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The Modulation of Self-interest Instruction on the Fair-Proposing Behavior in Ultimatum Game

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***Abstract*—**Ultimatum game is an experimental paradigm to study human decision making. There are two players, a proposer and a responder, to split a fixed amount of money. According to the traditional economic theory on ultimatum game, proposer should propose the selfish offers to responder as much as possible to maximize proposer's own outcomes. However, most evidences had showed that people chose more fair offers, hence two hypotheses – fairness favoring and strategic concern were proposed. In current study, we induced the motivation in participants to be either selfish or altruistic, and manipulated the task variables, the stake sizes (NT$100, 1000, 10000) and the share sizes (the 40%, 30%, 20%, 10% of the sum as selfish offers, and the 60%, 70%, 80%, 90% of the sum as altruistic offers), to examine the two hypotheses. The results showed that most proposers chose more fair offers with longer reaction times (RTs) no matter in choosing between the fair and selfish offers, or between the fair and altruistic offers. However, the proposers received explicit self-interest instruction chose more selfish offers accompanied with longer RTs in choosing between the fair and selfish offers. Therefore, the results supported the strategic concern hypothesis that previous proposers choosing the fair offers might be resulted from the fear of rejection by responders. Proposers would become more self-interest if the fear of being rejected is eliminated.

***Keywords*—**Ultimatum game, self-interest, altruistic, fear of rejection.

I. INTRODUCTION

ULTIMATUM game (UG) has been one of the experimental paradigms to study human decision making [6], [9], [11], in which there are two players, a proposer and a responder, to divide a fixed sum of money. The proposer is responsible to suggest how to split, and the responder decides whether to accept the offer. If the responder accepts, then the money would be divided as proposed. If the responder rejects, neither the proposer nor the responder would receive any money (zero dollar for both players). According to the self-interest prediction of traditional economic theory, proposer should propose the lowest amount of money to responder, and the responder should accept any offer as long as it is greater than zero, because both strategies would maximize their own outcomes [10]. However, most experimental findings did not support this prediction. Researchers found that proposers proposed more equal (50% of the sum) or slightly-selfish (40% of the sum) offers to their counterparts, and responders seldom rejected unless the money of the offer equal or less than 20% of the sum [3], [12]. Therefore, the proposing behavior was not as traditional economic theory predicted. Two hypotheses for fair-choosing motivation were often proposed.

The first hypothesis is fairness-favoring, which suggests that proposers favor fairness, care about others, and behave generously out of an altruistic motivation [3], [8], [12]. If this is the case, then proposers should mainly propose the fair offers no matter in UG or in dictator game (DG), where the responder could merely accept the proposed offer and have no opportunity to reject [5], [8]. However, the results showed that proposers offered less in DG (i.e., approximately 23% of the total) than in UG [12], [13], which implied that proposing fair offers might not be a fairness-favoring concern. Instead, it might be resulted from being afraid of rejecting by responders in UG. Therefore, the second hypothesis is strategic concern, which suggests that proposers propose the fair offers in order to avoid the possibility of being rejected by responders, resulting in receiving nothing [3]-[5]. Based on this hypothesis, the main goal for proposers is not to behave fairly, but still to maximize their own outcomes after deliberating on responder's answer. Reference [1] found that after proposers were explicitly instructed that responders should receive any offer greater than zero because accepting the lowest offer is still better than rejecting for nothing, they turned out to offer less than 25% of the sum. This amount is relatively lower than the amount in previous UG studies (approximately 40% of the sum). That is, the instructed strategy might decrease the deliberation on the possible decisions of responders, so proposers would not behave as fairly as previously found. These findings, thus, supported the second hypothesis. It was the strategic concern driving proposers to offer fairly in UG, and the goal was to maximize their outcomes.

To be cautious, although the self-interest instruction decreased the fair-choosing behavior, we still could not claim that people are self-interest motivated. In the study of [1], there was no control group without instruction to compare this effect. Furthermore, if people were hypothetically self-interest motivated, we were interested in whether there would be any behavioral change after they were instructed the generous or altruistic instruction. In the study of [7], they increased participants' generous behavior in DG by presenting the stylized watching eyes in front of them implicitly. Therefore, in current study, we would like to manipulate the instructed strategy as a between-subject variable, including the self-interest group (group SI: proposers received the explicit self-interest instruction), altruistic group (group A: proposers were implicitly watched by eyes), and no instruction group

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(group NI: no self-interest instruction or altruistic cue) as control, to examine the effect of different instructions.

