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Determinants of In-group Bias:
Group Affiliation or Guilt-aversion?

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Abstract

In-group favoritism in social dilemma situations is one of the main findings of studies in Social Identity Theory. We investigate what causes the in-group bias: is it due to mere group affiliation or, alternatively, is guilt-aversion a possible explanation? We induce group membership in a minimal group setting, observe in-/out-group transfers and elicit respective beliefs. We find that mere group affiliation affects beliefs and explains a substantial part of the bias, but we also find evidence in favor of guilt-aversion as a source of motivation.

JEL classifications: C72, D01, C91, C92, D84

Keywords: social preferences, experiments, social dilemma, group identity, guilt aversion

1 Intro

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 of Tajfel and Turner (1986) proposes that one result of the group context is 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 become the focus of some experiments in economics, both in the laboratory and in the field (See Charness *et al.* (2007) and Ruffle and Sosis (2006) as respective examples). The findings of in-group favoritism in social dilemma situations are thus 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 a combination of mere labeling and of sharing of a "common fate". [3] After groups have been formed our experimental setting (a dictator

[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 is enough to induce a more favorable behavior towards the in-group participants.

[2] The Social Identity Theory literature makes a clear distinction between an identity and an instrumental function of in-group bias (Scheepers et al. 2006). While this distinguishes between in-group bias on symbolic measures (identity approach) and material in-group bias for instrumental motives, the literature on a further decomposition of the instrumental motives is sparse and not consistent in its results. De Cremer et al. (2008) find that the effect of in-group favoritism is caused by mere group identity. In contrast, Kiyonari and Yamagishi (1999) show evidence that in-group favoritism is based on the expectation of reciprocal preferential treatment.

[3] The former aspect is the key element of group discrimination in the Minimal Group Paradigm tradition and is implemented here via membership to differently labeled groups (i.e., X or Y). Concerning the latter, previous contributions in the psychological literature show that sharing an outcome that is heavily affected by the behavior of in-group subjects, and only marginally so by the behavior of out-group subjects, is likely to strengthen the in-group bias (see, for instance, Gaertner *et al.*, 1999). The procedure employed here follows Güth *et al.* (forthcoming) 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.

game variant) lets subjects 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 receivers can choose whether they prefer the transfer of the in-group or out-group member and (since by chance only one is realized) they will be informed which dictator (in-group or out-group member) sent the money. In a second treatment we eliminate receivers' knowledge about 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 receivers do not know whether the transfer comes from within the group or not.

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

If varying the knowledge about the common group identity does however have an effect on in-group favoritism, then an alternative underlying motivation could play a role. Behavior of subjects could rather be expectations-based. With full knowledge about the common group identity, dictators expect receivers 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 receivers 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.

We relate this possible underlying process to *guilt-aversion* as, for instance, discussed by Charness and Dufwenberg (2006).[4] Taking the raised expectations of the in-group receiver under full knowledge of the common group identity into account, a certain dictator will give somewhat generously. He does this in order to avoid the guilt he would experience, if he had disappointed the expectations of

[4]Their guilt-aversion is one of several versions in the spirit of psychological games introduced by Geanakoplos *et al.* (1989).

the receiver. In contrast, this same dictator would not give so generously to her in-group fellow, who 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 receiver believes to get is lower. We elicit first-order and second-order beliefs of subjects in our experiment in order to relate the data to *guilt-aversion*. This helps us improve our understanding of the actual underlying motives.

In this respect, our work relates to the recent work of Dufwenberg *et al.* (2006) about the impact of framing on beliefs. In the absence of sorting, like in our experiment, the underlying features of alternative groups are the same and group affiliation represents a mere social framing. Through years a lot of attention has been paid to framing effects (as an example see, Tversky and Kahneman, 1986) but there is still no concluding evidence about the interplay between frames, beliefs, and actions.

