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Abstract: Experimental evidence suggests that the size of the foregone outside option does not affect the behavior of the opponent in a lost wallet and pie sharing games but that it matters in a mini-ultimatum game. In this paper we experimentally test a conjecture that it is the fairness property of the outside option which could be responsible for this effect. We compare the behavior of subjects in the lost wallet game when they face a fully unequal ("unfair") outside option, i.e., the first mover gets 10 and the second mover gets nothing, and when they face an equal ("fair") outside option, i.e., both get an equal amount of 5. Contrary to our conjecture we do not find a significant difference.

Keywords: Experimental economics; Outside option; Fairness

JEL Classification Codes: C72; C78; C91

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1.1 Introduction

The recent experimental studies of Dufwenberg and Gneezy (2000) and Brandts, Güth, and Steihler (2006) have produced quite surprising and counterintuitive results that the size of foregone outside option by the first mover does not affect the behavior of the second mover in a lost wallet and pie sharing game, respectively. In fact, several prominent models predict exactly the opposite type of behavior: For example, in the models of reciprocity (Falk and Fishbacher (2006) and Dufwenberg and Kirschteiger (2004)) the first mover is kinder the higher the outside option he foregoes as the potential cost of doing so is higher. This should be sufficient to induce the second mover to be more reciprocal. Similarly, if the second mover is guilt-averse (Battigalli and Dufwenberg (2007)), he should believe that the first mover expects to receive more the higher the forgone outside option. This reasoning is also referred to as the psychological forward induction.

The absence of a behavioral effect of the alternative that has not been chosen is a puzzle. This is magnified by the fact that the same behavior is not observed uniformly across games. For example, Charness and Rabin (2002) observe that the second mover's behavior has been influenced by the alternatives available to the first mover in a sequential game involving an element of trust, very similar to the lost wallet and pie sharing games. Similarly, in a slightly different experimental setting of a mini-ultimatum game Brandts and Solà (2001), Falk, Fehr, and Fischbacher (2003), Cox and Deck (2005) find that the reference point significantly affects the behavior of subjects, as explained by negative reciprocity. Brandts et al. (2006) conjecture that it is because the outside option in their setting is very unfair as it gives everything to the first mover. The same is true for the Dufwenberg and Gneezy (2000) study. In this paper we explore this issue by studying whether subjects' behavior responds to the equality (fairness) of the outside option.

1.2 Relative Fairness of Outside Options

Based on Brandts et al. (2006) we conjecture that the relative fairness might play a role in the decision-making process of the second mover and in particular when he is considering the

outside option as a part of his decision. Consider the lost wallet game in which the first mover decides to either choose IN, allowing the second mover to split the surplus between both players; or to choose OUT, collecting the outside option. On an intuitive level, if the outside option is very unfair towards the second mover, e.g., 10 for the first mover and 0 for the second mover, then the second mover may disagree with such split and because of it disregard it entirely. On the other hand, if the outside option is fair, the second mover consciences to it and is then willing to spend more time considering its implications. According to our conjecture the fair outside options are incorporated into second mover's decision while unfair outside options are ignored.

To make this clearer suppose the outside option is (x_i, x_j), where x_i and x_j are both nonnegative and denote what the first and the second mover gets on the outside. Consider now a fairness weighting function $f(x_i, x_j)$ which corrects for the importance that the outside option assumes in the mind of each player. That is, the outside options would be perceived as $\lfloor f_i(x_i, x_j) \cdot x_j,\ f_j(x_i, x_j) \cdot x_j \rfloor$. The fairness weighting function satisfies the following assumptions:

Assumption 1: $f(0, x) = 0$ and $f(x, x) = 1$.

Assumption 2: $f_i > 0$ for $x_i < x_j$, $f_i < 0$ for $x_i > x_j$ and $f(x, 0) \geq 0$.

Assumption 1 is motivated by our conjecture that fully unfair outside option is likely to be ignored entirely by the player and fully fair outside option is likely to be most salient. Assumption 2 says that the weight increases as the outside option becomes more equal and decreases otherwise. Furthermore, the outside option which assigns everything to me can be more pertinent to me as the one which assigns everything to the other player. This assumption is consistent and could be justified by arguments akin to Fehr and Schmidt (1999) and Bolton and Ockenfels (2000). A simple example of such fairness weighting function is $f(x_i, x_j) = 1 - 4\left(\frac{x_j}{x_i + x_j} - \frac{1}{2}\right)^2$. Notice that the outside option is most salient when x_i and x_j are equal and completely neutral when player *j* gets nothing on the outside.

