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A LABORATORY STUDY OF GROUP POLARISATION IN THE TEAM DICTATOR GAME*

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This paper introduces the team dictator game to study whether social dynamics within a group can cause groups' decisions to differ systematically from individuals' decisions. In the individual dictator game, a subject dictates the allocation of y dollars; in the team dictator game, a team of two subjects dictates the allocation of $2y$ dollars. We derive and test competing predictions for the two dominant psychological theories of group polarisation in this context. The data indicate that team choices tend to be dominated by the more other-regarding member. This result is more consistent with Social Comparison Theory than Persuasive Argument Theory.

This paper introduces the team dictator game to study whether social dynamics within a group can cause decisions made by groups to differ systematically from decisions made by individuals for a given problem. Most studies of economic decisions assume that the decision is made by a single individual. For example, in studying a firm's behaviour, economists usually assume that an individual – the owner or the manager – decides what to produce, how much to produce, or whether to invest in a particular project. It is also customary when studying consumer behaviour to assume that decisions are made by an individual consumer.

However, many economic decisions are made by a group of individuals instead of a single person. For example, in large corporations, important investment and production decisions are usually made by a top management team. For married couples, the decision regarding whether to buy an expensive consumer durable – like a car or a house – is often the result of intense discussion or even debate between the wife and husband.

Although most economic studies assume that decisions are made by individuals, economists have studied extensively how individuals' preferences or decisions – such as individual choices in voting decisions – are aggregated into a collective choice.[1] However, these studies tend to focus on how strategic interactions among individuals may affect the mapping from individual preferences to the collective choice under different 'rules of the game', and do not consider whether social dynamics matter in such settings.[2]

Contrary to the economic literature, the importance of social influence in

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[1] The seminal theoretical works are Arrow (1951) and Black (1958). Fiorina and Plott (1978) is an important early study of group decision-making in committee experiments.

[2] A notable exception is Akerlof (1991). Citing the social psychology literature on obedience and groupthink, Akerlof demonstrates how individual members' undue obedience to authority can cause groups to make suboptimal decisions.

decision-making has long been a central concern of social psychologists. In a classic study, Stoner (1961) found that following group discussion, groups made riskier decisions compared to decisions made by individual members prior to the discussion. His findings stimulated an extensive literature that studies the extent to which group decisions differ systematically from individual decisions. A major finding in this literature is the group polarisation hypothesis: group discussion moves decisions to more extreme points in the same direction as the initial tendencies of the group members' individual choices.

Notice that even if one believes that social dynamics can affect group decision making, it is possible that such social factors are insignificant in determining economic decisions. This could be true if the decision-makers – whether they are groups or single individuals – are constantly under the discipline of market competition. For example, when the decision-makers are managers of firms in competitive markets, the force of market competition may be sufficient to ensure that the firm will end up making the same kind of investment decisions, regardless of whether the decision is made by a single individual or a team of managers. However, the situation can be substantially different when the decision-maker/makers are not facing strong discipline from market competition. In such a situation, it is possible that group dynamics may create a systematic difference between group and individual decisions.

This paper reports a team dictator experiment to investigate this issue. In the individual dictator game, each subject is paired anonymously with another subject, and one is selected to 'dictate' the allocation of y dollars. In the team dictator game, subjects are anonymously placed into groups of four, and two subjects form a team to dictate the allocation of $2y$ dollars among the four subjects. The individual dictator game has been studied extensively by economists (for example, Forsythe *et al.* 1994; Hoffman *et al.* 1994; Bolton *et al.* 1995). By extending the dictator game to this team setting, we are able to incorporate some key insights from the psychological literature of group polarisation to study whether group dynamics matter in economic decisions. To the best of our knowledge, this is the first study that attempts to incorporate this psychological literature into economics.

In the individual dictator game, subjects chosen to be 'dictators' have complete control over the allocation of surplus between themselves and one other subject. It is obvious that if the dictator's only goal is to maximise her earnings, then she should allocate the entire surplus to herself. However, in several independent experiments researchers have found that many dictators give a substantial share of the surplus to other subjects (see Roth (1995) for a survey). While a consensus explanation for this other-regarding behaviour is yet to emerge, most explanations in the literature incorporate subjects' concerns for certain social goals to explain these deviations from income-maximising behaviour. Moreover, strategic considerations are absent in the dictator game, and in this extremely simple setting, the decision-maker/makers are completely free from any competitive pressure. For these reasons, the dictator game is an ideal environment to test whether group dynamics matter

in economic decisions: if group dynamics matter at all, they should matter here.[3]

The rest of the paper is organised as follows. Section I briefly summarises the psychological literature on group polarisation and discusses two competing explanations of the phenomenon – *Social Comparison Theory and Persuasive Argument Theory*. Section II describes the experimental design and procedure, and derives the hypotheses to be tested. Section III presents the results. The most interesting finding is that when teams consist of members who have made different individual choices, the team choices tend to be dominated by the more other-regarding member; i.e. the team member who took less of the y dollars when making her individual dictator decision. This tends to make team choices less self-regarding than individual choices for these teams, and the results are more consistent with Social Comparison Theory than Persuasive Argument Theory. Section IV concludes.

I. SOCIAL COMPARISON, PERSUASIVE ARGUMENT, AND GROUP POLARISATION

Psychologists have found that decisions made by groups differ systematically from decisions made by individuals. Initially, researchers conjectured that group discussion would generally lead to compromise between more extreme preferences of individual members and produce more moderate decisions. However, many laboratory studies in psychology suggest otherwise.

