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Group Membership, Team Preferences, and Expectations*

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Abstract

Group membership increases cooperation in social dilemma games, altruistic donation in dictator games, and fair offers in ultimatum games. While the empirical study of group action has grown rapidly over the years, there is little agreement at the theoretical level on exactly why and how group membership changes individual behaviour. According to some theorists, the effect of group framing is channelled primarily via the beliefs of group members, while others identify changes in preference as the key explanatory mechanism. We report an experiment using the minimal group paradigm and a prisoner's dilemma with multiple actions, in which we manipulate players' beliefs and show that common knowledge of group affiliation is necessary for group action. We also observe puzzling variations in behaviour when knowledge of group membership is asymmetric, which may be interpreted as cognitive dissonance generated by a normative cue administered in a highly unusual situation.

Keywords: group identity, team preferences, social dilemmas, experimental economics.

JEL Codes: C72, C92, H41

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1. Introduction

There is currently a revival of interest among economists in the concept of group membership and its effects on individual decision-making (e.g. Akerlof and Kranton 2000, 2010; Sugden 2000; Eckel and Grossman 2005; Bacharach 2006; Cooper and Kagel 2005; Bernhard et al. 2006; Goette et al. 2006; Ruffle and Sosis 2006; Charness et al. 2007; Efferson et al. 2008; Hargreaves Heap and Zizzo 2009; Chen and Li 2009; Sutter 2009; Benjamin et al. 2010; Zizzo 2011). The topic in itself is not new, its roots in the psychology literature going back at least to the 1960s. For various reasons, however, economists have traditionally been reluctant to investigate this topic: to begin with, a commitment to the principle of methodological individualism has always cast a shadow of doubt on the attribution of causal efficacy to groups at the expense of individual members. Moreover until recently social scientists and psychologists were unable to model the mechanisms through which this putative causal influence would be exerted, and as a consequence several key issues remained unresolved both theoretically and empirically.

These obstacles have been partly overcome over the last decade. Economists' prejudice against group concepts has been moderated by the realization that group action can be analysed in terms that are entirely consistent with methodological individualism. The behaviour of groups can now be explained using models of team reasoning (Sugden 2000, Bacharach 2006), theories of social norms (Bicchieri 2006, Gintis 2009), guilt aversion (Charness and Dufwenberg 2006), and generalised reciprocity (Yamagishi et al. 1999), to name some of the main proposals.

In such circumstances, it has become imperative to devise experimental tests that discriminate among these explanations and point theoretical research in the right direction. The overwhelming majority of decision models in social science explain behaviour in terms of the preferences and beliefs of the decision-makers. This is obviously true of expected utility theory, but also of non-standard models that relax one or more of its assumptions. A preliminary, fundamental question therefore is whether the effect of group membership on individual decisions takes place via preferences, beliefs, or both. Does group membership change people's *goals* (by, for example, modifying the argument of their utility function) or does it change people's *expectations* concerning what other individuals will do? Answering these questions would give us valuable information concerning the class of models that can explain group behaviour, and potentially rule out those theories that identify the effect of group membership with the wrong theoretical variable.

The experiment that we describe in this paper is especially designed for this purpose. The experiment is a two-person public goods game (or multiple-action prisoner's dilemma) in which group membership is induced using the minimal group paradigm devised by Tajfel et al. (1971) and widely replicated thereafter. We manipulate players' *beliefs* and compare conditions with common knowledge of group membership vs. asymmetric knowledge conditions. In the latter, all players are aware of *their own* group affiliation, but some players do not know the affiliation of their partner (who, in turn, knows that the first player ignores this piece of information).

Using this design we test the hypothesis that group membership affects behaviour via individual beliefs: if beliefs are crucial, we should observe significantly higher rates of contribution in the common knowledge than in the asymmetric knowledge conditions. As we shall see, our results confirm the hypothesis that beliefs matter: group membership does not raise cooperation, unless both partners are aware of their common affiliation.

2. Literature review

Pioneering work on group behaviour was carried out in the 1960s and 1970s by social psychologists. The classic studies of Muzafer Sherif (Sherif et al. 1961) and Henri Tajfel (Tajfel et al. 1971, Tajfel 1982), in particular, introduced the idea that "group identity" is causally related to competition with other groups (or out-group individuals) and involves a framing effect that can be manipulated by experimental means. The subsequent experimental literature made progress on the latter front in particular, exploring several ways in which group identity can be induced in the laboratory by means of surprisingly light experimental devices. Among these, the most widely used are: *plural pronouns* and *group language* in the experimental instructions (e.g. "we", "them", "our team"); *common fate* (the outcome of part of the experiment is determined by a mechanism that affects all the members of the group jointly and equally); *interdependence* (the outcome depends at least partly on the actions of other group members); *face-to-face contact*; *cheap talk* (e.g. promising); and *labelling* using meaningful or meaningless categories.¹

Meaningless labels are perhaps the most surprising device, for they highlight the human propensity to exploit arbitrary cues for the purpose of building social categories. In a classic experiment Tajfel et al. (1971) divided their subjects (fictitiously) in two groups based on their preferences for Klee or

¹ See e.g. Brewer and Kramer (1986), Isaac and Walker (1988), Orbell et al (1988), Dawes et al. (1990), Kerr and Kauffmann-Gilliland (1994); the social psychology literature is surveyed in Brown (2000) and Hogg and Abrams (2003).

Kandinsky paintings. Subjects engaged then in a separate task where they had to allocate money between random in-group and out-group members, and on average gave more resources to the former than to the latter. From an economic point of view, it is noteworthy that subjects sometimes sacrificed resources to increase the difference between in-group and out-group payoffs, that is, they behaved spitefully towards out-group members.

