to the out-group members in the *M* treatment. The average IN/OUT discrepancy is equal to 1.469 and it is significantly different than zero (Wilcoxon signed rank test, henceforth WSRT, p -value = 0.016).

The average IN/OUT spread is equal to 0.407 in the *R* treatment. The difference between the transfer to in-group and out-group fellows is weakly significant (WSRT, p -value = 0.065).

From what is reported above it emerges that group discrimination is observed both in the *M* and in the *R* treatment, though only marginally significant in *R*. However, does the magnitude of discrimination differ across these two conditions? When comparing the IN/OUT differentials in the two conditions we see that the difference in discrimination is not statistically significant (M.IN-M.OUT vs. R.IN-R.OUT, Wilcoxon rank sum test, henceforth WRT, p -value = 0.378).

At the individual level, in the *M* treatment 28.125% of the participants chose to send more to their in-group fellows than to members of the other group. In the *R* treatment 21.875% of the participants pursued the same behavior. 68.750% and 75.000% chose to send the same amount to the IN/OUT recipients of the *M* and *R* treatments, respectively.

It can be argued that the higher discrimination in the *M* than in the *R* condition is mainly due to the differential in the transfer sent by a considerable minority in the sample than to the different number of participants pursuing discrimination in the two conditions.

A statistically relevant difference is registered across the two conditions in the transfer sent to the in-group fellow, but not in the transfer sent to the out-group fellow (M.IN vs. R.IN and M.OUT vs. R.OUT, WRT, p -value = 0.055 and p -value = 0.601, respectively). Thus, being able to send specific transfers based on group membership raises the transfer sent to the in-group, but does not decrease the transfer sent to the out-group.

Table 2
Descriptive statistics dictators offers.

Treatment	<i>N</i>	Mean	Median	Std. dev.
M.IN	32	4.347	5.000	2.827
M.a.IN	16	3.750	4.000	2.720
M.b.IN	16	4.944	5.000	2.891
M.OUT	32	2.878	3.000	2.246
M.a.OUT	16	2.562	2.000	2.308
M.b.OUT	16	3.194	3.500	2.209
R.IN	32	2.969	2.500	2.559
R.a.IN	16	3.562	4.000	2.920
R.b.IN	16	2.375	2.000	2.061
R.OUT	32	2.562	2.000	2.382
R.a.OUT	16	3.125	3.000	2.754
R.b.OUT	16	2.000	2.000	1.862

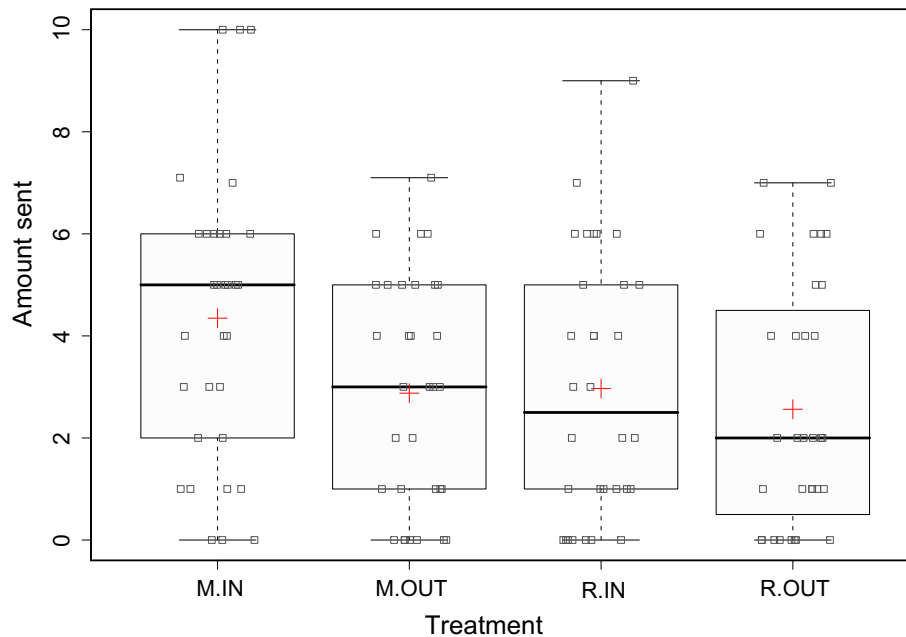


Fig. 1. Dictators' choices.

