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Experiment of Dictator Games  
And Fairness

by

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## 1. Introduction

Kaneda (2003) conducted an experiment testing the Coase theorem. They found several equal splits in the outcomes. Fairness and equal splits in ultimatum games have been issues for theoretical and experimental research during the past decade. We conduct a study of dictator games to simulate the “fair” behavior in the repeated game with identification. The effect of reputation in repeated games is important. We might be able to explain the fair behavior in society in terms of rationality.

## 2. Literature Review

Forsythe, Horowitz, Savin and Sefton (1994) conducted an experiment to test whether fairness alone can explain proposers’ willingness to provide nontrivial offers in an ultimatum game. They examined two treatments: two kinds of games (ultimatum or dictator) and payment (with payment or without payment). They found that the results of ultimatum and dictator games with payments are significantly different and that a subgame perfect equilibrium offer is the modal offer in a dictator game with payment. On the other hand, the modal offer in an ultimatum game with payment is an equal split of \$5. The results show that the subjects’ behaviors in an ultimatum game cannot be fully explained by a tendency toward fairness among proposers. In his or her test situation, each subject plays with another subject for only one game.

Hoffman, McCabe, Shachat and Smith (1994) made some modifications to the ultimatum and dictator game by examining the sense of property rights by specific procedure. In their experiment, the right to be the first mover (allocator) is earned by scoring high in a general knowledge quiz. They also made modifications to the instruction. In their “exchange” treatment, two players are supposed to sell and buy the

unknown products in their bargaining rather than split their monetary payoffs. They found that allocators make less offers, if their property rights are enhanced and the bargaining is framed as seller-buyer negotiations. They also found that the subject-experimenter anonymity strongly enhances the results of self-motivated behaviors.

Bolton and Zwick (1998) tested the two hypotheses about the results of ultimatum games. They compared the explanatory power of the anonymity hypothesis to the punishment hypothesis. The anonymity hypothesis implies that subject-experimenter anonymity induces the subgame perfect moves in an ultimatum game. The punishment hypothesis insists that the allocator makes a nontrivial offer in an ultimatum game, because the recipient may reject any trivial offer the allocator makes.

They used three different sets of cells in the experiment:- the Cardinal Ultimatum Cell, the Zero Knowledge Cell, and the Impunity Cell. The Cardinal Ultimatum Cell is a simplified ultimatum game providing only two choices for the allocator's offer. In this cell, the experiment is conducted under full experimenter observation. In the Zero Knowledge Cell, subjects play the same game as the Cardinal Ultimatum Cell, but there is subject-experimenter anonymity. In the Impunity cell, subjects play the Impunity game with full experimenter observation. In the Impunity game, recipients may reject allocators' offers, but the rejection does not change the allocator's payoff. The recipient may only reject his own payoff, which is why this game is called "impunity game."

In the Cardinal Ultimatum Cell, 30% of offers are subgame perfect offer. In the Zero Knowledge Cell, 46% of offers are subgame perfect equilibrium. In the Impunity Cell, 100% of offers are subgame perfect offers. Bolton and Zwick concluded that the

punishment hypothesis has much more explanatory power for the outcomes of ultimatum games than the anonymity hypothesis does.

When Bolton, Katok and Zwick (1998) refined the test in Bolton and Zwick (1995), they found no evidence of the experimenter observation effect. They explained the different results of dictator game in the previous experiments by the context of the game across dictator games. They found that allocators make capricious treatments for different recipients when they make their allocations successively against different players.

Regarding the framing of the game, Schotter, Weiss and Zapater (1996) showed that fairness is dependent on the context of the bargaining game. They introduced a situation in which the survival of the allocators at stake for each session. They conducted two experiments: a one-stage game and a two-stage game. In the first round of the two-stage game, allocators are ranked by their payoffs. Only those in the top half with respect to payoff would stay and proceed to the second round. The results show that allocators in the two-stage game keep more monetary value to themselves than the allocators in the one-stage game do. They found that market contexts affect people's behaviors.

