

Stated Fairness and (Non-)reciprocating Behaviour in the Ultimatum Game

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ABSTRACT

A classical ultimatum game experiment was performed in the beginning of the research weather a non-anonymous setting among Thai students including a survey of the participants' value, risk-taking behaviors and decision motives. In this study a lot of factors and functions were used for finding the greatest number of significant explanatory variables, such as Benevolence, Risk Averse, Standard Gamble and so on. The major findings are: (1) Stated minimum offers the responder are willing to accept are very well in accordance with the predictions of the theory of reciprocity by Falk and Fischbacher (2006). (2) Acceptance rates in the real game show a large discrepancy with the former indicating an almost non-reciprocating behavior for small offers. (3) These acceptance rates cannot be explained by any of the agent's personal characteristics from the survey. (4) Stated fairness is a good explanatory variable for acceptance rates. The findings suggest that reciprocation, although clearly reproducible, is not as stable and basic an underlying reason for behaviors than fairness.

1. The Ultimatum Game

The ultimatum game is one of the most intensively studied games in the economic literature. The reason for this is that in a significant number of cases a dominated strategy is chosen, which yields a pessimistic outcome for both players in rejection of a sure mutual win-win situation - at least given that preferences are mainly determined by self-interest.

Two players called "proposer" and "responder" play a sequential game, in which the responder learns the move of the proposer. The proposer offers an arbitrary share of a given stake to the responder, who can only decide to accept the offer or reject it, such that both player receive nothing. The responder has no influence on the choice of the proposer. The game is

played only once and is usually performed between players who are unaware of each other's preferences or strategies.

A few stylized facts are established in the literature and found to be "quite robust" [Falk and Fischbacher 2006]. They can be summarized as follows.

(1) There are "practically no offers" above 50%

(2) The "modal offer" is between 40-50%

(3) Offers close to 50% are "practically never rejected"

(4) Offers below 20% are "extremely rare"

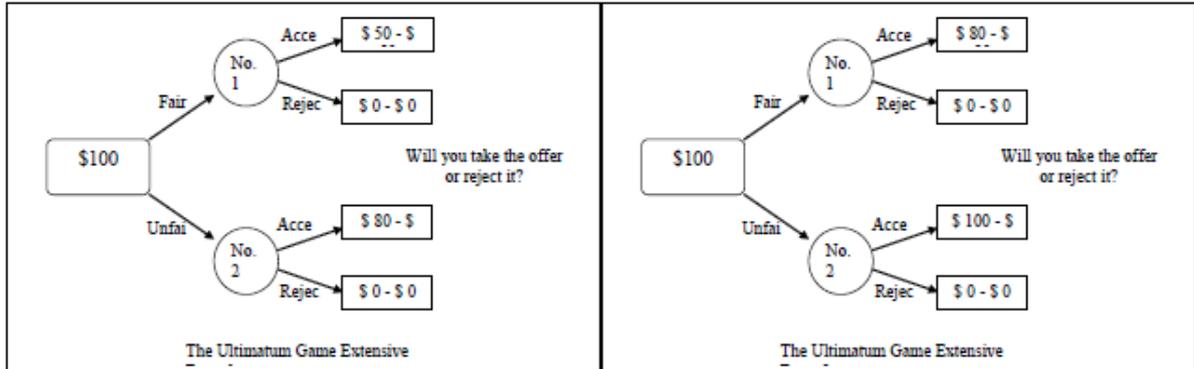
(5) Rejection rate for offers below 20% is "rather high"

An important empirical finding is that responders violate consequentialism. The frequency of acceptance does not only

change with the actual outcome, but also depends on the context of other available alternatives. Consider the two forms of the game depicted in figure 1. The same offer of 80/20 is rejected at a higher rate of 44.4% if the proposer could have chosen an equitable outcome (left picture). However, it is rejected at a lower rate of

8.9% if that is the most equitable alternative the proposer could have chosen (right picture) [Falk et al. 1999]. Thus any model by preferences which depends only on the outcome, such as Schmidt-Fehr preferences of inequality aversion [Fehr and Schmidt 1999], falls short of explaining this relation.