This *minimal group paradigm* has been used repeatedly in experimental studies of group identity, because it displays the cognitive effect of group framing in its purest form.² It remains unclear, however, *how* exactly the minimal group design induces higher levels of transfers towards in-group members. The theories that have been proposed fall roughly in two categories: according to *preference*-based theories, group identity transforms the utility function of individuals who are engaged in a group task; according to *belief*-based theories the group identity manipulation changes their expectations, and via this route modifies their behaviour, when they interact with in-group or out-group members.

2.1. Group identity and team preferences

The simplest way to incorporate group identity in economic theory is by modelling a concern for the payoffs of other players in the utility function of each individual member of a group. Suppose for example that the utility of every individual i *increases* with the payoffs of in-group members j ($\beta > 0$) and *decreases* with the payoffs of out-group members k ($\gamma < 0$):

$$U_i = \alpha(\pi_i) + \beta\left(\sum_j \pi_j\right) + \gamma\left(\sum_k \pi_k\right).$$

In the absence of group categories, the decision-maker would be unable to distinguish in-group from out-group individuals (j from k , in the formula above). Her behaviour as a consequence would reflect a basic tendency to maximize her own payoffs (β and γ are equal to zero).³ When the decision-maker *is* able to distinguish j from k , in contrast, the minimal group manipulation increases the relative weight of parameters β and γ compared to α . Group membership according to this simple model would augment the relative impact of other-regarding considerations on the individual

² We will use the term “minimal group” rather broadly, to include a number of experiments that differ in some respects from Tajfel’s. There are, to begin with, various degrees of “minimality”, and in our experiment we use different methods to elicit group identity. Secondly, while Tajfel’s subjects engaged in a task that had no payoff consequences for themselves, we follow the experimental economics tradition and study situations where pro-social behaviour has a cost for the decision-maker.

³ We are assuming for simplicity that group affiliation is the only source of other-regarding utility, which is probably not true in general (for a review see Cooper and Kagel, in press). The model can be easily modified to incorporate other-regarding concerns that do not depend on group identity. Notice however that in some experiments – with public goods, for example – the creation of experimental sub-groups may inadvertently trigger group identity effects. This would be consistent with evolutionary accounts that identify interaction in small groups and within the family as the natural breeding sites for cooperation (e.g. Binmore 2005, Bowles and Gintis 2011).

utility associated with a certain outcome or prospect. In the context of a simple prisoner's dilemma game, for example, when the players belong to the same group the payoffs represented in Figure 1(a) are transformed as in Figure 1(b). If β is close enough to one and $a+d < 2b$, mutual cooperation becomes the only equilibrium of the transformed game.

[Insert Figure 1 here]

This approach retains a crucial element of classic game-theoretic analyses, namely a commitment to individualistic strategic reasoning. A more radical alternative is to represent the preferences of group members by means of a special utility function that reflects the goals of the whole group or team. The *team reasoning* hypothesis (Sugden 2000, Bacharach 2006) postulates the existence of multiple preference structures that can potentially motivate individual choice. While personal preferences are attuned to achieving one's own objectives and typically enhancing one's own welfare, team preferences are attuned to collective goals and the welfare of the group. An advantage of this dual preference structure is that by temporarily "switching off" their personal preferences and focusing on collective goals, individuals may be able to avoid the pitfalls of Pareto-inferior equilibria.

Figure 2(a) and (b) represent the transformation in the context of a prisoner's dilemma. Notice that the decision now is not even a "game", strictly speaking, for it loses its strategic character. The decision-maker is the *pair* of subjects, and each individual simply does her part to achieve the outcome that appears superior from a collective point of view. Although we assume here for simplicity that team utility is a simple additive combination of the two individual payoffs, one can easily devise more complex transformation functions.

[Insert Figure 2 about here]

Team reasoning takes place in the mind of each individual team member, who has the problem of figuring out what to do in order to pursue the group's objectives. The decision can therefore be modelled as the choice of S that uniquely maximizes U , where U is the *team's* utility function, which is typically obtained by aggregating individual payoffs, and S is a profile of strategies (one for each member of the team). The main difference between standard (individualistic) game theory and team reasoning is that in the latter individuals evaluate entire profiles of strategies S , instead of

their individual components s_i , and they do so in light of the team's utility U rather than individual utilities u_i . Minimal group priming may be one way of triggering a collectivist frame, inducing subjects to focus on U instead of u_i .

2.2. Expectations and social norms

A second class of theoretical models are able to explain the effect of group membership as a manipulation of individual beliefs or expectations. These models move from the assumption that observed choices depend on prior beliefs that subjects bring with them when they enter the experimental laboratory. Beliefs concerning the moves of the other players are crucial especially if subjects are "conditional cooperators" (Fischbacher et al. 2001; Frey and Meier 2004; Fischbacher and Gächter 2010). A conditional cooperator prefers to contribute to the provision of a public good if the other players do the same, and conversely prefers not to contribute if others don't.

