The Effect of Stakes in Distribution Experiments

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Abstract

We replicate previous results showing that stakes do not affect offers in the Ultimatum Game and show that stakes also have no effect on allocations in the Dictator Game. Both results are robust to the inclusion of demographic factors.

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1 Introduction[1]

Economists generally believe that participants in experiments consider choices more carefully when there are financial consequences. But there is less agreement on the extent to which "social preferences," or concerns over adherence to norms like fairness and reciprocity, continue to be important relative to conventional pecuniary incentives as the monetary stakes are raised. In this short paper, we present experiments that examine the effects of increasing the stakes in two well-known distribution games, the ultimatum game and the dictator game. We find that raising the stakes from $10 to $100 has no statistically significant effect on behavior in either game.

In the ultimatum game (UG), a first-mover (proposer) proposes a division of a given sum of money. A second-mover (responder) decides whether to accept or reject the proposed division. If the responder accepts, the offer is implemented. If the responder rejects, both players receive nothing. If both players are rational

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and motivated only by pecuniary incentives, the subgame-perfect prediction is that the proposer will offer the smallest positive amount of money, and the responder will accept. The dictator game (DG) is a variant of the UG in which the second-mover must accept the division proposed by the first-mover. The subgame perfect allocation does not change noticeably: in the DG, first-movers receive all the money instead of nearly all the money as in the UG.

Camerer and Hogarth (1999) review the literature on the effect of stakes in economic experiments. Considering a broad range of games, they find that stakes tend to have little effect on average behavior, but that games with larger (or non-zero) stakes tend to generate data with less variance. The context in which stakes are most likely to be important is when moving from zero stakes to positive stakes, and the effect is to shift behavior in the direction of standard theory.

In the UG in particular, a number of studies have found an interesting pattern. At low stakes, it appears that proposers correctly estimate the probability at which low offers will be rejected (see Prasnikar and Roth, 1992). At high stakes, proposers' behavior shows little change, but responders tend to reduce the threshold below which they reject offers (e.g., Hoffman et al., 1996; Slonim and Roth, 1998; Cameron, 1999 and Munier and Zaharia, 2003). It is possible that proposers make systematic mistakes in estimating the likelihood that responders will reject their offers at high stakes. It is also possible, however, that proposers are risk-averse and are more sensitive to the risk of being rejected when the stakes are high. This hypothesis is consistent with Binswanger (1980), and Holt and Laury (2002) who report that players display more risk aversion at high stakes.

Comparatively little is known about the effect of stakes on behavior in the DG. Sefton (1992) finds that the average allocation to the second-mover drops by approximately half when going from no stakes to $5 stakes. Forsythe et al. (1994) find no significant stakes effect when increasing stakes from $5 to $10. (Note that the difference in the stakes is small, however.) Finally, List and Cherry (forthcoming) examine the effect of substantial stakes on dictator behavior and find no significant effect, but, as the authors acknowledge, the first stage of their experiment does not randomize participants into stakes treatments. Also, they do not examine the influence of demographic factors.

We make three contributions to this literature. First, we report the first randomized experiment that substantially raises the stakes in the DG. Second, we replicate earlier studies that have raised the stakes in the UG. Third, we examine the role of a variety of individual characteristics.

2 Methods

We conducted experiments with Middlebury College students using a set of single-blind instructions similar to Forsythe et al. (1994).[2] Volunteers were

[2] The specifics of our protocol (i.e., our instructions and survey) are reported in Carpenter et al. (2004).

elicited from the entire population of approximately 2500 students. We gathered a total of 79 observations as reported in Table 1. Participants filled out a demographic survey and then were given written instructions and told to follow along as one of the experimenters read aloud. After any questions were answered, we flipped a coin to see whether the people with odd or even participant numbers would become first-movers. Second-movers were taken to a different room and waited silently. First-movers were asked to choose between eleven discrete allocations: (0,10), (1,9) etc. in the $10 game, (0,100), (10,90) etc. in the $100 game. In the UG, responders circled either Accept or Reject. In the DG, responders were simply informed of the division. Second-movers were paid and then first-movers were paid.

3 Examining Stakes

Table 1 presents summary statistics on the fraction of the surplus allocated to the second player. In the UG the mean drops slightly as the stakes increase but, as shown at the bottom of Table 1, this difference is insignificant.[3] Because only one of a combined 39 UG offers was rejected we are unable to conduct any analysis of second-mover behavior. The problem is that responders' behavior is censored: the fact that nearly all offers were accepted suggests that their threshold levels were below what was offered, but we do not know how far below. There may have been changes in how far below the offers the responders' thresholds were, but we have no way of addressing this issue in our data.