Figure 1: Violation of Consequentialism



Our findings showed a significant discrepancy between stated acceptance levels and actual acceptance behavior for responders. While the stated willingness to accept is well in accordance with stylized facts and the psychological model of Falk and Fischbacher, the actual responder's behavior turns out much too friendly. However, we find no patterns in values, risk-taking attitude and motives which could explain this effect. Rather, the finding fits into the category of established contextual effects leading to rationalization of the responder's behavior. This leads to the conclusion that the proposed dependency on intentions, although clearly reproducible with stated preferences, is less stable than the theory of reciprocity might suggest. Moreover, probit regression analysis re-establishes fairness as the primary explanative variable for the acceptance rate in real-money games.

2. Models

A large variety of models have been proposed to model economic behavior in the Ultimatum Game. They can be roughly

assigned to two categories. The first type amends preferences to depend on parameters different from the personal payoff, such as expected fairness or other player's outcomes, in order to maintain consistency with classical game theory. Typically, these preferences involve some kind of disappointment-aversion component build into the utility function, generating disutility upon falling short of a certain expected outcome. A quite general class of such models can be given by:

$$U(x, y_1, \dots, y_n) = u(x) - \sum_{i=1}^n \alpha_i \cdot (u(y_i) - u(x))^+ - \sum_{i=1}^n \beta_i \cdot (u(x) - u(y_i))^+ \quad (2.1)$$

with $(z)^+ = \max(0, z)$, where x denotes the player's payoff, and y_1, \dots, y_n depend both on the actual outcomes and reference points given by other available alternatives. The dependence on alternative outcomes is necessary for the model to be consistent with the observed violation of consequentialism.

The above class of model has the advantage of being applicable to other

intensively studied cases of reference-dependent preferences, such as prospect theory or conspicuous consumption [Schoch 2010]. Compared with other classes of reference dependent preferences it has the distinctive property that a positive affine transformation of the basic utility function u translates to the same transformation of the utility function U . This allows for a determination of the basic utility independent of the game under investigation in a context of choices under risk. This is valuable in particular for competitive market situations, where preferences generally lose their reference-dependencies and effectively reduce to basic utilities [Fehr and Schmidt 2004]. Basic utilities $u(x)$ can be extracted from (2.1) by setting $x = y_1 = \dots = y_n$.

For linear basic utility, the model reduces to the Schmidt-Fehr preferences for inequality aversion [Rohde 2010]:

$$U(x, y_1, \dots, y_n) = x - \sum_{i=1}^n \alpha_i \cdot (y_i - x)^+ - \sum_{i=1}^n \beta_i \cdot (x - y_i)^+ \quad (2.2)$$

Despite their consequentiality character, Schmidt-Fehr preferences still provide an important foundation for empirical research [Engel and Strobel 2000][Bellemare et al. 2008]. The model (2.1) predicts that if parameters y_1, \dots, y_n are outcome independent (thus reference points), then indifference classes under basic utilities are preserved under the reference-dependent preferences. This allows one in principle to test the model by determining whether disappointments related to non-monetary outcomes have their cause in the object or, as this theory predicts, in the utility it generates.

The second class of models of reciprocating behavior involves a modification of classical game theory. Psychological game theory has been developed to explicitly model higher-order

reflexive expectations on the other person's move. The general structure (2.1) of our preferences can still be adapted to psychological game theory if we relate the coefficients α_i and β_i to the intentions of other players and see them as functions depending on former moves of the other players and possible outcomes.