Models of *reciprocity* try to capture this pattern of behaviour introducing utility functions that depend not just on the outcomes of the game, but also on the intentions of the other players (Rabin 1993, Dufwenberg and Kirchsteiger 2004, Falk and Fischbacher 2006). Intuitively, a reciprocator prefers to reward another player if the latter's move is perceived as "nice", and to punish if it is perceived as "nasty". To simplify, consider a prisoner's dilemma with two actions – cooperate (a "nice" move) or defect (a "nasty" move). Two reciprocators cooperate only if they believe that the other player cooperates. So imagine that i believes that j will not cooperate; this implies that i also believes that j does not expect her to cooperate. If the minimal group paradigm changes i 's beliefs concerning j 's behaviour, it must also change her second-order beliefs concerning j 's expectations: it would be inconsistent for i to believe that j will contribute, unless the latter also believes that i will cooperate. A cooperative equilibrium supported by reciprocity requires *mutual expectations of cooperation* in the population.

Models of this kind effectively transform public goods games in coordination problems, where each player would like to match the contribution of the other player. There are several possible matching equilibria, however, and no way to select a priori which one will be played. *Social norms*, according to some theorists, help overcome coordination problems of this kind. Let us define a social norm as a signal associated with a strategy s in a game G . A norm may play a function similar to a *correlating device* in Aumann-type correlated equilibria.⁴ Gintis (2009), who has extended Aumann's theory to account for the existence of social norms, calls this correlating device the

⁴ It is likely however that norms, unlike correlating devices, can modify individual incentives. See Bicchieri (2006) and Gintis (2009).

choreographer. Think of the choreographer not as a person, but as a rule dictating “do s” to each player. In correlated equilibria the advice given is optimal *assuming that the other players will follow the choreographer’s advice* (see Gintis 2009: 132-7).

But why should we expect that the other players will follow the choreographer’s advice? One possible answer is that the equilibrium identified by the norm is *salient*, for purely cognitive reasons or for precedence: traditionally, people have been following the rule, and using an inductive principle we infer that they will continue to follow it in the future (Schelling 1960, Lewis 1969). Alternatively, players may suffer from “guilt aversion”, a net loss of utility when their behaviour frustrates others’ expectations (Charness and Dufwenberg 2006, Battigalli and Dufwenberg 2007).

2.3. Evidence on expectations

A substantial body of evidence confirms the importance of expectations in sustaining pro-social behaviour (Kagel et al. 1996, Haley and Fessler 2005, Dana et al. 2007, Bicchieri and Xiao 2009, Ellingsen et al. 2011). None of these experiments, however, focuses specifically on group identity. In a study that is relatively close to ours, Ellingsen et al. (2011) for example manipulate subjects’ perception of a prisoner’s dilemma game using labels such as “community game” and “market game”. They observe that the social frame has a significant effect on behaviour only if there is common knowledge of the frame, and if both players choose simultaneously. In contrast, no effect is observed when subjects have asymmetric knowledge or when they choose sequentially, which is consistent with the hypothesis that the frames affect prior beliefs and are used by subjects mainly as coordination devices.

Can the same hypothesis account for the minimal group effect? We are aware of only three experiments which have attempted the manipulation of beliefs in the context of in-group/out-group settings. Yamagishi and Mifune (2008) have tested the importance of mutual beliefs in an experiment with the dictator’s game. Dictators give a fair share (1/2 of the cake) to recipients more frequently (65% vs. 47% of the time) in an in-group condition with common knowledge than in an in-group condition with asymmetric knowledge of group affiliation (i.e. when the recipient does not know the dictator’s affiliation). Additionally, there is no difference between in-group and out-group allocations when knowledge is asymmetric. A second experiment, by Güth et al. (2009), also uses the dictator’s game, but with the elicitation of subjects’ beliefs before *or* after the main experimental task. Interestingly, Güth and co-authors report a significant increase of donations in the in-group common knowledge condition only when the dictator’s beliefs concerning the

recipient's expectations are elicited *in advance* of making her decision. When the dictator's attention is not focused on mutual beliefs, in contrast, the asymmetry of information does not seem to matter. Jin and Yamagishi (1997), finally, created minimal groups using the classic Klee-Kandinsky device, and induced asymmetric knowledge of group membership before playing a continuous-payoff prisoner's dilemma game. Although Jin and Yamagishi report higher contributions to the public account when subjects are paired with a member of the same group *and* there is mutual knowledge of affiliation, we do not know much about the details of this design because the original paper was published in Japanese. In the next section we describe an experiment based on a similar game, but that probes different manipulation devices and checks their robustness using post-experimental questionnaires.

3. An experiment on beliefs and group priming

The effect of the minimal group paradigm on individual behaviour may be channelled through group members' beliefs, preferences, or both. An obvious way to discriminate among the various accounts is to block one of these channels and check whether the intervention makes any difference at the level of choice. In this paper we report an experiment in which *beliefs* have been manipulated in such a way as to assess their role in the minimal group design. More precisely, we ask the following question: *Is common knowledge of group membership necessary for the minimal group effect?*

The basic structure of our experiment is a 2 x 3 design (across subjects) where we manipulate (1) the group membership of two players in a one-shot prisoner's dilemma with multiple actions, and (2) information concerning the group affiliation of the other player. Along the first dimension, we have partners belonging to the same group in some sessions (IN-group conditions), and partners belonging to different groups in other sessions (OUT-group conditions). Along the second dimension, we have sessions with common knowledge of group membership (CK), and sessions with asymmetric knowledge where one player is aware of the group affiliation of both players (AK_full) while the other one knows her own affiliation but ignores the affiliation of her partner (AK_partial). In all cases, the prisoner's dilemma game was preceded by a priming session using the minimal group paradigm.