Our notion of fairness weighting is consistent with the intriguing results reported in the literature, Dufwenberg and Gneezy's (2000) or Brandts et al. (2006). Take Dufwenberg and Gneezy as an example. In their game they vary the outside option x_i of the first mover to be 4, 7, 10, 13, and 16, while keeping the outside option of the second mover to be 0. If the first mover does not take the outside option, the second mover gets to split a pie of 20; giving *y* to the first mover and keeping 20 - *y*. Because in all of their treatments the outside option of the second mover is fully unfair (zero), then according to our fairness weighting conjecture the perception of it by the second mover should always be the same (0,0). Indeed, Dufwenberg and Gneezy do not find any correlation between *x* and *y* and neither the *y*'s to be statistically significantly different between treatments.

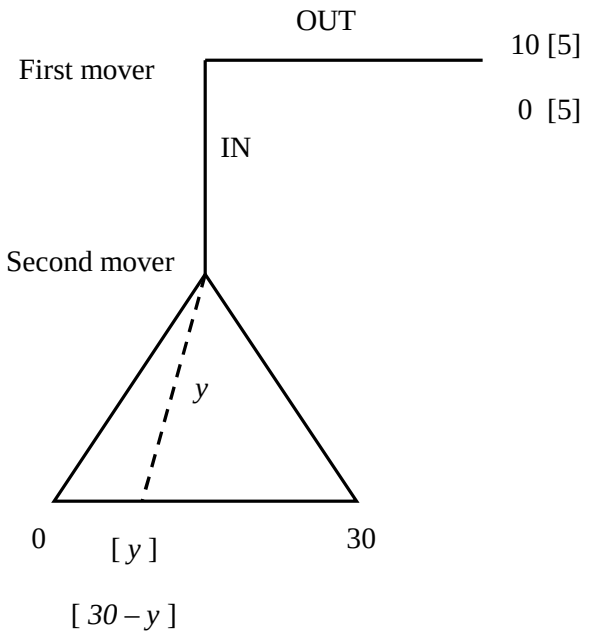
But not all evidence from the lost wallet game supports fairness weighting. Charness, Haruvy, and Sonsino (2007) find a relationship between the size of the outside option available to the first mover and the decision of the second mover in an experiment conducted over the internet using a within subjects design and a strategy method. Due to their choice of the design it remains unclear to what extent does the use of the strategy method play a role in determining the results. We think that in this particular scenario (and especially within subjects) it can be prone to producing a monotonic relationship between the variables of interest. Hence, we avoid using the strategy method and design our experiment in a way that allows us to test whether NBS can shed some light on subject's behavior.

2. The Experiment

Our experiment consists of two treatments implemented in across-subject design. In both treatments the subjects play the lost wallet game presented in Figure 1. The first mover chooses IN or OUT. If he chooses OUT, the game ends. The first mover receives \$10 (\$5) and the second mover receives \$0 (\$5). If the first mover chooses IN, the game continues. The second mover then chooses how to split \$30 between the two of them in \$1 increments. That is, the second mover chooses how much of \$30 to give to the first mover, (*y*), and how much of it to keep, $(30 - y)$. The second mover's choice determines the final payoffs. In the experiment we keep the

total outside option pie constant at 10 in order to avoid a possible confounding effect that subjects behave differently because there is a different amount of money on the table.

Figure 1. The Lost Wallet Game



The predicted behavior can vary between the two treatments for number of reasons that were already mentioned and we do not want to favor any of them. However, let us use the notion of psychological forward induction to illustrate the possible effect of fairness-weighting in our experiment. Psychological forward induction applied to our game yields very simple predictions. In the 10,0 treatment if the outside option was forgone by the first mover this should indicate to the second mover that his opponent expects at least 10 in the chosen subgame. If the second mover cares about the first mover's expectations, e.g., if he is guilt-averse, then he should return at least 10. Thus, without fairness-weighting, the psychological forward induction predicts that the first mover is likely to receive more in the 10,0 treatment than in the 5,5 treatment. On the other hand, with fairness-weighting, the outside option is perceived differently. In the treatment 10,0 the outside option is perceived as (0,0) and in treatment 5,5 it is perceived as (5,5) by the second mover. Hence, if the perception of the second mover matters in the way described, then

we have truly varied the outside option between our treatments. The psychological forward induction then predicts that the first mover is likely to receive more in the 5,5 than in the 10,0 treatment.

2.1 Procedures

The sessions were conducted in October of 2006 in the SonderForschungsBereich 504 laboratory at the University of Mannheim in Germany. A total of 22 subject pairs participated in the 10,0 treatment and 21 subject pairs in the 5,5 treatment. Most of the students had previously participated in economics experiments, including trust games. On average, a session lasted about 35 minutes. Subjects earned on average 10.58 Euro plus in addition to a 4 Euro show up fee. During the experiment all earnings were calculated in experimental dollars. At the end of the experiment the subjects' earnings were converted to Euro at the rate of 1 experimental dollar = 0.5 Euro. All sessions were computerized and run under single blind protocol using direct response elicitation method[1]

The participants were randomly and anonymously matched into pairs that consisted of the first mover and the second mover. The assignment was done according to the following process. Upon entering the laboratory subjects drew a ball from an urn. The number that was indicated on the ball assigned their seat for the experiment. The computer workstations were matched into fixed pairs to provide the maximum possible distance between first and second movers within each pair. This was unknown to the subjects. Each subject was provided a hard copy of English instructions that were identical across subjects. After the subjects finished reading the instructions they were asked to fill out a control questionnaire to check for understanding. The experimenters verified their answers and privately answered questions. Then the experimenters publicly provided the correct answers to the questionnaire.

