The Effects of "Observability" on Rejection Behavior in Ultimatum Game Experiments*

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Abstract

Using a modified ultimatum game experiment, we tested the hypothesis that greater "observability" of responders' actions leads to a higher rejection rate. Our experimental data on participants' rejection behavior rejected this hypothesis but confirmed the theory of reference-dependent preferences.

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1. Introduction

Relatively equal (fair) offers in ultimatum games are generally accepted by recipients, whereas unequal (unfair) offers are frequently rejected in laboratory experiments. The motivation behind such behavior has been widely studied in literature. Many studies have argued that an innate tendency to dislike unequal distributions (inequity aversion) or the counterpart's selfish behavior (strong reciprocity) urges players to act against monetary incentives.

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However, some recent studies have questioned this genuine motivation and found that being observed influences behavior in social contexts. A strand of such literature examines the concern about one's social image. In dictator games, Andreoni and Bernheim (2009) and Kim and Kim (2019) studied the behavior of dictators toward recipients when a random intervention obscured their decisions. They found that dictators would choose unfair offers more often when they could avoid being pinpointed. This implies that people wish to not only *be* fair but also *appear* fair (termed the *audience effect*). According to this view, if we implement a similar design in ultimatum games, responders are expected to reject unfair offers more often when their actions are more "observable" (i.e., more discernible from the random intervention), because they can be seen as fair-minded by rejecting unfair offers. Alternatively, people use the presence of an observer as an opportunity to strategically *signal* their type, such as their assertiveness or "toughness." In Yamagishi et al. (2012), participants played various games, such as ultimatum and dictator games across time. They suggested that the rejection behavior can be considered a strategy to signal one's toughness. According to this view, when responders' actions in ultimatum games are more "observable" to their counterparts, they are expected to reject unfair offers more often to signal their toughness. Therefore, both views suggest that greater "observability" of responders' actions in ultimatum games leads to a higher rejection rate. We tested this hypothesis in our modified ultimatum game experiment.

2. Experimental Design and Hypothesis

We conducted our experiment at the laboratory managed by the Center for Research in Experimental and Theoretical Economics (CREATE) at Yonsei University, Korea. Our experiment was computerized using oTree software (Chen et al., 2016). We recruited 134 undergraduate students from our subject pool. In every treatment, participants played 10 rounds of our modified ultimatum game and completed a demographic survey. Each participant's payoff was determined by a randomly selected round. The experiment lasted about 30 minutes. The average payment was KRW 5,485 (about USD 5), including the show-up pay of KRW 3,000.

In each round, participants were randomly paired and given one of two roles, namely, a proposer or a responder. Proposers were asked to choose between two distributions that could

be either accepted or rejected by responders: (proposer, responder) = (KRW 4,000, KRW 5,000) or (KRW 8,000, KRW 2,000).[1] If the offer was accepted, both proposer and responder would receive the money as proposed; however, if rejected, both would obtain nothing except for the show-up pay. On top of this rather standard ultimatum game, we introduced randomness to manipulate proposers' expectation (similar to Andreoni and Bernheim, 2009). Specifically, after a responder's decision had been made, the offer was rejected with probability p regardless of the decision, and the responder's decision was implemented with probability 1-p. The probability of intervention, either $p = 0.7$ or $p = 0.2$, was randomly decided with equal probability and notified to the players at the outset of each round. We introduced two treatments in our experiment. In treatment "observable (henceforth, O)," the responder's decision was revealed to the proposer. In treatment "unobservable (henceforth, U)," only the realized outcome was shown. Therefore, if a proposer's offer was rejected in treatment U, he/she could not tell if it was the responder who rejected his/her offer.

Hence, two factors influence the "observability" of responders' actions in our design: whether responders' actions are revealed to proposers and whether the probability of nature's intervention is high. Using these two factors, we derived two hypotheses to test whether greater observability of responders' actions indeed leads to a higher rejection rate. First, fixing the probability of nature's intervention, a responder's action was more observable in treatment O than in treatment U because his/her action was revealed directly to his/her counterpart. Therefore, responders were expected to reject unfair offers more often in treatment O. Second, in treatment U, a responder's action was more observable when $p = 0.2$ than when $p = 0.7$, because his/her action was highly likely to determine the outcome in the case of $p = 0.2$, making it easier for his/her counterpart to make an inference about the action from the outcome. Thus, in treatment U, responders were expected to reject unfair offers more often when $p = 0.2$. By contrast, in treatment O, rejection rates should not respond to p because a responder's action was perfectly observable regardless of the intervention probability.

Hypothesis 1. Fixing the probability of nature's intervention, the rejection rate is higher

[1] The reason we made the "fair" choice (KRW 4,000, KRW 5,000) instead of (KRW 5,000, KRW 5,000) was mainly to induce more unfair offers from proposers. It is possible that some responders accepted unfair offers to maximize social welfare. As our aim was to compare rejection rates across treatments, so long as such responders were evenly distributed across treatments, the motivation would not affect our results.

in treatment O than in treatment U.

Hypothesis 2. In treatment U, the rejection rate is higher when the probability of nature's intervention is lower. In treatment O, the rejection rate is the same regardless of the probability of nature's intervention.

