

# Individual and Group Behavior in the Ultimatum Game: Are Groups More “Rational” Players?

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## **Abstract**

This article reports two experiments that compared the standard ultimatum game played by individuals with the same game played by three-person groups. In the group treatment, the members of the allocating group conducted a brief, face-to-face discussion in order to decide, as a group, on a proposed division, whereas the members of recipient group held a discussion on whether to accept or reject the proposal. If the proposal was accepted, each group member received an equal share of his group’s payoff (the pie in the group condition was three times that in the individual condition). In both experiments, groups offered less than individuals. But as indicated by the low rejection rate in both treatments, groups were also willing to accept less.

**Keywords:** ultimatum game, group decision

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## **Introduction**

The one-period bargaining or ultimatum game involves two players—player 1 (the allocator) and player 2 (the recipient). The two players are allocated a sum of money, and player 1 has to propose a division of this sum between himself and player 2. If player 2 accepts the proposed division both are paid accordingly, if player 2 rejects the proposal both are paid nothing. The game-theoretic prediction for this game is straightforward. If both players are rational in the sense that each is concerned only with maximizing his own profit, player 1 should propose to keep all but a penny for himself and give a penny to player 2. Player 2 should accept this proposal since even a penny is better than nothing.

However, results from numerous experiments have shown that people do not behave in line with this prediction. Instead, offers typically average about 40 to 50 percent of the total, with the 50-50 split being the modal offer. Moreover, a substantial proportion of positive offers are rejected. These findings have been replicated across different populations of subjects using different amounts of money and different experimental procedures. And as concluded by Camerer and Thaler (1995) in a recent review of the literature, the experimental results “are no longer in question” (see also a recent review by Roth, 1995).

## **Individual versus group decisions**

The experimental research on the ultimatum game has focused primarily on individual behavior. Little systematic work has been done to study how groups behave in this game.<sup>1</sup>

We see two reasons for studying group behavior. First, as pointed out by Messick et al. (1997), in many real-life bargaining situations the negotiators are groups (such as families, boards of directors, legislatures or committees) rather than individuals. Second, as we hope to demonstrate, studying groups may shed new light on how individual subjects interpret the ultimatum game and how they approach its solution.

This article reports two experiments which compared the ultimatum game played by individuals with the same game played by three-person groups. In the individual treatment, player 1 had to propose a division of  $x$  points between himself and player 2, and player 2 had to decide whether to accept or reject the proposal. In the group treatment, the members of the group in the role of player 1 had a few minutes of face-to-face discussion to propose a division of the  $x$  points between their group and group 2, and the members of group 2 had a similar discussion to decide whether to accept or reject the proposal. If the proposal was accepted, each player received an equal share of his group's payoff (each point in the group condition was worth three times that in the individual condition).

Since the strategic structure of the ultimatum game is not affected by this manipulation, the game-theoretic solution for the two treatments is identical—namely, player 1, whether an individual or a group, should propose to keep all but a single point and player 2 should accept this proposal. Of course, we already know that individuals do not behave in this way, and the question that we focus on here is whether the behavior of groups is any different from that of individuals.

There are several grounds for expecting groups and individuals to behave differently. One possibility, which arises from social psychological research, is that groups are more competitive or aggressive than individuals. The tendency of intergroup behavior to be more contentious than interpersonal behavior, termed the “discontinuity effect”, has been demonstrated in the two-person prisoner's dilemma game (Insko and Schopler, 1987; Schopler and Insko, 1992). To the extent that this phenomenon generalizes to the context of the ultimatum game, groups would be more inclined to take advantage of their player 1 position and try to obtain more for themselves than might be considered fair. However, if competitiveness is a property of groups, then groups in the role of player 2 would share it and would be less inclined to accept unfair offers than the less competitive individual players (Roth, 1995). So under the “group competitiveness” hypothesis, one would expect *lower* offers and *higher* rates of rejections in the group as compared with the individual condition.

Another possibility is that groups are more rational than individuals in the sense that they offer less but are also willing to accept less. This possibility is based on the assumptions that some individual subjects do not immediately grasp the strategic structure of the ultimatum game and that group deliberation might serve to explicate the task. While some researchers maintain that the ultimatum game is so simple that misunderstanding of the task is not a real problem (Camerer and Thaler, 1995), Binmore et al. (1985) argued otherwise. In their view, subjects, faced with a new problem, simply choose the equal division as an obvious solution. However, “such considerations are easily displaced by calculations of strategic advantage, once players fully appreciate the structure of the game” (p. 1180).