3.1.2. Recipients

The descriptive analysis of dictators' behavior highlights discrimination along the dimension of group membership. Given this, it pays for recipients to systematically choose offers of members of their own group instead of offers originating from members of the other group. The data show that most recipients (i.e., 75%) choose the in-offer (exact binomial test, p -value = 0.007). Overall, recipients prefer the offer from the in-group member which – ex post – turns out to be the better choice.

3.2. Beliefs in the Dictator Game

Table 3 presents some descriptive statistics about the beliefs of the dictators (upper panel) and the recipients (bottom panel) in the modified dictator game.

3.2.1. Dictators

The upper panel of Table 3 shows that the average dictators' second-order beliefs in the M treatment are higher for the in-group than for the out-group transfers. The difference in beliefs, which is equal to 1.073, is highly statistically significant (WSRT, p -value < 0.001).

In the R treatment, the average IN/OUT spread in second-order beliefs is equal to 0.546. Even in this case, a statistically significant difference is observed (WSRT, p -value = 0.005).

A relevant question here is whether the discriminatory pattern observed in dictators' beliefs is stronger in the M treatment than in the R treatment. When comparing IN/OUT spreads in beliefs across these two experimental conditions, no statistical difference is detected (M.IN-M.OUT vs. R.IN-R.OUT, WRT, p -value = 0.166).

Although their elicitation has not been incentivized, we briefly describe the main tendencies of dictators' first-order beliefs collected in the post-experimental questionnaire. The large majority of the dictators in the M condition (i.e., 78.12%) expects the recipients of their own type to choose the in-group offer. Only about half of the dictators (i.e., 46.87%) believes that the recipients of the other type choose their in-group offer. An explanation could be a possible confidence bias as participants may think that also the other type is going to choose them, despite being out-group. It may also simply have been a difficulty with the specific wording of this question with respect to the "other type reference".

3.2.2. Recipients

The bottom panel of Table 3 reports some descriptive statistics about the first-order beliefs of the recipients. Like for second-order beliefs of the dictators, beliefs associated to the in-group transfer are higher than those associated with the out-group transfer. In the M treatment, the average IN/OUT spread is equal to 0.749 and is significantly different than zero (WSRT, p -value < 0.001).

In the R condition, the average IN/OUT spread is smaller than in the M treatment (i.e., 0.312) but, still, statistically significant (WSRT, p -value = 0.016). As for the dictators, the discriminatory pattern observed in beliefs is not statistically stronger in the M treatment than in the R treatment (WSRT, p -value = 0.172). A marginally significant difference is registered when

Table 3
Descriptive statistics beliefs.

Treatment	N	Mean	Median	Std. dev.
<i>Dictators (second-order)</i>				
M.IN	32	4.369	4.600	2.204
M.a.IN	16	4.181	4.200	2.374
M.b.IN	16	4.556	4.800	2.081
M.OUT	32	3.296	3.550	1.624
M.a.OUT	16	3.454	3.800	1.976
M.b.OUT	16	3.138	3.250	1.222
R.IN	32	3.429	3.200	1.934
R.a.IN	16	3.895	4.000	1.904
R.b.IN	16	2.962	2.000	1.908
R.OUT	32	2.883	2.300	1.658
R.a.OUT	16	3.141	3.050	1.668
R.b.OUT	16	2.625	2.000	1.660
<i>Recipients (first-order)</i>				
M.IN	32	3.676	3.900	1.550
M.a.IN	16	3.564	3.900	1.612
M.b.IN	16	3.789	3.900	1.529
M.OUT	32	2.927	2.650	1.343
M.a.OUT	16	2.932	2.950	1.450
M.b.OUT	16	2.921	2.550	1.274
R.IN	32	2.922	2.800	1.611
R.a.IN	16	2.770	2.350	1.671
R.b.IN	16	3.075	3.100	1.588
R.OUT	32	2.610	2.700	1.297
R.a.OUT	16	2.208	2.000	1.063
R.b.OUT	16	3.012	3.100	1.415

comparing condition *M.IN* and condition *R.IN*, only (two-sided Wilcoxon rank sum test, p -value = 0.072). Recipients expect more from the in-group dictator when the source of the transfer is known.