Harrison and McCabe (1996) designed a simultaneous-move ultimatum game to manipulate subjects' expectations. The results of their experiment reject the hypothesis that considerations of fairness drive bargaining outcomes independently of subject expectations.

Guth and van Damme (1998) made three-party experiment to verify whether the behaviors of allocators in ultimatum games is motivated by a sense of fairness. Three

players in the experiment have different roles. The first player, X, is called the “proposer” and makes information decisions and allocation decisions among the three players in the game. In addition, the proposer must allocate the minimum amount to the other two players. The second player, Y, is called “responder.” The responder may reject the allocation of the proposer. If the responder rejects the allocation, no one gets any monetary values; if the responder accepts the allocation, however, each player receives his or her amount according to the allocation. The third player, Z, does not make any decisions and has no strategic power. The proposer provides some information about his decision. The experiment has three informational environments: full information, essential information and irrelevant information.

In the full information environment, the proposer provides the allocation to all three players. In the essential information environment, the proposer provides the information of allocation only to the responder. In the irrelevant information environment, the proposer provides the information of allocation only to the third player. Guth and van Damme (1998) had two treatments in the experiment. In the cycle treatment, subjects play 9 rounds and they play three different messages cyclically. In the constant treatment, subjects play 6 rounds with fixed informational treatment.

In the cycle mode, when information is full or essential, the proposer offers approximately  $\frac{1}{3}$  of the cake to the responder and he demands approximately  $\frac{1}{2}$  for himself. In the case of irrelevant information, the proposer demands essentially all of the cake. Z's share is very small. The proposal depends on the experience of the game. X increases over time, while Z decreases; Y remains roughly constant.



Regarding these experimental results, subjects' behaviors cannot be explained solely by a sense of fairness. In the face-to-face bargaining in the experiment of Coase theorem, subjects tend to split their payoffs equally. Although we tend to respect the sense of fairness in the social interaction, it does not necessarily mean that we behave fairly only with the considerations of fairness. The next question is whether we may explain the fair behavior in terms of gamesman behavior. The following paper provides insight to the social behavior with respect to this issue.

Kahneman Knetsch and Thaler (1986) conducts several experiments including the following two. In the first experiment, subjects are instructed to divide \$20 with a mutually anonymous player. In the second experiment, a subject is instructed to divide \$10 with another player twice. One of those two players allocates \$10 to himself and offers \$10 to the paired player in the first experiment (even player). Another of those two players allocates \$18 to himself and offers \$2 to the paired player in the second experiment (uneven player). An allocator in the second experiment chooses either of \$5/\$5 with even player or \$6/\$4 with uneven player. In this choice, 74% of subjects punish the uneven player choosing \$5/\$5 with even player, sacrificing \$1 additional payoff for themselves.

Bolton (1991) postulates that the bargainers behave as if they are negotiating over both "absolute" and "relative" money. In his model, bargainers are concerned about the relative split of money as well as their own cash payoff.

Lin (1998) extends the previously conducted one-round and two-round structured bargaining experiments to multiround bargaining and studies the effects of outside option on the infinite-round bargaining experiment results. In this paper, we try to simulate the

effect of reputation in Dictator Games. Our major purpose is to imitate the social constraints of fairness in terms of rational behaviors.

### 3. Experimental design

If some of the players tend to punish the other unfair subject ("uneven player" in the experiment of Kahneman et al.), subjects (or human beings in the society in general) have strong incentives to behave fairly or risk being punished economically by other subjects. Punishment for the unfair treatment of others would be a strong device in society to keep fairness.

The objective of our experimental objective is to simulate the fair behavior in terms of multiple-round game. If we can simulate the situation, we know that the rationality would be the plausible story for the sense of "fairness" in the bargaining, given that the sense of fairness is attained in the social interaction.

In this experiment, a dictator's game is used as a basic scheme of the experiments. In the standard setting, we keep complete anonymity for subjects. But, in these experiments, we use identities such as A, B, C to conceal true identity of each subject in the society.