In contrast to the existing literature our experiment uses a design that elicits expectations in an incentivized manner and clearly distinguishes between two motivational factors (group affiliation and guilt aversion). The results of our study - in-group favoritism partly disappears when we eliminate the recipients' knowledge of the senders' identity - contribute to the further development of Social Identity Theory and connect the underlying process to an expectations-based model.

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

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 **X** and
- Y and y live in the neighboring region **Y**

Subjects 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 **X**-public good is then produced in amount $c_X + c_x$ and the **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.*, forthcoming, 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 $\beta = .3$ and $\alpha = .9$.

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 amounts $x_x, x_y \geq 0$ 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 amount $U_y^2 = x_y$. 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 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 amount comes from X or Y. In the main condition (M) the transfers are determined according to the choice of 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 can determine with probability 1/2 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. This would mean that x expects X to treat her preferentially, whereas y thinks that Y will be more generous to him than to x. What the control condition R excludes is such conscious selection between T_X and T_Y by the recipients x and y. There is no possibility to trace back the observed offer to one of the two "dictators" (with certainty). Hence, in R the "dictators" X and Y can rely on their own intrinsic inclination of generosity towards x and y without having to consider any expectations and beliefs of recipients regarding their generosity and how this relates to group affiliation.

2.1.3 Beliefs

We are going to elicit choices and beliefs of the two players. More specifically, first-order and second-order beliefs of the players will be collected. Each dictator K in the modified dictator game will be 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_K^κ)), and about her second-order belief (i.e., what she thinks that the partner expects concerning the size of the two transfers (i.e., $b_K^{\kappa K}$)). The recipient in the modified game will be asked about the size of the IN and OUT transfer (i.e., b_κ^K) and about the beliefs of the partner about her choice (i.e., $b_\kappa^{K\kappa}$). 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., $b_K^{\kappa k}$ vs. b_κ^K).[5] Note that we asked only for dictators' second-order beliefs and recipients' first-order beliefs during the experiment in an incentive compatible fashion by using a quadratic scoring

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

rule (for an example, see Schotter and 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 elicited in the post-experimental questionnaire. These guesses were not incentivized.[6]

2.1.4 Treatments

Choices of dictators and recipients in the modified dictator game are collected under 8 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 amount received comes from an in-group offer or from and 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 subject (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 in order 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. Croson

[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.

(2000), for instance, finds that eliciting beliefs about moves of the counterpart produces more equilibrium play in Prisoner's Dilemma-like interactions. We consider such findings, however, insufficient for the general claim that one can induce more strategic behavior by asking for behavioral expectations before letting players decide.

[Table 1 about here]

Table 1 provides a summary of the labels employed to identify the distinct experimental treatments. When analysing 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. Subjects 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 were asked, both for the in-group counterpart and for 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,[7] 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.

[7] 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.

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 maximizing own profit. However, the social psychology literature has evidenced strong discrimination in transfers across group boundaries. Our first hypothesis originates from this evidence.

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

If hypothesis 1 would not be rejected, two distinct behavioral explanations can be identified for the observed other-regarding behavior. On the one hand, the higher in-group offer may be due to *in-group favoring* because of the group status. In other words, the inclination to give more may be higher, when the partner is an in-group fellow than an out-group participant. The recipient may correctly anticipate this and hence choose the offer of the in-group fellow.
On the other hand, the higher in-group offer may be motivated by a subject's *guilt aversion*. Assume the dictator expects that the recipients expect more from an in-group fellow than from an out-group participant. Thus, in order to equalize the feeling of guilt across recipients, a dictator will offer more to the in-group recipient than to the out-group recipient. In turn, the recipient will anticipate this and choose the in-group offer confirming the initial assumption.