Stoner (1961) reported the first experimental demonstration that group decisions led to riskier choices than individual decisions. Stoner used the Choice Dilemma Questionnaire that was devised by Wallach and Kogan (1959) to investigate individual risk-taking behaviour. Each Choice Dilemma describes a situation in which a person has to choose between two actions that may lead to two different outcomes with uncertainty. The subject's task was to advise the decision-maker in the story regarding how much risk he should take in facing the choice problem. The following is a sample problem used by Stoner:

> Mr. A, an electrical engineer who is married and has one child, has been working for a large electronics corporation since graduating from college five years ago. He is assured of a lifetime job with a modest, though adequate, salary, and liberal pension benefits upon retirement. On the other hand, it is very unlikely that his salary will increase much before he retires. While attending a convention, Mr. A is offered a job with a small, newly founded company with a highly uncertain future. The new job would pay more to start and would offer the possibility of a share in the ownership if the company survived the competition of the larger firms.
>
> Imagine that you are advising Mr. A. Listed below are several probabilities or odds of the company's proving financially sound. Please check the *lowest* probability that you would consider it worthwhile to make Mr. A to take the new job.

[3] We are grateful to an anonymous referee for helping us highlight this point.

[ ] The chances are 1 in 10 that the company will prove financially sound.
[ ] The chances are 3 in 10 that the company will prove financially sound.
[ ] The chances are 5 in 10 that the company will prove financially sound.
[ ] The chances are 7 in 10 that the company will prove financially sound.
[ ] The chances are 9 in 10 that the company will prove financially sound.
[ ] Place a check here if you think that Mr. A should not take the new job, no matter what the probabilities.

In his original experiments, Stoner asked the subjects to first make recommendations for twelve Choice Dilemma problems. Having made their choices individually, the subjects were then asked to make a recommendation as a group to the decision-maker in each problem. They assembled together, and discussed each item until they reached consensus on a group recommendation. Stoner found that for most problems, group choices on the whole reflected greater willingness to take risk than the average individual choices of the group members. This finding was referred to as the 'risky-shift' phenomenon, and it immediately initiated a wave of experimental studies.

In many independent experiments, researchers were able to replicate this risky-shift phenomenon. However, they also found that for certain choice problems, the group became more cautious than the average individual members. This was referred to as the 'cautious-shift' phenomenon. In fact, in Stoner's original experiment, while the subjects exhibited risky-shift in ten of the twelve choice problems, they exhibited cautious shift in the other two problems.

Teger and Pruitt (1967) was the first to recognise that in these Choice Dilemma experiments, there was a systematic correlation between the mean initial response of the individuals and the direction of the shift of the group's decision. When the initial mean of the individual choices is relatively risky, group discussion generally causes further shift toward the risky extreme. In contrast, problems that elicit relatively cautious individual means tend to result in further shifts in the cautious direction after group discussion.

In view of this observation and further evidence, Moscovici and Zavalloni (1969) proposed the group polarisation hypothesis: group discussion moves decisions to more extreme points in the same direction as the average of the group members' initial individual choices. Following many studies there is now a consensus among psychologists that group polarisation is a well-established empirical phenomenon (Baron *et al.* 1992; Brown, 1986; Isenberg, 1986; Myers and Lamm, 1976).

While researchers have proposed many explanations to account for this phenomenon, two hypotheses – Social Comparison Theory (SCT) and Persuasive Argument Theory (PAT) – emerged as the dominant explanations. According to PAT, people are influenced by the number and persuasiveness of pro and con arguments that they recall from memory when making decisions. Therefore, group discussion will cause an individual to change her position in a given direction to the extent that the discussion exposes her to persuasive arguments favouring that direction. When subjects engage in group discussion, they are engaging in a process of pooling their arguments together. The final

decision of the group is affected by this pool of arguments. If the initial mean response of the individuals exhibits a preference toward a particular position, then it is likely that the subjects will be exposed to more persuasive arguments in favour of this position during the discussion. Hence, group discussion is likely to produce a shift in choices in favour of the initial pre-discussion tendency (Burnstein *et al.* 1973; Bishop and Myers, 1974; Brown, 1974, 1986; Vinokur and Burnstein, 1978).

SCT provides an alternative perspective. According to this theory, people are motivated both to perceive and to present themselves in a socially desirable way. This theory further suggests that people desire to perceive themselves as more favourable than what they believe to be the average tendency. To accomplish this, a person observes how other people behave, and she then adjusts her behaviour to present herself in a socially more favourable way. Since group interaction induces subjects to engage in such a social comparison process, it will elicit a shift of choices in a direction of greater perceived social value (Brown, 1986; Levinger and Schneider, 1969; Myers *et al.* 1980).

Notice that both theories maintain that group interaction can affect decision-making because it enables a member of a group to obtain new information that can change her behaviour. However, the mechanisms through which this occurs are different. SCT emphasises that when interacting with others, subjects will concentrate on gathering information to determine what is socially desirable. PAT, on the other hand, postulates that people are influenced by the number and persuasiveness of pro and con arguments. If subjects are exposed to convincing arguments that appeal to considerations other than social desirability, then group discussion can cause a shift of choices in the direction that is contrary to what they perceive to be socially desirable.[4]

For example, if subjects in the dictator game perceive that other-regarding behaviour is socially desirable, then SCT predicts that group choices will be more other-regarding than individual choices, regardless whether the group's initial tendency is self-regarding or not. However, PAT predicts that for groups in which individual choices exhibit an initial tendency towards self-regarding behaviour, the group choices will tend to be more self-regarding since group discussion will generate more arguments in support of self-regarding behaviour. We explain these empirical hypotheses more precisely in the next section.

II. EXPERIMENTAL PROCEDURE AND HYPOTHESES

We adopt the exchange framing for the dictator decisions, and our instructions follow as closely as possible to the exchange treatment in Hoffman *et al.* (1994). In the exchange framing of the (individual) dictator game, one subject was randomly assigned the role of the seller and the other the role of the buyer. The seller chose a price that ranged between 0 and 5 dollars. The buyer was

[4] Also notice that contrary to PAT – which emphasises the importance of group discussion – SCT implies that a subject's behaviour can change if there are ways through which she can gather information about others' behaviour even in the absence of discussion. For example, merely observing what others have chosen can induce behavioural change according to SCT.