Second-order beliefs of the recipients were also collected in the non-incentivized post-experimental questionnaire. In accordance to the beliefs of the dictators, the large majority of the recipients in the *M* condition (i.e., 83.87%) maintains the belief that the dictators of their same type expect them to choose the in-group offer. Only about half of the recipients (i.e., 41.66%) believe that the dictators of the other type expect them to choose the in-group offer. Again, the caveat mentioned when discussing the non-incentivized first-order beliefs applies as the wording of this question was potentially misleading.

3.3. Beliefs and choices

In Fig. 2 average beliefs of the two parties in the game are juxtaposed with average actual choices of the dictators.

A measure of the correctness of dictators' beliefs can be obtained by comparing the first column from the left with the second column in each treatment. A measure of the correctness of recipients' beliefs is gathered from a comparison between the second column and the last column from the left in each treatment. Concerning the former, none of the comparisons is statistically different (WRT, all p -values ≥ 0.252). Similarly, the comparisons between the dictators' transfer and the transfer expected by the recipients do not produce any statistically significant difference (WRT, all p -values ≥ 0.20). Thus, both the beliefs of the dictators and those of the recipients are overall correct.

Fig. 2 also provides information about correlation between beliefs and actions of the dictators (first column and last column in each treatment). A series of WSRT does not find any significant difference between beliefs and actions of the dictators (all p -values ≥ 0.104).

The majority of the recipients (i.e., 75%) chooses the in-group offer in the *M* condition. To understand why, we compare the IN/OUT spread in beliefs of recipients choosing the in-group offer to the IN/OUT spread of those choosing the out-group offer. On average, the differential between in-group and out-group beliefs is equal to 0.941 for the former and to 0.175 for the latter. A marginal statistical significance between the two distributions is registered by a non-parametric test (WRT, p -value = 0.062). Thus, recipients choosing the in-group offer have higher expectations about the in-group premium.

3.4. Robustness check

As a robustness check, two alternative timings for beliefs elicitation were considered in the experiment. Beliefs were elicited either before (b) or after (a) choices. In this section, main differences between the two conditions are presented.

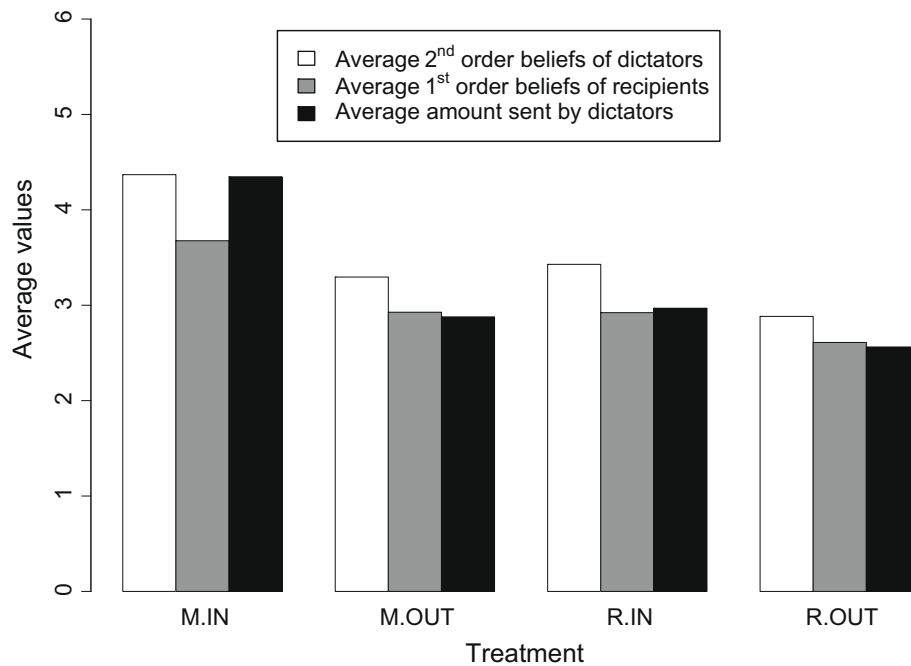


Fig. 2. Beliefs and choices.

Concerning dictators' choices (see Table 2), no statistically significant differences are registered between the two conditions (WRT, all p -values ≥ 0.209).