In this setting, we would be able to observe the effect of reputation in the dictator game. The major purpose of this experiment is to observe how subjects behave in the dictator game with identification. The other objective is to observe how subjects tend to punish the unfair allocator in this setting. We expect that subjects tend to provide more to recipients in a dictator game with identification than in an ordinary dictator game, because some players might punish subgame perfect equilibrium offer in the next stage.

To have reputation effect, offers of allocators in the previous rounds are provided to all players. Offers in the game are common knowledge in this experiment.

In the actual experiment, we have four sessions. The first session is a training session, which has five rounds. Randomly paired subjects play the “stone, paper, scissors” game to determine the role of allocator and recipient. The “stone, paper, scissors” game does not provide the moral authority to allocator to get larger payoff, but it provides the sense of winner to allocator and makes subjects feel in the “game” to play rather than in the real negotiation. It would mitigate the influence of social custom in the bargaining. The mitigation of social constraints is a necessary condition to measure the effect of reputation in the dictator game with identities, otherwise we would not have a distinguishable results in the following session. Since the first session is only a trial session, subjects are not paid but play the dictator game with anonymous and randomly assigned partners. In each round, each subject changes partner and never plays with each other in the same session.

In the second session, subjects play exactly the same game as in the first session, but in this case they are actually paid for their payoffs. They play “stone, paper, scissors” game and dictator games with anonymous and randomly assigned partners. Subjects receive their payoffs after finishing the experiment.

In the third session, we have a different treatment in which we will inform subjects how much money allocators provided to recipients in the previous rounds. They will receive this information only for the third session. Subjects’ behaviors in the first and second sessions will never be revealed to other players. Information about allocation in

the previous rounds with identities is shown on the board in the room. Except for this information, subjects will play the exactly same game in the third session.

In the fourth session, subjects are instructed as follows:

“Some of you are selected to participate the game. If you are selected, you play the game as an allocator against two different recipients. The information about recipient’s allocation in the last round of the first session will be provided. (The information is about the first session and it is not on the board.) The recipients’ identities are not provided. If you participate, you make allocations against two recipients and write your allocations on the record sheet.”

#### 4. Hypothesis

We have the following hypotheses.

H1: In the training session, some subjects make offers other than perfect equilibrium offers.

In the training session, some subjects are supposed to show the effect of social constraint toward fair allocation. Given that they compete for the role of allocator, the allocators’ offers should be closer to subgame perfect equilibrium than in the previous experiments without contests.

H2: If no identification is provided to players, the modal offer of allocators is subgame perfect equilibrium offer in a dictator game.

In the second session, the outcomes are supposed to be close to subgame perfect equilibrium. The subjects learned how to play the game in the training session, and the effect of social constraint is mitigated with the introduction of contests and the learning process in the training session.

H3: If all allocators' offers in the previous rounds (only in the third session) are provided to all subjects, subjects' offers are different against even and uneven allocators in the previous rounds only if an uneven allocation was made against the even allocation.

In the third session, information about the allocation in the previous rounds is provided to all players. This would create a reputation effect of the subjects' behavior. Subjects are supposed to punish the uneven allocator who made uneven allocation against the even allocators in the preceding round.

H4: If allocators' offers in only the preceding one round is provided, subjects tend to punish the unfair allocator regardless of the offer in the past. (The difference between offers for even allocators and offers for uneven allocators is positive.)

In the fourth session, subjects are instructed to make payoff allocations against two different players. One player made an even allocation in the previous session, while the other player made an uneven allocation in the previous session. If subjects have the sense of fairness, they tend to punish the uneven allocator in the previous session and take advantage of the situation.

## 5. Results of the experiment

As we expected, the modal offer in the training session is the subgame perfect equilibrium offer, and some subjects show the tendency to split the payoffs fairly. The results in the training session support Hypothesis 1. In the first session, we have two \$10 offers made by allocator. This might be caused by the fact that the cost of fair treatment is free in the first session because it is the training session and subjects do not incur costs to provide the payoffs to the counterpart. (See Appendix 1, "Allocation in First Session.")

In the second session, the modal offer is the subgame perfect equilibrium. The results in the second session support the hypothesis. We also recognize the learning effect through the first session and the second session. The frequency of “fair” allocation is decreased.