Can one expect group members to have a better understanding of the game's strategic structure following discussion and, consequently, to behave in a way that is more consistent with the game-theoretic prediction? A recent review of the group-decision literature

(Kerr et al., 1996) demonstrates that group discussion can attenuate, amplify, or simply reproduce the judgmental bias of individuals. The relative quality of group performance depends primarily on the degree to which the normative principle pertaining to the decision task is “demonstrably” correct. That is, the degree to which this principle, once voiced, is accepted by group members as valid. In highly demonstrable tasks groups consistently outperform individuals. This is because factions favoring the correct alternative are more likely to prevail than comparable factions favoring an incorrect alternative (Davis, 1992).

Of course, we do not know whether the sub-game-perfect equilibrium argument (“player 2 should accept any positive offer since something is better than nothing; therefore, we should offer the bare minimum”) is self-evidently correct. However, we surmise that, if this is indeed the case, groups would offer less than individuals; moreover, groups would be willing to accept less. In other words, the “group rationality” hypothesis predicts that offers in the group treatment would be *lower* than those in the individual treatment, whereas the rejection rates in the group treatment would not be any higher—that is, rejection rates would be the *same* as or *lower*, than those in the individual treatment.

A third hypothesis concerning possible differences between groups and individuals invokes the notion of a social norm. The social norm explanation of the ultimatum game results maintains that subjects share a common perception of what constitutes a reasonable offer under the circumstances (or develop such a notion during the course of the game). Consequently, allocators make offers that they believe the recipients will find reasonable and those are indeed accepted (Roth, 1995). This explanation received considerable support from a cross-cultural study by Roth et al. (1991), which compared the behavior in the ultimatum game in the United States, Japan, Yugoslavia, and Israel. They found that, while in all four countries the modal offers were in the typical range of 40 to 50 percent, there were significant differences among the subject pools. For example, Israeli subjects made lower offers than Americans. The important point is that Israeli subjects were also willing to accept less and, as a result, that the rejection rate in Israel was not any higher than that in the United States.

Social norms, however, are not known with certainty. Individual estimates of the norm are more appropriately described as a random distribution around some central value (which is presumably the social norm prevailing in the culture). Assuming that group members use the opportunity for discussion to form a common notion of the social norm by averaging their initial estimates, the distribution of group offers is the sampling distribution with sample size 3 from the original individual distribution. This distribution has the same mean as the original distribution but a smaller variance (more precisely, one-third).

If groups indeed have a more accurate notion of the prevailing norm, the probability of rejections in the group treatment should be lower than in the individual treatment. Assume that the distribution of reasonable offers is identical for all participants, regardless of whether they are in the allocator or the recipient role. Nonetheless, the samples of allocators and recipients in a particular experiment, being two independent (and relatively small) draws from that distribution, may hold different norms. The closer the means of these two random samples, the smaller the expected average gap between an allocator’s norm and a recipient’s norm, and the lower the expected rejection rate. As argued above, the distribution of group norms is narrower than that of individuals, and therefore two independent samples from the

group distribution are less likely to be different from each other than two samples from the individual distribution. Thus, our third hypothesis implies that, on average, groups would offer the *same* amount as individuals, but the rejection rate in the group condition would be *lower*.

To summarize, we consider three possibilities: (1) groups are more competitive than individuals, (2) groups are more “rational” than individuals, and (3) groups are more “normative” than individuals.

### *Experiment 1*

**Experimental procedure.** Eighty male students participated in the experiment. Twenty (ten pairs) were assigned to the individual condition and sixty to the group condition (ten pairs of three-person groups). In the individual condition, four participants were recruited at a time, and each was shown individually into a separate room. Two of the participants were given the allocator (player 1) instructions and two the recipients (player 2) instructions (see the appendix). To ensure strict confidentiality, the participants were told that they would be released one at a time (to minimize encounters in the corridors) and that they should not expect to find out who they had played against.<sup>2</sup>

The amount to be divided between an allocator and a recipient was 100 points, each worth 0.5 New Israeli Shekels (NIS 50 equaled approximately \$17 at the time of the experiment). The allocators were asked to write down their proposal as to how to divide the 100 points (the instructions are described in detail in the appendix). The experimenters then collected the written offers from the allocators and transferred them to randomly preassigned recipients in one of the other rooms for their decision. Each recipient had to indicate in writing whether he accepted or rejected the offer. The participants received their payments in sealed envelopes outside the test rooms.

