UNIVERSITY OF
Southampton
School of Social Sciences

School of Social Sciences
Economics Division
University of Southampton
Southampton SO17 1BJ, UK

Discussion Papers in
Economics and Econometrics

Group Outcomes and Reciprocity

Christos A. Iammou, Shi Qi and Aldo Rustichini

No. 1106

This paper is available on our website
http://www.southampton.ac.uk/socsci/economics/research/papers

ISSN 0966-4246

Group Outcomes And Reciprocity

Christos A. Ioannou [*†] University of Southampton

Shi Qi [‡] Florida State University

Aldo Rustichini [§] University of Minnesota

This draft: April 8, 2011

Abstract

Group membership affects an agent's individual behavior. We determine how, by testing two competing hypotheses. One is that group membership operates through social identity, and the other is that group membership implements a correlation among the actions of in-group members in response to an implicit signal. We introduce two novel features in the experimental design. The first feature is the display of group outcomes. This allows us to assess directly the importance of relative group performance on subjects' decisions. The second is a careful manipulation of the Dictator game and the Trust game. More specifically, we choose parameters strategically so as to ensure no change in the pecuniary incentives across the two games. For a precise quantitative test of the two hypotheses we develop a structural model to describe an agent's behavior across treatments. Our findings suggest that the role of social identity on motivating agents' decisions has been exaggerated. The display of group outcomes induces a *group effect*, but a careful analysis of this effect reveals that participants use group outcomes as a signal to coordinate in-group members on favorable outcomes. Furthermore, we find evidence in support of recent experimental studies which demonstrate that an agent's allocation choice is sensitive to the behavior of the agent that generated the choice set.

[*]We would like to thank David Cooper, Tim Salmon, Miltos Makris, Alice Schoonbroodt, Mirco Tonin, Maria Kyriacou for their suggestions. We would also like to thank the seminar participants at the Florida State University, University of Southampton, University of St Andrews, North American Summer Meeting 2011 (St Louis, Missouri) and International Meeting on Experimental and Behavioral Economics 2011 (Barcelona, Spain). The usual disclaimer applies.

[†]Mailing Address: Economics Division, University of Southampton, Southampton, SO17 1BJ, United Kingdom. Email: c.ioannou@soton.ac.uk

[‡]Mailing Address: Department of Economics, Florida State University, 113 Collegiate Loop, Bellamy 288, P. O. Box 3062180, Tallahassee, FL 32306. Email: sqi@fsu.edu

[§]Mailing Address: Department of Economics, University of Minnesota, 1925 Fourth Str. S., 4 – 149 Hanson Hall, Minneapolis, MN 55455. Email: arust@econ.umn.edu

1 Introduction

The behavior of an agent competing for a monetary reward often runs contrary to the assumptions of standard microeconomic theory. A substantial body of research suggests that concerns of equity, reciprocity, trust as well as emotional motives affect significantly the behavior of an agent (Camerer (2003)). In addition, recent experimental studies provide evidence to suggest that group membership affects significantly the individual behavior of an agent (see for example, Chen and Li (2009)). In this study, we determine how group membership alters an agent's behavioral principles by testing two competing hypotheses. One hypothesis is that group membership operates through social identity, and the second hypothesis is that group membership implements a correlation among the actions of in-group members in response to an implicit signal.

The theoretical premise of social identity is that agents have a desire for positive self-identity. Esteem for one's self-identity derives partly from one's personal qualities (abilities and skills), but also derives from the social membership to the group with which one is associated. From this perspective, agents show preferential treatment towards in-group members as a means of making their own group positively distinct. On the other hand, the second hypothesis tests a notion that is relatively new in the field. According to this hypothesis, agents respond to implicit forms of communication by correlating their actions. The notion of implicit communication was first studied by Roth and Ockenfels (2002) in the context of second-price internet auctions. In their framework, late-bidders (may) use late-bidding because late bids have a positive probability of not being successfully transmitted (due to internet traffic congestion). This opens a way for late-bidders to implicitly collude in order to avoid detrimental bidding wars that would raise the expected final transaction price. Likewise in the context of laboratory experiments, participants (may) use features of the experimental design as an implicit form of communication (an implicit signal) to correlate their actions on favorable outcomes.

Additionally, the study develops a structural model to describe an agent's conditional behavior across treatments. Initially, the subjects are divided into two groups based on a trivial criterion. The subjects then play one of either the Trust game or the Dictator game. Our novel methodology incorporates group outcomes in the set-up that allow the experimenter to assess directly the importance of relative group performance on subjects' decisions. In addition, we choose parameters strategically so as to ensure no change in the pecuniary incentives across the two games when the allocator decides on the split. Our framework also incorporates an interaction between group outcomes and reciprocity in order to provide a more discerning evaluation of the group dynamics.

The sequential nature of the Trust game allows the first mover's transfer to infiltrate the second mover's choice set and thus facilitates a clear understanding of the role of reciprocity when the latter interacts with group outcomes. On the other hand, the Dictator game provides the basis for comparison in the absence of reciprocity.

Overall, our findings suggest that the role of social identity on motivating agents' decisions has been exaggerated. Despite the presence of a group effect in the Dictator game and in the Trust game when group outcomes are displayed, a careful analysis of the results reveals that participants use group outcomes as a signal to coordinate in-group members on favorable outcomes. In other words, the display of group outcomes acts as a node of orientation; that is, a device that harmonizes the expectations of in-group members, reduces uncertainty despite the presence of imperfect information and finally, coordinates their activities towards favorable outcomes. We also find evidence in support of recent experimental studies which demonstrate that allocation choices are sensitive not only to the choice set available to the agent contemplating an action, but also to the behavior of the agent that generated the choice set. Thus, agents are concerned not only with the distribution of the material payoff, but also with the process leading up to the available choices at hand.

The project is novel in several respects. First, the emphasis is not on whether agents interact differently with in-group and out-group members, but on *how* group membership affects an agent's individual behavior. Second, in answering the question of how an agent's behavioral principles are altered, we do not simply survey the literature for candidate hypotheses; instead, we test competing hypotheses via an array of experimental games. The rest of the paper is organized as follows. In Section 2, we review the related literature and in Section 3, the experimental design is presented. In Section 4, the methodology with the specific logit choice model is specified. In Section 5, we report the important findings while in Section 6, we provide a discussion of the results and interesting extensions. Finally, in the Conclusion we summarize our findings and offer direction for future research.

2 Literature Review

Experiments in economics, quite often, foster a conduct that is sharply different from the standard notion of competitive self-interest. This observation has been culminated in the development of social preferences models. As of recent, models of social preferences have been extended to

incorporate the notion of identity in a group-setting (Chen and Li (2009)). Yet, group identity has been a central topic in social psychology for quite some time now. In the early 1970s, a team headed by social psychologist Henri Tajfel set up a *minimal* group, as the control condition, in order to identify the critical factor(s) responsible for the emergence of in-group preferential treatment. The minimal group consisted of: (a) a trivial group-assignment, (b) no social interaction, (c) anonymity, and (d) no trade-off between the decision-maker's payoff and others' payoff.[1] The objective of the team was to investigate what extra factors were needed to produce behavior favoring in-group over out-group members. Surprisingly, the team found out that no additional factor was needed as participants could still, heavily identify (categorize) with their own group.