If group membership is associated with expectations of conformity to group norms, by varying information concerning group affiliation we should also manipulate subjects' beliefs concerning

others' behaviour, and beliefs concerning *expectations* of behaviour. Terms like “group” and “team” may trigger the inductive application of a rule that people usually apply in everyday life. When the game is among in-group members the rule says “cooperate”; when it is among out-group members, it says “do not cooperate”. Suppose for example that *i* believes that *j* does not expect her to contribute to the public good. The minimal group paradigm may change *i*'s behaviour by manipulating her beliefs concerning *j*'s expectations. But *i*'s beliefs can change only if *i* learns that *j* knows that *i* knows that they are fellow group members. Information concerning group affiliation must be common knowledge among the players. For imagine that only *i* knows about the common group affiliation: since *j* does not know whether she is playing with an in-group or an out-group member, she is unable to infer the correct rule for that situation, and she cannot do better than play randomly. Player *i* as a consequence is also unable to predict the contribution of *j*, and cannot do better than play randomly. The minimal group paradigm should have no significant effect on the average behaviour of experimental subjects in one-shot games with asymmetric information of group membership.

3.1. Experimental design

Overall 410 subjects participated in the experiment, drawn from the student population of the University of Trento in the North of Italy. Subjects were recruited using flyers and registered online in a dedicated website of the Cognitive and Experimental Economics Laboratory. As they entered the laboratory, subjects were seated randomly at computer desks separated by partitions. A laboratory assistant read the instructions aloud and invited subjects to answer six questions to test their comprehension of the experimental task. The assistant then illustrated the correct answer to each question and encouraged further requests of clarification. When all doubts had been dispelled, the experiment began.

Stage 1 of the experiment consisted of a minimal group manipulation. To cross-check the effect of the group identity manipulation, we used different techniques in different sessions. The manipulations are labelled “Guess”, “Bracelets”, and “Painters”.

GUESS: Subjects were asked to estimate the number of students currently registered at the University of Trento. It was made clear in the instructions that the only purpose of this task was to divide them into separate groups on the basis of a similarity criterion (so that each subject would

belong to a group of *similar* individuals).⁵ Once they had formulated their guess, subjects were told that those whose answers lied above the median would be assigned to the “Yellow” group, and those below the median to the “Red” group. The value of the median was then calculated and each subject’s group affiliation was communicated privately.

BRACELETS: Subjects picked randomly a coloured bracelet (Red or Yellow), which they were asked to wear during the experiment. The random draw method has been used by several other experimenters before (following Billig and Tajfel 1973); the only difference is that we tried to enhance the perception of similarity using a physical marker that remained salient throughout the task.

PAINTERS: Subjects were asked to evaluate a series of paintings by Vassily Kandinsky, assigning a score from one to ten. The median score was then communicated, and subjects were divided in the Yellow or Red group depending on whether their own score lied above or below the median.⁶ To further bolster group identity, subjects engaged in a recognition task (they had to identify the authors of five modern art paintings) which earned them five cents for every correct answer provided by a member of their group (including one’s own answers). This device was meant to implement the “common fate” condition that according to social psychologists constitutes an important element of group identity.

After group identity had been primed using one of these three techniques, *Stage 2* of the experiment began. Subjects were paired randomly and asked to play a two-person linear public goods game (or, equivalently, a prisoner’s dilemma with $n > 2$ discrete actions). Each subject received an endowment of 10 euro, to be allocated in units of one euro across two separate accounts. Each unit invested in the “Personal Account” produced exactly one euro for that player. Each unit invested in the “Public Account” was added to those invested by the other player, multiplied by a factor of 1.5, and divided equally between the two players. The production function was therefore

$$\pi_i = E - c_i + .75 \times (c_i + c_{j \neq i}),$$

where E is the initial endowment, and c_i, c_j are the contributions of the two players.

⁵ The word “similar” was underlined in the instructions, to convey an idea of group homogeneity (according to cognitive psychologists homogeneity is an important factor in group framing). However, the arbitrariness of the mechanism used to divide subjects in groups was totally explicit and no deception was involved.

⁶ We used this device to replicate Tajfel’s original task as closely as possible, but without deception.

Subjects were asked to allocate the endowment by entering two numbers (one for the Private and one for the Public Account) in separate boxes on their computer screen. As anticipated in the instructions, the screen contained information concerning the affiliation of the other player. In the *common knowledge conditions* (CK) it said “The other player is Yellow [Red]. He/she knows that he/she is Yellow [Red], knows your colour, and knows that you know both players’ colours”. In the *asymmetric knowledge conditions*, it said either “The other player may be Yellow or Red” (condition AK_partial), or “The other player is Yellow [Red]. He/she knows his/her colour, but does not know your colour” (condition AK_full). To make group affiliation salient, we represented it visually using two human-shaped icons coloured in yellow or red. When subjects did not know their partner’s affiliation, the icon on the right-hand side was coloured in grey and carried a large question mark. When subjects were told that their affiliation had not been disclosed to their partner, the icon on the right-hand side was appropriately coloured (red or yellow) but carried a balloon with a question mark to signify the partner’s lack of information. Figure 3 summarizes the various treatments and displays some of the icons that we used.

[Figure 3 about here]

After all subjects had made their decision, they answered a short questionnaire that elicited their subjective experiences of participation in the experiment. One question in particular probed their feeling of identification with the group, and will be discussed in more detail in the next sub-section. At this point each participant received feedback about the money she had earned, filled in a brief questionnaire requesting generic information about age, gender, university degree, etc., and was paid privately in cash (the average earning was roughly 12 euros).

3.2. *Experimental results*

Table 1 includes the relative frequency of contribution choices across the experimental conditions. On the rows we report the results of the three beliefs conditions (CK, AK_partial, AK_full), while on the columns we report some statistical indicators, organized according to the two treatments (IN and OUT). We also disaggregate the data according to the manipulation device that we have used (Guess, Bracelets, Painters), and then aggregate all the data in a pooled sample (at the bottom).

