Does odd or even make a difference

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ABSTRACT

The evidence from literature on ultimatum games suggests that proposers often split the stake equally when they make an offer. In this study we investigate the effect of odd size stakes (OSS) in ultimatum games. OSS prevents the proposer from splitting the stake in two equal parts. The results suggest that when stakes are odd, proposers do not stay in the neighborhood of an equal split, rather they are tempted to move away and make lower offers.

Keywords: Ultimatum Games; Odd stake size; fair offers; fairness norms

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1. Introduction

In ultimatum games (UG) (Güth, Schmittberger & Schwarze, 1982), a proposer makes an offer to a responder on how to divide an endowment (cash). The responder can either accept the offer and agree to the split, or reject the split at the cost of destroying the whole endowment. Based on the canonical assumption of selfish rationality, a responder should accept any positive amount, since a rejection would leave her with no earnings at all. Also, in such a case, the proposer should make a minimum positive offer to maximize their payoffs.

However, equal split seems to be a common characteristic of two person bargaining (Carpenter, 2003) and offers of more than 50 percent of the stake size are rare (Forsythe, Horowitz, Savin, & Sefton, 1994; Andersson, Galizzi, Hoppe, Kranz, Van Der Wiel, & Wengström, 2010). In fact offers of equal split have been observed in different settings, chess players who are more likely to play strategically, were seen to offer equal splits in over 60% of cases (Bühren, Frank, Krabel, & Werner, 2012). Thaler (1988) suggests that fairness in offer sizes is driven by twin motives of preference for fairness and a fear that small offers will not be accepted. It has been seen that equal splits are a norm even when the stake size is high (Cameron, 1999). Overall, there is an overwhelming evidence that even split of the stake is common even though it is possible to give more or less (Andreoni & Miller, 2002; Andreoni & Bernheim, 2009).

As such there is strong evidence that proposers are likely to offer equal splits of the stake and make offers higher than what the assumptions of rationality suggest. However, in ultimatum bargaining, there can be situations in which there are factors which could make offers of equal split impossible. For example, if the stake size is odd (OSS) it cannot be split in two equal halves. The objective of this study is to understand the impact of OSS on offers sizes. There are two distinct possibilities when the proposers are presented with an OSS; one possibility is that proposers make an offer as close as possible to an equal split. Alternatively, an OSS may lead proposers to make smaller offers than what they would normally make.

2. Experiment 1

The objective of experiment 1 was to examine the impact on offers with an OSS which makes it impossible for proposers to split the offer into two equal parts.

2.1 Experiment Design

A total of 240 student volunteers from a university in Western India were randomly assigned a role either as a proposer or a responder. The proposers were further randomly assigned to one of the two cells which were identical in all respects but for the stake sizes which were Rs. 99 and Rs. 100. Written instructions were provided to the participants in the classrooms. The proposers had to indicate their offers from the given stake size. The instruction sheet had an individual identification number. The offers were to be made only in multiples of 1 and fractional offers were not permitted. After the experiment, the proposers and responders were randomly matched and assigned payoffs. The payments were made in closed envelopes the same day.

2.2 Results

Fair offers for the stake size of 100 are defined as 50 or more, while for the stake size of 99, the close to equal offer is 49 or 50 and hence fair offers are defined as an offer of 49 or more. The number of fair offers with stake size 99 are 30 (46.7%), while for stake size 100 are 41 (68.3%). A chi square test suggests that the number of fair offers in the case of stake size 100 is significantly higher than when the stake size is 99 ($X^2(1) = 4.17$, $N = 120$, $p = 0.04$. A two tailed Mann Whitney test suggests that the offer sizes in the stake size 100 condition is significantly larger (*Mdn* = 50) than in stake size 99 condition (*Mdn* = 45), $U = 1089.5$, $p = .000$.

Since the stake size is different across the two conditions, additional analysis is done on the share of stake offered. The result suggest that the share of stake offered is significantly higher when the stake size is 100 as (*Mdn* = 50.0) compared to when stake size is 99 (*Mdn* = 45.5), $U = 1089.5$, $p = .000$.