According to the strategic concern hypothesis, proposers would propose offer to be accepted by responders, therefore, they may not propose offers with high probability to be rejected. It was also found in previous studies that raising stakes has little effect on proposers' offers and this might result from aversion to costly rejection when the stakes were high [2]. Consequently, proposers may remain acting relatively fairly to the responder as the stake increases. Thus in current UG task, we manipulated the within-subject variables inclusive of the share size (selfish offer: the 40%, 30%, 20%, 10% of the sum; altruistic offer: the 60%, 70%, 80%, 90% of the sum) and the stake size (NT$100, $1000, and $10000) to examine the effects of different amount of the money. During the task, proposers were asked to make a binary choice between a fair and a selfish, or between a fair and an altruistic offer in each trial, the choices and RTs in proposers were collected as dependent variables. According to the strategic concern hypothesis, proposers should choose the offers to maximize their own outcomes, so we hypothesized to find an interaction between the instructed strategies and the offers.

In choosing between fair and selfish offers, proposers in group SI would choose more selfish offers with shorter RTs than choose fair offers, because the instructed self-interest strategy was consistent with their self-interest motivation. However, even though proposers in both group NI and group A were hypothetically motivationally selfish, they would show the reversed behavior due to the manipulation from either the no further instruction or the watching eyes. Proposers in group NI would choose more fair offers with longer RTs, consistent with the explanations that fair-choosing is a strategic concern for outcomes and needs more deliberation. Proposers in group A would show the similar pattern from the influence of watching eyes to decrease their self-interest choices [7]. In choosing between the fair and the altruistic offers, proposers in both group SI and group NI would choose more fair offers with shorter RTs than choose altruistic offers, because choosing fair offers would make themselves receive more money than choosing altruistic offers. Conversely, proposers in group A would choose more altruistic offers with shorter RTs than choose fair offers because of the influence of watching eyes.

II. Method

A. Participants

36 students were recruited from National Chengchi University, Taiwan, to participate in this study (age M = 22.028, SD = 3.094; 8 males and 28 females). None of their majors or minors was in economics or related fields to avoid the possibility that they had learned about the knowledge of UG or other game theories. Each participant gave written informed consent before the beginning, and received the debriefing and NT$120 as participation fees at the end of the experiment.

B. Stimuli and Task Design

There were 3 instructed strategies (self-interest, altruistic, no instruction), 3 stake sizes (NT$100, $1000, and $10000) and 8 share sizes (the 40%, 30%, 20%, 10% of the sum as selfish offers, or the 60%, 70%, 80%, 90% of the sum as altruistic offers) manipulated in current study.

In instructed strategies, the experimental instruction to induce self-interest motivation in SI participants was employed from [1], the main idea was to instruct participants that in UG, each responder should accept any offers as long as it is not zero if his/her goal is to maximize his/her outcomes, because only accepting all offers could accumulate their positive earnings. On the other hand, proposers should propose the lowest offers to responders, because responders should not reject any ones for receiving nothing, and the proposing of the lowest offers would accumulate the outcomes for proposers as much as possible.

The altruistic cue was the same stylized watching eyes employed from the study of [7], and we replicated exactly the same manipulation by presenting the watching eyes on the center of the screen in front of the participants (see Fig. 1). In addition, in control group, there was no further instruction.

Fig. 1 The presentation of watching eyes in experiment (employed from [7])

In stake sizes, we employed 3 levels as NT$100 (ranged from $80 to $120), NT$1000 (ranged from $800 to $1200), and NT$10000 (ranged from $8000 to $12000). The means and standard deviations of the 3 stakes were 100 (12.73206), 1000 (127.3206), and 10000 (1273.206) respectively, which yielded the same CV value as 0.127321 for all the stake sizes, ensuring the differences among all the share sizes were consistent across all stakes.

In share sizes, the fair split was to offer 50% of the sum to responder, the selfish split was to offer 40%, 30%, 20%, or 10% of the sum to responder, and the altruistic split was to offer 60%, 70%, 80%, or 90% of the sum to responder. For example, the stake of NT$120 was presented with two offers: '60 60' was the fair split, one of the '72 48', '84 36', '96 24', or '108 12' was the selfish split, and the '48 72', '36 84', '24 96', and '12 108' were altruistic splits. In each trial, the position (left or right on the screen) for either the fair or the unequitable (selfish or

altruistic) offer, and the position of the money assigned to proposer or responder (left or right in an offer) were counterbalanced among participants. Therefore, the experiment was a 3 x 3 x 8 mixed design with the factors instructed strategies, stake sizes, and share sizes. Each combination of 3 stake sizes x 8 share sizes were tested for 20 repetitions, yielding a total of 480 trials divided into 6 blocks.