Table 1

Summary of Sessions

Session number	Number of subjects	First choice	Second choice
Session 1	16	Individual	Team
Session 2	20	Team	Individual
Session 3	20	Team	Individual
Session 4	16	Individual	Team
Session 5	24	Team	Individual
Session 6	16	Individual	Team
Session 7	24*	Team	Individual
Session 8	24	Individual	Team
Session 9	28	Individual	Team

* One subject participated in an earlier session, so his choices in this later session (and those of his teammate) were removed from the data before analysis.

required to buy at that price. If the seller chose a price of P dollars, the buyer received $5-P$ dollars while the seller received P dollars, so the seller dictated the allocation of the \$5 surplus.

In our experiment, each seller made two decisions – an individual decision and a team decision. The decisions were made sequentially within a twenty-minute session. In the team decision a pair of two seller subjects chose a price, and a pair of two buyer subjects were paired with each seller team. The seller team also chose a price that ranged between 0 and 5 dollars. If the seller team chose a price of P dollars, each buyer received $5-P$ dollars while each seller received P dollars, so the seller team dictated the allocation of the \$10 surplus. Thus, the design kept per-subject monetary incentives constant across the team and individual decisions.[5]

The primary treatment variable in our experiment is the ordering of the two decisions within a session. We refer to the sessions that began with the individual decision as the I–T (Individual–Team) treatment, and the sessions that began with the team decision as the T–I (Team–Individual) treatment. The different sequencing of decisions permits us to test both the group polarisation hypothesis and an alternative 'observer effect' hypothesis proposed by Hoffman *et al.* (1994).

Instructions are available by request from the authors. Table 1 summarises the nine sessions.[6] Subjects were recruited from three large microeconomics principles classes. All sessions were conducted in a large classroom, and all

[5] In our design, the monetary stakes are \$5 per pair of subjects for each decision. This differs from the \$10 stakes used in Hoffman *et al.* (1994). Forsythe *et al.* (1994) find that there is no significant difference in offer distributions when the total surplus changes from \$5 to \$10. However, they find that paying subjects in individual dictator games increases the amount kept by dictators compared to hypothetical choices.

[6] The number of subjects was allowed to vary across sessions for practical reasons, in order to maximise the number of observations for each session. We believe a range of 16 to 28 all constitutes a large enough group so that each subject assigns a sufficiently small probability that any other subject is the one (of 15 to 27) with whom they are paired. This belief is supported empirically by our inability to find significant behavioural differences across group sizes; for example, average individual offers on the first decision were \$1.15, \$1.25 and \$1.21 for groups of size 16, 24 and 28, respectively.

participants immediately received a $3 cash appearance fee. Subjects first randomly drew an identification number that determined their role (either buyer or seller) and the subject with whom they were paired for the team decision. The identification numbers were designed so that subjects could not determine which were buyers and which were sellers. They then filled out subject payment sheets that included their address for mailing their cash experiment payment.[7]

The experimenter then passed out decision forms to all subjects. Sellers allocated the surplus by circling payment divisions, which were available in discrete intervals of $0.50. For the team decision, every team was called to the front of the room (by identification numbers) and excused to the hallway to discuss their decision and fill out the form in private. Both buyers and sellers received decision forms to preserve anonymity. The buyer decision forms elicited expectations about the seller offer, but the instructions emphasised that these choices did not affect buyer payments from the experiment. Teams were not given an explicit time limit to reach a consensus, but all finished within five minutes.

What do the two psychological theories summarised in Section I predict for the team dictator experiments studied here? To answer this question, we need to operationalise the concept of group polarisation in our setting. The two theories require us to classify offers as self-regarding or other-regarding. Therefore, for an empirical test of these theories, it is necessary to first establish a central or neutral point for the offer distributions. Unfortunately, as Myers and Lamm (1976) point out (p. 607), it is difficult (they say 'impossible') to define a neutral point on the altruism-selfishness continuum.

One possibility is to use the 'fair' offer of $2.50 as the neutral point because it gives equal payment to each subject. Offers below $2.50 are self-regarding, and offers above $2.50 are other-regarding. On the other hand, an economist who believes that subjects only care about pecuniary rewards might suggest the 'rational' offer of $0 as the neutral point. However, the data do not seem to suggest that either of these are appropriate neutral points. In fact, nearly all offers lie in the interval [$0, $2.50].

In what follows we consider an empirically-defined neutral point, similar to the approach taken by Abelson (1973), Butler and Crino (1992), and Knox and Safford (1976). In particular, we employ $1.50 as the neutral point because it is the overall median of the offers. Our results are qualitatively unchanged if we use $1.00 (the median of the I-T treatment) or $1.35 (the overall mean) as the neutral point.

Let $\bar{y}_k$ denote the mean of the individual dictator game seller offers for the two members of the kth team. If $\bar{y}_k$ is less than the neutral point – that is, on average, the team members offered less than the sample median when making

[7] Although paying subjects through the mail after the session is a departure from traditional procedure, we do not believe this affects the results. We mailed the payments in order to complete the sessions in less than 20 minutes, and we emphasised in the experiment that all payments would be mailed in cash within 48 hours of the session. Since results in our individual dictator decisions replicate the Hoffman *et al.* (1994) results that employ immediate cash payment (see Section III), the empirical evidence indicates that this procedural departure is innocuous.

their individual offers – we classify this team as a 'self-regarding team'. If $\bar{y}_k$ is more than the median, we classify this team as an 'other-regarding team'.[8]

In most previous studies, SCT and PAT predict the same qualitative shifts after group discussion. Therefore, researchers have studied the content of group discussion ('content analysis') or manipulated the information available through discussion to differentiate between the two explanations (Isenberg 1986).[9] To keep our experimental design similar to existing studies of the individual dictator game, we made no attempt to observe team negotiations, so the procedure did not permit a content analysis of the team bargaining. However, an advantage of the present design is that the value-laden context of the dictator game implies that SCT and PAT make different predictions in the I–T treatment.