The elicitation of beliefs allows us to assess the relevance of expectations-based motivation with respect to transfers 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 subject. 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 subjects 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. An intrinsically discriminating dictator motivated only by other-regarding concerns due to in-group favoritism will not change her behavior between condition R and M. Thus, this information condition 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 need to look for an alternative explanation of the in-group bias. 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 this condition 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 that $\hat{b}_x > b_x^Y = E[Y_x]$. Thus, given the expectations of the recipients, a purely guilt-averse dictator expecting this will decrease the amount given to the in-group subject and increase the amount given to the out-group subject. She would suffer when disappointing what is expected from her. If the recipients know the guilt reduction aims of the dictators and correctly anticipate that the amount 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. 128 participants were recruited among students from various disciplines at the University of Jena. In each session gender composition was approximately balanced and subjects took part only in one session. Participants were recruited using the ORSEE software (Greiner, 2004). The experiment was programmed and conducted with the software z-Tree (Fischbacher, 2007) and took, on average, 80 minutes. 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 subjects 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. Subjects had to pass several control questions before each phase of the experiment to make sure that they understood the instructions properly. After the experiment subjects were paid in cash according to their performance. Privacy was warranted during the payment phase.

3 Results

3.1 Choices in the Dictator Game

Dictators

Table 2 reports some descriptive statistics of the behavior of dictators in the game. This is complemented by Figure 1 illustrating the distributions of choices

(boxplots) together with individual observations (square dots) and distributional means (cross dots).

Table [2] about here

Figure [1] about here

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. In particular, the average IN/OUT spread is equal to 1.188 in the $M.a$ treatment and it is equal to 1.750 in the $M.b$ treatment. According to non-parametric tests, a marginally significant statistical difference is detected only in the latter condition (two-sided Wilcoxon signed rank test, p-value=0.181 and p-value=0.089, respectively). However, when pooling data irrespectively of the timing of belief elicitation,[8] the IN/OUT discrepancy is statistically highly significant (M.IN vs. M.OUT, two-sided Wilcoxon signed rank test, p-value=0.0161).

As shown by Table 2, the average IN/OUT spread is equal to 0.437 in the $R.a$ treatment and to 0.375 in the $R.b$ treatment. Non-parametric tests show that the IN/OUT discrimination is statistically relevant only in the latter condition (two-sided Wilcoxon signed rank test, p-value=0.269 and p-value=0.095, respectively). When pooling data irrespectively of the timing of belief elicitation, the difference between amount sent to in-group and out-group subjects is weakly significant (R.IN vs. R.OUT, two-sided Wilcoxon signed rank test, 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. 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, two-sided Wilcoxon rank sum test, p-value=0.378). A considerable difference is registered only

[8] At this end, it must be noticed that no statistically significant difference is registered when confronting distributions of choices obtained in treatments differing only for the timing of belief elicitation

when conditioned to the timing of belief elicitation, namely when comparing the *M.b.IN* treatment and the *R.b.IN* treatment. In the former the amount sent is twice as big as the amount sent in the latter (two-sided Wilcoxon rank sum test, p-value=0.011)

At the individual level, in the M condition 28.125% of the participants chose to send more to their in-group fellows than to members of the other group. In the R condition 21.875% of the participants pursued the same behavior. Among the others, 68.750% and 75.000% chose to send the same amount to the recipients in the two groups in the M and in the R condition, respectively.

From this it can be argued that the higher discrimination in the M than in the R condition is mainly due to the differential in the amount sent by a considerable minority in the sample than to the different number of subjects pursuing discrimination in the two conditions. When pooling data irrespectively of the timing of belief elicitation, a statistically relevant difference is registered across the two conditions in the amount sent to the in-group fellow, but not in the amount sent to the out-group subject (M.IN vs. R.IN and M.OUT vs. R.OUT, Wilcoxon rank sum test, p-value=0.055 and p-value=0.601, respectively). Thus, being able to send specific amounts based on group membership raises the amount sent to the in-group, but does not decrease the amount sent to the out-group.

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. Data show that the majority of recipients chooses the offer of the in-group dictators both in the *M.a* condition and in the *M.b* condition (62.500% and 87.500%, respectively). Exact binomial tests show that the two distributions of choices do not statistically differ. When pooling the data irrespectively of the timing of beliefs elicitation, 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 their 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.