C. Experimental Procedure

Each participant was randomly assigned to one of the self-interest group (SI), altruistic group (A), or no instruction group (NI) as control. There was no age difference for participants in 3 groups tested by one-way ANOVA [$F(2, 35) = .741$, $p = .485$].

After signing the informed consent and being instructed the rule of UG (or the further self-interest instruction), participants practiced 12 trials to familiar with the task procedures. During the UG task, in each trial, participants were firstly presented with a white fixation cross '+' on the center of the black screen for 2 s. Next, a certain amount of the money as a stake, e.g. \$90, was presented on the top of the screen, simultaneously two kinds of offer choices on how to split the money, e.g. '45 45' and '72 8', were presented below the stake on the screen for 4s. Participants were asked to choose one of the offers they wanted to propose by pressing the button '1' (choosing the offer on the left) or '3' (choosing the offer on the right). Each trial ended after 4 s presentation no matter participants made a choice or not, and then was the black screen as the inter-trial interval (ITI) for 2 s. The next trial began after the ITI ended, and this procedure kept going until the end of the experiment. There were totally 480 trials presented in a random order to each participant, and participants had a short break after doing every 60 trials.

D. Statistical Analyses

Both the choices and RTs in proposers during the whole UG task were analyzed by the 3 instructed strategies (self-interest, altruistic, no instruction) x 3 stake sizes (\$100, \$1000, and \$10000) x 4 share sizes (the 40%, 30%, 20%, 10% of the sum) x 2 offers (fair and selfish) mixed ANOVA on choosing between the fair and the selfish offers, and the similar 3 instructed strategies x 3 stake sizes x 4 share sizes (the 60%, 70%, 80%, 90% of the sum) x 2 offers (fair and altruistic) mixed ANOVA on choosing between the fair and the altruistic offers.

III. Results

A. Choosing between the Fair and the Selfish Offers

As expected, significant interactions between instructed strategies and offers were found on both choices and RTs, $F(2, 33) = 5.965$ and 6.961, $ps = .006$ and .003, respectively. In choices, Bonferroni post hoc comparisons showed that proposers in group SI did choose more selfish offers ($M = 65.482\%$, $SE = 9.278$) than fair offers ($M = 32.849\%$, $SE = 9.325$), $p = .088$. And proposers in both group NI and group A chose more fair offers (NI: $M = 69.125\%$, $SE = 9.325$; A: $M = 74.722\%$, $SE = 9.325$) than selfish offers (NI: $M = 29.795\%$, $SE = 9.278$; A: $M = 23.403\%$, $SE = 9.278$), $ps \leqq .042$. In RTs, both NI and A proposers did choose fair offers (NI: $M = 1545.559$ ms, $SE = 126.260$; A: $M = 1406.836$ ms, $SE = 126.260$) with longer RTs than selfish offers as expected (NI: $M = 1210.683$ ms, $SE = 162.152$; A: $M = 903.851$ ms, $SE = 162.152$), $ps \leqq .067$. However, SI proposers did npt show the expected pattern. Instead, they chose the selfish offers with longer RTs ($M = 1593.981$ ms, $SE = 162.152$) than chose fair offers ($M = 1219.173$ ms, $SE = 126.260$), $p = .041$ (see Fig. 2).

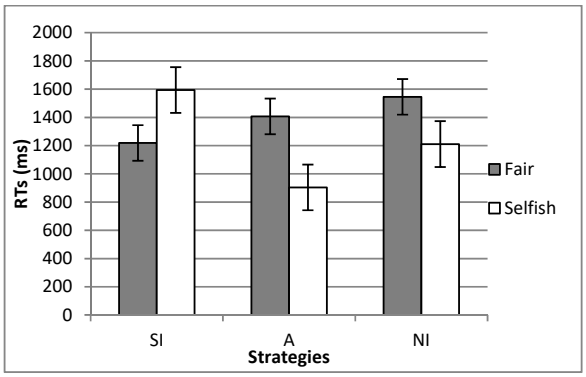

Fig. 2 The significant interaction for RTs (milliseconds) between the instructed strategies and the offers in choosing condition between the fair and the selfish offers: Proposers in group SI chose selfish offers with longer RTs than chose fair offers; Reversely, proposers in both group NI and A chose fair offers with longer RTs than chose selfish offers