In the third session, the hypothesis was apparently rejected. With the information about the previous rounds, everyone knows that other subjects provide nothing when they play as an allocator. And the offers in the third session are closer to the subgame perfect equilibrium. There is only one non-equilibrium offer. In the third session, most offers are perfect equilibrium; it seems that subjects do not feel the sense of unfairness for perfect equilibrium offer in the third session. As Schotter, Weiss and Zapater (1996) showed, a sense of fairness depends on the framing of the game. In the third session, everyone offers nothing, which might appear “fair” to the subjects.

Throughout the three sessions, we observe the learning effect. If we compare each allocator’s offers in a time-series manner, each subject offers less as time goes by. (See Appendix 1, “Allocation to recipients.”) It may take time to adjust their sense of fairness to the equilibrium of the game in this experiment.

In the fourth session, subjects are instructed to make allocations against the two different players. As shown in Appendix 1, four out of seven subjects make different offers to even and uneven players. (The subject with ID number 4 did not participate this session.) Even after playing with several perfect equilibrium offers, subjects tend to punish the uneven allocation while reducing their payoffs. The results coincide with those of Schotter, Weiss and Zapater (1996). If some other players punish the unfair behavior,

players have strong incentives to behave fairly in society. This issue has important implications to the fair behavior in society.

## 6. Concluding remarks and extensions

We conducted the experiments on dictator games with identities to simulate the effect of unfair behavior. Our original experimental design did not work, because most offers made in the sessions of our experiment were subgame perfect equilibrium offers and none of subjects punished uneven allocation in previous rounds.

But we still have some results in the fourth session, in which some subjects still punished players who made uneven allocation. This has an important implications for human behavior in society. If some people punish unfair behaviors in the society, even gamesmen try to behave fairly to maximize their utilities.

We might think of the inherent nature of human beings as a source of fairness. But the results of an experiment contradict to this intuition. Camerer and Thaler (1995) cited the experimental results of Murnighan and Saxon (1994), who studied ultimatum games between children and adults using a dollar or a pile of M&M candies. According to the citation, "kindergartners accepted minimal offers about 70 percent of the time, compared to about 40 percent for third- and sixth- graders and probably much less for the typical college student subjects." Considering the results of this cited experiment, we may think that the fair treatment and rejecting unfair treatment are acquired behaviors in social interaction rather than parts of the inherent nature of human beings. If society maintains the custom of enhancing fair treatment, it is quite difficult to distinguish the sense of fairness and rational behavior of gamesman in the society.

In the existing experiments of dictator game, most subjects play in the anonymity condition so that the experimenter may avoid the influence of social constraints.

According to the results of the previous experiments, subjects do not consider a sense of fairness in the anonymity condition. The sense of fairness seems to exist in the social interaction and reputations of each individual. Our experiments try to simulate the fair treatment in the existence of reputation. If we can mimic such social behavior with gamesman behavior, we may better understand the nature of fairness in society.

In the extension of this experiment, we might consider replicating the fourth session in a repeated game. Since the original intuition behind the third session did not work well in our experiment, we should start with the two dictator games with different players to observe the effect of past behavior.

The extension works as follows. Subjects are asked to allocate against two different players: even and uneven allocators in the previous rounds. Then, information about the offers in this round is provided to all players. Subjects are then asked to make allocations in a dictator game toward the players in the first round. In the first round, some subjects may have allocated significant amount to the recipient, while others may have allocated all payoffs to themselves regardless of the information. In the second stage of the experiment, some subjects would try to punish “unfair” behavior. We may observe the effect of backward induction in the subjects’ behavior.

We might have other extensions as will. If we observe the effect of social custom in the early rounds of the dictator game, we should be wary of this effect. We might conduct a training session and an experiment with the instruction of HMSS.



We may also conduct an experiment on a dictator game with face-to-face interaction, comparing the results of the first extension using the scheme of the fourth session with the results of this extension. We might be able to observe different behaviors in a simulated game with artificial identities and a face-to-face dictator game.

