RAISING THE STAKES IN THE ULTIMATUM GAME: EXPERIMENTAL EVIDENCE FROM INDONESIA

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The ultimatum game has generated considerable interest because experimental evidence strongly rejects the standard game-theoretic predictions. A limitation to this general result is the possibility that experimental results are an artifact of small stakes. Implementing the ultimatum game in Indonesia makes it possible to raise the stakes to three times the monthly expenditure of the average participant. Even with these sizable incentives, results do not uniformly approach the sub-game perfect, selfish outcomes. More specifically, responders become more willing to

Standard game theory assumes that participants play with the sole aim of maximizing their payoffs. As such, it predicts that the Responder should be willing to accept any amount larger than \$0. Knowing this, the Proposer should take just a little less than the whole pie for herself. The subgame perfect equilibrium is thus an allocation of $(A - \varepsilon, \varepsilon)$. However, the standard result from ultimatum games played in the U.S. for moderate

demand: as the stakes increase the price of fairness increases and hence the quantity demanded decreases.

If Responders react to increased stakes by being more willing to accept a given percentage offer, then the optimal response of Proposers is to offer a smaller percentage of the pie. However, this argument abstracts from the issue of risk. Neither of the above models explicitly model the uncertainty faced by the being received by the Responders, and their conclusion was based on a small sample.[6] This study uses considerably higher stakes than in Hoffman et al. [1996], provides a larger sample size, and conducts a formal statistical analysis of both Proposer and Responder behavior. The experimental design has the additional advantage of controlling for player heterogeneity.

Straub and Murnighan [1995] also investigated the effect of increasing stakes in the ultimatum game, but with each player having only a small probability of receiving payment on the basis of the game's outcome. (The average expected payoff was $10.) They found no drop in the minimum percentage offer acceptable to Responders until the (hypothetical) stakes increased beyond US$100.

Slonim and Roth [1998] have since examined learning in high stakes ultimatum games in the Slovak Republic (although for lesser sums than in this study). Where comparable, their findings confirm the results presented below. Their results from repeated high stakes games suggest that Proposers may learn to make lower offers over time in such games.

IV. PROCEDURAL DETAILS

Experiments were conducted with students in the Faculty of Sociology and Politics at Gadjah Mada University in Yogyakarta, Central Java. The desired sample size was 40 pairs in each trial; however, class sizes varied with the result that some sessions fell slightly short of this. The English language instructions were translated into Indonesian and then translated back into English to check for any errors. All instructions and explanations were written, thus minimizing the amount of verbal communication. A pretest of 15 pairs of students was run to guard against problems during the real games.

The English language versions are available from the author on request. The games were played in almost complete silence, with the students sitting at least one seat apart from one another. At the start of each session, two examples were given and the students were asked to respond as a group as to how much each player would receive if the Responder accepted the offer and how much if the offer was rejected. The same two examples were used in all sessions.

The instructions stated that the game was anonymous and that they would never play the same person twice. The Proposers sat on one side of the room and the Responders on the other. No player played in more than one session and each session consisted of two rounds. They were told at the start only that there would be "a number of" rounds.[7] The Indonesian currency is the Rupiah and all players received a flat rate of Rp5000 ($US=Rp2160) for playing in addition to any takings in the real money games. Three real money sessions were conducted. The first round in each session was always for Rp5000 and the second round was for the same or an increased amount. In those games where the stakes increased in the second round, participants were not told that this would be the case until the start of that round. The advantage of allowing players to play twice is that it allows one to compare individuals' behavior across rounds and so, unlike many similar analyses of experiments, it is possible to control for the large amount of player heterogeneity that is typical of such experiments. The analysis below will focus on the differences between offers and responses in the two rounds of each game. The one game in which players played for the same amount, Rp5000, makes it possible to separate out the effect of experience and the effect of the increase in the stakes. In addition to the real money games, one hypothetical game was played. Table I shows the details of the different sessions.

According to self-reports from the subjects, the largest stake used, Rp200,000, is about three times the average monthly expenditure of the participants. This is much higher than the largest amounts used in previous ultimatum game studies.

V. RESULTS

Proposer Behavior

Real Money Games. The results of the games are shown in Figures 1, 2, 3 and 4

6. Hoffman et al. [1996] conclude that rejection rates decrease as the stakes increase on the basis of one less rejection (sample size of 26) in the US$100 game compared to the US$10 game. They do not control for offers received or player heterogeneity, and do not test the significance of the difference.