A social theory was then proposed to explain this phenomenon. The SIT argues that individuals have a desire for positive self-identity. Esteem for one's self-identity derives partly from one's own qualities but also derives from the social membership to the group with which one is associated. Therefore, esteem for one's group may be positive or negative depending on how well the in-group compares to relevant out-groups. From this perspective, participants in Tajfel's minimal group experiments treated in-group members more favorably than out-group members as a means of making their own group positively distinct. Yet, in all its success, the theory has been subjected to some serious criticism based on the realization that the minimal group paradigm was less minimal than it originally was thought to be. Social psychologists Yamagishi and Kiyonari (2000) for one, argue that in-group preferential treatment in the minimal group condition occurs only when expectations of in-group reciprocity, but not of direct reciprocity, are operating. Their finding is based on a modified Prisoner's Dilemma game. Even though, agents cooperate more with an in-group than an out-group member in the simultaneous-move game, the group effect disappears in the sequential one-shot game. In the latter, the expectation of direct reciprocity is strong enough to eliminate the group effect. Thus, Yamagishi and Kiyonari infer that participants in the minimal group experiments do not give preferential treatment to in-group members unconditionally; rather, they treat other in-group members favorably only when they expect similar favorable treatment in return.

In the field of experimental economics, recent research efforts have been primarily focused on the impact of group identity on agents' decisions. Many experiments are designed to assess whether and to what extent, people interact differently with in-group and out-group members.

[1]The last criterion is often circumvented in economics where most decisions involve some trade-off between one's own payoff and the payoffs of others.

These experiments use either primed natural identities (such as gender or ethnicity) or induced identities. The results in the experiments that prime natural identities are mixed (Brown-Kruse and Hummels (1993), Cadsby and Maynes (1998), Solow and Kirkwood (2002), and Bernhard, Fehr, and Fischbacher (2006)). On the other hand, in experiments that use induced identities, the extend to which behavior is affected depends on the strength of group identity. Charness, Rigotti, and Rustichini (2007) report a series of experiments on the effect of group membership on individual behavior in Prisoner's Dilemma and Battle of the Sexes games. The authors manipulate the saliency of group membership, which leads them to the conclusion that group membership significantly affects individual behavior when members identify with their group. Yet, when members do not identify with their group, the rate of cooperation between in-group and out-group members is not statistically different. Another important contribution to the literature is the paper by Chen and Li (2009) who use the framework of Charness and Rabin (2002) to estimate the effect of group identity on subjects' behavior under two regimes: (a) when the match receives a higher payoff, and (b) when the match receives a lower payoff. The key finding is that subjects show an increase in charity concerns when their in-group match receives a lower payoff, and a decrease in envy when their in-group match receives a higher payoff. In addition, Chen and Li identify two competing hypotheses that can potentially explain their results. One is social identity (Tajfel and Turner (1986)) and the other is expectations of generalized reciprocity among in-group members (Yamagishi and Kiyonari (2000)).

This study contributes to the literature by suggesting a third hypothesis that has been surpassed by previous studies: group effects may arise due to correlation amongst the actions of in-group members in response to implicit forms of communication. Thus far, the literature has primarily focussed on the impact of explicit (pre-play) communication on agents' decisions. **?** for example, find out that pre-play communication (plain conversation) in a Matching Pennies game with three players leads to behavior that is coordinated among subjects. Moreover, their experimental results suggest that the subjects' attempt to realize mutual gains naturally leads to correlated play. Roth and Ockenfels (2002) have been, to our knowledge, the first to incorporate implicit forms of communication in their model. Roth and Ockenfels indicate that late-bidders (may) use late-bidding on internet second-price auctions because late bids have a positive probability of not being successfully transmitted (due to internet traffic congestion). Therefore, late-bidding opens a way for bidders to implicitly collude in order to avoid detrimental bidding wars that would raise the expected revenue of the seller.

3 Experimental Design & Summary Statistics

In what follows, we determine how group membership affects an agent's individual behavior in an *almost minimal* setting; that is, a setting consisting of criteria: (a) a trivial group-assignment, (b) no social interaction, and (c) anonymity.

3.1 Experimental Design

We hypothesize that the behavior of subjects in an environment where group membership matters may be influenced in two ways. The first is the observability of group outcomes. The second is the possibility of reciprocal behavior. To identify the way in which group membership affects agents' decisions, we implemented a two by two experimental design.[2] This results in 4 treatments and 2 controls. In each experimental session there were 16 subjects. The treatment sessions consisted of three stages. The first stage was a group-assignment stage. In this stage, the participants were asked to estimate the number of dots on a slide that was flashed in front of their computer monitors. The division of subjects into the two groups was thus done via a trivial criterion so as to isolate variables that could potentially cause favoritism ex ante such as face-to-face interaction, racial background or gender bias. Based on the similarity of the estimates, the participants were assigned to two groups: Group A and Group B.[3] The participants were then privately notified of their own group identity which they retained for the entire duration of the experimental session. In the second stage, the subjects had to participate in one of either the Trust game or the Dictator game. The games were played for 15 rounds. The number of rounds was not communicated to the subjects. In each round, the subjects had to face a different participant of the same or of different group identity. With the conclusion of the experimental session, the subjects were paid in private their cash earnings.[4] In the third stage, the subjects were asked to complete a questionnaire.

In the Trust game, one subject had the role of the first mover and the other subject had the role of the second mover. The subjects' roles were determined by random draw. The first mover

[2]The experiments were programmed and conducted with the use of the experimental software z-Tree (Fischbacher (2007)). The detailed instructions are reported in the Supplementary Appendix.

[3]To ensure an equal split, we grouped the participants who provided an estimate above the median in Group A and those who provided an estimate at or below the median in Group B. This information was not released to the participants.

[4]There was a map of 2 to 1 between the fictional quarters used in the sessions and the actual quarters paid at the end of the experimental session.

was initially given an endowment of 4 quarters and was asked to specify an integer amount of quarters, between zero and 4 quarters inclusive, to transfer to the second mover. Any quarters that were not transferred to the second mover were secured as profit for the first mover. On the other hand, the amount of transfer was multiplied by 4 before reaching the second mover. The second mover was asked next to allocate the new amount. The second mover, regardless of the first mover's transfer, had always a constant choice set of five alternatives to choose from. The choices, together with the corresponding allocation of quarters between the second mover and the first mover, were explicitly mentioned in the experimental instructions as well as indicated on the subjects' computer screens. The round was completed with the earnings of the subject for the specific round indicated on the screen along with the cumulative earnings of the subject thus far in the game. In one of the two treatments, the group payoffs were also displayed on a screen, whereas in the other treatment the group payoffs were not displayed. More specifically, in the former treatment, the earnings of both, Group A and Group B for the specific round were shown on a screen right after the screen indicating the cumulative earnings of the subject. The earnings of each group consisted of a summation of the earnings of each member of the group.

In the Dictator game, one subject had the active role as the dictator and the other subject had the passive role.[5] The subjects' roles were determined by random draw. The dictator was given an endowment of quarters and was asked to allocate this endowment between himself and the passive participant. Even though, different numbers of quarters were provided as endowments, the dictator would always face a constant choice set of five alternatives. The choices along with the corresponding allocation of quarters between the dictator and the passive participant were explicitly mentioned in the experimental instructions as well as indicated on the subjects' computer screens. At the end of each round, the earnings of the subject for the specific round were indicated, as well as the cumulative earnings so far in the game. Analogous to the Trust game, in one of the two treatments, the group payoffs were also displayed on a screen, whereas in the other treatment the group payoffs were not displayed.