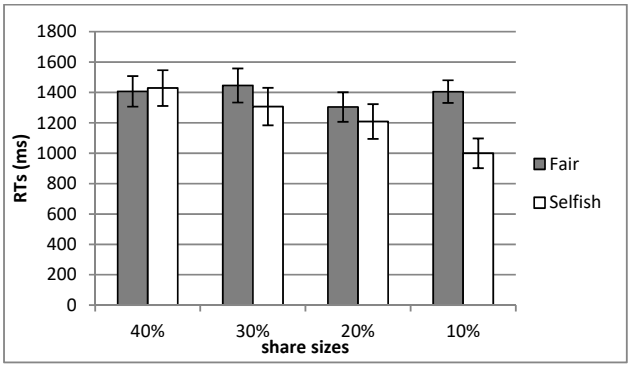

Fig. 3 The significant interaction for RTs (milliseconds) between the share sizes and the offers in choosing condition between the fair and the selfish offers: As the share sizes went from 40% to 10% of the sum, proposers chose the selfish offers with shorter RTs

We also found significant interactions between share sizes and offers on both choices and RTs, $F(3, 99) = 8.647$ and 3.617, $p < .001$ and $p = .016$, respectively. Bonferroni post hoc comparisons showed that as the share size went from 40% to 10% of the sum to responders, proposers chose more fair offers (40%: $M = 48.419\%$, $SE = 6.209$; 30%: $M = 56.806\%$, $SE = 5.583$; 20%: $M = 63.426\%$, $SE = 5.744$; 10%: $M = 66.944\%$, $SE = 5.944$) with similar RTs (40%: $M = 1406.862$ ms, $SE = 100.520$; 30%: $M = 1445.962$ ms, $SE = 112.319$; 20%: $M = 1304.001$ ms, $SE = 96.847$; 10%: $M = 1405.266$ ms, $SE = 74.627$). Simultaneously, proposers chose fewer selfish offers as the share size went from 40% to 10% of the sum to responder

(40%: *M* = 50.000%, *SE* = 6.166; 30%: *M* = 40.880%, *SE* = 5.568; 20%: *M* = 35.370%, *SE* = 5.734; 10%: *M* = 31.991%, *SE* = 5.926) with significantly shorter RTs (40%: *M* = 1429.224 ms, *SE* = 117.644; 30%: *M* = 1306.972ms, *SE* = 123.641; 20%: *M* = 1208.701 ms, *SE* = 114.168; 10%: *M* = 999.790 ms, *SE* = 98.110) (see Fig. 3).

B. Choosing between the Fair and the Altruistic Offers

Not consistent with our expectation, there were no interactions found between the instructed strategies and the offers in both choices and RTs. However, we found the significant main effects for offers on both choices and RTs, $F(1, 33) = 144.279$ and 59.495, $ps < .001$. Post hoc comparisons showed that proposers chose more fair offers (*M* = 88.176%, *SE* = 3.312) with longer RTs (*M* = 1517.080 ms, *SE* = 58.848) than altruistic offers (Choice: *M* = 10.003%, *SE* = 3.215; RTs: *M* = 724.839 ms, *SE* = 94.767), *p*s < .001. Also, we found the significant interactions between the share sizes and the offers on both choices and RTs, $F(3, 99) = 11.520$ and 4.034, $ps \leqq .009$. Bonferroni post hoc comparisons showed that as the share size went from 60% to 90% of the sum, proposers chose more fair offers (60%: *M* = 82.130%, *SE* = 4.026; 70%: *M* = 88.074%, *SE* = 3.626; 80%: *M* = 90.231%, *SE* = 3.232; 90%: *M* = 92.269%, *SE* = 3.099) with similar RTs (60%: *M* = 1600.995 ms, *SE* = 61.608; 70%: *M* = 1497.232 ms, *SE* = 62.218; 80%: *M* = 1486.935 ms, *SE* = 58.892; 90%: *M* = 1483.158 ms, *SE* = 67.426). Simultaneously, proposers chose fewer altruistic offers as the share size went from 60% to 90% of the sum to responder (60%: *M* = 16.187%, *SE* = 3.875; 70%: *M* = 9.241%, *SE* = 3.325; 80%: *M* = 8.333%, *SE* = 3.179; 90%: *M* = 6.250%, *SE* = 3.120), and chose the altruistic ones with significantly shorter RTs (60%: *M* = 1037.903 ms, *SE* = 144.747; 70%: *M* = 661.830 ms, *SE* = 133.956; 80%: *M* = 710.533 ms, *SE* = 100.395; 90%: *M* = 489.088 ms, *SE* = 100.500) (see Fig. 4).