Table [3] about here

Dictators

The upper panel of Table 3 shows that the average dictators' second order beliefs in the M condition are higher for the in-group transfers than for the out-group transfers. In more details, the average spread IN/OUT differential is equal to 0.727 in the $M.a$ treatment and to 1.418 in the $M.b$ treatment. Non-parametric tests show that these differences in beliefs are statistically significant at the conventional significance levels (two-sided Wilcoxon signed rank test, p-value=0.035 and p-value=0.004, respectively). The distributions of beliefs do not statistically differ across the timing of beliefs elicitation, both for the M condition and for the R condition. After pooling data the difference in beliefs in the M condition increases in its statistical significance (M.IN vs. M.OUT, two-sided Wilcoxon signed rank test, p-value$<$ 0.001).

As shown by the upper panel of Table 3, the average IN/OUT spread in second order beliefs is equal to 0.754 in the $R.a$ treatment and equal to 0.337 in the $R.b$ treatment. Non-parametric tests show that only the former difference in beliefs is statistically significant at the conventional significance levels (two-sided Wilcoxon signed rank test, p-value=0.019 and p-value=0.115, respectively). When neglecting the timing of belief elicitation, a statistically significant difference is observed (R.IN vs. R.OUT, two-sided Wilcoxon signed rank test, $p - value = 0.005$).

A relevant question here is whether the discriminatory pattern observed in dictators' beliefs is stronger in the M condition than in the R condition. 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, two-sided Wilcoxon rank sum test, 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 expects the recipients of their own type to choose the in-group offer (78.12% when pooling together data from M.a and M.b). Only about half of the dictators believes that the recipients of the other type choose their in-group offer (46.87% when pooling together data from M.a and M.b). 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".

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. 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 significance levels (two-sided Wilcoxon signed rank test, p-value= 0.022 and p-value=0.006, respectively). Pooling of beliefs across the timing of belief elicitation is limited here because of the statistically significant difference between $R.b.OUT$ and $R.a.OUT$ (two-sided Wilcoxon rank sum test, p-value = 0.045). Nevertheless, when comparing pooled $M.IN$ observations with pooled $M.OUT$ observations the discrepancy in beliefs becomes statistically more robust (two-sided Wilcoxon signed rank test, p-value < 0.001). Interestingly, a marginally significant dif-

ference is registered when comparing pooled data *M.IN* and pooled data *R.IN* (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.

The bottom panel of Table 3 shows that the average IN/OUT spread in the *R.a* condition is equal to 0.562, while it is equal to 0.063 in the *R.b* condition. Non-parametric tests show that, similarly to what happens for the dictators, only the former difference is statistically significant at the conventional significance levels (two-sided Wilcoxon signed rank test, p-value=0.022 and p-value=0.272, respectively).

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 maintains the belief that the dictators of their same type expect them to choose the in-group offer (83.87% when pooling together data from M.a and M.b). Only about half of the recipients believe that the dictators of the other type expect them to choose the in-group offer (41.66% when pooling together data from M.a and M.b). 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 Figure 2 average beliefs of the two parties in the game are juxtaposed with average actual choices of the dictators.

[Figure 2 about here]

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. Similarly, 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, the distribution of dictators' be-

liefs and recipients' beliefs weakly differs in statistical terms only in treatment *R.a.IN* (two-sided Wilcoxon rank sum test, p-value = 0.092). Thus, the beliefs of the dictators about the beliefs of the recipients are overall correct. Concerning the comparison between beliefs of the recipients and actions of the dictators, a marginally significant statistical difference is registered only in treatment *R.b.OUT* (two-sided Wilcoxon rank sum test, p-value = 0.058). Overall, the beliefs of the recipients are in line with actual choices of the dictator in the game.

Figure 2 also provides information about correlation between beliefs and actions of the dictators (first column and last column in each treatment). A series of Wilcoxon signed rank tests shows that the distributions of second order beliefs and choices of the dictators statistically differ only in treatment *M.a.OUT*(p-value = 0.019; for all the other comparisons, p-value > 0.1). This testifies of a strong correlation between actions of the dictators and beliefs about the amount expected by the counterpart.