3. Results

Among 134 participants, 66 were randomly assigned to treatment O and 68 to treatment U. Of all the offers made, 34% involved fair distribution, 99% of which were accepted. We dropped the responses to these fair offers and used only the data on responders' behavior toward unfair offers for data analysis.[2] Table 1 presents the number of observations in each treatment.

Table 1. Number of observations by treatment

		Observation of action	
		Unobserved	Observed
Probability of intervention	$p = 0.7$	116	121
	$p = 0.2$	120	85
	Total	236	206

Figure 1 shows the rejection rate of unfair offers in each treatment. In contrast to our hypotheses, we found that the rejection rate was higher when the intervention probability was higher in both treatments (p-value = 0.2316 in treatment U and 0.0179 in treatment O). Moreover, fixing p, there was no statistical difference in the rejection rate between treatments U and O (p-value = 0.3016 for $p = 0.7$ and 0.7731 for $p = 0.2$).

[2] We did not exclude any observations, although most individuals received unfair offers more than once. We used panel data regressions with random effects to account for possible issues from having multiple observations across individuals.

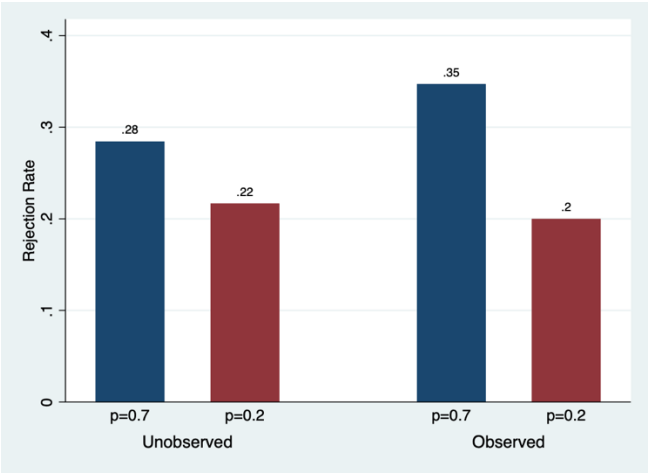

Figure 1. Rejection rate of unfair offers

Table 2 shows the regression results using a random-effects model. The dependent variable was a dummy variable indicating whether or not the responder rejected the unfair offer. We controlled for participants' major, gender, age, and religion.

Table 2. Results of regression analysis

Probability of rejecting an offer	(1) All	(2) U	(3) O
U	-0.0019		
	(0.0719)		
$p = 0.7$	0.1232**	0.0745*	0.1255**
	(0.0541)	(0.0445)	(0.0579)
U × $p = 0.7$	-0.0508		
	(0.0720)		
N	442	236	206
# of participants	128	66	62

Standard errors in parentheses
*** p<0.01, ** p<0.05, *p<0.1

Column (1) of Table 2 shows the results from the pooled data. The data show that the treatment had no effect on the rejection rate, thereby rejecting Hypothesis 1. Columns (2) and (3) show the results in treatments U and O, respectively. First, the coefficient on $p = 0.7$ in column (2) is positive and statistically significant at 10%. Therefore, instead of reducing the rejection rate, a higher level of intervention probability was shown to increase the rejection rate in treatment U, thereby rejecting the first part of Hypothesis 2. Moreover, although the

second part of Hypothesis 2 suggests an insignificant coefficient on $p = 0.7$ in column (3), our regression results showed that it is positive and statistically significant at 5%, thereby rejecting the second part of Hypothesis 2. The audience effect by Andreoni and Bernheim (2009) and the signaling motive by Yamagishi et al. (2012) cannot explain this last finding, because responders' actions were always revealed to their counterparts regardless of the intervention probability. In summary, our regression results suggested that responders did not wish to appear fair or signal toughness to proposers. Comparing our results with Andreoni and Bernheim (2009) and Kim and Kim (2019) suggests that the audience effect is sensitive to the details of the bargaining environment, including which role the agent is playing and who the audience is.[3]

Additionally, we found that the theory consistent with our experimental data is the reference-dependent preferences by Kőszegi and Rabin (2006), who assumed that a person's reference point is formed prior to an action as his/her rational expectations. In such a case, choosing an action different from the expectations incurs some loss of utility to the decision maker; therefore, a change in expectation on a seemingly irrelevant event could directly influence one's behavior (see Abeler et al., 2011, and Ericson and Fuster, 2011 for experimental evidence). In our experiment, a higher probability of automatic rejection might move a responder's reference point closer to rejection, thereby reducing the feeling of loss (in money) from rejecting an offer. Therefore, significant increases in the rejection rate in response to higher probabilities of intervention can be attributed to responders who are subjected to loss aversion.

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[3] Peterburs et al. (2017) is closely related to our study and worthy of mention. They examined the within-subject audience effects of a neutral, third-party observer in ultimatum games. They showed that responders rejected unfair offers more often when put under close individual supervision. Comparing this to our findings suggests that the effect of observation differs depending on the identity of the audience, that is, a third party or the counterpart.

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