[Insert Table 1 about here]

We start with a broad description of the main patterns, and move subsequently to more detailed statistical analysis. It is immediately clear looking at the pooled sample that with common knowledge of group affiliation (CK) there is a difference of behaviour across the IN and OUT conditions: in-group pairs contribute more. In contrast, IN/OUT contributions barely differ when knowledge is asymmetric. While this is to be expected for those players who know their own affiliation but do not know the affiliation of their partner (AK_{partial}), the results of fully informed players (AK_{full}) are theoretically quite interesting: the data suggest that knowing that the other player belongs to your own group is insufficient, by itself, to induce higher levels of cooperation. This is *prima facie* evidence that the minimal group manipulation influences the *expectations* of players, rather than changing their preferences directly.

If we look at the three manipulations separately (Guess, Bracelets, and Painters), we notice that the effect of group membership is strikingly consistent in the CK conditions. In contrast, there is more variation in the AK conditions. These differences must be taken with a pinch of salt given the limited number of observations, but nevertheless offer insights in the decision process and invite some methodological reflections that will be discussed later. Consider in particular that in the Guess manipulation fully informed players (AK_{full}) contribute more when they are matched with an in-group than with an out-group player. But in the Painters manipulation the opposite is true: AK_{full} subjects contribute more when they are matched with an out-group than when they are matched with an in-group player. Data under the Bracelets manipulation fall roughly in between: IN/OUT behaviour is practically indistinguishable.

To confirm these first impressions, we run a series of Wilcoxon Rank Sum tests across all conditions (see Table 2). Moving from the bottom of the table, again, we see that the only significant difference in the pooled data concerns the CK_IN and CK_OUT conditions. The discrimination seems to originate in a higher propensity to cooperate with in-group members, rather than in a tendency to free ride more with out-group members. (This is apparent if we compare the results of the common knowledge conditions with the asymmetric knowledge conditions.) Notice also that the CK_IN vs. CK_OUT difference is significant or close to significance levels in all manipulation conditions except Bracelets. However, this is the only condition where no difference whatsoever is observed across all comparisons, which suggests that the manipulation device may have failed to generate group identity. We will double-check this hypothesis shortly using some questionnaire data.

[Insert Table 2 about here]

The other anomalous results concern the AK_full conditions. While in Bracelets fully informed subjects do not discriminate significantly between IN and OUT partners, in Guess and in Painters they do, but in opposite ways: while in Guess they cooperate more when matched with in-group partners, in Painters AK-full subjects cooperate more with out-group players. In Painters, however, the anomalously high values observed in AK_full_OUT are due to a single experimental session where ten subjects contributed on average 2.8 tokens to in-group partners and 9.1 tokens to out-group partners. In the other session that we ran with the same manipulation device, the average contributions were 4.3 and 4.75 respectively, very much in line with what we observed in the experiment overall. We conjecture that if we had had a chance to run further sessions, the anomaly of the Painters manipulation would have disappeared.⁷

To improve our understanding of the determinants of contribution we also run a regression estimation.⁸ Contribution to the public account is taken as the dependent variable, and alternative experimental conditions are considered as explanatory factors. More precisely, CK is set equal to one when a participant is in the common knowledge condition and zero otherwise; AK_full is equal to one when a participant is in the asymmetric knowledge condition and zero otherwise. The interaction between these two explanatory factors and the group membership of the other player is also considered. The variable IN is set equal to one when the other player has the same colour as the decision maker and equal to zero when the colours are different. We also add a few control variables to the regression: Age captures the age of the decision maker; Female captures the gender of the decision maker; Freshman is equal to one when the decision is made by a first-year student and equal to zero otherwise; Economics is equal to one when the student is majoring in Economics and equal to zero otherwise.

[Insert Table 3 about here]

The regression outcomes of Table 3 show that when data from the three experiments are pooled together (column [1]), subjects tend to cooperate more in the IN condition than in the OUT condition ($CK \times IN$). Contributions in the OUT condition (CK) do not differ from those in AK_partial, which we take as our baseline condition. However, contributions to the public good are

⁷ This proved to be impossible, unfortunately, because employing 400 students had exhausted our pool of subjects.

⁸ We used a Tobit regression analysis to account for the censoring at 0 and 10 in the dependent variable. Robust standard errors are computed to account for the discrete nature of the data.

higher in condition CK when interacting with individuals of the same colour than in the baseline (see LinHyp.1). Concerning AK_full, no significant difference is observed between in- and out-group conditions. Furthermore, only a marginally significant difference is registered between contributions in the in-group condition and contributions in the baseline.

If we analyse each manipulation separately, heterogeneity of behaviour emerges once again. While contributions in condition CK are never lower when interacting in the in-group condition than when interacting in the out-group condition, in conditions with asymmetric knowledge (AK) behaviour is more volatile. Under the Guess manipulation, a highly significant positive difference between in- and out-group contributions is observed. Moreover, the contributions in condition IN are higher than those in the baseline. In Bracelets the treatments do not produce any significant effect. In Painters we have the same surprising pattern discussed above: contributions in condition AK_full_OUT are significantly higher than in condition AK_full_IN and in the baseline.