In particular, PAT predicts that following group discussion, compared to the mean of their individual offers, the self-regarding teams will make team offers that are more self-regarding, and the other-regarding teams will make team offers that are more other-regarding. In contrast, SCT predicts that both the self-regarding teams and the other-regarding teams will make team offers that are more other-regarding than the mean of their individual offers.

We now explain how we arrive at these predictions. Recall that PAT predicts that following group discussion, team offers will shift and become more extreme than the initial pre-discussion tendency. This occurs because if the initial mean individual response of the team members exhibits a preference toward a particular position, then it is likely that the members of this team will be exposed to more persuasive arguments favouring this position during discussion. In the I–T treatment, PAT predicts this shift in choices because discussion takes place after the individuals make their decisions and before the team makes its decision. However, PAT predicts no shift in the T–I treatment because subjects are not exposed to any additional arguments after the team makes its decision and before the individuals make their decisions.

Persuasive Argument Hypothesis for the Team Dictator Game: In the I–T treatment, compared to the mean of their individual offers, the self-regarding teams will make team offers that are more self-regarding, and the other-regarding teams will make team offers that are more other-regarding.

[8] As pointed out by a referee, if we were to extend the dictator game to allow for teams to consist of more than two members, the mean of the members' individual offers may not be an appropriate measure of the central tendency of these individual offers. For example, suppose a six person team chose to offer the following vector (3, 3, 3, 3, 3, 10) in their individual decisions when the surplus to be allocated in the individual decision is $20. Suppose further that the overall sample median offer was 4. This team had a mean of 4·17, so it will be considered an other-regarding team if the classification is established by comparing the group mean to the overall sample median. This seems inappropriate because five out of six members were more self-regarding than the median. However, in our current experiment, a team only consists of two members. Since the median and the mean are identical for a two person team, this complication does not arise.

[9] For example, consider a design in which in one treatment, subjects are only allowed to communicate the amount that they propose the team allocate to itself, and are not allowed to offer supporting arguments. This treatment would eliminate the role that persuasive argument may play in affecting decisions. In another treatment, subjects are required to offer supporting arguments. In the current experiment, subjects have complete freedom in deciding whether or not to offer any supporting arguments when making their proposals.

SCT makes a different prediction. Recall that according to SCT, subjects are motivated both to perceive and to present themselves in a socially desirable way. This theory further suggests that people desire to perceive themselves as more favourable than what they believe to be the average tendency. An individual observes how other people present themselves, and adjusts her presentation accordingly. Since group discussion induces the agents to engage in such a comparing process, it will elicit an average shift in a direction of greater perceived social value.

If subjects perceive that other-regarding behaviour is socially desirable, social comparison will cause subjects to shift their offers in that direction after group discussion. In the I–T treatment, discussion takes place after the individuals make their decisions and before the team makes its decision. SCT thus predicts that in the I–T treatment, both the self-regarding teams and the other-regarding teams will make team offers that are more other-regarding than the mean of their individual offers. On the other hand, SCT predicts no systematic shift in the T–I treatment because there are no additional interactions which will induce subjects to engage in social comparison after the team makes its decision and before the individuals make their decisions. To summarise:

Social Comparison Hypothesis for the Team Dictator Game: In the I–T treatment, both the self-regarding teams and the other-regarding teams will make team offers that are more other-regarding than the mean of their individual offers.

As pointed out by a referee, it is possible that subjects may perceive self-regarding behaviour as socially desirable in this setting. Because our subjects are recruited from economics classes (as is typical for economics experiments), there are at least two reasons for this possibility (Marwell and Ames, 1981). First, there may be a selection bias among these subjects. Students who are attracted to economics classes may be more concerned about pecuniary benefits and therefore may consider taking most of the surplus to be the socially desirable action, at least among this particular group. Secondly, if learning economics has led subjects to think that the economically 'correct' decision is to take the entire surplus, then they may perceive that self-regarding behaviour is socially desirable. According to this operationalisation, SCT predicts that in the I–T treatment both the self-regarding and other-regarding teams will make a more self-regarding team offer compared to the mean of their individual offers.

Our conjecture was that this self-regarding version of SCT is unlikely to be confirmed by the data, because in most dictator experiments subjects exhibit a significant degree of other-regarding behaviour. Moreover, our data provide no evidence that increased economics training affects decisions in this setting.[10] As we report below, the data are inconsistent with this self-regarding version of SCT but support the other-regarding version of SCT, since the vast majority of teams that shift make more other-regarding offers on the team decision.

[10] The mean individual offer is identical ($1.28) for the sellers with no previous economics class ($N = 71$) and for the sellers with one previous economics class ($N = 20$).

Finally, the team dictator game also enables us to test an explanation of subjects' behaviour, which extends an idea proposed by Hoffman *et al.* (1994). They argued that subjects in the (individual) dictator game may be concerned about whether their offers are judged unfair by the experimenter, so the experimenter as observer could be increasing other-regarding behaviour. To test this observer effect hypothesis, they conducted a clever double blind dictator experiment, in which individual subjects' decisions could not be known either by the experimenter or by anyone else. They show that the offer distributions in the double blind dictator game are significantly more self-regarding than offer distributions in other experimental treatments that do not ensure subject anonymity to the experimenter. However, Bolton *et al.* (1995) fail to detect an observer effect in the dictator game when keeping the instruction frame constant. Moreover, Laury *et al.* (1995) also fail to detect an observer effect in a laboratory public goods environment, and Bolton and Zwick (1995) only find a very modest observer effect in the ultimatum game.[11] In his review of the laboratory bargaining literature, Roth (1995) concludes that the observer effect, if it exists at all, is insignificant.