Finally, the control sessions consisted of two stages. The first stage was the game-play stage, whereas in the second stage the subjects were asked to complete a questionnaire. In one of the two controls, the subjects played the Trust game as specified above, whereas in the other control, the subjects played the Dictator game as specified above. The design of the experiment was otherwise

[5]To avoid focal-point effects the term "dictator" was replaced by "the participant with the active role" on the subjects' computer screens and the instructions.

identical to the one given above. The experimental sessions were conducted in May of 2010 at the campus of Florida State University. The subjects were undergraduate students of the Florida State University. Some general characteristics of the sessions are shown in Table 1.

Table 1: Features of Experimental Sessions

Treatments	# of Periods	Trial Periods	# of Sessions	# of Subjects
Trust w/ Group Payoffs	15	1	9	144
Trust w/o Group Payoffs	15	1	6	96
Dictator w/ Group Payoffs	15	2	6	96
Dictator w/o Group Payoffs	15	2	6	96
Control Trust	15	1	3	48
Control Dictator	15	2	3	48
Total				528

3.2 Notation and Payoff Structure

Let $i \in \{1, 2\}$ index the order of the mover in the Trust game. Recall that the first mover in the Trust game, is asked to specify an integer amount of quarters that is transferred to the second mover. Let the amount of quarters transferred be denoted as $x \in \{0, 1, 2, 3, 4\}$. The second mover thus receives $4x$ quarters for any transfer x. Let $y \in \{1, 2, 3, 4, 5\}$ be the choice of the second mover, and let π_i denote the payoff of mover i in quarters, where given any transfer x and choice y, $\pi_2 = (y - 1) \times x$ and $\pi_1 = 3x + 4 - \pi_2$.

On the other hand, in the Dictator game, let $i = 1$ index the passive subject and let $i = 2$ index the dictator. Recall that the dictator is given an endowment. Let the endowment values be denoted by $\tilde{x} \in \{7, 10, 13, 16\}$. The values were set so as to establish meaningful comparison between the Trust game and the Dictator game. Thus, we establish that $\tilde{x} = 3x + 4$ for $x \in \{0, 1, 2, 3, 4\}$ in order to ensure no change in the pecuniary incentives across the two games. Let $y \in \{1, 2, 3, 4, 5\}$ be the choice of the dictator, and let π_i denote the payoff of subject i in quarters where given any endowment $\tilde{x}$ and choice y, $\pi_2 = (y-1)(\tilde{x}-4)/3$ and $\pi_1 = \tilde{x} - \pi_2$. The particular payoff structure confirms that, not only the cardinality of the choice set is the same for all active participants across the two games, but also that the monetary payoffs across the two games are the same.

3.3 Descriptive Statistics

Table 2 reports descriptive statistics on the raw experimental data. In particular, the frequency of the transfer in the Trust game and the choice variables in both, the Dictator and the Trust game is presented. Notice that in the Dictator game, 82.1% of the subjects acting as dictators chose to keep the maximum allowable amount. The percentage of dictators who chose to keep the maximum allowable amount was 87.5% when the latter were matched with out-group members and 75.9% when matched with in-group members. In addition, it is also worth noticing that only choices $y = 3$, $y = 4$ and $y = 5$ have a strictly positive number of observations in the Dictator game. Similarly, we observe differences across group identities in the Trust game. More specifically, only 27.2% of the first movers transferred more than half of their endowment to out-group members. On the other hand, the percentage of first movers who transferred more than half of their endowment to in-group members was 41.4%. Furthermore, 60.7% of second movers kept the entire allowable amount when matched with an out-group member versus 53.5% when matched with an in-group member.

Table 3 shows the distribution of each choice y across different treatments. In particular, we show how the distribution of each choice y changes with the endowment in the Dictator game, and how it changes with the first mover's transfer in the Trust game. In the Dictator game, when the endowment was 7 quarters, over 90% of the dictators chose to keep the entire amount. This percentage drops when the endowment was 16 quarters. More specifically, the proportion of dictators who chose to keep the entire amount in the Dictator game treatment without group payoffs displayed and the Dictator game treatment with group payoffs displayed was 77.7% and 68.1%, respectively. On the other hand, in the Trust game, the percentage change is more radical and dependent on the magnitude of the transfer. For example, when first movers transferred only one quarter, then 92.6% of the second movers in the Trust game treatment without group payoffs displayed and 87.8% of the second movers in the Trust game treatment with group payoffs displayed chose to keep the entire amount. Yet, when second movers received a transfer of two quarters, the percentage of them who kept the entire amount drops to 46.9% and 52.2%, respectively. The percentages remained low when the transfer was 3 quarters and 4 quarters.

Table 2: Transfer and Choices across Games & Group Identities

Dictator	Overall		Out-group		In-group	
Choice y	Freq.	Percent	Freq.	Percent	Freq.	Percent
1	0	0.0	0	0.0	0	0.0
2	0	0.0	0	0.0	0	0.0
3	51	3.5	18	2.3	33	4.9
4	207	14.4	78	10.2	129	19.2
5	1182	82.1	672	87.5	510	75.9
Total	1440		768		672	
Trust	Overall		Out-group		In-group	
Transfer x	Freq.	Percent	Freq.	Percent	Freq.	Percent
0	633	35.2	387	40.3	246	29.3
1	204	11.3	126	13.1	78	9.3
2	354	19.7	186	19.4	168	20.0
3	129	7.2	60	6.3	69	8.2
4	480	26.7	201	20.9	279	33.2
Total	1800		960		840	
Trust	Overall		Out-group		In-group	
Choice y	Freq.	Percent	Freq.	Percent	Freq.	Percent
1	12	1.0	6	1.1	6	1.0
2	0	0.0	0	0.0	0	0.0
3	171	14.7	54	9.4	117	19.7
4	318	27.3	165	28.8	153	25.8
5	666	57.1	348	60.7	318	53.5
Total	1167		573		594	

Note: Choice of amount kept is conditional on a transfer $x > 0$.

Table 3: Distribution of Choice y across Treatments

Dictator game without group payoffs displayed								
y\$\tilde{x}$	7		10		13		16	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
1	0	0.0	0	0.0	0	0.0	0	0.0
2	0	0.0	0	0.0	0	0.0	0	0.0
3	3	2.3	0	0.0	0	0.0	18	6.4
4	6	4.5	30	13.0	9	12.0	45	16.0
5	123	93.2	201	87.0	66	88.0	219	77.7
Dictator game with group payoffs displayed								
y\$\tilde{x}$	7		10		13		16	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
1	0	0.0	0	0.0	0	0.0	0	0.0
2	0	0.0	0	0.0	0	0.0	0	0.0
3	0	0.0	3	1.3	0	0.0	27	9.6
4	9	6.8	36	15.6	9	12.0	63	22.3
5	123	93.2	192	83.1	66	88.0	192	68.1
Trust game without group payoffs displayed								
y\x	1		2		3		4	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
1	3	3.7	3	2.0	0	0.0	0	0.0
2	0	0.0	0	0.0	0	0.0	0	0.0
3	0	0.0	0	0.0	6	7.7	75	32.9
4	3	3.7	75	51.0	42	53.9	60	26.3
5	75	92.6	69	46.9	30	38.5	93	40.8
Trust game with group payoffs displayed								
y\x	1		2		3		4	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
1	3	2.4	0	0.0	3	5.9	0	0.0
2	0	0.0	0	0.0	0	0.0	0	0.0
3	0	0.0	15	7.2	3	5.9	72	28.6
4	12	9.8	84	40.6	15	29.4	27	10.7
5	108	87.8	108	52.2	30	58.8	153	60.7

4 Structural Model

In this section, we outline a simple conceptual two-person model that extends Charness and Rabin (2002) model to incorporate group identity and reciprocity. The model describes an agent's conditional behavior across treatments. Thus, the weights should not be interpreted as stable characteristics of subjects' preferences but as behavioral patterns that depend on the particular environment.