The average IN/OUT spread in dictators' choices is significantly different than zero only in the *M.b* and in the *R.b* treatments (WSRT, p -value = 0.089 and p -value = 0.095, respectively).

Focusing on recipients' choices, the majority of recipients chooses the offer of the in-group dictators both in the *M.a* and in the *M.b* treatment (62.500% and 87.500%, respectively). Exact binomial tests show that the two distributions of choices do not statistically differ.

The distributions of dictators' second-order beliefs (see Table 3) do not statistically differ across the two conditions, both for the *M* and for the *R* treatments (Wilcoxon rank sum test, all p -values ≥ 0.180).

The average IN/OUT spread in dictators' beliefs is equal to 0.727 in the *M.a* treatment and to 1.418 in the *M.b* treatment. Non-parametric tests show that both these differences are statistically significant at the conventional significance levels (WSRT, p -value = 0.035 and p -value = 0.004, respectively). The average IN/OUT spread is equal to 0.754 in *R.a* and equal to 0.337 in *R.b*. Only the former, however, is statistically significant at the conventional significance levels (WSRT, p -value = 0.019 and p -value = 0.115, respectively).

When replicating the same analysis for the recipients' first-order beliefs (see Table 3), a statistically significant difference is observed only when comparing *R.b.OUT* and *R.a.OUT* (WSRT, p -value = 0.045).

The average IN/OUT spread is equal to 0.632 in the *M.a* treatment and to 0.868 in the *M.b* treatment. Non-parametric tests confirm that these differences are statistically significant at the conventional levels (two-sided Wilcoxon signed rank test, p -value = 0.022 and p -value = 0.006, respectively). The average IN/OUT spread in *R.a* is equal to 0.562, while it is equal to 0.063 in *R.b*. Non-parametric tests show that, similarly to what happens for the dictators, only the former difference is statistically significant at the conventional levels (WSRT, p -value = 0.022 and p -value = 0.272, respectively).

To conclude the analysis of the robustness check, we investigate the correspondence between beliefs of the players and choices. The distribution of dictators' beliefs and recipients' beliefs weakly differs in statistical terms only in treatment *R.a.IN* (WRT, p -value = 0.092). The comparison between beliefs of the recipients and actions of the dictators highlights a (marginally) significant statistical difference only in treatment *R.b.OUT* (WRT, p -value = 0.058). Finally, the distributions of second-order beliefs and choices of the dictators statistically differ only in treatment *M.a.OUT* (WSRT, p -value = 0.019).

Overall, the robustness check shows that eliciting beliefs before choices tends to produce choices and beliefs which are more in line with hypothesis 3. A potential interpretation of this pattern is given in Section 4 and some directions for future research are identified.

3.5. Regression analysis

We estimate two distinct regression models, one for the second-order beliefs of the dictator (*avg.SOB*), and one for the transfer sent by the dictator (*offer*). For both dependent variables, the generic model $y_{it} = \beta \mathbf{X}_{it} + v_{it}$ is estimated, where v_{it} is the composite error given by the sum of the individual unobserved effect c_i and of the error component u_{it} . The presence

Table 4
Dictators' beliefs (random-effects Tobit regression).

Regressor	Avg. SOB Coeff. (std. err.)
<i>in.group</i>	0.546 (0.284)*
<i>before.beliefs</i>	−0.188 (0.431)
<i>known.source</i>	0.474 (0.463)
<i>Female</i>	0.317 (0.433)
<i>Age</i>	0.081 (0.074)
<i>in.group</i> × <i>known.source</i>	0.527 (0.401)
<i>cons</i>	0.969 (1.852)
Obs (groups)	128 (64)
Wald $\chi^2(6)$	22.89***

*** 1% Significance level.

** 5% Significance level.

* 10% Significance level.

Table 5
Dictators' choices (random-effects Tobit regression).