The observer effect we test is different from the previous studies, however, because the previous studies manipulate the observability of the subjects' choices to the experimenter. In our team dictator game all subjects' choices are observed by the experimenter, but the *number* of observers has been increased when moving from the individual decisions to the team decisions. In the team decision, a seller's final choice is observable to an additional person other than the experimenter – namely, his teammate. Importantly, this explanation does not include any role for information gathering in group discussion and therefore applies with equal force in the T–I and I–T treatments.

Observer Effect Hypothesis of the Team Dictator Game: In both the T–I and the I–T treatments, teams will make team offers that are more other-regarding than the mean of their individual offers.

Note that both the social comparison and the observer effect hypotheses predict that team offers should be more other-regarding than the mean individual offers in the I–T treatment. However, the explanations for this shift are different in the two hypotheses, and they generate different predictions in the T–I treatment. According to the observer effect hypothesis, individuals behave in a less self-regarding way when the number of observers increase because they do not want to be perceived by others as selfish. Therefore, it predicts that team offers will be more other-regarding than the individual offers in both the T–I and the I–T treatments.

On the other hand, SCT maintains that individuals desire to perceive themselves as better than the social average (Brown, 1974). Once group discussion induces subjects to engage in social comparison and causes them to behave in a more other-regarding way, because subjects are concerned about their self-perception, they will continue to behave in the same way even if the

[11] In an ultimatum game, the buyer has the opportunity to accept or reject the seller offer. In the case of rejection, both subjects receive zero payments.

number of people observing their behaviour is reduced. Hence, SCT predicts shifts in choice in the I–T but not in the T–I treatment.

III. RESULTS

For all 46 teams, the Appendix tables present (a) the individual decision by the two team members separately (columns 1 and 2); (b) the average of these two individual offers (denoted $\bar{y}_k$ in column 3); (c) the offer made by this team on the team decision (denoted y_{kt} in column 4); (d) the classification of the mean individual offer as other-regarding or self-regarding (column 5); and (e) the direction of the shift on the team offer relative to the mean individual offer of the team (column 6).

Consistent with previous dictator game experiments, offers range widely from \$0 to equal split allocations. The pooled median is \$1.50. The individual offer distributions in both the I–T and T–I treatments are not significantly different from the dictator share distributions in Hoffman *et al.* (1994) that employ exchange wording and are not double-blind; Characteristic Function (CF) test (χ^2 (D.F. = 4)) statistics range between 5 and 7.[12] This provides evidence that the different procedures and subject pool we employ do not change subjects' behaviour compared to previous studies of the individual dictator game.

Recall that according to PAT, groups with a mean individual offer less than \$1.50 would polarise toward \$0 on their team offer, while groups with a mean individual offer greater than \$1.50 would polarise toward \$5 on their team offer. The data do not support this hypothesis. Table 2*a* shows that 23 of the 25 teams in the I–T treatment have a mean individual offer different from \$1.50, and only two shift toward the predicted poles (i.e. align in the indicated corners of Table 2*a*). Eleven teams shift in the direction that contradicts PAT, and 10 teams do not change. A three-by-three contingency table test rejects the null hypothesis that the direction of shift is independent of whether the mean individual offer is self-regarding or other-regarding, in favour of choice shifts toward the neutral point [χ^2 (D.F. = 4) = 12·52, $p = 0{\cdot}03$]. This is the direct opposite of PAT.[13] This leads to our first conclusion.[14]

[12] Epps and Singleton (1986). The 10% critical value for a one-tailed test is 7·78 for the CF test. For tests that fail to reject the null hypothesis (that is, those with p-value > 0·1), we usually suppress the p-value. Forsythe *et al.* (1994) find that the CF and the Anderson–Darling test have the most power in these dictator game settings, and we prefer the CF test because it does not require continuous distribution functions. We also conducted all of the distributional tests using the more familiar Kolmogorov–Smirnov test. Conclusions are unchanged, so we report only the CF test.

[13] The middle row of Table 2*a* shows the teams with a mean individual offer equal to the neutral point, and PAT makes no prediction for such teams. The middle column of Table 2*a* shows the teams whose team offers do not differ from their mean individual offers, and most of these teams consist of members who make identical offers in their individual decisions. Group discussions in these teams are not likely to generate many new persuasive arguments, so they are not very useful for testing PAT. These observations suggest a two-by-two test that eliminates the middle column and row of Table 2*a*. This test also indicates that teams shift toward the neutral point rather than toward the predicted poles [χ^2 (D.F. = 1) = 4·17, $p = 0{\cdot}05$].

[14] Daniel Friedman has pointed out to us that this conclusion might be sensitive to alternative operationalisations of the null hypothesis. In particular, under a null hypothesis of random behaviour and independent errors, the likelihood of observing shifts toward the predicted poles is less than shifts away from

Table 2

Frequency of Shifts Toward Other-Regarding and Self-Regarding Team Offers and Classification of Mean Individual Offer

	Direction of shift (team)			
	Self-regarding (team < mean individual)	No change (team = mean individual)	Other-regarding (team > mean individual)	Total (row)
(a) Individual–Team (I–T) treatment Mean of the individual offer is				
Self-regarding (< $1.50)	1*	6	9†‡	16
Neutral (= $1.50)	2	0	0†‡	2
Other-regarding (> $1.50)	2	4	1*†‡	7
Total (column)	5	10	10	25
(b) Team–Individual (T–I) treatment Mean of the individual offer is				
Self-regarding (< $1·50)	1	3	5‡	9
Neutral (= $1.50)	0	2	2‡	4
Other-regarding (> $1.50)	3	2	3‡	8
Total (column)	4	7	10	21

* Observations in these cells are consistent with Persuasive Argument Theory.
† Observations in these cells are consistent with Social Comparison Theory.
‡ Observations in these cells are consistent with the Observer Effect.