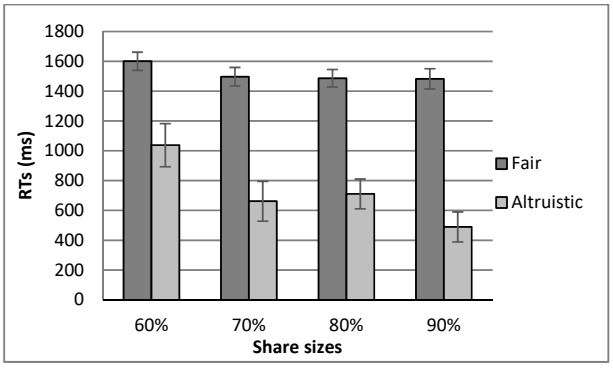

Fig. 4 The significant interaction for RTs (milliseconds) between the share sizes and the offers in choosing condition between the fair and the altruistic offers; As the share sizes went from 60% to 90% of the sum, proposers chose the altruistic offers with shorter RTs

IV. Discussion

Two hypotheses, the fairness-favoring and the strategic concern, have been proposed to explain the fair-choosing behavior in UG [3]-[5], [8], [12]. In current study, we analyzed proposer's choosing behavior in a binary choice UG task, one was choosing between fair and selfish offers, and the other was choosing between fair and altruistic offers. We manipulated the instructed strategies, stake sizes, and share sizes. Our results showed that, no matter in which condition, proposers chose the offers to maximize their own outcomes. Therefore, the strategic concern hypothesis, not the fairness-favoring hypothesis, was supported. We speculated that the fair-choosing behavior in previous UG studies was from the goal to decrease the possibility to be rejected by responders, leading to maximize the outcomes.

In instructed strategies, many studies induced different motivations like selfishness, fairness, or altruism in UG or DG (e.g., [1], [7]). We employed the self-interest instruction from [1] and the stylized watching eyes from [7] to induce proposers' motivation. Also, we added a control without any further instruction. Our results showed that in choosing between fair and selfish offers, there was an interaction between instructed strategy and offers as expected, the amount of choosing selfish offers increased under self-interest instruction. However, participants chose the selfish offers with longer, but not shorter RTs, contrary to our expectation. Therefore, it seems that the self-interest instruction modulated proposers' fair choosing behavior by increasing their motivation to choose selfish offers, but not decreasing the deliberation or consideration on responders or another aspect. On the other hand, in group NI and A, as expected, proposers chose more fair offers with similar RTs, which supported the strategic concern hypothesis and previous UG findings.

Although exactly the same watching eyes were replicated from the DG study of [7], there were no generous outcomes for proposers in group A in our study. In the condition of choosing between the fair and the altruistic offers, all the proposers with different instructed strategies showed the similar behavior. That is, choosing the fair rather than the altruistic offers, which choices would lead to maximize proposers' outcomes. Thus in this condition, participants' behaviors still supported the strategic concern hypothesis.

Share sizes, one of the task variables, no matter in the condition of choosing between the fair and the selfish offers or choosing between the fair and the altruistic offers, had significant influences on offers. When the share size in selfish offer (e.g. the 40% or 30% of the sum) was closed to the fair offer (the 50% of the sum), proposers spent more time considering which offer to choose. They might try to propose the slightly selfish offers for the reason that the disparity in the two amounts of money in selfish offers was not too large, and the possibility to be rejected was low. If responders accepted it, then proposers would receive more money comparatively to proposing the fair offers in each trial. When the share size in altruistic offer (e.g. the 60% or 70% of the sum) was closed to the fair offer (the 50% of the sum), although some proposers proposed the slightly altruistic offers to responders as "a small act of kindness", most proposers still did not. Because proposing the altruistic offers made them receive fewer than proposing the fair offers in each trial, which was contrary to their self-interest motivation.

As the share size went too selfish (e.g. the 20% or 10% of the sum) or too altruistic (e.g. the 80% or 90% of the sum), proposers chose the fewest of that kind of extreme offers. Because choosing the extremely selfish offers increased the possibility to be rejected by responders, and choosing the extremely altruistic offers decreased too much their own outcomes. Therefore, it has been difficult to find participants who tended to choose these extreme offers in previous UG studies. In our study, we found that if proposers chose the extreme selfish or the altruistic offers, they did both only within 1000 ms. Future researchers could investigate which psychological factors would drive people to choose the extreme offer, and what the behavior mechanism is inside. The stake sizes, however, did not influence proposers' choosing behavior. Although most participants self-reported that the stake size influenced their choices, they still proposed more fair offers as the stake size went larger. These results are consistent with previous studies [2].

To sum up, our results supported the strategic concern hypothesis, which suggests that proposers propose the fair offers to avoid the possibility of being rejected by responders, resulting in receiving nothing. Their main goal is not to behave fairly, but to maximize their own outcomes as much as possible.

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