7. This avoids possible changes in behaviour in a pre-announced final round.

TABLE I
Summary of Games Played

Game 1	Game 2	Game 3	Game 4
Real Money	Real Money	Real Money	Hypothetical
I. Rp5000	I. Rp5000	I. Rp5000	I. Rp5000
II. Rp5000	II. Rp40,000	II. Rp200,000	II. Rp200,000
N = 29 pairs	N = 35 pairs	N = 37 pairs	N = 40 pairs

below. The figures show the distribution of Proposer offers and indicate whether the offers were accepted or rejected. Acceptances are shown in black and rejections in the gray shaded area. In a small number of cases the Responder filled in an incorrect answer to the question "How much will you receive if you [redacted]

Rounds 1 and 2 within games reflect the effect of two factors: the increase in the stakes *and* the learning or experience effect. For that reason, in Game 1 the students played for the same amount Rp5000 in both rounds. The results of Game 1 can then be used as a control for the effect of learning.[10] The experimental [redacted]

FIGURE 1
Game 1 Proposer and Responder Behavior

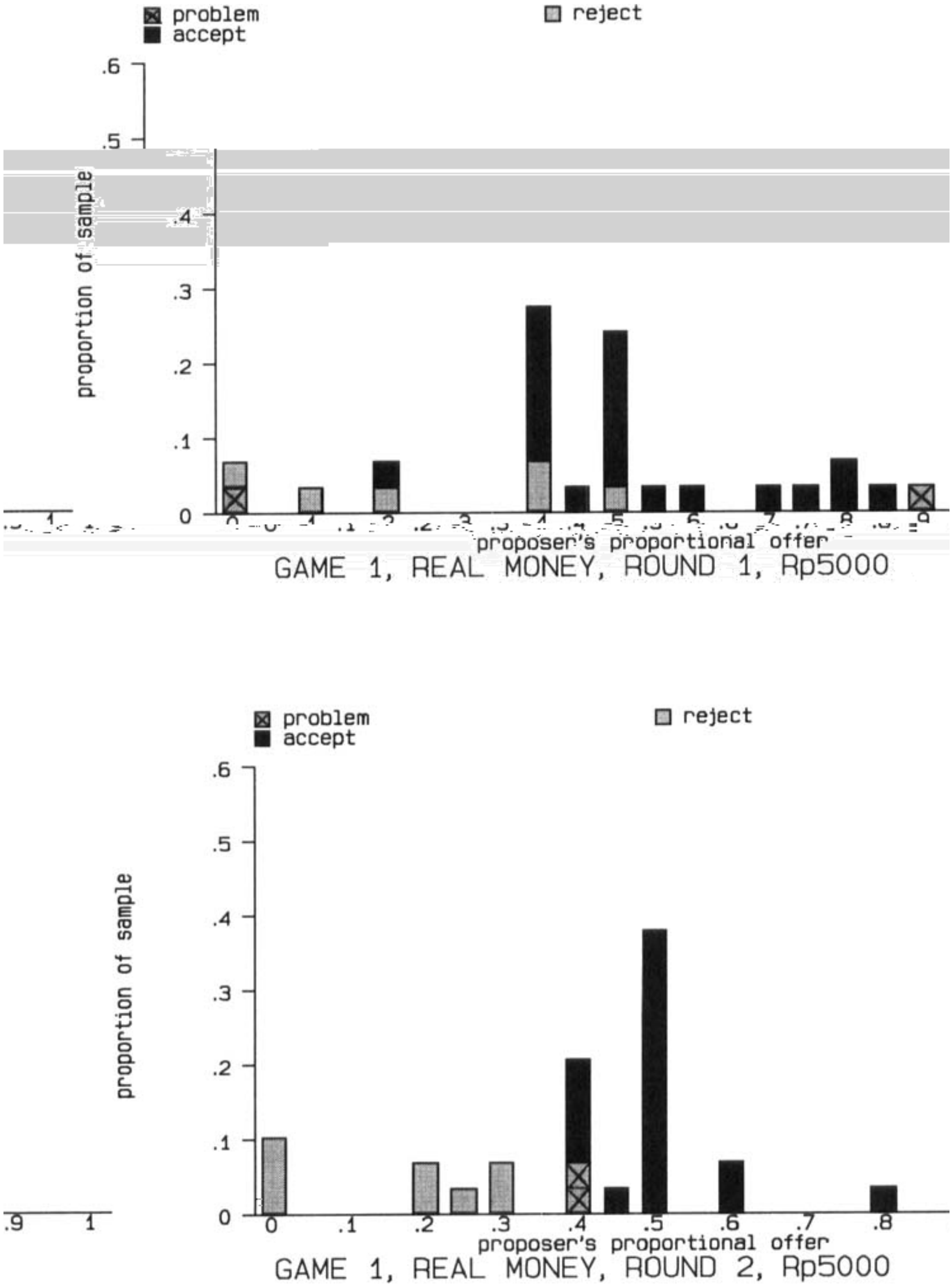

FIGURE 2
Game 2 Proposer and Responder Behavior

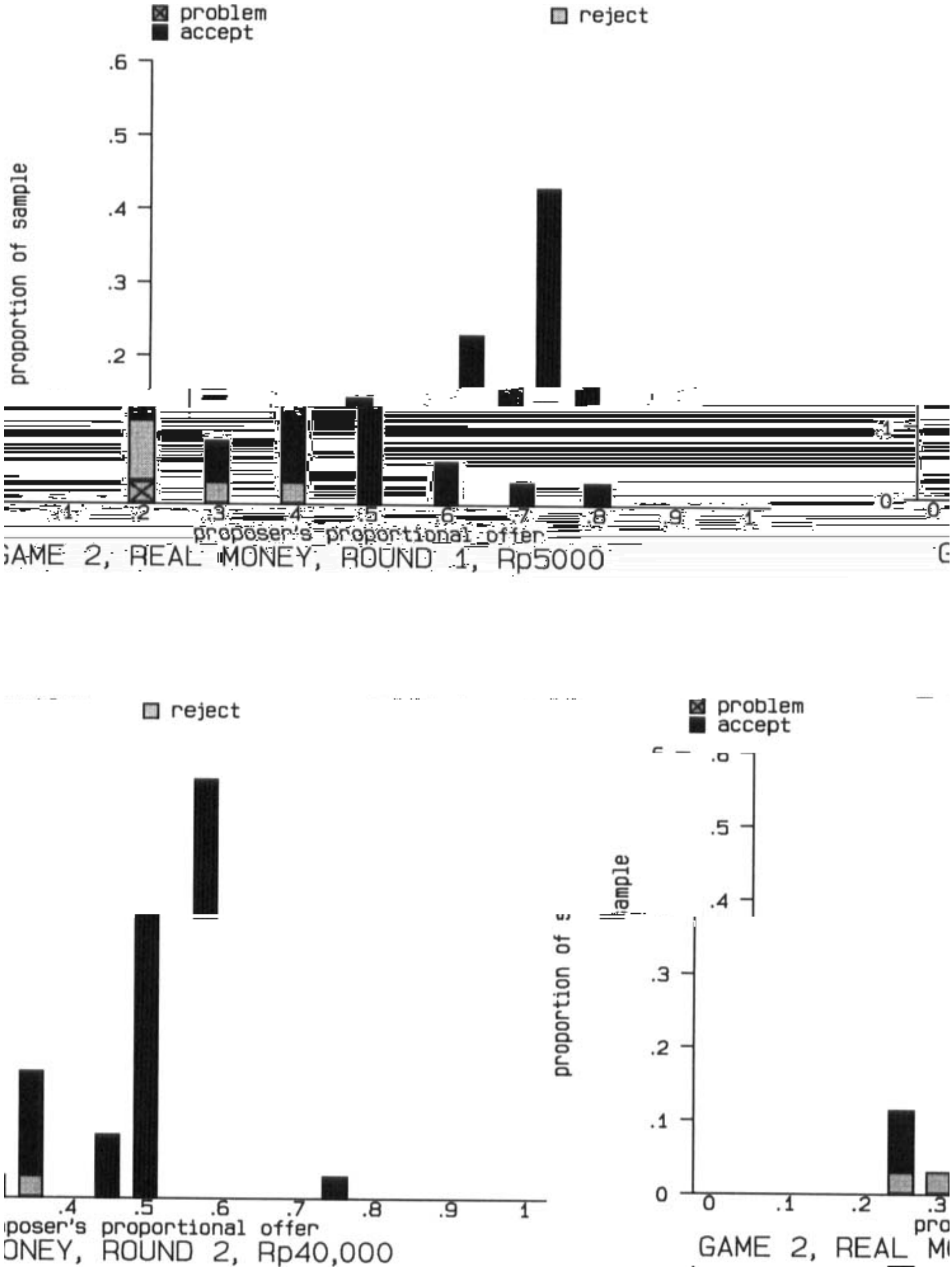

FIGURE 3
Game 3 Proposer and Responder Behavior

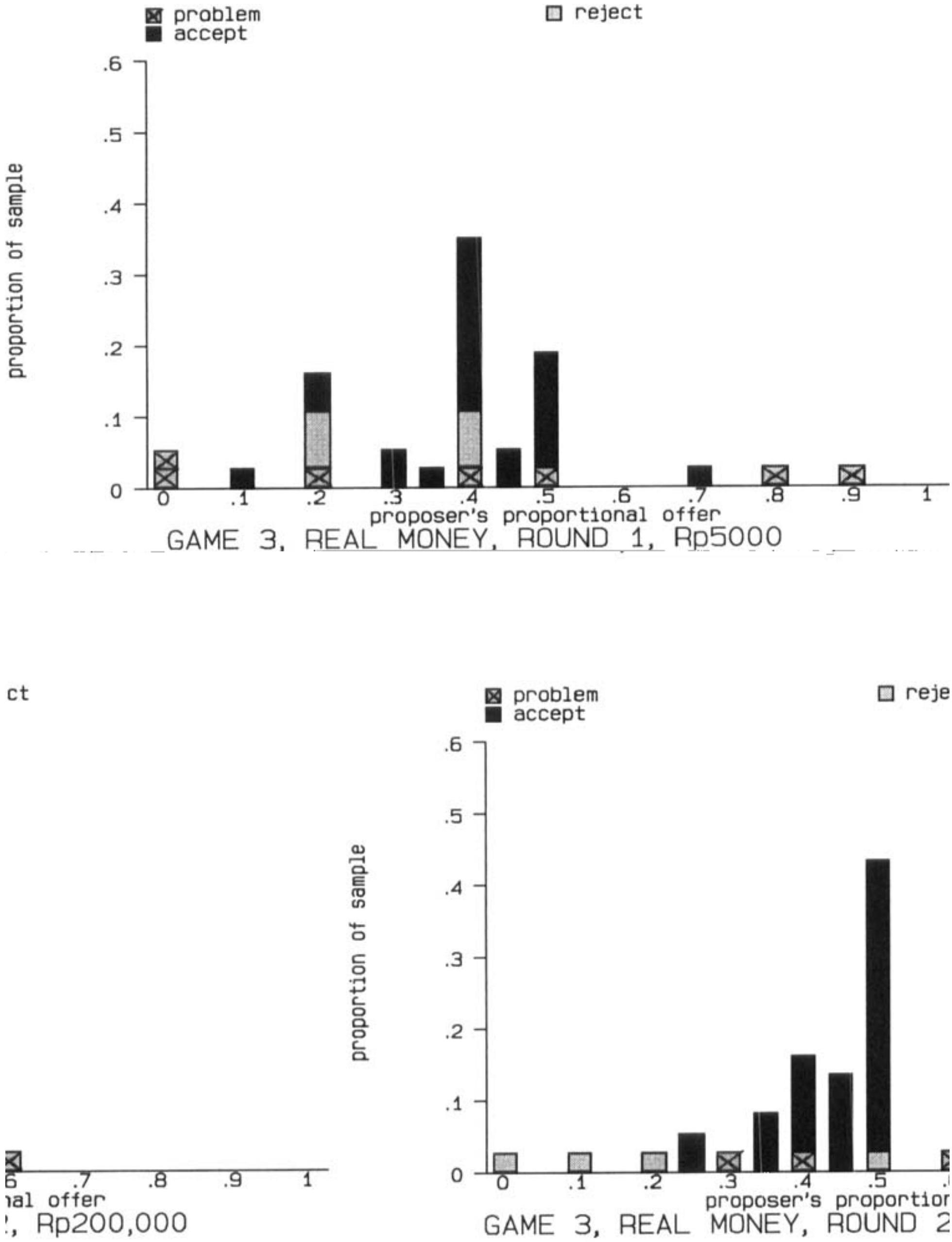

FIGURE 4
Game 4 Proposer and Responder Behavior

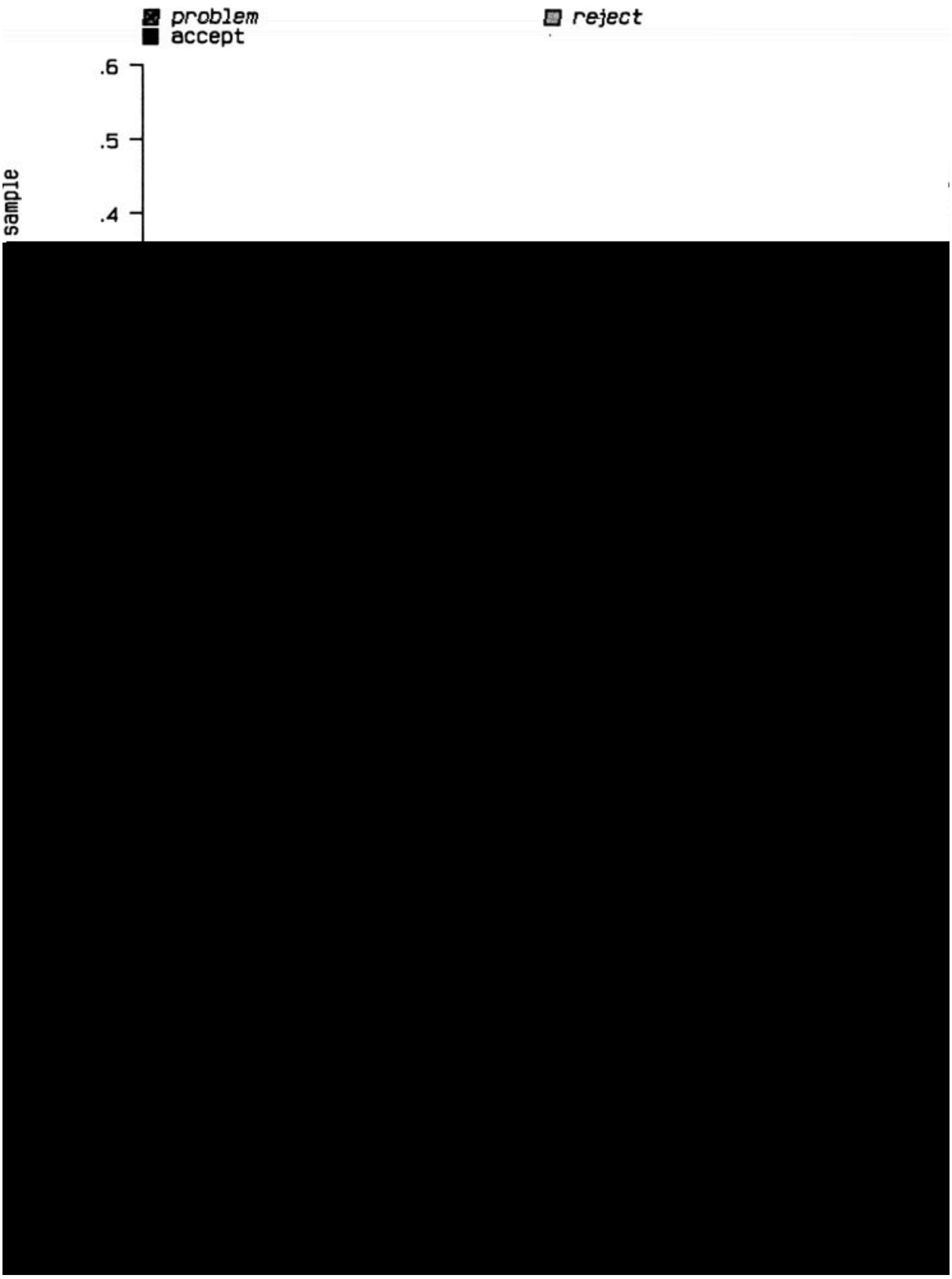

TABLE II
Summary Statistics of Proposer and Responder Behavior

	Game 1	Game 2	Game 3	Game 4
[illegible]				
Round 1				
Amount	Rp5000	Rp5000	Rp5000	Rp5000 Hypothetical
Mean offer	0.4672	0.4331	0.3849	0.3627
Mode	0.40	0.50	0.40	0.35
Std. Dev.	0.2291	0.1395	0.1853	0.1954
Acceptance Rates	76.9%	85.3%	79.3%	47.4%
Round 2				
Amount	Rp5000	Rp40,000	Rp200,000	Rp200,000 Hypothetical
Mean offer	0.3990	0.4475	0.4192	0.3961
Mode	0.50	0.50	0.50	0.50
Std. Dev.	0.1846	0.1024	0.1204	0.2135

[illegible]