Regressor	Offer	
	(1) Coeff. (std. err.)	(2) Coeff. (std. err.)
<i>avg.SOB</i>	1.250 (0.105)***	
<i>in.group</i>	0.058 (0.234)	1.135 (0.363)***
<i>Age</i>	−0.013 (0.082)	0.095 (0.114)
<i>Female</i>	−0.513 (0.498)	−0.219 (0.709)
<i>contr.PGG</i>	0.029 (0.081)	0.141 (0.113)
<i>cons</i>	−1.099 (1.973)	−0.648 (2.815)
Obs (groups)	128 (64)	128 (64)
Wald $\chi^2(5)$	168.03***	12.59**

*** 1% Significance level.

** 5% Significance level.

* 10% Significance level.

of the subscript t in the model is due to the fact that participants make repeated choices, i.e. one for each of the two group membership conditions. The sets of explanatory variables \mathbf{X} differ in the two models.

Concerning second-order beliefs of the dictator, the following explanatory variables are taken into account: *in.group*, equal to 1 when the offer is made to an in-group recipient and equal to 0 when the offer is made to an out-group recipient; *before.beliefs*, equal to 1 when beliefs are elicited before the related actions and equal to 0 when the beliefs are elicited after the related actions; *known.source*, equal to 1 when data are collected in the experimental condition M and equal to 0 when data are collected in the experimental condition R ; gender (i.e., *female*) and *age* of the dictator. In addition to these variables an interaction term between *in.group* and *source* is considered.

The set of explanatory variables for the transfer sent by the dictator also contains the variables *in.group*, *female*, and *age*. In addition, it contains the variables *avg.SOB* and the variable *contr.PGG*.⁹ The latter measures the contribution of the dictator in the independent public goods game, and provides us with a proxy for other-regarding attitudes of the decision maker.

Tables 4 and 5 present the outcome of a random-effects Tobit regression for the second-order beliefs of the dictator and for the transfer sent by the dictator, respectively.¹⁰

Table 4 shows that only *in.group* has a marginally significant impact on the average second-order beliefs of the dictator (coeff. = 0.546, p -value = 0.055). Thus, beliefs about expectations of an in-group counterpart are higher than beliefs about expectations of an out-group counterpart. Moreover, experimental conditions (M or R) do not significantly affect the beliefs of the dictators.

Column (1) in Table 5 shows that only *avg.SOB* has a statistically significant impact on choices made by the dictators (coeff. = 1.250, p -value < 0.001). Interestingly, *in.group* does not have a statistically relevant impact on choices (coeff. = 0.058, p -value = 0.804). Column (2) shows that, when not controlling for beliefs, the dummy variable measuring in-group

⁹ The simultaneous presence of *avg.SOB* as dependent and independent variable in the two models produces a recursive system of equations. In the presence of correlation between the error component of the two models, an instrumental variable approach should be adopted to avoid a biased estimation of the model containing *avg.SOB* as an explanatory variable (Baltagi, 1998). To control for potential endogeneity of *avg.SOB*, we performed an instrumental variable Tobit regression of the recursive model. However, a Wald test did not reject the hypothesis of exogeneity of *avg.SOB* (p -value = 0.747). Therefore, we estimated the two models separately.

¹⁰ In Table 5, following the advice of an anonymous referee, we also present an estimation omitting second-order beliefs from the set of regressors.

membership captures, at least in part, the effects that in the fully specified model are due to second-order beliefs. This may be interpreted as further evidence for the crucial role played by beliefs in mediating dictators' preferences.

The regression analysis shows that second-order beliefs of the dictator are raised by the fact that the recipient is an in-group fellow. At the same time, second-order beliefs positively affect the transfer of dictator. This suggests that beliefs play an important role in shaping the amount transferred by the dictator. However, contrary to what would be expected in the presence of guilt-driven motivations (see [Hypothesis 3](#)), beliefs are not significantly affected by the interaction between knowledge about the source of the offer and group membership.

4. Discussion and conclusions

Discrimination by dictators is observed both in the *M* and in the *R* conditions. However, the tendency to favor an in-group over an out-group fellow is more pronounced when in the former condition than in the latter. This discrimination pattern is also reflected by the (first-order) beliefs of recipients, who in general expect more from in-group than from out-group dictators. Expectations for the in-group transfer are slightly higher in condition *M* than in condition *R*. Moreover, dictators seem to correctly anticipate the beliefs of recipients and determine their transfers closely related to their second-order beliefs as required by the consistency requirement of psychological game theory.