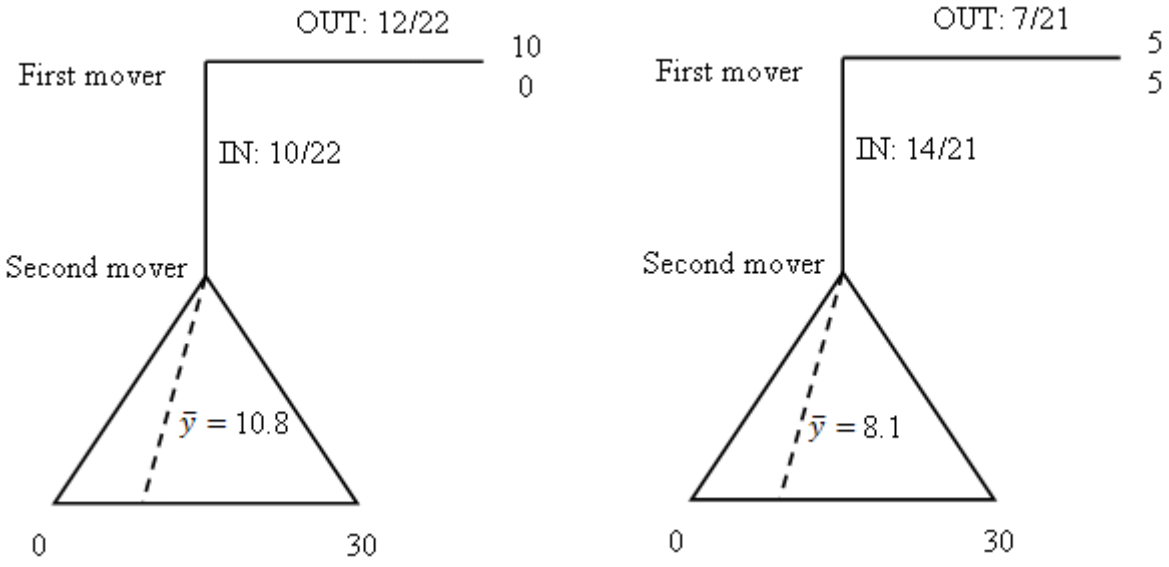
[1] This was done in order to address our concerns with the strategy method in the given environment, although the strategy method would yield a higher number of responses by the second movers. For comparison, Dufwenberg and Gneezy (2000) use only 13 subject pairs in each of their treatments.

2.2 Results

Figure 2 presents the summary of data for both treatments. Treatment 10,0 is displayed on the left and treatment 5,5 on the right. Not surprisingly, twelve out of twenty two (55%) first movers chose OUT when the outside option was 10 in comparison to seven out of twenty one (33%) when it was 5. However, this difference is statistically not significant at the conventional level (p = 0.223 Fisher exact test 2-sided).

Recall that the if the outside option is weighted by its fairness, the second mover, if called upon play, is likely to implement a split with a higher *y* in the 5,5 than in the 10,0 treatment. In our data we observe that the second movers chose on average $y = 10.8$ and $y = 8.1$ in 10,0 and 5,5 treatments, respectively. In order to assess the qualitative difference in the data, we test a hypothesis that the choices of *y* are higher in the unequal 10,0 than in the equal 5,5 treatment. However, the 1-sided two-sample Wilcoxon rank-sum test reports that this difference is not significant (p = 0.144). Consequently, the hypothesis that choices of *y* are higher in the 5,5 treatment than in the 10,0 one, as predicted by the relative fairness of the outside options, is rejected at p = 0.856. Hence, we conclude that the fairness of the outside option did not affect the subjects' behavior in our game.

Figure 2. Subjects' Behavior



3. Discussion

In this paper we tried to address the question whether the second mover ignores the forgone outside option by the first mover as found in the previous literature because it gives everything to the first mover. We chose to derive predictions based on a function which weights the relative fairness of outside options. Our data reject the conjecture that it is the fairness property which could be responsible for this effect. The result seems consistent with Cox et al. (2007) who model reciprocity based on what is the maximal available payoff to the second mover following the first mover's action. From that perspective, the outside option is irrelevant, as we have observed in our experiment.

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