In the group condition, twelve participants were recruited at a time. The participants were randomly divided into four three-person groups, and each group was shown into a separate room. Two of the groups were given the allocator (player 1) instructions and two the recipients (player 2) instructions (see appendix). The members of the group in the role of player 1 were told that they have up to ten minutes of free discussion to reach a joint decision as to how to divide 100 points between their group and group 2. They were also told that the members of group 2 would have a similar discussion to decide whether to accept or reject their proposal. The participants in both groups were informed that, should an offer be accepted, *each* group member would be paid NIS 0.5 for each point retained by his group. Thus the group as a whole would receive NIS 1.5 per point and the total amount to be divided between the two groups would be 150 shekels (approximately \$51—three times that in the individual condition). Except for the ten minutes time limit for reaching a decision, there were no specific instructions as to how the group’s decision should be made.

**Results.** Table 1 shows the demands made by the ten individuals and the ten groups (rejected demands are highlighted) and the mean demand in each condition. As can be seen in the table, groups demanded an average of 60.8 percent of the total, whereas the average individual demand was only 51.4 percent. These means are significantly different both by

*Table 1.* Distribution of demands (in percentage) in experiment 1 (rejected demands are highlighted).

Individuals	40	50	50	50	50	50	50	50	60	64	Mean = 51.4
Groups	50	50	50	50	<b>60</b>	60	70	70	73	75	Mean = 60.8

a  $t$ -test [ $t(18) = 2.56, p < .05$ ] and by a nonparametric Mann-Whitney test [ $W = 80.5, p < .05$ ]. A single proposal (of 60 : 40) was rejected in the group condition and none were rejected in the individual condition.

### *Experiment 2*

The purpose of experiment 2 was to test whether the pattern of results observed in experiment 1 is robust and which aspects of it, if any, are sensitive to the experimental procedure. Toward this end, we followed a double-blind procedure that allowed the participants a greater degree of confidentiality. A similar procedure was used by Hoffman et al. (1994) in the context of the dictator game. Hoffman et al. (1994) argued that, while in a typical bargaining experiment subjects in the bargaining pairs do not know each other's identities and decisions, the experimenter is fully informed as to who made what decision. They expressed the concern that subjects, being aware of this fact, might adapt their behavior in an attempt to avoid a negative evaluation by the experimenter. Hoffman et al. (1994) indeed showed that in the dictator game a double-blind procedure, which guaranteed subjects anonymity with respect to both the other subjects and the experimenter, led to considerably less generous behavior.

***Experimental procedure.*** Eighty male students participated in the experiment (as before, twenty were assigned to the individual condition, and sixty to the group condition). We gave the allocators a total of fifty shekels in coupons (in denominations of 10, 5, and 1) and asked them to indicate their allocation decision by dividing the fifty paper shekels and placing the amount offered to the other side in a separate envelope to be delivered by the experimenter. The allocators were asked to seal the envelope so that the experimenter who passed the offers to the recipients could not know what they were. The recipients then delivered their response in an envelope to the experimenter, who then passed it to the cashier (another experimenter, who was stationed outside the lab and did not interact with the participants during the experiment). The cashier paid each participant one real shekel for each paper shekel in the envelope, and the participants were then released one at a time without an opportunity to interact with one another. In the group condition, each group member was paid one real shekel for each paper shekel retained by his group.

***Results.*** Table 2 shows the demands made by the ten individuals and the ten groups (the rejected demands are highlighted) and the mean demand in each condition. To facilitate comparison with experiment 1, we present the demands on a percentage scale. As in experiment 1, groups in the role of player 1 demanded more than individuals. The average group demanded 66.6 percent of the total, whereas the average individual demanded 56.4

Table 2. Distribution of demands (in percentage) in experiment 2 (rejected demands are highlighted).

Individuals	46	50	50	50	50	50	60	60	68	<b>80</b>	Mean = 56.4
Groups	50	50	60	60	60	70	76	80	80	80	Mean = 66.6

percent. The difference between these two means is significant [ $t(18) = 2.00, p < .03$ , one tail, and Mann-Whitney,  $W = 78.0, p < .05$ , one-sided test]. A single proposal (of 80-20) was rejected in the individual condition and none were rejected in the group condition.