TABLE III
Difference in Difference Tests: Differences Between First and Second Round Proposer Offer Proportions (Round 2 – Round 1)

	Mean Difference	Standard Deviation of Differences
Game 1	–0.0683	0.3150
Game 2	0.0104	0.1424
Game 3	0.0343	0.1595
Game 4	0.0333	0.2353
P-values of difference in differences:[a]		
Game 1 vs. Game 2	0.1419	0.0000*
Game 1 vs. Game 3	0.0533	0.0001*
Game 2 vs. Game 3	0.6318	0.2547
Game 3 vs. Game 4	0.9814	0.0102*
Test of Equality of Mean Differences in Games 1, 2 and 3: $p = 0.1372$		

[a]The p-value for the null hypothesis of no difference in the differences.
*Indicates a significant difference across the games at the 5% level.

also significantly more uniform when the stakes increase than when the stakes are constant, perhaps signifying a more shared reaction of Proposers to the increase in stakes.

Real Money versus Hypothetical Money

Figure 4 presents the results of the hypothetical games. A comparison of Figures 3 and 4 can be used to examine the effect of using real money as opposed to playing hypothetically. The figures show no obvious differences in the overall distribution of offers. Mann-Whitney tests do not reject the null hypothesis that the distributions are the same in the real money and hypothetical game (p-values of 0.445 in Round 1 and 0.498 in Round 2). Table III shows that the difference in mean differences between Round 1 and Round 2 offers in the real and hypothetical games is not significant.[14] However, the standard deviation of the changes in percentage offers between Round 1 and Round 2 is much greater in the hypothetical game than in the real money game.

Thus, the above analysis of Proposer behavior produces the following results:

1. With respect to the real money results, the evidence lends no support to the speculation that proposals might move closer to the game-theoretic predictions as the stakes increase.

2. With respect to the hypothetical results, the null hypothesis that the distributions of offers are the same in the real money and hypothetical game cannot be rejected.

Responder Behavior

Table II shows the acceptance rates in each round of each game which are defined as the percentage of offers that are accepted by Responders.[15] The acceptance rates are much lower in the hypothetical game than in the real money game. Acceptance rates also increase as stakes increase in the real money games. This cannot however be taken to indicate that Responders are more willing to accept a given percentage offer at higher stakes.[16] As we have seen above, there is evidence suggestive that some offers may have become more gen-

14. Also, unlike the real money game, the proportion of Proposers who offer less than 20% does not decrease significantly when the hypothetical stakes are increased.

15. Responders who filled in an incorrect answer to "If I accepted the offer I would receive ..." in either round of the game were dropped from the sample used to analyze responder behavior.

16. Even though the acceptance rates are much smaller in the higher stakes rounds, there were still some surprising rejections in the high stakes games that show a significant divergence from game-theoretic behavior. For example, one individual in Game 3 gave up Rp41,000 by rejecting an offer. His response to the expenditure question on the questionnaire identifies him as someone in the lowest expenditure category which makes the Rp41,000 approximately equivalent to his average monthly expenditure.

TABLE IV
Linear Probability Model of Responder Behavior

	Linear Probability Model with Random Effects
A1	–0.0635 (–0.779)
A2	0.0855 (1.168)
A3	0.1077 (1.384)
hyp1	–0.2615 (–3.576)
hyp2	–0.2277 (–3.134)
Offer Share	1.137 (8.088)
σ^2	0.0143
Constant	0.3161 (4.346)
Test: A1 = A2 = A3	Pr > $chi^2(2)$ = 0.1822
Test: hyp1 = hyp2	Pr > $chi^2(1)$ = 0.6784
Test: A3 = hyp2	Pr > $chi^2(1)$ = 0.0003
Test: A1 = A2 (one-tailed)	Pr > t = 0.063

pothetical game than in the first round of a real money game. Random effects are used to control for player heterogeneity.[18]

The F-test of equality of the coefficients on A1, A2 and A3 shows that the differences between the probabilities of acceptance of a given percentage offer in the real money games are statistically insignificant (p-value = 0.182).[19] However a one-tailed t-test of the null hypothesis that A1 = A3 against the al- [redacted]

percentage offer. These differing reactions of Proposers and Responders may reflect the reaction of Proposers to the risk of losing a greater absolute amount. Proposers must juggle the conflicting pressures of potentially greater gain versus the risk of loss. If a Proposer's utility function is characterized by increasing partial risk aversion, his/her optimal response to increased stakes may not be to offer less. In contrast, Responders face a [redacted]