The discrimination pattern emerging both from the descriptive part of the analysis and from the model estimation is in line with [Hypothesis 1](#). Group boundaries matter for dictator's generosity which confirms previous experimental findings for allocation tasks within and between artificially induced groups. To better understand what actually explains discrimination at the group level, [Hypotheses 2 and 3](#) try to disentangle group-mediated other-regarding concerns from guilt-aversion. The differential in choices and beliefs across group boundaries observed in condition *R* shows that discrimination is not purely driven by beliefs as postulated by guilt-aversion. Like [de Cremer et al. \(2008\)](#), who measured participants' expectations after they had made their decision, we did not find evidence for purely expectations-based motivation.

However, from a methodological point of view it is interesting that eliciting beliefs before choice generates behavior more in line with [Hypothesis 3](#) than when eliciting the same beliefs after the choice. Eliciting action beliefs before choices in a strategic interaction setting should foster best reply-behavior and thereby strategic considerations (see, for instance, [Croson, 2000](#)). Since in our setting interaction is social and not strategic, earlier belief elicitation might be viewed as a best case-scenario for guilt-aversion by alerting dictator participants to wonder what recipients expect to get and whether to disappoint them. In this sense it seems that the timing of belief and choice elicitation can imply important effects.

How are guilt-aversion and cognitive limitations in the unfolding of beliefs then connected? In order to assist dictators with the updating process of beliefs, we ran two additional sessions of the *R.b* and *M.b* treatments (32 participants each) informing participants about the respective average first-order beliefs of the recipients (3.789 in *M.b.IN* and 2.921 in *M.b.OUT*, 3.075 in *R.b.IN* and 3.012 in *R.b.OUT*) before they made their choices.¹¹ The manipulation did not produce significant differences across treatments (Wilcoxon rank sum test: *M.b.IN* vs. *R.b.IN*, p -value = 0.432; *M.b.OUT* vs. *R.b.OUT*, p -value = 0.817). Overall, choices were not significantly different from respective beliefs shown to the dictators. The only exception is represented by treatment *R.b.OUT* (WRT, p -value = 0.009). In this treatment the dictators' second-order beliefs were equal to 2.595, the recipients' average belief shown were equal to 3.012 and the average choice were equal to 2.125. A pattern of this kind may signal a tendency to asymmetric belief updating like in [Reuben, Sapienza, and Zingales \(2009\)](#). In treatment *R.b.OUT* five of 16 participants had beliefs/made choices in such an asymmetric fashion.¹²

The group context adds another dimension that potentially complicates the updating of action beliefs. A discrepancy between a dictator's second-order beliefs and the verified first-order beliefs of the recipient may interact with the group status. An in-group recipient who expects more than the dictator believes her to expect may be more likely forgiven or acquiesced, while an out-group recipient who expects too much may cause a negative reaction and the actual transfer is reduced. More generally, the additional treatment shows that the updating of beliefs is difficult to manipulate and results in confounding effects.

Appendix A. Belief elicitation

Let's denote recipients by κ and dictators by K . In the experiment both first-order beliefs of the recipients (b_{κ}^K) and second-order beliefs of the dictators (b_K^{κ}) are elicited in an incentive compatible fashion. In more details, the following procedure is applied to reward second-order beliefs of each dictator. Given a set of choice intervals J , the average estimated probability $\hat{p}_{\kappa j}^K$ of the N recipients for each choice interval $j \in J$ is collected

$$\hat{p}_{\kappa j}^K = \frac{1}{n} \sum_{n \in N} p_{\kappa j n}^K$$

¹¹ We are grateful to an anonymous referee for this suggestion.

¹² A total of 3 (3) participants had lower (higher) second-order beliefs than the revealed average expectation of recipients and transferred not more than (at least as much as) this amount. A total of 3 (1) participants had lower (higher) second-order beliefs than the revealed average expectation of recipients and adjusted their transfer slightly upwards (downwards). One participant could not be classified.

Then, the average belief about the transfer to be received by the N recipients (\hat{b}_k^K) is computed as follows:

$$\hat{b}_k^K = \sum_{j \in J} \text{med}(j) \times \hat{p}_{kj}^K$$

Finally, given dictator i 's estimated probability for each choice interval $j \in J$ (p_{kij}^{KK}), the payoff for i is obtained with the following quadratic scoring rule

$$\pi_i = 4 - \frac{2}{10,000} \left(\sum_{j \in J} (p_{kij}^{KK} - S_{kj}) \right)^2$$

where $S_{kj} = 100$ if $j \leq \hat{b}_k^K < \bar{j}$ and $S_{kj} = 0$, otherwise.