To put these data in perspective, we discuss briefly the results of a short questionnaire that subjects completed *after* they had chosen their contribution in the Bracelets and Painters manipulation conditions.⁹ The questionnaire included several questions concerning the subjective experience of participating in the experiment. The first one, crucially, asked: “During the interaction did you feel that the two participants were like one group or like separate individuals?” (1=group, 2=individuals). When they were administered the Painters manipulation, 60% of participants answered positively (they felt as a group) in the CK_IN condition, compared to only 12.5% in CK_OUT. This difference is highly significant ($p = 0.006$, Fischer Exact Test). The answers in AK_full_IN and AK_full_OUT were practically indistinguishable, in contrast (25 vs. 27.8%, $p = 1.000$, FET), which again confirms the importance of common knowledge of affiliation for the creation of group identity. The picture in Bracelets is more blurred, which explains why the behavioural patterns are also rather uninteresting under this treatment. In CK_IN, 40% of subjects felt as group, compared to 35% in CK_OUT ($p = 1.000$, FET); in AK_full the frequencies were 50 and 44.4% respectively ($p = 1.000$, FET).

Questionnaire data support two important methodological points: first of all, the manipulation treatments that we administered had variable effects. We can say with a high degree of confidence that the Painters and, probably, the Guess devices induced group identity effectively, while the Bracelets manipulation did not. This failure may be attributed to the blatantly artificial process of

⁹ We do not have questionnaire data about the Guess manipulation, unfortunately, because the idea of a manipulation check was suggested by a referee after these sessions had already been run.

group formation (random draw), and to the fact that subjects in this condition did not engage in any common task before playing the public goods game. The data should make one pause and reflect on all those experiments that have used the “lightest” version of the minimal group design. In any case, it is advisable to always do manipulation checks like the questionnaire we administered in Painters and Bracelets.

The second point concerns the anomalous patterns of behaviour observed in the Painters treatment. Recall that subjects with full information in the AK condition cooperated more with out-group than with in-group subjects. We have already remarked that the anomalous data are concentrated in one specific session: if we disaggregate the questionnaire results, we find that indeed only 10% of the subjects in that session identified with in-group members, compared with a strange 30% identification with out-group members. In the other session, the data are much more in line with the rest of the experiment (40% identification with in-group members vs. 25% with out-group members). We should therefore conclude that the manipulation had a bizarre effect in a single session, which should be discounted from the overall results observed in the experiment.

Are these mere statistical anomalies due to low numerosity, or is there something more going on? It is not surprising, in our view, that we observed the greatest variance of results in the AK conditions. Contrary to the relatively straightforward situation faced in the CK sessions, in AK the experimental subjects receive contradictory messages: first they are given information about group membership. This information is highly salient, and is probably interpreted as a cue for the decisions they will make in the public goods game. At the same time, however, subjects in AK are put in a situation where they cannot use this information, because either they do not know the affiliation of the other player, or the other player does not know their affiliation. The “obvious” decision rule (cooperate with in-group, defect with out-group members) is thus of dubious utility, which probably causes confusion and puzzling behaviour in some of the AK sessions.

This analysis raises some important questions about the very nature of the minimal group effect. Right from the beginning, Tajfel’s paradigm was criticized for its “artificiality”. In particular, some critics argued that subjects reacted to an obvious experimental demand to modulate cooperation according to group membership. Responding to his critics, Tajfel agreed with the premise of this argument, but pointed out that not all demand effects are artificial (in the sense of lacking a counterpart outside of the laboratory):

what was no more than a hint from the experimenters about the notion of ‘groups’ being relevant to the subjects’ behaviour had been sufficient to determine, powerfully and consistently, a particular form of intergroup behaviour. [...] The problem then must be restated once again in terms of the need to specify why a certain *kind* of intergroup behaviour can be elicited so much more easily than other kinds [...]. [T]he subjects structured the situation for themselves as one involving relations between groups, and [...] they behaved in ways similar to those habitual to them in situations of this kind. (Tajfel 1982: 235-6)

Tajfel’s analysis may be extended to all experiments that study social norms in the laboratory. To observe the effects of social norms, an experimenter must create expectations about conformity to a behavioural rule that is deemed appropriate to the situation. *All* framing effects (like those investigated by Eckel and Grossmann 2005, for example, or Ellingsen et al. 2011) exploit a demand effect in this sense. The scientific interest of these studies lies in the hypothesis – which is a priori plausible and may be confirmed by field data – that the experimental manipulation cues behavioural rules that have been “imported” in the laboratory from the outside world. If this is the case, the experimental results have external validity *because* the subjects have complied with the demand (rather than “in spite” of it).¹⁰

Our results add another important nuance to this methodological point: the key mechanism linking group identity with cooperation is subjects’ concern about the expectations *of their peers*. Our data, in other words, indicate that subjects are not particularly concerned about the expectations of the experimenter, since removing mutual knowledge of group membership tends to make the effect disappear. The minimal group should be considered a “peer demand effect”, rather than an “experimenter’s demand effect”, which makes one think that the validity of group identity extends beyond laboratory walls.

4. Summary and conclusion

People tend to discriminate against out-group members when choosing their contribution level to a public good. When group boundaries are known, participants tend to contribute more when they are matched with an in-group member than when they are matched with an out-group member. Thus, pro-social cooperative behaviour is affected by group affiliation. Positive discrimination however takes place only if both subjects have access to information about the group membership of the

¹⁰ For general discussions of the problem of external validity in experimental economics see e.g. Guala (2005), Schram (2005), Levitt and List (2007), Bardsley et al. (2009).

other player. When knowledge is asymmetric, fully informed participants do not cooperate more with in-group than with out-group subjects. Overall their average level of contribution is statistically indistinguishable from that of partially informed subjects. There is evidence of puzzled (and puzzling) behaviour, however, because fully informed subjects are probably unable to make sense of the experimental cue provided by group affiliation, in an environment where their partners do not possess the same information.