4.1 Logit Choice Model of Second Movers and Dictators

In the model outlined next, let the utility of a second mover or dictator, s, making choice y be specified as the following:

$$U_{2sy}(\pi_1, \pi_2) \quad = \quad w_1\pi_1 + (1 - w_1)\pi_2 + \xi_{sy}, \tag{1}$$

where ξ_{sy} is the idiosyncratic shock of s choosing y. We assume ξ_{sy}s are identically and independently drawn from a Type I extreme value distribution.[6] Let w_1 denote the weight $i = 2$ places on the payoff of $i = 1$. The weight function is assumed to have the form:

$$w_{1j} = \alpha_j + \beta_j I$$

where $I = 1$ if in-group, $I = 0$ otherwise.

So α_j captures the weight $i = 2$ places on an out-group $i = 1$, whereas $\alpha_j + \beta_j$ captures the weight placed on an in-group $i = 1$, and β_j captures the weight difference between an out-group subject and an in-group subject. The two parameters α_j and β_j vary in the alternatives examined so as to clearly assess the effect of identity and reciprocity on agents' decisions. In particular, we categorize all the observations based on the following criteria:

$G =$ Group payoffs displayed,

$N =$ group payoffs Not displayed,

$D =$ the Dictator game was played,

$T =$ the Trust game was played,

$L =$ transfer was *L*arger than 2 quarters,

$l =$ transfer was *l*ess than or equal to 2 quarters.

[6] In multinomial logit choice models, error term ξs are identically and independently drawn from a Type I extreme value distribution with a scale parameter μ. This parameter measures how sensitive utility differences are to subject choices. When $\mu = 0$, variance of the error term ξ approaches infinity, and the model predicts equal probability for each of a subject's choices. When μ becomes arbitrarily large, the error term ξ disappears, and the probability of choosing the highest utility choice approaches one. However, the scale parameter μ cannot be identified because of confounding with the vector of utility parameters.

Due to sample size concerns, we distinguish the choices of transfer into two categories. Thus, we use index L to indicate that a first mover in the Trust game transfers more than half of his endowment, and use index l otherwise. The threshold of two quarters is an ex post condition, set after observing that the median transfer is two quarters (59.17% had transfer ≤ 2). The notation denoting each alternative j is presented in Table 4.

Table 4: Data Alternatives for Second Mover or Dictator

j	Description
ND	No group payoffs in Dictator game
GD	Group payoffs in Dictator game
NTl	No group payoffs in Trust game with transfer $l$ess than or equal to 2
NTL	No group payoffs Trust game with transfer Larger than 2
GTl	Group payoffs Trust game with transfer $l$ess than or equal to 2
GTL	Group payoffs Trust game with transfer Larger than 2

Given x, let $u_2(y|x) = w_1\pi_1 + (1-w_1)\pi_2$ so that the choice probability for any $y = 1, 2, 3, 4, 5$ has the logit form:

$$\mathbb{P}_2(y|x) = \frac{\exp(u_2(y|x))}{\sum_{k=1}^{5}\exp(u_2(k|x))}. \tag{2}$$

Suppose we observe $n_{y|x}$ occurrences of choice y given transfer x; then, the likelihood function is:

$$\mathbb{L}_2 = \prod_x \prod_y \mathbb{P}_2(y|x)^{n_{y|x}}, \tag{3}$$

and the log likelihood function is:

$$\widetilde{\mathbb{L}}_2 = \sum_x \sum_y n_{y|x} \log \mathbb{P}_2(y|x). \tag{4}$$

The estimated α_j^* and β_j^* of a given alternative j maximize the above likelihood function. We can then compute w_{1j}^* for $j = ND$, GD, NTl, NTL, GTl, GTL and thus compare the weights across different alternatives.

4.2 Logit Choice Model of First Movers

To model the behavior of the first mover we need to make some explicit assumptions. First, we need to assume that before deciding on the number of quarters transferred to the second mover, first movers have some prior belief on how the second movers are going to respond. Furthermore, we assume that the first movers can perfectly predict the second movers' behavior. In other words, the first mover's belief is consistent with the observed probability distribution of the second movers' choices. As shown in the previous subsection, we can construct the second mover's choice probability $\mathbb{P}_2(y|x)$ for any given transfer x, from the weight w_1 second movers place on first movers' payoffs and the observed second movers' choices y. Third, we assume that the first movers can also deduce correctly this specific choice probability. Thus, the expected payoff of the first and second movers for a given x is:

$$E[\pi_i|x] = \sum_{y=1}^{5} \mathbb{P}_2(y|x)\pi_i(y) \quad \text{for } i = 1, 2.$$

Analogous to the second mover's utility function, let w_2 be the weight the first mover places on the second mover's expected payoff. Then, given x, a first mover f has the following specification of utility:

$$U_{1fx}(\pi_1, \pi_2) = (1 - w_2)E[\pi_1|x] + w_2 E[\pi_2|x] + \hat{\xi}_{fx} \tag{5}$$

where $\hat{\xi}_{fx}$s are idiosyncratic shocks that are identically and independently drawn from a Type I extreme value distribution. Notice that weights w_2 may vary across first mover's own choice of transfer x. This is because first movers expect different responses from the second movers depending on the transfer. In addition, the game ends when a first mover chooses a transfer of zero; at this point the first mover knows with certainty that $\pi_1 = 4$ and $\pi_2 = 0$.

We analogously specify the weight function of first movers in the following fashion:

$$w_{2j} = \hat{\alpha}_j + \hat{\beta}_j I$$
$$\text{where } I = 1 \text{ if in-group, } I = 0 \text{ otherwise.}$$

Since we are dealing with first movers in only the Trust games, there are only 4 alternatives. These are NTl, NTL, GTl and GTL as described in Table 4 above. Let $u_1(x) = (1-w_2)E[\pi_1|x] + w_2 E[\pi_2|x]$ so that the choice probability of the first mover choosing transfer $x = 0, 1, 2, 3, 4$ is:

$$\mathbb{P}_1(x) = \frac{\exp(u_1(x))}{\sum_{k=0}^{4} \exp(u_1(k))}. \tag{6}$$

Next, we construct the log likelihood function of the first mover in a similar manner as that of the second mover/dictator. Suppose we observe m_x occurrences of transfer choice x, then the log likelihood function is:

$$\widetilde{\mathbb{L}}_1 = \sum_x m_x \log \mathbb{P}_1(x). \tag{7}$$

The estimated $\hat{\alpha}_j^*$ and $\hat{\beta}_j^{\,*}$ maximize the above likelihood function. We can then compute w_{2j}^* for $j = NTl$, NTL, GTl, GTL, and thus compare the weights across different alternatives.