As an example, consider the following mutually exclusive choice intervals: $j_1 = [0, 3)$, $j_2 = [3, 5)$, $j_3 = [5, 7)$, and $j_4 = [7, 10]$. If $\hat{b}_k^K = 4$, the average guess of the recipients falls in the interval j_2 . If a dictator assigns full probability to this interval she earns the maximum amount in the beliefs stage (i.e., ECU 4). However, if she assigns only 50% probability to the interval j_2 and the remaining 50% to another interval (e.g., j_3) her earnings in ECU will be equal to $4 - \frac{2}{10,000} ((50 - 100)^2 + (50 - 0)^2) = 3$. If the dictator assigns full probability to an interval different than j_2 her earnings in the task are equal to 0.

Concerning the recipients, the same quadratic scoring rule is applied to their first-order beliefs but the average transfer believed by the N recipients (\hat{b}_k^K) is replaced by the average transfer actually sent by the dictators.

Appendix B. Experimental instructions

Welcome and thanks for participating in this experiment.

Please read the following instructions carefully. From now on any communication with other participants is forbidden. If you have any questions or concerns, please raise your hand. We will answer your questions individually. It is very important that you follow this rule, otherwise we will exclude you from the experiment and from all payments.

The experiment allows you to earn money. Your experimental income will be calculated in ECU (Experimental Currency Unit), where 1 ECU = €0.50. At the end of the experiment, the ECU-income you have earned will be converted to Euro and paid to you in cash. You receive a show-up fee of €2.50.

B.1. Instructions

In this experiment, you are randomly matched with three other persons, whose identity will not be revealed to you at any time. Two of you will be of type X and two of you of type Y.

Each participant – regardless of his/her type – receives an endowment of 10 ECU, and will face *only once* the following choice situation:

- X-types must decide *how many ECU they want to contribute to project X*.
- Y-types must decide *how many ECU they want to contribute to project Y*.

Whatever is not contributed is kept for oneself. The sum of all contributions to X is called X-amount. The sum of all contributions to Y is called Y-amount.

Your earnings are the sum of

1. the “ECU you keep”: 10 ECU – your contribution,
2. your “income from the projects”.

Your “**income from the projects**” is determined as follows:

Income from the projects for X-types	<table style="border-collapse: collapse; margin: 0 auto;"> <tr> <td style="padding-right: 10px;">0.9</td> <td>[X-amount]</td> </tr> <tr> <td style="padding: 0 10px;">+</td> <td></td> </tr> <tr> <td style="padding-right: 10px;">0.3</td> <td>[Y-amount]</td> </tr> </table>	0.9	[X-amount]	+		0.3	[Y-amount]
0.9	[X-amount]						
+							
0.3	[Y-amount]						
Income from the projects for Y-types	<table style="border-collapse: collapse; margin: 0 auto;"> <tr> <td style="padding-right: 10px;">0.3</td> <td>[X-amount]</td> </tr> <tr> <td style="padding: 0 10px;">+</td> <td></td> </tr> <tr> <td style="padding-right: 10px;">0.9</td> <td>[Y-amount]</td> </tr> </table>	0.3	[X-amount]	+		0.9	[Y-amount]
0.3	[X-amount]						
+							
0.9	[Y-amount]						

Note that the contribution by an X-type increases only the X-amount. Likewise, the contribution by a Y-type increases only the Y-amount. If you are a participant of type X and contribute, for instance, 1 ECU, this increases the X-amount by 1 ECU and leaves the Y-amount unchanged. As a consequence, your income as well as the income of the other X-type

increases by 0.9 ECU, and the income of the two Y-types increases by 0.3 ECU. The same applies to contributions of Y-types.

Each ECU that you keep yields money for YOU ALONE. The others do not receive anything for the ECU that you keep. You will receive information about the number of ECU contributed by the others and your earnings at the end of today's session.

Before the experiment starts, you will have to answer some control questions to verify your understanding of the experiment. Please remain quiet until the experiment starts and switch off your mobile phone. If you have any questions, please raise your hand now.

B.2. Instructions for phase II

B.2.1. Roles

The experiment will end after this stage. Your total earnings in the experiment are given by your earnings in the previous interaction (phase I) and in the interaction you are going to face now (phase II).