Conclusion 1: The data in this team dictator experiment provide no support for Persuasive Argument Theory.

Next consider SCT, which predicts that team offers will move in the other-regarding direction for both self-regarding and other-regarding teams. The data are more favourable to SCT. Ten of the 25 teams in the I–T treatment shift in the other-regarding direction, five teams shift in the self-regarding direction, while 10 teams do not shift. However, shifts toward other-regarding offers are not significantly more frequent than shifts toward self-regarding

the poles due to the possibility of a regression toward the mean. We conducted a simulation to determine the strength of this possible bias, and found that our conclusions remain unchanged and that we can reject this null hypothesis of random behaviour. For the simulation we drew 1,000 samples of 50 independent individual offers and 25 team offers from the empirical distribution of offers. (The sample size of 25 teams is the same as in the I–T treatment.) We then classified the mean individual offers and the direction of the team offer shift as in Table 2. As expected, shifts toward the poles are less common than shifts away from the poles, with an average (over the 1,000 samples) of 6·31 teams shifting toward the poles and 13·17 teams shifting away from the poles. However, we observe only two teams shift toward the poles in the I–T treatment (Table 2*a*), which is less than the fifth percentile of the pole-shift rate in the simulation (three teams). Therefore, we reject this null hypothesis of random behaviour and independent errors at 5% using a Monte Carlo test, in the direction of more shifts inconsistent with PAT.

offers using a binomial test ($p = 0{\cdot}15$).[15] The other-regarding shift is present primarily for the teams who are individually self-regarding. Nine of these 16 teams shift in the other-regarding direction, while only 1 shifts in the self-regarding direction. For these self-regarding teams, the data reject the null hypothesis that other-regarding and self-regarding shifts are equally likely in favour of the shift predicted by SCT (binomial test $p = 0{\cdot}01$).[16]

The contingency table and binomial tests only capture the direction of shifts but do not account for their magnitude. To analyse shift magnitudes, we explicitly consider the 'bargains' struck by team members. Consider the following team bargaining equation, where y_{kt} denotes the offer made by the kth team, and individual offers are ordered $y_{k1} \geqslant y_{k2}$ so that the subject with the 1 index is more other-regarding:

$$y_{kt} = \alpha_0 + \alpha_1 y_{k1} + \alpha_2 y_{k2} + \epsilon_\kappa, \tag{1}$$

where ϵ_k is an error term. The hypothesis that the team members have an equal impact on the team offer implies $\alpha_1 = \alpha_2$. If, as predicted by SCT, team offers shift in the other-regarding direction compared to the individual offers, the team offers will tend to be dominated by the individual offer of the more other-regarding team member. This will imply that $\alpha_1 > \alpha_2$.

Estimates of (1) are shown in Table 3 for the two treatments, in all cases excluding the 13 teams comprised of sellers with equal individual offers.[17] Column (1) presents the I–T treatment and Column (2) presents the T–I treatment. For the I–T treatment, the team offer responds positively to the individual offer of the more other-regarding team member (y_{k1}), and the coefficient on the more self-regarding team member's individual offer (y_{k2}) is negative but not significantly different from zero. This indicates that when a team consists of members who have made different individual offers, the team offer tends to be dominated by the more other-regarding member. The F-statistic in the bottom of Table 3 indicates that for the I–T treatment, the data reject the null hypothesis that each team member has equal influence on the team offer (p-value $= 0{\cdot}03$).

Conclusion 2: In the I–T treatment, team offers tend to shift in the other-regarding direction, especially for the teams who make self-regarding individual offers. Our estimate of a team bargaining equation reveals that team offers are dominated by the more other-regarding member. Combined with conclusion 1, these findings provide better support for SCT than PAT.

[15] The binomial test we employ calculates the likelihood that the outcome x will be observed m times or less in a sample of size n, under the null hypothesis that outcomes x and not-x are equally likely. For this test we exclude the teams which do not shift on the team choice.

[16] The simulation based on the null hypothesis of random behaviour and independent errors discussed in footnote 14 indicates that our conclusions regarding SCT are also robust. Other-regarding and self-regarding shifts are equally likely for the teams overall, so the null hypothesis in the binomial test that each shift is equally likely is still appropriate. For the sample of teams who are individually self-regarding, the simulation indicates that other-regarding shifts occur more frequently than self-regarding shifts. Nevertheless, using either a Monte Carlo test or binomial test employing the simulation probability for other-regarding shifts, the data still reject this null hypothesis of random behaviour in favour of the shift predicted by SCT.

[17] With equal individual offers there is no bargaining disagreement to explain. Results are similar when using all 46 teams.

Table 3

Estimates of Team Bargaining Equation

(Dependent variable: Team offer (surplus per buyer))

Variable or statistic	I–T treatment (1)	T–I treatment (2)
More other-regarding individual offer (α_1)	0·654**	0·040
	(0·255)	(0·217)
More self-regarding individual offer (α_2)	−0·460	0·294
	(0·274)	(0·280)
Intercept (α_0)	0·416	1·189**
	(0·393)	(0·461)
Observations	18	15
Adjusted R^2	0·22	−0·04
F-statistic testing $\alpha_1 = \alpha_2$	6·064†	0·387

Notes: Standard errors are in parentheses; * denotes significantly different from 0 at 10% level; ** denotes significantly different from 0 at 5% level; † denotes reject $\alpha_1 = \alpha_2$ at the 5% level. All estimates exclude the 13 teams with equal individual choices.

The fact that team offers shift in the other-regarding direction in the I–T treatment is consistent with both SCT and the observer effect hypothesis. However, the two hypotheses make different predictions in the T–I treatment. In particular, the observer effect predicts that team offers will be more other-regarding than the mean of the team members' individual offers in the T–I treatment, while SCT does not predict any systematic shift.