4.3 General Hypotheses

We hypothesize that the behavior of subjects in an environment where group membership matters may be influenced in two ways. The first variable is the observability of group outcomes. More specifically, the experimental design provides a platform that allows subjects to clearly assess their social ranking before transferring money to in-group and out-group members. Thus, to clearly assess the significance of social identity on agents' decisions, our design allows two treatments. In one treatment, subjects make decisions after observing the group outcomes of last period, whereas in the other treatment, subjects make decisions without observing the group outcomes of last period.

The second variable is the possibility of reciprocal behavior. Many recent experimental studies have demonstrated that agents are concerned not only with the distribution of the material payoff, but also with the process leading up to the available choices. The impact of group identity is thus evaluated under two regimes. In the first regime, reciprocity is possible. The sequential nature of the Trust game allows the first mover's transfer to infiltrate the second mover's choice set and hence facilitates a clear understanding of the role of reciprocity. In the second regime, reciprocity is not possible. Thus, in the Dictator game, the endowment is decided by the experimenter, while the dictator decides on the allocation. A crucial element in our design (refer to Section 3.3) is that the possible sizes of the amount to be allocated by the second mover in the Trust game and by the dictator in the Dictator game are exactly the same, so as to advance crisp comparison across the two games.

The introduction of the treatment variables serves two objectives. First, to determine if group membership in the almost minimal group paradigm can be attributed to social identity or to

the coordination amongst in-group members in response to an implicit signal. Second, to test the limitations of the competing hypotheses. This results in the predictions of hypotheses 1 and 2. While hypothesis 1 conveys the implications of social identity independently of the variable treatments, hypothesis 2 is based on the activation of a signal with the display of group outcomes. Before explicitly stating the hypotheses, let us denote by w_i^I the weight placed on the in-group participant's payoff, and by w_i^O the weight placed on the out-group participant's payoff

Hypothesis 1: Social identity postulates that $w_i^I > w_i^O$ for $i \in \{1, 2\}$, regardless of the observability of group outcomes and/or the possibility of reciprocal behavior.

More specifically, if social identity is salient then, it would ex-ante change the other participant's weight. In other words, a subject places a weight on an in-group participant that is ex-ante higher than that placed on an out-group participant. As a result, whether subjects can observe group outcomes or not, should not affect the ex-ante favoring of in-group members. Similarly, the possibility of reciprocal behavior in the Trust game should not affect $w_i^I > w_i^O$ for $i \in \{1, 2\}$.

On the other hand, the second hypothesis rests on the display of group outcomes. According to this hypothesis, a subject places a weight on an in-group participant that is higher than that placed on an out-group participant, conditional on the display of group outcomes. The second hypothesis is thus stated as follows.

Hypothesis 2: If agents respond to implicit forms of communication by correlating their actions on favorable outcomes then, $w_i^I > w_i^O$ for $i \in \{1, 2\}$, only when the group outcomes are displayed.

5 Results

5.1 Results of Second Movers and Dictators

In this section, we report our findings as they pertain to the aspects of conditional behavior discussed in the previous section. Table 5 reports the estimated parameters α_j and β_j of the second movers and the dictators for a given alternative j while controlling for clustering effects. The standard errors are included in the parentheses. Table 6 provides the weights of the controls as well as the constructed weights for ND, NTl, and NTL.

Table 5: Estimated Parameters for $i = 2$

Parameter	Coefficient	Parameter	Coefficient
α_{ND}	0.141***	β_{ND}	0.070
	(0.052)		(0.053)
α_{GD}	0.081	β_{GD}	0.229***
	(0.062)		(0.052)
α_{NTl}	0.235***	β_{NTl}	-0.148
	(0.048)		(0.105)
α_{NTL}	0.398***	β_{NTL}	0.024
	(0.016)		(0.019)
α_{GTl}	0.156***	β_{GTl}	0.020
	(0.057)		(0.080)
α_{GTL}	0.318***	β_{GTL}	0.098***
	(0.035)		(0.036)
Observations: 2607		Clusters: 432	

Table 6: H_0: Control Weight$_j$ = Out-group/In-group Weight$_j$

	D	Tl	TL
Controls	0.202	0.255	0.399
	ND	NTl	NTL
Out-group	0.141	0.235	0.398
Prob $> \chi^2$	0.318	0.827	0.973
In-group	0.211	0.087	0.423
Prob $> \chi^2$	0.857	0.150	0.357

The weights in the controls are not statistically different from the corresponding weights of in-group and out-group members when the group payoffs are not displayed. More specifically, in the Dictator control, the weight on the other participant's payoff is 0.202, compared to 0.211 when the dictator is paired with an in-group member and 0.141 when the dictator is paired with an out-group member. Notice that if social identity was, in fact, salient, then, dictators should have reduced significantly the weight placed on the passive out-group participants. Recall that the Dictator has an endowment that is to be allocated between the dictator and another member

who might be in-group or out-group. Thus, if a dictator cares about group performance, then he should make a deliberate effort to decrease the out-group participant's allocation. Yet, dictators do not reduce significantly the weight placed on the passive out-group participant. This finding thus provides initial evidence to refute the social identity hypothesis. In addition, there exist no significant differences in the weight placed on first movers in the Trust control, compared to the weights placed on either in-group or out-group members regardless of the amount of transfer. These findings are summarized in our first result.

RESULT 1: *Categorizing subjects into groups is not sufficient to cause in-group preferential treatment nor discrimination against out-group members.*

In Table 7, we construct the weights w_{1j} for each alternative j. A *group effect* is defined as the significant difference between the weight placed on an in-group member's payoff and the weight placed on an out-group member's payoff, for a given alternative j; alternatively, a group effect can be defined as a rejection of the H_0: Out-group Weight$_j$ = In-group Weight$_j$. Looking at the alternatives where group payoffs are not displayed (that is, ND, NTl, and NTL), we find no evidence in support of the existence of a group effect. Subjects, do not differentiate between members of different groups when it comes to the allocation of monetary rewards, if group payoffs are not displayed. On the other hand, there is evidence to support a group effect in two alternatives when group payoffs are displayed. These are the alternatives GD and GTL. The presence of a group effect in these two alternatives provides evidence in support of the second hypothesis. Recall that the second hypothesis states that $w_i^I > w_i^O$ for $i \in \{1, 2\}$, only when the group outcomes are displayed. In addition, it is important to notice that there exists no group effect in the alternative GTl. Thus, in games of reciprocity, the activation of signals via the display of group payoffs is conditional on the preceding agent's actions.

Table 7: H_0: Out-group Weight$_j$ = In-group Weight$_j$

	ND	GD	NTl	GTl	NTL	GTL
Out-group	0.141	0.081	0.235	0.156	0.398	0.318
In-group	0.211	0.311	0.087	0.176	0.423	0.416
Prob $> \chi^2$	0.191	0.000	0.157	0.201	0.802	0.007

At this point, it will be useful to our understanding of the implications of the incorporation of group payoffs into the experimental design, if we tested two additional statistical hypotheses. The first hypothesis tests H_0: Out-group Weight$_j$ w/o Group Payoffs = Out-group Weight$_j$ w/ Group Payoffs, and the second hypothesis tests H_0: In-group Weight$_j$ w/o Group Payoffs = In-group Weight$_j$ w/ Group Payoffs. The results are reported in Table 8.