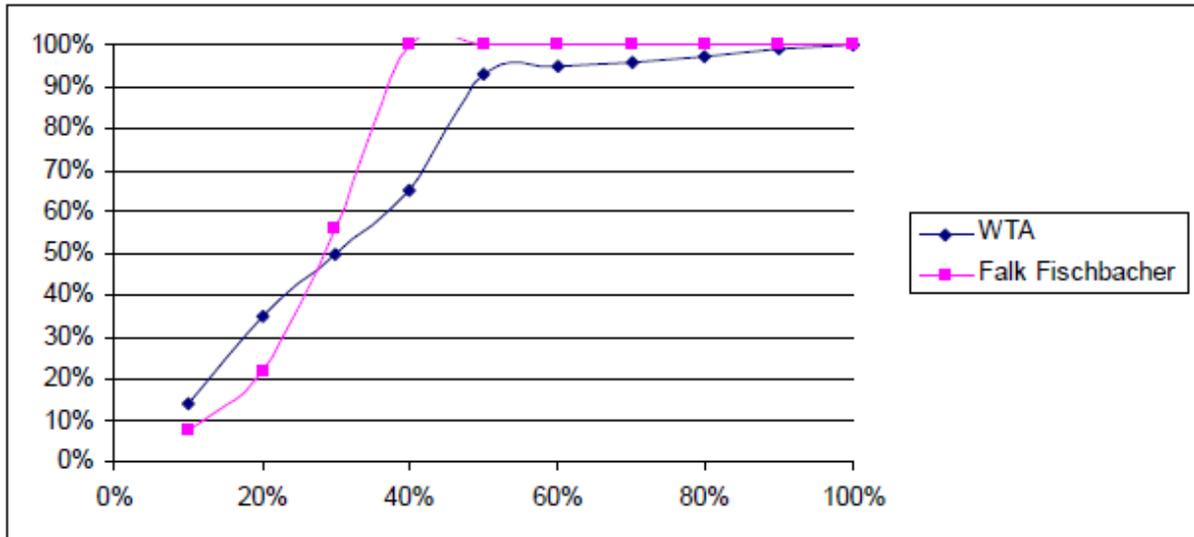
An example of a formulation of the second type is Falk and Fischbacher's model of reciprocity [Falk and Fischbacher 2006]. A remarkable property of this model is that it predicts acceptance rates $p(c)$ for the ultimatum game as a function of the offer c in a psychological Nash equilibrium.

$$p(c) = \begin{cases} \min(1, \frac{c}{\rho_2 \cdot (1-2c)(1-c)}), & c < \frac{1}{2} \\ \text{else.} & \end{cases} \quad (2.3)$$

The model depends on a universal positive reciprocity parameter ρ_2 , which "captures the strength of the [second] player's reciprocal preferences." It is set by the authors to equal 2 in their examples.

3. Setting of the Experiment

The experiment was performed with students of Chiang Mai University from different faculties including both regular students and professionals taking weekend lectures. Very few of the interviewees were Non-Thai such as travelers, businessmen or students from different universities. An extended interview was performed prior to the actual game to assess stated preferences on the ultimatum game and general attitudes towards reciprocation and risk taking (see the questionnaire in appendix A). The person takes either the role of the proposer or the role of the decider in a real money ultimatum game of stake of either 100 or 200 Bath. The role is determined by flipping a coin. After performing the game, additional questions on the motives of the decision were asked.

Figure 4.1: WTA best fits Falk/Fischbacher

The ultimatum game was personally explained to each participant. Before the real game, the participants evaluated the two forms of the ultimatum game from figure 1 for both roles of players. They were asked for their choice in a hypothetical role of proposer; for both alternatives if they would accept the role of responder; and how fair they consider the offers to be (on a 5 point Likert scale). Form 1 allowing for both an equitable share and an 80:20 offer (left in figure 1) was considered first. Afterwards the participants were confronted with a situation in which the same 80:20 offer was given if only a more unequal 100:0 offer was possible. Thus the participants were aware of the fact that their acceptance decisions could depend up on the presence of other alternatives. We can therefore regard the participants as informed deciders. Moreover, the following questions (the firsts four on a 5 point Likert scale) were asked about the evaluation of the 80:20 offer in the hypothetical role of the responder when it is the fairest choice available.