The bargaining equation estimate in Column (2) of Table 3 indicates that the team offer is not dominated by either the more other-regarding or the more self-regarding member for the T–I treatment. A comparison between the adjusted R^2 in the I–T and T–I equation estimates reveals that although this simple bargaining equation performs reasonably well in the I–T treatment, it performs poorly in the T–I treatment. This provides some evidence against the observer effect hypothesis. However, Table 2*b* indicates that 10 of the 21 teams in the T–I treatment shift in the other-regarding direction, while only four of these teams shift in the self-regarding direction (Binomial test $p = 0{\cdot}09$). The rate of shifts toward other-regarding behaviour is very similar in both the I–T and the T–I treatments, and a two-by-two contingency table test fails to reject the null hypothesis that the shift rate toward other-regarding offers on the team decision is independent of the (I–T versus T–I) decision order (χ^2 (D.F. = 1) = 0·08). The magnitude of this shift in offers is modest in the T–I treatment, however. As shown in the appendix, the mean team offer is only six cents larger than the mean individual offer.[18]

[18] Also note that the corresponding difference in the I–T treatment is only nine cents. But if we exclude those teams that consist of members who make identical individual offers, this difference increases to eighteen cents in the I–T treatment but only increases to eight cents in the T–I treatment. None of these differences in mean offers nor any differences in offer distributions are statistically significant according to conventional tests, however.

Conclusion 3: Consistent with the observer effect, more teams shift in the other-regarding direction than in the self-regarding direction in the T–I treatment. The frequency of this shift is not significantly different in the I–T and T–I treatments. However, estimates of a bargaining equation and a comparison of the mean offers indicate that the magnitude of this shift is smaller in the T–I treatment. These mixed results therefore do not provide strong evidence to distinguish between SCT and the observer effect.

Finally, we consider the role of demographic factors in explaining choices.[19] Gender is the only demographic factor that significantly affects seller offers. Individual offers are about equal for females (mean offer = \$1.37) and males (mean offer = \$1.26) and are not significantly different (t-value = 0·51, $p = 0{\cdot}61$). This lack of a gender effect in the dictator game was reported previously by Bolton and Katok (1995). However, an analysis of team offers suggests a possible role for gender in affecting team offers. Twenty of the 46 teams were comprised of one male and one female. Eight of these 20 teams either had initially equal preferences (four teams) or made a team offer that was equidistant from the two individual offers (four teams). Of the remaining 12 teams with a team offer dominated by one team member, nine of the team offers are closer to the individual offers made by females. The estimate for a gender bargaining equation analogous to equation (1) using all 20 teams of differing gender is

$$\begin{array}{lll} y_{kt} = & 0{\cdot}244 & +0{\cdot}702y_{kf}+0{\cdot}230y_{km}, \quad N = 20, \bar{\mathrm{R}}^2 = 0{\cdot}72 \\ & (0{\cdot}197) & (0{\cdot}105) \quad (0{\cdot}082) \end{array} \tag{2}$$

where y_{kf} is the individual offer of the female member and y_{km} is the individual offer of the male member of the kth team (standard errors in parentheses). Although the coefficients on both individual offers are highly significant, the female team member appears to dominate the team bargaining. Furthermore, we can strongly reject the hypothesis that the team members have an equal impact on the team offer. ($\mathrm{F}(\text{D.F.} = 1, 17) = 13{\cdot}51$, $p < 0{\cdot}01$).[20] This result is summarised by our final conclusion:

Conclusion 4: In teams comprised of one female and one male subject, the team offers are dominated by the female team member.

We find this result puzzling, especially since most experimental economic studies fail to find a significant gender effect. We hesitate to draw any strong conclusions because of the small sample size of teams comprised of one female and one male subject, and also because unlike other hypotheses tested above, we do not have any a priori intuitive explanation for a gender effect. However, we note that Bolton and Katok (1995) observe that in studies which find gender effects (Brown-Kruse and Hummels, 1993; Eckel and Grossman, 1994),

[19] After all the decisions were made, subjects filled out a brief demographic questionnaire. The demographic data were used to determine if dictator decisions differed systematically by gender, the amount of economics training, age, cultural background and other factors. (The University of Southern California has a very diverse undergraduate student population, and more than one third of our subjects were born outside the United States.)

[20] This significant gender effect in team bargaining suggests that (1) might be misspecified because it does not include gender. We therefore reestimated a version of (1) that includes gender interaction effects for both treatments, but these interaction effects were insignificant and our conclusions were unchanged.

subjects learn the gender of others in their group. In contrast, studies which fail to observe significant gender effects usually provide no such information to subjects. Our study falls into the first category, and our finding adds some strength to this observation regarding the differences between studies that find significant gender effects and those that do not. Additional laboratory studies may help us to determine the potential generality and significance of this observation better.

IV. CONCLUSION

This paper introduces the team dictator game and uses the psychological theories of group polarisation to study whether social dynamics within a group can cause groups' decisions to differ systematically from individuals' decisions. We operationalise the two dominant theories of group polarisation – Persuasive Argument Theory and Social Comparison Theory – in the context of the dictator game, and show that they generate different predictions. Perhaps the most interesting finding of our experiment is that when teams consist of members who have made different individual choices in the I–T treatment, the team choices tend to be dominated by the more other-regarding member. This makes team choices more other-regarding than individual choices for these teams, although the difference is modest.

Overall, in this setting, our data provide strong evidence against PAT, and are more consistent with SCT than PAT. The data do not provide strong evidence to distinguish between the SCT and the observer effect hypotheses, but our results are consistent with findings in previous studies which indicate that the observer effect is probably not very significant.

Beyond these empirical findings, a contribution of this paper is the incorporation of some insights from social psychology regarding group behaviour to study economic decision-making. We believe that this exercise provides a reasonably good case for the need of future research along these lines.