Table 8: H_0: Out/In-group Weight$_j$ w/o Group Payoffs = Out/In-group Weight$_j$ w/ Group Payoffs

	Out-group	In-group		Out-group	In-group		Out-group	In-group
ND	0.141	0.211	NTl	0.235	0.087	NTL	0.398	0.423
GD	0.081	0.311	GTl	0.156	0.176	GTL	0.318	0.416
$P > \chi^2$	0.461	0.027	$P > \chi^2$	0.293	0.384	$P > \chi^2$	0.037	0.761

Consider first the alternatives in the Dictator games. The out-group weights across the two Dictator treatments are not statistically different. Thus, dictators do not alter their allocation decisions with the display of group payoffs, when paired with an out-group participant. On the other hand, the in-group weights are statistically different across the two Dictator treatments, which indicates that dictators are more generous to in-group participants conditional on the display of group payoffs. Consider next, the alternatives in the Trust games with a transfer that is more than half the endowment of the first movers. The significance tests indicate that the in-group weights across the two Trust treatments with a transfer that is more than half the endowment of the first mover is not statistically different. Yet, the counterpart out-group weights are, in fact, statistically different. In other words, second movers act opportunistically to increase their monetary payoff by exploiting the trust of out-group first movers. The latter findings uncover clearly the implications of the incorporation of group payoffs into the experimental design. These findings are captured in our second result.

RESULT 2: *The display of group payoffs is a signal that coordinates in-group members on favorable outcomes. More specifically, in the GD, the display of payoffs coordinates in-group members to allocate more to each other. In addition, in the GTL, the display of group payoffs leads second movers to act opportunistically in order to increase their monetary payoffs at the expense of the out-group first movers who entrusted them.*

To get a more comprehensive idea of the underlying mechanics of the games, we also run statistical tests to determine the role of a transfer that was more than half the endowment of the first mover. Thus, we test the hypothesis H_0: Out/In-group Weight$_j$ of Transfer > 2 = Out/In-group Weight$_j$ of Transfer ≤ 2. The results are reported in Table 9. Clearly, a transfer of more than half the endowment is significant in all the alternatives considered. Thus, we find evidence in support of recent experimental studies which demonstrate that allocation choices are sensitive not only to the choice set available to the agent contemplating an action, but also to the behavior of the agent that generated the choice set. Agents are, therefore, concerned not only with the distribution of the material payoff, but also with the process leading up to the available choices at hand. Our third result is thus summarized as follows:

RESULT 3: *A first mover's trust is reciprocated by the second mover, independently of the first mover's group identity.*

Table 9: H_0: Out/In-group Weight$_j$ of Transfer > 2 = Out/In-group Weight$_j$ of Transfer ≤ 2

	Control		Out-group	In-group		Out-group	In-group
Tl	0.255	NTl	0.235	0.087	GTl	0.156	0.176
TL	0.399	NTL	0.398	0.423	GTL	0.318	0.416
$P > \chi^2$	0.037	$P > \chi^2$	0.000	0.000	$P > \chi^2$	0.006	0.000

5.2 Results of First Movers

Table 10 reports the estimated parameters $\hat{\alpha}_j$ and $\hat{\beta}_j$ of the first movers for a given alternative j while controlling for clustering effects. The standard errors are included in the parentheses. Table 11 provides the weights of the controls as well as the constructed weights for NTl and NTL. The weights in the controls are not statistically different from the corresponding weights of in-group and out-group members when the group payoffs are not displayed, controlling for the amount transferred. More specifically, there exist no significant differences in the weight placed on first movers in the Trust control, compared to the weights placed on either in-group or out-group members when controlling for the amount of transfer.

Table 10: Estimated Parameters for $i = 1$

Parameter	Coefficient	Parameter	Coefficient
$\hat{\alpha}_{NTl}$	0.119^{*}	$\hat{\beta}_{NTl}$	0.001
	(0.066)		(0.085)
$\hat{\alpha}_{NTL}$	0.067	$\hat{\beta}_{NTL}$	-0.015
	(0.041)		(0.019)
$\hat{\alpha}_{GTl}$	-0.020	$\hat{\beta}_{GTl}$	0.112^{**}
	(0.051)		(0.053)
$\hat{\alpha}_{GTL}$	0.110^{***}	$\hat{\beta}_{GTL}$	-0.100^{***}
	(0.026)		(0.008)
Observations: 1800		Clusters: 240	

Table 11: H_0: Control Weight$_j$ = Out-group/In-group Weight$_j$

	Tl	TL
Control	-0.011	0.080
	NTl	NTL
Out-group	0.119	0.067
Prob $> \chi^2$	0.362	0.860
In-group	0.120	0.052
Prob $> \chi^2$	0.382	0.743

In Table 12, we construct the weights w_{2j} for each alternative j. In general, first movers attach low weights to second movers' payoffs. This indicates that first movers are primarily concerned with their own monetary payoff. It is noteworthy, that a negative weight is, in-fact, possible.[7] Looking at the alternatives where group payoffs are not displayed (that is NTl and NTL), we find no evidence in support of the existence of a group effect. Subjects, do not differentiate between members of different groups when making transfer decisions in expectation, if group payoffs are not displayed. On the other hand, there is evidence to support a group effect in two alternatives when group payoffs are displayed. The two alternatives are GTl and GTL. Interestingly enough, the two alternatives have opposite implications for the second mover. More specifically, in GTl, first movers significantly favor an in-group second mover, whereas in the GTL, first movers significantly

[7]The weights were not restricted to non-negative values a priori.

favor an out-group second mover. Second movers are expected to allocate significantly more to in-group first movers in the second stage of the GTL game. Therefore, favorable transfers by in-group first movers in GTL can be explained more by first mover's pecuniary interests than their altruistic feelings towards in-group second movers. This further suggests that social identity is inactive.

Table 12: H_0: Out-group Weight$_j$ = In-group Weight$_j$

	NTl	GTl	NTL	GTL
Out-group	0.119	−0.020	0.067	0.110
In-group	0.120	0.092	0.052	0.009
Prob $> \chi^2$	0.992	0.036	0.727	0.008

To get a more comprehensive idea of the underlying mechanics of the games, we also run statistical tests to determine the role of a transfer that was more than half the endowment of the first mover. Thus, we test the hypothesis H_0: Out/In-group Weight$_j$ of Transfer > 2 = Out/In-group Weight$_j$ of Transfer ≤ 2. The results are reported in Table 13. We observe a significant difference only in the out-group weights when group payoffs are displayed. This result corroborates with the results in Table 12. First movers attach a higher weight to out-group second movers when the former transfer more than half their endowment, in anticipation that the out-group second movers will keep most of the new amount.

Table 13: H_0: Out/In-group Weight$_j$ of Transfer > 2 = Out/In-group Weight$_j$ of Transfer ≤ 2

	Control		Out-group	In-group		Out-group	In-group
Tl	-0.011	NTl	0.119	0.120	GTl	−0.020	0.092
TL	0.080	NTL	0.067	0.052	GTL	0.110	0.009
$P > \chi^2$	0.568	$P > \chi^2$	0.482	0.500	$P > \chi^2$	0.042	0.321

6 Discussion

6.1 Behavior of First Movers

In this subsection, we discuss the behavior of the first movers in the Trust game. Theoretically, if a second mover only cares about maximizing his own payoff, then his best response is to always keep everything, independently of the magnitude of the first mover's transfer. Thus, contingent on this profit maximizing assumption, the only Subgame Perfect Nash Equilibrium (SPNE) in the Trust game is for the first mover to transfer zero in expectation of the second mover's best response.