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## Appendix 1

### Game Instruction

Now we begin an experiment. You are not supposed to talk with each other during this entire experiment. If you have any questions, please let us know. We will answer to your question at the corner of the room. Please do not show your ID to other players in the room. Please put your ID card on the desk so that we can see it. On the record sheet, you just write your ID and other player's ID when you find it.

You will be involved in an experiment will last for 4 sessions. You will be randomly matched with another person. You do not know whom you are dealing with. You only know the ID of other player. ID of each player changes for each session. In the same session, you will be matched with different persons for 5 rounds. You will be paid for the amount you earn in this experiment.

In the **First session**, we make five trial rounds. In this session, you won't be paid for the amount you earn. It is just for trial run. **Each round** proceeds as follows.

#### Contest to determine the role

We use "stone, paper scissors" to determine the role of you and your paired player. The rule is as follows: Stone wins against scissors. Scissors win against paper. Paper wins against stone. You and your paired player choose one of stone, paper and scissors and write the choice on the sheet at the same time. (In the record sheet, stone, paper and scissors are abbreviated as ST, P and SC respectively.) The experimenters will collect sheets and decide which player wins. If you win in the contest, you will be an "allocator." If you lose, you will be a "recipient." If both players write the same choice, you will do the second contest to decide the role. This procedure will be repeated until the roles of all players are determined. To conceal the pair of players, we will always collect the record sheets of all players.

After the contest, Allocator have 10 Ryo (Ryo is ancient monetary unit in Japan. Let us assume that 100 Ryo is equal to \$10 for this experiment.) Allocator decides how much of that 10 Ryo to allocate to Recipient. Allocator writes his/her decision on the game sheet. The experimenters check and record the allocation. Recipient receives the amount as Allocator decided.

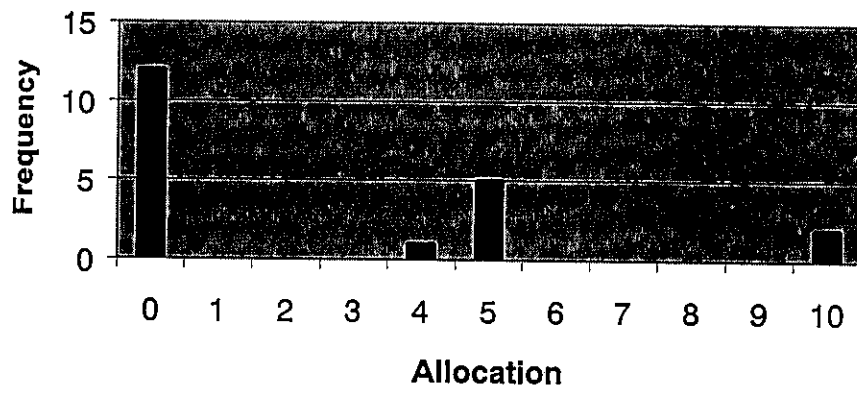
At the end of each round, you are assigned with different player. You never reveal your ID. You do not know whom you are working with. After five rounds in the First session, you will start **Second session**.

In the **Second session**, you will be paid for the amount you earn. You will play 5 rounds of game exactly as in the **First Session** except for the actual payment. (You will receive the payment after the experiment.)

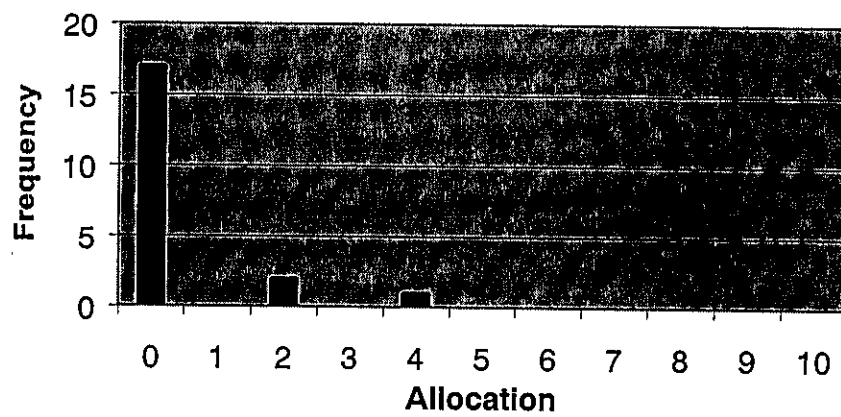
In the **Third session**, we have different treatment. In the **Third session**, we will provide you how much money Allocator provided to Recipients in the previous rounds in the **Third session**. You will have this information only for the **Third session**. Your behaviors in the **First and Second session** will never be revealed to other players. Information about allocation in the previous rounds is showed on the board in the room. Except for this information, you will do the exactly same game in the **Third session**. (You will receive the payment after the experiment.)