Table 1: Descriptive Statistics for low stake size

	Low Stake Size	
	Rs 99	Rs. 100
Number of offers	60	60
Mean offers	34.12	41.45
Median Offers	45	50
Mean shares offered (percentage of stake)	34.46%	41.45%
Number of fair offers[1]	28	41
Percentage of fair offers	46.7%	68.3%

2.3 Discussion

The results of this experiment suggest that in situations where the norms for a fair offer are ambiguous, proposers move away from the neighborhood of fair offer and make lower offers. The findings suggest that norms of fairness may be unstable and susceptible to contextual effects and could tempt people to move away from such norms.

3.0 Experiment 2

The objective of experiment 2 is to examine the robustness of the findings from experiment 1 at higher stake size. The experiment is similar to experiment in all respects other than the stake size which were Rs. 499 and Rs. 500.

3. Experiment Design

A total of 120 student volunteers from a university in Western India were randomly assigned a role either as a proposer or a responder. The proposers were further randomly assigned to one of

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[1] Fair offers is defined as an even split of stake when the stake can be divided in two equal halves i.e. k when the stake size is 2k. When the stake is odd of the form 2k+1 and cannot be divided into two halves, a fair offer is k or more.

the two cells which were identical in all respects but the stake sizes which were Rs. 499 and Rs. 500. Written instructions were provided to the participants in the classrooms. The proposers had to indicate their offers from the given stake size. The instruction sheet had an individual identification number. After the experiment, the proposers and responders were randomly matched and assigned payoffs. The payments were made in closed envelopes the same day.

3.2 Results

Fair offers for the stake size of 499 are defined as 249 or more and for 500 are defined as 250 or more. The number of fair offers with stake size 499 are 11 (36.7%), while for stake size 500 are 19 (63.3%). A chi square test suggests that the number of fair offers in the case of stake size 500 is significantly higher than when the stake size is 499 ($X^2(1) = 4.28$, $N = 60$, $p = 0.04$).

Mann Whitney test suggests that the UG offers when the stake size is Rs. 500 (*Mdn* = 250) is significantly larger than when the stake size is Rs. 499 (*Mdn* = 150), $U = 217$, $p = .000$. Moreover, the offer share is significantly higher when the stake size is 500 (*Mdn* = 50) as compared to when stake size is 499 (*Mdn* = 30.1), $U = 265$, $p = .005$.

Table 2: Descriptive Statistics for high stake size

	High Stake Size	
	Rs. 499	Rs. 500
Number of offers	30	30
Mean offers	137.8	204.0
Median Offers	150	250
Mean shares offered (percentage of stake)	27.6%	40.8%
Number of fair offers	11	19
Percentage of fair offers	36.7%	63.3%

The results of experiment 2 suggest that the effect of odd stake size on the size of offers is robust and is observed at small as well as large stakes.

4. General Discussion and Conclusion

The impact of stake size on offers has been an area of research interest in Ultimatum Games. The literature suggests that offers sizes have been largely invariant to stake sizes, and even stake sizes that differ by the order of magnitude of 5, produce minor changes (Andersen, Ertaç, Gneezy, Hoffman & List, 2011).

However, the results of the two experiments show that even small differences in stake sizes, can alter the way proposers think and can have a large impact on the offer sizes. As per prior research, most proposers are used to making either absolute fair offers (even splits) of the stake, or offers that are largely fair (close to 40% of the stake size). However, when the stake sizes are odd, it is not possible to split the stake in equal halves and hence it is not easy to define norms of fairness in such situations. It is likely that such situations tempt proposers to abandon the fairness norm altogether and make increasingly unfair offers. It seems that norms related to fairness are contextual. In certain contexts there are strong prescriptions of fair behavior and proposers tend to follow them. However, when the norms are not a binding they provide players a moral wriggle room to act in self interest (Dana, Weber, & Kuang, 2007).

The findings of this study raise fundamental questions about the nature of norms. It seems that norms such as fairness that are not rooted in self-interest are unstable and susceptible to destabilizing triggers. This study makes three important contributions, firstly, this study shows, that even small changes in stake sizes that make a stake odd can have large implications on offers. This is in contrast to earlier findings which have either not observed change in offer size with stake or observed minor changes when the stake size was increased by a large factor. Secondly, the study suggests that norms of fairness are not robust and are susceptible to contextual factors. Thirdly, in real life ultimatum negotiations stakes are often not round or even, the learnings from this research provides a better understanding of such negotiations.

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