Table 14: Actual Observed First Mover Behavior

	Trust w/o		Trust w/	
Out-group	Group Payoffs		Group Payoffs	
Transfer	Freq.	Percent	Freq.	Percent
0	105	27.3	282	49.0
1	42	10.9	84	14.6
2	90	23.4	96	16.7
3	54	14.1	6	1.0
4	93	24.2	108	18.8
Total/Avg.	384		576	

	Trust w/o		Trust w/	
In-group	Group Payoffs		Group Payoffs	
Transfer	Freq.	Percent	Freq.	Percent
0	81	24.1	165	32.7
1	39	11.6	39	7.7
2	57	17.0	111	22.0
3	24	7.1	45	8.9
4	135	40.2	144	28.57
Total/Avg.	336		504	

In Table 14, we present the summary statistics of the choices of the first mover under each treatment for both in-group and out-group pairings. It is noteworthy that first movers transfer, on average, more to in-group than to out-group members, independently of the treatment. Furthermore, the presence of group outcomes reduces the average transfer to, both, in-group and

out-group participants. In addition, a high percentage of first movers choose the extremes; that is, first movers either transfer nothing or transfer all 4 quarters. Around 20% of the first movers choose to transfer half their endowment while, relatively, few participants choose to transfer 1 or 3 quarters.

Table 15: Expected Payoffs in the Trust Game From the Descriptive Prediction

	Trust w/o		Trust w/	
Out-group	Group Payoffs		Group Payoffs	
Transfer	$E[\pi_1\|x]$	$E[\pi_2\|x]$	$E[\pi_1\|x]$	$E[\pi_2\|x]$
0	**4.00**	0.00	**4.00**	0.00
1	3.07	3.93	3.18	3.82
2	3.33	6.67	3.19	6.81
3	3.17	9.83	**4.00**	9.00
4	3.23	12.77	1.11	14.89

	Trust w/o		Trust w/	
In-group	Group Payoffs		Group Payoffs	
Transfer	$E[\pi_1\|x]$	$E[\pi_2\|x]$	$E[\pi_1\|x]$	$E[\pi_2\|x]$
0	**4.00**	0.00	**4.00**	0.00
1	3.08	3.92	3.08	3.92
2	2.74	7.26	3.03	6.97
3	2.88	10.13	2.40	10.60
4	**4.00**	12.00	3.92	12.08

Note: Max Highlighted

Alternatively, suppose that every first mover can perfectly observe the distribution of all second movers' choices y. Then, a first mover can calculate the probability of a second mover's choice y given the first mover's transfer x, $P(y|x)$ as:

$$P(y|x) = \frac{n_{y|x}}{m_x},$$

where $n_{y|x}$ is the number of times the second movers chose option y when the first mover's transfer was x quarters; and m_x is the number of times the first movers chose to transfer x quarters. Then, the expected payoff of the second mover is $E[\pi_2|x] = \sum_{y=1}^{5}(y-1)\cdot x \cdot P(y|x)$, whereas the expected payoff of the first mover is $E[\pi_1|x] = \sum_{y=1}^{5} 4+3x-((y-1)\cdot x \cdot P(y|x))$. We present the expected payoffs $E[\pi_1|x]$ and $E[\pi_2|x]$ in Table 15.

Table 16: Expected Payoffs in the Trust Game From the Structural Model Prediction

	Trust w/o		Trust w/	
Out-group	Group Payoffs		Group Payoffs	
Transfer	$E[\pi_1\|x]$	$E[\pi_2\|x]$	$E[\pi_1\|x]$	$E[\pi_2\|x]$
0	4.00	0.00	**4.00**	0.00
1	**4.05**	2.95	3.85	3.15
2	3.01	6.99	2.67	7.33
3	3.83	9.17	2.44	10.55
4	2.84	13.16	1.20	14.80

	Trust w/o		Trust w/	
In-group	Group Payoffs		Group Payoffs	
Transfer	$E[\pi_1\|x]$	$E[\pi_2\|x]$	$E[\pi_1\|x]$	$E[\pi_2\|x]$
0	4.00	0.00	4.00	0.00
1	3.70	3.30	3.89	3.11
2	2.47	7.53	2.74	7.26
3	**4.45**	8.55	**4.27**	8.73
4	3.72	12.28	3.46	12.54

Note: Max Highlighted

Had the sample size been large, the above descriptive prediction of expected payoffs would have been unbiased via an application of the law of large numbers. Yet, due to the limited sample size of our experimental data, we also construct the expected payoffs using the structural model introduced in Section 4. The expected payoffs of the structural model is presented in Table 16. It is noteworthy that the descriptive statistics of Table 14 indicate that more than 50% of first movers chose to transfer more than zero quarters to out-group second movers. This statistic shows that first movers are altrusitic towards out-group members. The structural estimation of the first movers' weights on second movers' payoffs is thus in line with the descriptive statistic of Table 14. On the other hand, first movers attain the maximum expected payoff (> 4 quarters) when they choose to transfer 3 quarters to an in-group member, regardless of whether group outcomes are shown. Referring back to Table 14, we observe that less than 50% of first movers, when group outcomes were not displayed, and less than 40% of first movers, when group outcomes were displayed, chose to transfer more than half their endowment to in-group second movers. This provides evidence of risk aversion on the part of the first movers. Thus, first movers are willing to give up 1 to 2 quarters in expected payoff in order to secure a certain payoff of 4 quarters.

6.2 Evolution of Choices

We use the following regression to illustrate the evolution of the first mover i's transfer x in period t of the Trust game sessions.

$$x_{it} = \hat{\lambda} + \hat{\gamma}_1 \cdot \text{Period} + \hat{\gamma}_2 \cdot \text{Period} \times I + \hat{\varepsilon}_{it}$$

Table 17: Evolution of First Mover's Transfer in Trust Game

Coefficients	All	NT	GT
Constant($\hat{\lambda}$)	2.132^{***}	2.453^{***}	1.917^{***}
	(0.136)	(0.214)	(0.171)
Period ($\hat{\gamma}_1$)	-0.075^{***}	-0.057^{**}	-0.088^{***}
	(0.016)	(0.026)	(0.021)
Period$\times I$ ($\hat{\gamma}_2$)	0.067^{***}	0.029	0.092^{***}
	(0.014)	(0.022)	(0.018)

Note: *** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$

The regression results are reported in Table 17. The coefficient $\hat{\gamma}_1$ captures the evolution of transfer across periods when the first mover is paired with an out-group participant. On the other hand, the evolution of transfer when the first mover is paired with an in-group participant is $\hat{\gamma}_1 + \hat{\gamma}_2$. Thus, the coefficient $\hat{\gamma}_2$ captures the difference in the evolution of transfer between a second mover that is in-group and one that is out-group. We observe that first movers are progressively transferring less to out-group participants since $\hat{\gamma}_1$ is significantly negative in both Trust game treatments. In addition, the coefficient $\hat{\gamma}_2$ is only significant when the group payoffs are displayed. We test whether $\hat{\gamma}_1 + \hat{\gamma}_2$ is significantly different from zero, and the test results are presented in Table 18. We see that the change in transfer is not significant when the first-mover is faced with an in-group participant.