These data are consistent with theories of social norms based on mutual expectations and correlated equilibria, as well as theories of reciprocity and guilt aversion. The message is that the minimal group paradigm acts primarily on individual beliefs, and through this channel (given an underlying preference to conform with others' expectations) modifies behaviour in games of cooperation. All theories that postulate a direct link between group identity and preferences – unmediated by mutual beliefs – are therefore refuted by the evidence. Bacharach (2006) for example explicitly allows that a team member may act on the basis of team preferences even if she is uncertain that the other members will do the same. This hypothesis follows quite naturally from the team reasoning perspective, since a player who is aware of the common group affiliation could in principle maximize the group's U function even though she knows that the other player (who is unaware) is going to maximize her individual utility. Such an account however seems inconsistent with the data, and ought to be abandoned to save the team reasoning hypothesis.

One solution is to introduce an *assurance* condition along the lines of Sugden (2000, 2006): there is genuine team reasoning only if there is common reason to believe that each member of the team *endorses* and *acts* on team reasoning. Sugden's version of team preference theory shares features with both theories of norms and "pure" team reasoning *à la* Bacharach. As in Bacharach's theory, group priming affects behaviour primarily through a modification of people's preferences (or a switch between frames). But in order for team preferences to be translated into choice, the "right" expectations must be in place – as in the theories of norms based on mutual beliefs reviewed in the second section of this paper. This opens the question whether team reasoning with assurance is operationally distinguishable from alternative explanations based on social norms and reciprocity – a question that will require further research on this topic.

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	C	D
C	b_1, b_2	d_1, a_2
D	a_1, d_2	c_1, c_2

(a)

	C	D
C	$b_1+\beta(b_2), b_2+\beta(b_1)$	$d_1+\beta(a_2), a_2+\beta(d_1)$
D	$a_1+\beta(d_2), d_2+\beta(a_1)$	$c_1+\beta(c_2), c_2+\beta(c_1)$

(b)

Figure 1: Transformation of a prisoner's dilemma game (a) using a simple other-regarding utility function (b). Payoffs are ranked $a > b > c > d$.

	C	D
C	b_1, b_2	d_1, a_2
D	a_1, d_2	c_1, c_2

(a)

	C	D
C	$b_1 + b_2$	$d_1 + a_2$
D	$a_1 + d_2$	$c_1 + c_2$

(b)

Figure 2: Transformation of a prisoner's dilemma using a team utility function. Payoff are ranked $a > b > c > d$, and are transformed using a simple additive rule.

		IN	OUT
Asymmetric Knowledge (AK)	Full		
	Partial		
Common Knowledge (CK)			

Figure 3: Summary of conditions and icons used in the experiment.

		IN				OUT			
		N	Avg	Med	Std Dev	N	Avg	Med	Std Dev
Guess	AK_partial	32	4.438	4.500	2.873	31	3.645	2.000	3.498
	AK_full	32	5.906	5.000	3.315	31	3.419	3.000	3.233
	CK	32	5.188	5.000	3.031	32	3.812	3.000	2.934
Bracelets	AK_partial	16	4.500	3.500	3.812	18	5.222	5.000	2.981
	AK_full	16	5.250	5.000	3.022	18	5.333	5.000	3.531
	CK	20	5.100	4.000	3.194	20	4.500	4.000	2.947
Painters	AK_partial	20	4.050	4.500	3.332	18	4.056	4.000	2.775
	AK_full	20	3.550	4.000	2.685	18	7.167	8.500	3.185
	CK	20	6.650	6.500	3.407	16	4.000	3.000	4.000
Pooled	AK_partial	68	4.338	4.000	3.203	67	4.179	4.000	3.205
	AK_full	68	5.059	5.000	3.195	67	4.940	5.000	3.613
	CK	72	5.569	5.000	3.210	68	4.059	4.000	3.181

Table 1: Contribution levels across conditions and treatments.

		AK_full_IN	AK_partial_IN	CK_IN	AK_full_OUT	AK_partial_OUT
Guess	AK_partial_IN	0.095				
	CK_IN	0.354	0.324			
	AK_full_OUT	0.005	0.132	0.024		
	AK_partial_OUT	0.005	0.152	0.039	0.864	
	CK_OUT	0.016	0.394	0.069	0.487	0.608
Bracelets	AK_partial_IN	0.470				
	CK_IN	0.859	0.457			
	AK_full_OUT	1.000	0.497	0.871		
	AK_partial_OUT	0.917	0.476	0.882	0.962	
	CK_OUT	0.553	0.923	0.621	0.444	0.526
Painters	AK_partial_IN	0.594				
	CK_IN	0.003	0.025			
	AK_full_OUT	0.002	0.005	0.798		
	AK_partial_OUT	0.689	0.918	0.012	0.008	
	CK_OUT	0.987	0.987	0.038	0.019	0.650
Pooled	AK_partial_IN	0.208				
	CK_IN	0.353	0.028			
	AK_full_OUT	0.729	0.365	0.258		
	AK_partial_OUT	0.079	0.687	0.008	0.249	
	CK_OUT	0.073	0.594	0.006	0.166	0.870

Table 2: Contribution to public good (Wilcoxon Rank Sum test, p-values, two-tailed)