During phase II you will again interact with the three other participants of the previous phase (one of the same type, two of the other type). Additionally, you are randomly assigned one of two roles. You will either be a Subject A or a Subject B. You will be told your type before the beginning of the interaction. Each Subject A receives an endowment of 20 ECU at the beginning of the interaction. Subjects B do not receive anything.

B.2.2. Choices of Subject A

Each Subject A has to decide how much money to send to the Subject B of the same type and how much to send to the Subject B of the other type. Each of the two transfers to the Subject B's must be between 0 and 10 (extremes included). Subject A keeps the rest for herself, respectively (In case Subject A sends both 10 ECU, she will not have any earnings from this phase).

B.2.3. Choices of Subject B (in the case of M conditions)

Each Subject B can choose, whether to implement the transfers made by a Subject A belonging to her same group or by a Subject A belonging to the other group. Only one of the transfers will be realized.

B.2.4. Choices of Subject B (in the case of R conditions)

Subjects B do not have any choice in this phase. They are also not informed about the origin of the transfer.

B.2.5. Payoffs from choices (in the case of M conditions)

With probability 1/2 either the Subject B of the X-type or the Subject B of the Y-type will be selected. The decision of the selected Subject B (transfer of same type/other type Subject A) will then be implemented. In case the choice of a Subject B gets realized, the selected Subject A becomes active, his/her transfers will be executed and the respective amounts are transferred to the two Subjects B. Similarly, if the choice of the other Subject B becomes effective, the transfers are defined according to the choices of the Subject A chosen by the other Subject B. This implies that both Subjects B receive transfers only from one Subject A, the one who got activated. This activated participant A receives the rest (20 ECU minus the transfers). The non-activated Subject A does not receive anything in this phase.

B.2.6. Payoffs from Choices (in the case of R conditions)

With probability 1/2 either the Subject B of the X-type or the Subject B of the Y-type will be selected. Which Subject A has been selected is not known to the Subjects B. The decision of the randomly selected Subject A will then be implemented. His/her transfers will be executed and the respective amounts are transferred to the two Subjects B. This means both Subjects B receive transfers only from one Subject A, the one who got activated. Subjects B only receive the transfer. They do not know, whether it originated from a Subject A of the X-type or the Y-type. The activated participant A receives the rest (20 ECU minus the transfers). The non-activated Subject A does not receive anything in this phase.

B.2.7. Beliefs

Besides choosing your actions you will be asked to provide some estimations about the actions of other subjects. You will also be asked to provide estimations of the other subjects' expectations with respect to your actions. You can earn money with these estimations. The closer you are to the real value, the more you earn.

B.2.8. Beliefs of Subject B

As a Subject B in the interaction you are asked to state the belief about potential transfers of Subject A. This means one estimation for the transfer of Subject A of the same type and one estimation for the transfer of Subject A of the other type. You can distribute your estimation on intervals. Estimated probabilities must be between 0 and 100 and the sum of estimated probabilities for each of the two questions must be equal to 100.

B.2.9. Beliefs of Subject A

As a Subject A in the interaction you are asked to state the belief about the expectation of Subject B with respect to the transfer of Subject A. This means one estimation for the expectation of Subject B of the same type and one estimation for the

expectation of Subject B of the other type. You can distribute your estimation on intervals. Estimated probabilities must be between 0 and 100 and the sum of estimated probabilities for each of the two questions must be equal to 100.

B.2.10. Payoffs from beliefs

The earnings in the beliefs stage are defined, for both roles (Subjects A as well as Subjects B), according to how close the stated beliefs are to the actual choices observed. The closer the belief to the actual behavior, the higher the earning in the stage. The maximum earning (when all real values are in the intervals you have chosen) is 4 ECU. Actual choices are defined by considering all the subjects. This means your estimation of the potential transfer of a Subject A of your type will be compared to the average offer of all Subjects A to a Subject B of the same type. It is optimal for you to provide your actual expectations. You will be told (on request after the experiment) how exactly your earnings from the estimations are calculated.

Once again before the experiment starts, you will have to answer some control questions to verify your understanding of this phase of the experiment. Please remain quiet until the experiment starts. If you have any questions, please raise your hand now.

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