In the **Fourth Session**, some of you are selected to participate the game. If you are selected, you play the game as Allocator against two different Recipients. The information about recipient's allocation in the last round of the **First session** will be provided. (The information is about the **First session** and it is not on the board.) The recipients' identities are not provided. If you participate, you make allocations against two Recipients and write your allocations on the record sheet. (You will receive the payment after the experiment.)

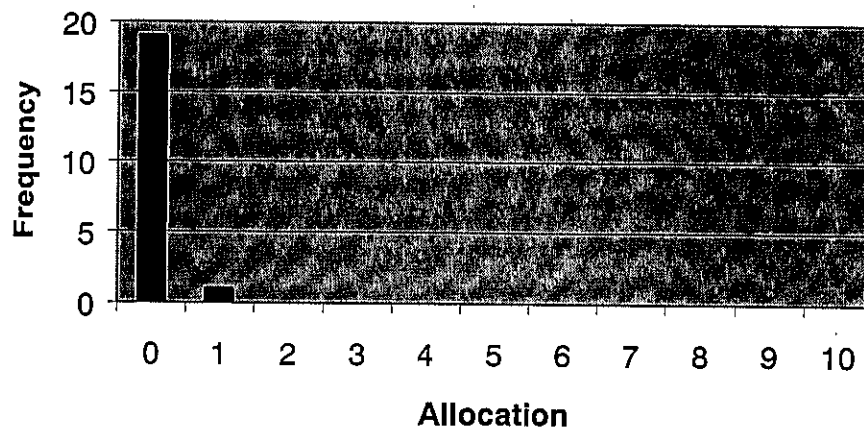
**Allocation in First Session**



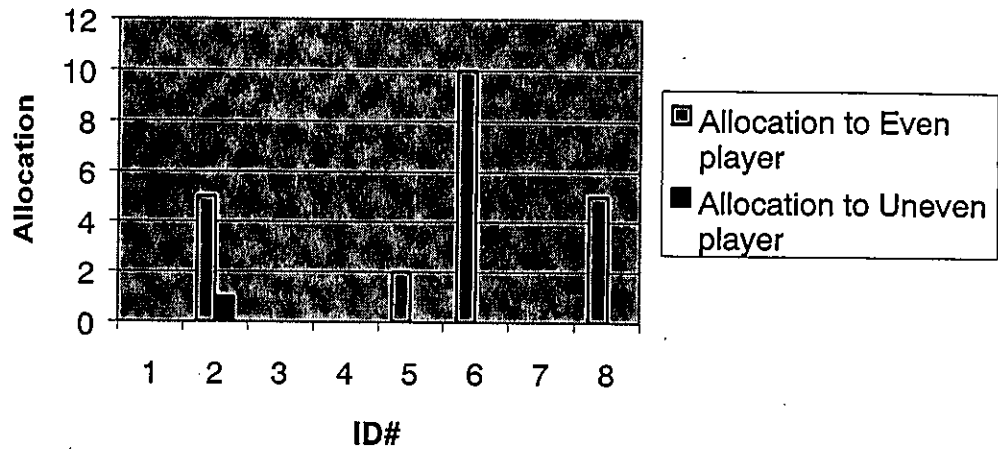
**Allocation in Second Session**



**Allocation in third session**



### Allocation in Fourth Session



### Allocation to recipients