	Coeff. (Robust Standard Error)			
	[1] Pooled	[2] Guess	[3] Bracelets	[4] Painters
<i>Intercept</i>	2.552 (1.010)*	3.776 (2.940)	4.646 (1.427)**	-0847 (5.262)
<i>CK</i>	-0.469 (0.670)	-0.500 (0.897)	-0.973 (0.163)	-0.297 (1.563)
<i>AK_full</i>	0.820 (0.736)	-1.013 (1.006)	-0.224 (1.229)	4.407 (1.462)**
<i>CK × IN</i>	2.192 (0.779)**	1.661 (0.990) °	0.422 (1.415)	4.039 (1.899)*
<i>AK_full × IN</i>	0.483 (0.835)	3.691 (1.214)**	0.823 (1.449)	-4.570 (1.507)**
<i>Age</i>	0.076 (0.039) °	0.007 (0.122)	0.011 (0.030)	0.243 (0.232)
<i>Female</i>	-0.609 (0.468)	-0.211 (0.649)	-1.981 (0.866)*	-1.809 (0.956) °
<i>Freshman</i>	0.353 (0.518)	-0.422 (0.762)	0.956 (0.988)	2.111 (1.253) °
<i>Economics</i>	0.086 (0.487)	0.285	2.723 (1.044)*	-0.954 (0.924)
LinHyp.1	F(1,400) = 6.52*	F(1,181) = 1.67	F(1,99) = 0.19	F(1,104) = 6.58*
LinHyp.2	F(1,400) = 3.74 °	F(1,181) = 7.00**	F(1,99) = 0.23	F(1,104) = 0.03
N	408	189	107	112
Left censored	63	29	13	21
Right censored	60	25	16	19
F	2.15*	1.84°	2.14*	3.35*

*** (0.001); ** (0.01); * (0.05); ° (0.1); significance level

LinHyp.1: $CK + CK \times IN = 0$

LinHyp.2: $AK_full + AK_full \times IN = 0$

Table 3: Contribution to public good (Tobit regression)

Appendix: Experimental Instructions (translated from Italian)

You are now taking part in an economic experiment which has been financed by various foundations for research purposes. The instructions which we have distributed to you are solely for your private information. It is prohibited to communicate with the other participants during the experiment. Should you have any questions please ask us. If you violate this rule, we shall have to exclude you from the experiment and from all payments.

At the end of the experiment you will receive a sum of money proportional to what you have earned during the experiment. The exact amount that you will earn will depend on your decisions and the decisions of the other participants in the experiment. During the experiment your earnings will be calculated in tokens. At the end of the experiment the total amount of tokens you have earned will be converted into real money at the following rate:

1 token = 1 euro

During the experiment you will have the opportunity of making choices that will influence both your earnings and those of other participants. The choices made by each subject however will be totally anonymous. Anonymity will be maintained both during and after the experiment: all the money you will earn will be paid privately when the experiment will be over.

Description of the decision situation

We now introduce the situation you will face during the experiment. Sixteen subjects will participate in each experimental session.

[Guess manipulation]: First, you will have to answer a simple question that will appear on the screen of your computer. Depending on your answers, each subject will be assigned to a group identified by a colour (Red or Yellow). The division in groups will take place according to a similarity criterion: the same colour will be assigned to those individuals who have answered in a similar way to the above question. None of the participants however will know which subjects belong to his/her group.

[Bracelets manipulation]: When you entered the laboratory, you were randomly assigned to a group identified by a colour (Red or Yellow).

[Painters manipulation]: In the first part of the experiment you will be asked to express your judgment and to answer some questions on a series of modern art paintings. You will receive detailed instructions regarding questions and earnings directly on your PC.]

[Asymmetric Knowledge conditions]: At this stage the computer will match you with another subject. Some participants may be aware of the group affiliation of the other subject with which they have been matched, while others may not be informed about this. These details will be explained on your computer screen.

[Common Knowledge conditions]: At this stage the computer will match you with another subject. All participants will be aware of the group affiliation of the other subject with which they have been matched. These details will be explained on your computer screen.

At this point you will have to make an important decision. Each participant will receive an endowment of 10 tokens, and will have to decide how to divide them into two separate accounts. For each token invested in the Personal Account, the participant will earn one token, which will be

converted in money at the end of the experiment. Each token invested in the Public Account, in contrast, will be added to the tokens invested in the Public Account by the other player; the total will then be multiplied by 1.5 and shared in equal parts among the two players.

For example, suppose a subject decides to invest X tokens in her Personal Account and $10 - X$ in the Public Account. At the end of the experiment she will receive a number of tokens equal to:

$$(X) + \frac{[1.5 \times (\text{total number of tokens in Public Account})]}{2}$$

To help you understand this mechanism, we ask you to answer some questions. Please write your answers on the sheet of paper in front of you:

(1) If both players decide to invest 10 tokens in their Personal Account and nothing in the Public Account, (that is, if $X = 10$), how much will each player earn?

(2) If both players decide to invest 0 tokens in their Personal Account and 10 in the Public Account, (that is, if $X = 0$), how much will each player earn?

(3a) If one player decides to invest 5 tokens in her Personal Account, and the other decides to invest 8 tokens in her Personal Account, how much will the first player earn?

(3b) How much will the second player earn?

(4a) If one player decides to invest 5 tokens in her Personal Account, and the other decides to invest 2 tokens in her Personal Account, how much will the first player earn?

(4b) How much will the second player earn?

At the end of the experiment you will be asked to fill in a short questionnaire; when you have finished, wait for the experimenter to indicate the money you have earned. You will be asked to sign a receipt, and you will be paid privately in an adjacent room. We would also be grateful if you did not discuss the experiment with the other participants outside the laboratory.