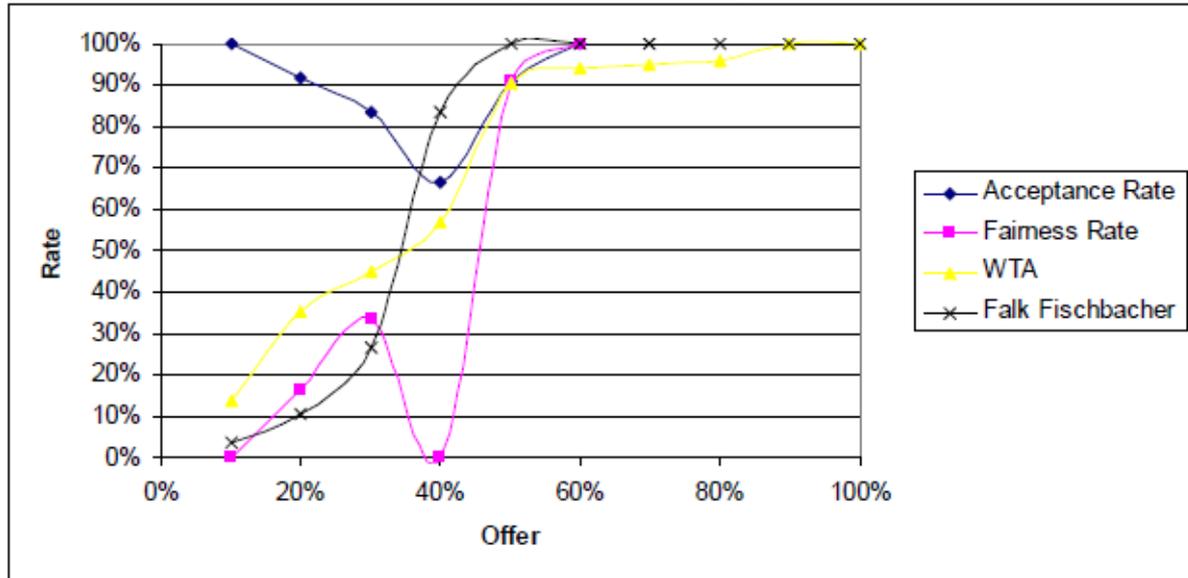
- I think the 80/20 offer is fair, since this is the best offer he could make
- I think the proposer deserves the \$80
- I am happy to keep at least \$20 out of hundred
- Will you feel envy for the responder to get \$80?
- What will be the most likely reason for you to turn down the deal? Unfairness/The offer is lower than my expectation/Envy/Other unpleasant feelings

Initially, most students seem to have difficulties in understanding the relevance of questions on the motives for the decision. The ultimatum game itself, however, was perfectly clear to them after explanation. At the very beginning of the interview when no money is involved, most of them stayed in a simple mindset and answered the surveys rather like an examination paper. Directly before the real money game, the participants were informed that the game was now to be played for real monetary stakes. We found strong reactions of surprise and increased level of attention and thoughtfulness.

Table1: Acceptance Rates for Contextual Choice

Offer	80/20	50/50	80/20	100/0
Acceptance Rate	58%	99%	87%	39%
dto. Literature	44%		81%	
Fairness (Mean)	2.70	3.99	3.07	-

Figure 4.2: Perceived WTA and Acceptance Rate Responder



4. Results

The first four stylized facts are well confirmed for the real money game. The modal offer of 50% was accepted in 91% of cases. Only 6% of all offers were above 50%, while 6% were at 20% and below. The stated minimum willingness to accept closely follows the prediction of Falk and Fischbacher. Figure 4.1 shows the best fit of the model (2.3), yielding a reciprocity parameter for the responder of $\rho_2 = 1.91$, in close proximity to the suggested value of 2.