For example, a natural extension is to study whether the empirical findings reported here generalise or perhaps become sharper when the size of teams increases. By varying the size of teams systematically, one can determine whether any differences between group and individual choices are magnified or diminished as group size increases. Another experiment could solicit an individual offer, followed by a team offer, then followed by an additional individual offer (i.e. an I–T–I design). This would provide another test to distinguish SCT from the observer effect, because it would allow us to compare individual choices by the same subject before and after group discussion.

The hypotheses discussed in this paper generate implications for the study of organisations that can be tested in field studies. For example, when choosing between alternative production processes, manufacturing firms are making economic decisions that often have important social consequences, such as how much or how little harm to inflict on the environment. If managers consider protecting the environment to be socially desirable, SCT implies that decisions by a management team will be systematically biased toward processes that are

more protective of the environment compared to individual decisions. In contrast, PAT implies that decisions by a management team will exhibit a bias that magnifies the individual team members' average preferences toward the environment. It predicts that 'non-protective' management teams will adopt a production process that is less protective of the environment compared to individual decisions. Additional laboratory and field studies along these lines may provide useful insight in how organisations make decisions that have social consequences.

Finally, a limitation of the current study is that we have not addressed the question of what determines the persuasiveness of an argument; nor have we provided any explicit theory that specifies in detail the process through which an individual uses the information conveyed by others' choices to update his belief regarding what constitutes socially desirable behaviour in a particular context. For example, to further evaluate the Persuasive Argument Theory, it would be useful to determine if a person's perception of the relative persuasiveness of different arguments depends mainly on their content, or whether their ranking is substantially affected by the order in which the arguments are presented. Similarly, Social Comparison Theory postulates that an individual uses the information conveyed by the choices of others to update his belief regarding what constitutes socially desirable behaviour. However, the theory does not specify whether an individual uses the simple average of the observed choices of others to do so, or whether he puts a disproportional weight on the majority opinion in a group composed of more than two individuals. Further studies of these issues are essential for a more complete understanding of how group dynamics affect economic decision making.

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Table A1

Raw Data and Team Classifications for I–T Treatment

More other-regarding individual offer (y_{k1}) (1)	More self-regarding individual offer (y_{k2}) (2)	Mean individual offer ($\bar{y}_k$) (3)	Team offer (y_{kt}) (4)	Classification of mean individual offer (5)	Direction of shift on team offer (6)
0·5	0	0·25	0	SR	SR
0·5	0	0·25	1·5	SR	OR
1	0	0·5	0·5	SR	NC
1	0	0·5	0·5	SR	NC
1	0·5	0·75	1	SR	OR
1	0·5	0·75	1	SR	OR
1	0·5	0·75	1	SR	OR
1	0·5	0·75	1	SR	OR
1·5	0	0·75	1·5	SR	OR
2	0	1	2	SR	OR
2	0	1	2·5	SR	OR
1	1	1	1	SR	NC
2	0	1	1	SR	NC

Table A1 continued opposite

Table A1 (*cont.*)

More other-regarding individual offer (y_{k1}) (1)	More self-regarding individual offer (y_{k2}) (2)	Mean individual offer ($\bar{y}_k$) (3)	Team offer (y_{kt}) (4)	Classification of mean individual offer (5)	Direction of shift on team offer (6)
1	1	1	1	SR	NC
1	1	1	1	SR	NC
2·5	0	1·25	2·5	SR	OR
2·5	0·5	1·5	1	N	SR
1·5	1·5	1·5	0·5	N	SR
2	1·5	1·75	1	OR	SR
2	1·5	1·75	2	OR	OR
2	2	2	2	OR	NC
2·5	1·5	2	2	OR	NC
2	2	2	2	OR	NC
2·5	2	2·25	0	OR	SR
2·5	2·5	2·5	2·5	OR	NC
Mean = 1·58	Mean = 0·80	Mean = 1·19	Mean = 1·28		
S.E. = 0·13	S.E. = 0·16	S.E. = 0·13	S.E. = 0·15		
Median = 1·50	Median = 0·50	Median = 1·00	Median = 1·00		

Notes: SR, Self-Regarding; OR, Other-Regarding; N, Neutral; NC, No Change.

Table A2

Raw Data and Team Classifications for T–I Treatment

More other-regarding individual offer (y_{k1}) (1)	More self-regarding individual offer (y_{k2}) (2)	Mean individual offer ($\bar{y}_k$) (3)	Team offer (y_{kt}) (4)	Classification of mean individual offer (5)	Direction of shift on team offer (6)
0	0	0	0	SR	NC
0	0	0	0	SR	NC
1	0	0·5	2	SR	OR
1	0·5	0·75	1·5	SR	OR
1	0·5	0·75	1	SR	OR
1·5	0	0·75	1	SR	OR
1·5	0·5	1	1	SR	NC
1·5	1	1·25	1·5	SR	OR
1·5	1	1·25	0	SR	SR
2	1	1·5	2	N	OR
1·5	1·5	1·5	1·5	N	NC
2·5	0·5	1·5	2·5	N	OR
1·5	1·5	1·5	1·5	N	NC
2	1·5	1·75	2	OR	OR
2	1·5	1·75	2	OR	OR
2·5	1·5	2	1·5	OR	SR
4	0	2	1	OR	SR
2·5	2	2·25	2·5	OR	OR
2·5	2·5	2·5	2·5	OR	NC
3·5	2	2·75	1·5	OR	SR
3	3	3	3	OR	NC
Mean = 1·83	Mean = 1·05	Mean = 1·44	Mean = 1·50		
S.E. = 0·22	S.E. = 0·19	S.E. = 0·18	S.E. = 0·17		
Median = 1·50	Median = 1·00	Median = 1·50	Median = 1·50		

Notes: SR, Self-Regarding; OR, Other-Regarding; N, Neutral; NC, No Change.