The majority of the recipients chooses the in-group offer in the *M* condition (75%, when pooling data from *M.a* and *M.b*). To understand why it is interesting to 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 (Wilcoxon rank sum test, p-value = 0.062). Thus, recipients choosing the in-group offer entertain higher expectations about the in-group premium.

3.4 Regression Analysis

When analyzing beliefs and choices of the modified dictator game, it is assumed that beliefs affect choices and that experimental conditions affect both beliefs and actions. Thus beliefs are fully determined by exogenous variables whereas actions are jointly determined by an endogenous variable (i.e., beliefs) and by

exogenous variables. This leads us to the parameter estimation of the following system of equations

$$\mathbf{y}_1 = \gamma_1 \mathbf{X}_1 + \epsilon_1 \quad (1)$$

$$\mathbf{y}_2 = \gamma_2 \mathbf{X}_2 + \beta_2 \mathbf{y}_1 + \epsilon_2 \quad (2)$$

In the experiment, $\mathbf{y}_1$ denotes the average second order beliefs of the dictator (*avg.SOB*) and $\mathbf{y}_2$ the amount sent by the dictator (*offer*). Both these variables can range from 0 to 10. $\mathbf{X}_1$ and $\mathbf{X}_2$ contain the exogenous explanatory variables for $\mathbf{y}_1$ and $\mathbf{y}_2$, respectively. Finally, ϵ_1 and ϵ_2 represent the usual error terms.

$\mathbf{X}_1$ contains the following explanatory variables: *group.membership*, 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; *belief.elicitation*, equal to 1 when beliefs are elicited before the related actions and equal to 0 when the beliefs are elicited after the related actions; *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 *group.membership* and *source* is considered.

$\mathbf{X}_2$ overlaps with the following dimensions of $\mathbf{X}_1$: *group.membership*, *female*, and *age*. In addition, it contains the variable *contr.PGG* which represents the contribution of the dictator in the independent public goods game. This measure should provide a proxy for the other-regarding attitudes of the decision maker.

In the presence of a correlation between ϵ_1 and ϵ_2 an instrumental variable approach should be adopted to avoid a biased estimation of the parameters of equation (2) in the recursive system reported above (Baltagi, 1998). However, a Wald test of exogeneity applied to an instrumental variable Tobit regression of the recursive system under examination does not allow us to reject the null hypothesis of no endogeneity (p-value = 0.747). Given this, we ran two distinct random-effects Tobit regressions to estimate parameters in equation (1) and (2)

(see Table 4 and Table 5, respectively). The random effect is introduced in the analysis to account for potential estimation biases due to repeated choices of the same individual.

[Insert Table 4 about here]

Table 4 shows that only *group.membership* 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.

[Insert Table 5 about here]

Among the explanatory variables of dictators' offers, according to Table 5 only *avg.SOB* has a statistically significant impact (coeff. = 1.250, p-value < 0.001). Interestingly, *group.membership* does not have a statistically relevant impact on choices of the dictators (coeff. = 0.058, p-value = 0.804).

The regression analysis shows that second order beliefs of the dictator are raised by the fact that the recipient is an in-group fellow and that they positively affect the amount sent by the dictator. This suggests that the impact of group membership on the amount sent by the dictator is not direct but indirect, namely via beliefs. 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 condition. 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 in the beliefs of the recipients, who in general expect more in case of in-group transfers than from out-group transfers. Moreover, slightly higher expectations for the in-group transfer are registered in condition M than in condition R. Finally, dictators seem to correctly anticipate the beliefs of recipients and determine their transfers closely related to their second order beliefs.