The stated acceptance rates for the contextual choice displayed in figure 1 show the same trends as in the literature [Falk et al. 1999]. Differences remain within the range of reported cultural variations [Fehr and Schmidt 2004]. The acceptance rates for the 80/20 offers are significantly higher (at the 95% confidence) in presence of the 50/50

option, and just at the lower edge of the confidence interval if 100/0 is the only alternative. In the latter case, both contrary feelings of envy and desert of the responder with regard to the proposer receiving a share of 80\$ are significantly higher than those of self-satisfaction with the own lower share of 20\$. Surprisingly, in the same case - when 80/20 is the fairest possible offer - perceived fairness and envy are highly positively correlated (0.83 at 95%).

In the real game, acceptance and fairness ratings, although disparate, were nevertheless found significantly correlated at the 95% confidence level. The only attitude with a significant correlation was the stated goal to set a maximum loss before entering rounds of gambling. We found a slightly negative correlation of -0.29. Thus, surprisingly, people who are cautious about risk are less likely to accept the given offer.

Table 2: Probit Regression

		Coef.	Std. Err.	z	$P > z $	[95% Conf. Interval]
Acceptance	Fair	1.60	.40	3.95	0.000	.80 2.39
	const	.35	.27	1.28	0.202	-.18 .88
Fairness	Propose	2.23	1.14	1.96	0.049	.005 4.47
	const	-.21	.52	-0.41	0.680	-1.23 .80
Acceptance	WTA	2.80	1.76	1.60	0.110	-.63 6.25
	const	-.86	1.34	-0.64	0.519	-3.49 1.76

Table 3: Seemingly unrelated bivariate probit

		Coef.	Std. Err.	z	$P > z $	[95% Conf. Interval]
Fairness	Propose	2.14	1.12	1.92	0.054	-.04 4.34
	const	-.17	.50	-0.34	0.737	-1.16 .82
Acceptance	WTA	2.69	1.66	1.62	0.105	-.56 5.94
	const	-.77	1.26	-0.61	0.542	-3.25 1.70
	/athrho	.97	.29	3.39	0.001	.41 1.54
	rho	.75	.13			.39 .91

We found, however, a strong discrepancy between the stated willingness to accept and the actual acceptance behavior in the game with real money. Even though offers at 30% and below were considered unfair, they were nevertheless accepted at an overall high rate increasing for smaller offers. There is only one variable significantly correlated with the attitude to accept offers at 30% and below. This question reads “If somebody cheats me, I will still be kind to him/her.” No other attitudes are able to explain the lack of negative reciprocation. Acceptance of low rates at 40% and below was found highly significantly and negatively correlated (-0.61) with the stated minimum offer the subject was willing to accept. A particular anomaly is constituted by the eight out of 50 responders who were confronted with an offer of exactly 40%. Only 70% of them actually accepted the offer, although lower offers were accepted at a higher rate. None of the eight responders found the offer fair, while several people did so for a lower offer of 20% or 30%. Except for this single data point, stated willingness to accept runs

parallel to the fairness perception of the real game.

A profit regression showed that fairness is a significant variable explaining the acceptance rate in the real money game (Table 2). Alternatively, a two stage estimation method is employed. The acceptance rate is modeled against the stated minimum willingness to accept, and fairness is modeled as a function of the actually proposed value. This is in accordance with the findings that fairness considerations have a greater influence on the responder than envy or altruism [Bethwaite and Tompkinson 1996].

In addition to using the single equation probit, we have also run a seemingly unrelated bivariate - probit on the simultaneous equation model. The results are shown in table 3. The correlation was found to be significantly different from zero, and we reject the null hypothesis at the .0001 level of significance. However, the simultaneous equation model seems to perform no better than the single equation probit model.

5. Conclusion

One of the most surprising results was the highly significant positive correlation of perceived fairness and envy when the 80/20 offer is the fairest possible choice. This is in accordance with the anomalous high acceptance rates for low offers we have observed in the real game. It seems that envy or unfairness aversion gives rise to a primary impetus to reject an unfair offer and that this first move is given a second thought. Other studies also suggest a complex interaction between stated fairness and observed behavior [Handgraaf et al. 2004].