The double-blind procedure in experiment 2 had led to somewhat less generous offers. Individual allocators demanded on average 5 percent more than in experiment 1, and groups demanded 5.8 percent more. To test whether these differences are statistically significant, we performed an analysis of variance on the data combined from the two experiments with experiment (or experimental procedure) as one factor and allocator type (groups versus individual) as the other. The main effect of allocator type was, of course, statistically significant [ $F(1, 36) = 10.1, p < .01$ ], but the effect of the experimental procedure was not [ $F(1, 36) = 3.57, p < .10$ ].<sup>3</sup>

## Discussion

Both experiments found that groups in the role of player 1 demanded more than individuals. The mean difference between the group and the individual demands was in fact quite large—about 10 percent of the pie. The distributions of demands (summed across the two experiments) show that 60 percent of the individual allocators offered a 50-50 split, as compared with only 30 percent of the groups. Demands of 60 percent or more were made by 30 percent of the individuals as compared with 70 percent of the groups. Finally, only a single individual demanded 70 percent or more of the pie, as compared with 45 percent of the groups.

While groups were considerably less generous than individuals, the rate of refusals in the two treatments was equally low (a single offer was rejected by a group in experiment 1 and a single offer was rejected by an individual in experiment 2). This implies that groups not only offered less than individuals but were also willing to accept less. While we do not have enough observations to warrant a definite conclusion, it is interesting to note that the single proposal of 80-20 made in the individual treatment was rejected, whereas three such proposals made in the group treatment were accepted.

This pattern of results supports the hypothesis that groups are more rational than individuals over the alternative hypotheses. Recall that if groups were more competitive than individuals, lower offers in the group treatment should have been associated with higher rejection rates. Alternatively, if groups had a better perception of the prevailing social norm, the mean offer in the two treatments should have been the same.<sup>4</sup>

As suggested earlier, one explanation for why groups offer less and are willing to accept less is that groups have a better understanding of the game's strategic structure and, in particular, of the strategic advantage associated with the allocator's position. The fact that two individual allocators (one in each experiment) offered to give away more than 50 percent

of the total, whereas none of the groups made such an unreasonable offer, is supportive of this explanation. Further evidence will be obtained in future research by monitoring group discussions. This will enable us to verify whether the strategic argument for making a low offer is indeed voiced and, if it is, whether it has a decisive effect on the group's decision.

A somewhat different explanation for the same pattern of results is that, when generating their proposal, groups in the allocator role take into account the decision rule likely to be used by the recipient group.<sup>5</sup> In particular, it is possible that group members operate under the assumption that, for their proposal to be accepted, it needs only to be acceptable to the *majority* of individuals in the other group, and therefore they can get away with lower offers (although not as low as game-theoretic considerations prescribe). If this is indeed the case, groups should offer more when the recipient is an individual player rather than a group. This possibility also awaits further investigation.

## Appendix

The appendix to this paper is available upon request from the authors or through the homepage of this journal (<http://www.wkap.nl/journalhome.htm/1386-4157>).

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## Notes

1. The single exception that we are aware of is a study by Messick et al. (1997). These researchers, however, did not compare group behavior with individual behavior. Rather, they studied how individual allocators made offers to a group of recipients. The manipulation involved the decision rule by which the group decided whether to accept the proposed division. In one condition, an offer was accepted if it equaled or exceeded the minimum acceptable by each of the group members, while in the other condition, an offer was accepted if it equaled or exceeded the minimum acceptable by any of the members. Messick et al. found that individuals fail to account for the group's decision rule in making their allocations.
2. We chose to employ subjects of the same sex in an attempt to reduce potential "noise" associated both with the subjects' own sex and the groups' sex composition. This consideration is particularly important given the relatively small number of observations and the fact that sex differences in ultimatum game behavior were reported in the past (Rapoport et al., 1994). We chose males simply because they were more easily available at the time.
3. Bolton and Zwick (1995) also found that anonymity made little difference in the ultimatum game. In any case, our purpose in conducting experiment 2 was establish the robustness of the individual-group difference observed in experiment 1 rather than to examine the effect of anonymity per se.
4. Unless, of course, one speculates that there exists a different, less generous, norm for intergroup as compared with interpersonal bargaining.
5. Although, as mentioned earlier, Messick et al. (1997) found that individuals fail to account for the group's decision rule in making their allocation decision, it is possible that groups are more capable of doing so.

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