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 the dictator's decision in the game. This evidence confirms previous experimental findings for allocation tasks within and between artificially induced groups. However, the main aim of the paper is not to replicate previous findings but to understand what actually explains discrimination at the group level. Hypotheses 2 and 3 explicitly deal with this issue and try to disentangle group-mediated other-regarding concerns from guilt-aversion. The differential in choices and beliefs across group boundaries observed in condition R does not support the hypothesis that discrimination is purely driven by beliefs as postulated by our specification of guilt aversion. This appears to confirm the results of de Cremer et al. (2008) who measured participants' expectations after they had made their decision and did not find evidence for 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. Previous contributions (e.g., Croson, 2000) have shown that eliciting beliefs before choices in a strategic interaction setting fosters strategic considerations. Since in our setting there exists no strategic interaction, 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. Whereas when beliefs are elicited after, dictators may correctly anticipate that – because of limited iterations in the unfolding of beliefs – expectations of recipients are conditioned only on group membership and not

on the information about the source of the offer. Given this, the dictators may decide to minimize their guilt by sending more to the in-group irrespectively of the information available. These connections between guilt-aversion and cognitive limitations in the unfolding of beliefs deserve some further investigation and should be judged in the light of several rather than only one experimental study.

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A Belief Elicitation

Let's denote recipients by κ and dictators by K. In the experiment both first-order beliefs of the recipients (b^K_κ) and second-order beliefs of the dictators ($b^{\kappa K}_K$) 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 $\hat{p}^K_{\kappa j}$ of the N recipients for each choice interval $j \in J$ is collected

$$\hat{p}^K_{\kappa j} = \frac{1}{n} \sum_{n \in N} p^K_{\kappa jn}$$

Then, the average belief about the amount to be received by the N recipients ($\hat{b}^K_\kappa$) is computed as follows

$$\hat{b}^K_\kappa = \sum_{j \in J} med(j) \times \hat{p}^K_{\kappa j}$$

Finally, given dictator i's estimated probability for each choice interval $j \in J$ ($p^{\kappa K}_{Kij}$), the payoff for i is obtained with the following quadrating scoring rule

$$\pi_i = 4 - \frac{2}{10000} \left(\sum_{j \in J} (p^{\kappa K}_{Kij} - S_{\kappa j}) \right)^2$$

where $S_{\kappa j} = 100$ if $\underline{j} \leq \hat{b}^K_\kappa < \overline{j}$ and $S_{\kappa j} = 0$, 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 $\hat{b}^K_\kappa = 4$, 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 $4 - \frac{2}{10000}\big((50-100)^2 + (50-0)^2\big) = 3$. 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 quadrating scoring rule is applied to

their first-order beliefs but the average amount believed by the N recipients ($\hat{b}^k_\kappa$) is replaced by the average amount actually sent by the dictators.

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.

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	=	**0.9** [**X-amount**] + **0.3** [**Y-amount**]
Income from the projects for Y-types	=	**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.

Instructions for Phase II

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.

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).

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.

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.

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.

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.

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.

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.

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.

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.

C Tables

Table 1: Experimental Treatments in the Modified Dictator Game

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

Table 2: Descriptive Statistics Dictators Offers

Treatment	N	Mean	Median	Std.Dev.
M.a.IN	16.000	3.750	4.000	2.720
M.a.OUT	16.000	2.562	2.000	2.308
M.b.IN	16.000	4.944	5.000	2.891
M.b.OUT	16.000	3.194	3.500	2.209
R.a.IN	16.000	3.562	4.000	2.920
R.a.OUT	16.000	3.125	3.000	2.754
R.b.IN	16.000	2.375	2.000	2.061
R.b.OUT	16.000	2.000	2.000	1.862