Our effect could possibly be attributed to the influence of the Asian culture of Thailand and the circumstance that the experiment was not anonymous. Although in both Christian and Buddhist societies envy is highly depreciated, Asian populations are more trained in suppressing negative emotions in order to maintain face. In particular, giving the other person a greater share is regarded as a good work (*tham boon*) in Thai culture which reduces Karma.

A similar influence of anonymity and social distance on the offering side of the ultimatum game has - in contrast to the dictator game - not been found in other studies [Charness and Gneezy 2008]. In the complete absence of any human agent, when the problem is presented non-verbally by an abstract decision theory, a likewise far reaching rationalization effect on the responder's preferences has been found [Stahl and Haruvy 2008]. In contrast to information on the agent, missing information on the stake and share leads to lower offers and demands, thus increased rationality [Croson 1996].

There are connections between fairness consideration and reference-dependency in decisions under risk. Both can be modeled by the same class (2.1) of preferences. There are also differences. Our findings confirm the established dependency of reciprocating behavior on the presence of

alternatives available to the proposer, which have not been chosen. A similar dependency on bygone alternatives in decisions under risk - a violation of separability - could not be confirmed in a recent study [Cubit et al. 2010].

Almost none of the questions on values, risk-taking attitudes and motives show significant correlation to any of the variables related to the ultimatum game. The only exception was "Before I gamble I set a maximum loss after which I stop," which showed significant correlations with both stated and revealed acceptance levels. This and the observed discrepancy point to the conclusion that reciprocation is a fragile phenomenon, which could be overridden in several contexts. As a consequence, the proposed dependency on intentions, although clearly reproducible with stated preferences, is less stable than the theory of reciprocity might suggest. Together with the results of probit regression analysis, we find ourselves in a position to re-establish fairness as the primary explanatory variable for the acceptance rate in real-money ultimatum games.

Appendix A: Questionnaire on Attitudes and Motives

Personal data included age, marital status, religion, employment status, occupation, education, income level, and household size and structure. The following questions were asked on a five point Likert scale prior to the game.

Questions on risk-taking attitudes

- I buy lottery tickets very often
- I like to gamble
- I do not gamble for high stakes
- If I lose in gamble, I am ready to double the stake to make up my losses
- Before I gamble I set a maximum loss after which I stop
- General taking risk can generate a better pay-off
- In investments, I look for a low risk portfolio

- I often buy equities of a single firm expecting them to rise
- I am careful in taking credits since I fear loosing my job or salary cut
- I am easily satisfied monetarily
- I regularly buy a first-class insurance for my car
- I always have insurance for my house/ apartment
- I feel uncomfortable without insurances

What affect you the most for buying or not buying a lottery?

- Price of the lottery ticket
- Jack pot value
- Chance of winning

Questions on expenditure planning

- I will need money for my retiring age
- I will need money for education for people in my household
- I will need money for my own business
- I will need money for real estate
- I will need money for a car

Questions on values

- My religion or disbelief is important for me
- Religion makes people thinking more benevolent of others
- Benevolence to others is an important value for me
- Fairness is an important value for me
- Equality is an important value for me
- I sometimes envy other people
- I complain when I feel treated unfairly
- Overall happiness
- Overall security

After performing the game, the following questions on the motives of the decision were asked

- I was only looking at my own payoff
- The other person's payoff influenced my decision
- I envy the other person's share, if he/she gets more than me
- I do not envy the proposer's share, as long as he gives me the best possible offer
- I feel that everybody should have an equal share in this game

- It would be stupid not to take the maximum possible advantage for me
- I feel justified in taking the maximum advantage, since others would do the same
- If somebody does not cooperate for a fair share, I am ready to forfeit my payoff to punish him
- I care more about the other person than about myself
- If somebody cheats me, I will still be kind to him/her
- I fear retaliation of the other person if I do not give him enough

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