Table 18: H_0: $\hat{\gamma}_1 + \hat{\gamma}_2 = 0$

	All	NT	GT
$\hat{\gamma}_1 + \hat{\gamma}_2$	-0.008	-0.028	0.004
Prob $> F$	0.609	0.297	0.844

We use the following OLS to illustrate the evolution in subject i's choice y of amount kept in period t.

$$y_{it} = \lambda + \gamma_1 \cdot \text{Period} + \gamma_2 \cdot \text{Period} \times I + \varepsilon_{it}$$

Table 19: Evolution of Second Mover/Dictator's Choice y

Coefficients	All	ND	GD	NT	GT
Constant (λ)	4.517^{***}	4.799^{***}	4.776^{***}	4.002^{***}	4.418^{***}
	(0.047)	(0.062)	(0.070)	(0.119)	(0.108)
Period (γ_1)	0.021^{***}	0.004	0.008	0.042^{***}	0.027^{*}
	(0.006)	(0.008)	(0.008)	(0.015)	(0.016)
Period$\times I$ (γ_2)	-0.017^{***}	-0.003	-0.021^{***}	-0.002	-0.036^{***}
	(0.005)	(0.007)	(0.007)	(0.014)	(0.013)

Note: *** $P < 0.01$, ** $P < 0.05$, * $P < 0.1$

The regression results are reported in Table 19. The coefficient γ_1 captures the evolution of amount-kept choices across periods when subject $i = 2$ is paired with an out-group participant. On the other hand, the evolution of choice when subject $i = 2$ is paired with an in-group participant is $\gamma_1 + \gamma_2$. Thus, the coefficient γ_2 captures the difference in the evolution of choices between a subject $i = 1$ that is in-group and one that is out-group. We observe that the coefficient γ_1 is not significantly different from zero in the Dictator game, but it is significantly positive for both Trust game treatments; the latter result, indicates that subjects keep more as the game progresses. The coefficient γ_2 is not significantly different from zero when group payoffs are not displayed, but it is significantly negative when group payoffs are displayed. We test whether $\gamma_1 + \gamma_2$ is significantly different from zero, and the test results are presented in Table 20. We see that the change in the choice of amount kept is not significant when a subject is paired with an in-group participant, with the exception of the Trust game with no group payoffs displayed (significantly positive).

Table 20: H_0: $\gamma_1 + \gamma_2 = 0$

	All	ND	GD	NT	GT
$\gamma_1 + \gamma_2$	0.004	0.001	-0.014	0.040	-0.008
Prob $> F$	0.511	0.932	0.112	0.009	0.534

6.3 Questionnaires

Our overall findings indicate that the role of social identity in motivating agents' decisions has been exaggerated. Yet, this could be attributed to a weak group manipulation. Thus, here, we report results on the participants' attachment to in-group and out-group members to determine whether or not the group manipulation was, in-fact, weak. In the post-experimental questionnaire, the participants' degree of attachment was measured on a scale from 1 to 10. The results are shown in Table 21. All of the group attachment-differences are statistically significant across the four treatments. These results demonstrate the success in the manipulation of the treatments: participants felt more closely-attached to an in-group than an out-group participant. Thus, the ineffectiveness of social identity in influencing agents' decisions can not be attributed to failure in invoking group identity across the different treatments.

Table 21: H_0: Mean Out-group Attachment = Mean In-group Attachment

	Dictator w/o Group Payoffs	Dictator w/ Group Payoffs	Trust w/o Group Payoffs	Trust w/ Group Payoffs
Out-group	1.938	2.344	2.531	2.563
	(0.265)	(0.350)	(0.370)	(0.285)
In-group	2.844	3.719	3.500	4.083
	(0.315)	(0.463)	(0.409)	(0.363)
$Pr(\|T\| > \|t\|)$	0.032	0.021	0.084	0.001

7 Conclusion

This paper reports findings from laboratory experiments in an almost minimal group setting, that investigate how group membership affects an agent's individual behavior. More specifically, the study tests two competing hypotheses. One is that group membership operates through social identity, and the other is that group membership implements a correlation among the actions of the in-group members in response to the display of group payoffs. The study also develops a structural model to describe an agent's conditional behavior across treatments.

Our results suggest that the role of social identity on motivating agents' decisions has been exaggerated. Despite the presence of in-group favoritism in the Dictator game when group outcomes are displayed, a careful analysis of the results reveals that in-group favoritism is manifested

as favorable in-group treatment in response to the display of group outcomes. In addition, in the Trust game with group outcomes displayed, second movers discriminate against out-group first movers who transfer more than half of their endowment to them. Thus, second movers seize the opportunity to increase their monetary payoff at the expense of the out-group first movers who entrusted them. In all other contexts, there is no evidence in support of differential treatment despite the success in the manipulation of the treatments as indicated in the post-experimental questionnaires. We thus propose that participants use group outcomes as a coordinating device to align the expectations of in-group members, reduce uncertainty despite the presence of imperfect information and finally, to coordinate their activities towards favorable outcomes. Finally, we find evidence in support of recent experimental studies which demonstrate that allocation choices are sensitive not only to the choice set available to the agent contemplating an action, but also to the behavior of the agent that generated the choice set.

Our hopes are that the findings gleaned from these experiments, will eventually be applied to a variety of economic and social settings. Some selected applications could be: auctions, attitudes of consumers towards different tax schemes, and employee response to changes in wages. In addition, our findings will enable researchers in the future to, also, examine identity-based behaviors across space and time. The researchers for example, could consider why notions of "class" or "race" vary across countries; why might gender and racial integration vary across industries; what might explain the rise and fall of ethnic tensions.

References

Bernhard, Helen, Ernst Fehr, and Urs Fischbacher. "Group Affiliation and Altruistic Norm Enforcement." *American Economic Review,* 96, 2: (2006) 217–21.

Brown-Kruse, Jamie, and David Hummels. "Gender Effects in Laboratory Public Goods Contribution: Do Individuals Put Their Money Where Their Mouth Is?" *Journal of Economic Behavior and Organization,* 22, 3: (1993) 255–67.

Cadsby, Bram, and Elizabeth Maynes. "Gender and Free Riding in a Threshold Public Goods Game: Experimental Evidence." *Journal of Economic Behavior and Organization* 34, 4: (1998) 603–20.

Camerer, Colin F. *Behavioral Game Theory.* Princeton University Press, 2003.

Charness, Gary, and Matthew Rabin. "Understanding Social Preferences with Simple Tests." *Quarterly Journal of Economics,* 117, 3: (2002) 817–69.

Charness, Gary, Luca Rigotti, and Aldo Rustichini. "Individual Behavior and Group Membership." *American Economic Review,* 97, 4: (2007) 1340–52.

Chen, Yan, and Sherry Xin Li. "Group Identity and Social Preferences." *American Economic Review,* 99, 1: (2009) 431–57.

Fischbacher, Urs. "z-Tree: Zurich toolbox for ready-made economic experiments." *Experimental Economics* 10, 2: (2007) 171–8.

Roth, Alvin, and Axel Ockenfels. "Last-Minute Bidding and the Rules for Ending Second-Price Auctions: Evidence from eBay and Amazon Auctions on the Internet." *American Economic Review,* 92, 4: (2002) 1093–1103.

Solow, John L., and Nicole Kirkwood. "Group Identity and Gender in Public Goods Experiments." *Journal of Economic Behavior and Organization,* 48, 4: (2002) 403–12.

Tajfel, Henry, and John Turner. "The Social Identity Theory of Intergroup Behavior." *The Psychology of Intergroup Relations,* ed. Stephen Worchel and William Austin, Chicago, IL: Nelson-Hall: (1986) 7–24.

Yamagishi, Toshio, and Toko Kiyonari. "The Group as the Container of Generalized Reciprocity." *Social Psychology Quarterly,* 63, 2: (2000) 116–32.