Table 3: Descriptive Statistics Beliefs

Treatment	N	Mean	Median	Std.Dev.
Dictators (2^{nd} order)				
M.a.IN	16.000	4.181	4.200	2.374
M.a.OUT	16.000	3.454	3.800	1.976
M.b.IN	16.000	4.556	4.800	2.081
M.b.OUT	16.000	3.138	3.250	1.222
R.a.IN	16.000	3.895	4.000	1.904
R.a.OUT	16.000	3.141	3.050	1.668
R.b.IN	16.000	2.962	2.000	1.908
R.b.OUT	16.000	2.625	2.000	1.660
Recipients (1^{st} order)				
M.a.IN	16.000	3.564	3.900	1.612
M.a.OUT	16.000	2.932	2.950	1.450
M.b.IN	16.000	3.789	3.900	1.529
M.b.OUT	16.000	2.921	2.550	1.274
R.a.IN	16.000	2.770	2.350	1.671
R.a.OUT	16.000	2.208	2.000	1.063
R.b.IN	16.000	3.075	3.100	1.588
R.b.OUT	16.000	3.012	3.100	1.415

Table 4: Dictators' Beliefs (Random–Effects Tobit Regression)

	avg.SOB
Regressor	Coeff. (Std. Err.)
group.membership	0.546 (0.284)*
belief.elicitation	-0.188 (0.431)
offer.source	0.474 (0.463)
female	0.317 (0.433)
age	0.081 (0.074)
group.membership×*offer.source*	0.527 (0.401)
cons	0.969 (1.852)
Obs (Groups)	128 (64)
Wald $chi^2(6)$	22.89***

***(1%); **(5%); *(10%) significance level

Table 5: Dictators' Choices (Random–Effects Tobit Regression)

	offer
	Coeff (Std. Err.)
avg.SOB	1.250 (0.105)***
group.membership	0.058 (0.234)
age	-0.013 (0.082)
female	-0.513 (0.498)
contr.PGG	0.029 (0.081)
cons	-1.099 (1.973)
Obs (Groups)	128 (64)
Wald $chi^2(5)$	168.03***

***(1%); **(5%); *(10%) significance level

D Figures

Figure 1: Dictators' Choices

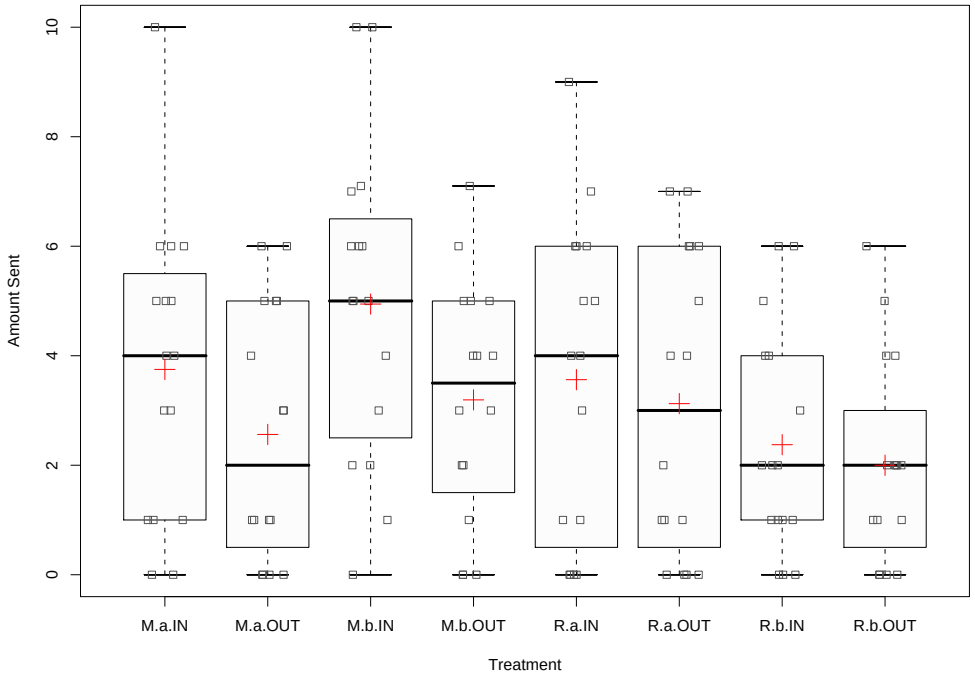

Figure 2: Beliefs and Choices