As is common in the DG (e.g. Forsythe et al., 1994; Hoffman et al., 1994), the distribution of offers lies to the left of the equal split, but allocations are still mostly positive. The mean allocation in the $10 DG is higher than in the $100 DG, but this is partially driven by an outlier in the $10 DG where one dictator gave away all $10. In fact, the lower panel of Table 1 illustrates that stakes do not appear to have a significant effect on behavior in the DG.[4]

4 Controlling for Demographics Effects

We gathered a set of standard demographic variables from our participants: age, sex, years of schooling, family income, ethnicity, and number of siblings. We also had participants fill out a personality scale called the *Mach scale* first developed in Christie and Geis (1970). The Mach scale consists of twenty statements drawn from Machiavelli's *The Prince* to which subjects agree or disagree. Those who tend to agree with the statements are called "high Machs," and those who disagree "low Machs."[5] We included the Mach scale with the goal of controlling

[3] We employ two tests to check for differences in the distributions. The first test is the Wilcoxon test for differences in central tendencies and the second test is the Komogorov-Smirnov test for differences in the cumulative distributions.

[4] Without the outlier, the DG test statistics are Z=0.60, p=0.55; KS=0.21, p=0.72.

[5] The Mach scale is designed to capture three components of an individual's personality: the extent to which a subject has a cynical view of human nature, believing that others are

for variations in predispositions toward engaging in manipulative behaviors. In previous work, Meyer (1992) found evidence suggesting high Machs are less likely to reject low offers, while Gunnthorsdottir, McCabe, and Smith (2000), using a modified trust game, found high Machs reciprocated less. Also in a trust game, Burks et al. (2003) found that high Machs were less trusting but no less likely to reciprocate than low Machs.

Finally, we collected measures of risk-aversion and strength of the endowment effect (Thaler, 1980) at the individual level. The challenge in eliciting indicators of risk-aversion from a written survey is that the indicators may be sensitive to the framing of the survey questions. We addressed this issue by framing the same question in two ways. In one question (Risk A), we asked at what price subjects would be willing to sell a lottery ticket with a 50% chance of paying $0 and a 50% chance of paying $10. In a second question (Risk B), we asked how much they would be willing to pay to purchase such a ticket. We take the mean of these two responses as our measure of individual attitudes toward risk: the lower the mean, the more risk-averse the subject. Note also that the difference between the two responses can be interpreted as a measure of the endowment effect, that is, the tendency of subjects to value objects in their possession more than identical objects they do not possess. By these measures, we find that our subjects were mildly risk-loving; the overall mean of responses to both questions was $5.17. Subjects also displayed strong evidence of an endowment effect; the mean response to question A was $6.41; the mean response to question B was only $3.94. The difference is statistically different from zero at the 1% level. Our hypotheses for first-mover behavior are (1) that the more risk-averse a proposer is, the more she will be willing to offer to the responder; and (2) the larger the proposer's endowment effect, the less she will be willing to offer to the responder.

Because our dependent variable is cardinal but discrete, we use the interval estimator. We also use robust standard errors to account for heteroskedasticity. Table 2 presents our results. In the UG we see that neither stakes nor most individual characteristics have statistically significant effects. The exceptions are race and the number of siblings. Non-white participants proposed 15% more than our white participants; each additional sibling is associated with a 2% reduction in the amount proposed. In the DG, we also continue to see no effect of stakes, with or without the outlier. It is also interesting that DG allocations are significantly affected by family income. The effect is three times larger than in the UG and negative. A standard deviation increase in family income reduces a dictator's allocation by 9%.

As we hypothesized, our point estimates for the UG suggest that proposers with a larger measured endowment effect offer less, and those who are more risk-averse offer more (those who are more risk-loving offer less), but neither

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not trustworthy; the willingness of a subject to engage in manipulative behaviors; and the extent of the subjects' concern (or lack thereof) with conventional morality (Christie and Geis, 1970). Scores are summed over the 20 questions, and a constant of 20 is added, to generate a measure that ranges between 40 and 160, with a neutral score of 100.

of these effects are statistically significant in our small sample.[6] In the DG, we find a smaller coefficient on the risk measure, consistent with the fact that there is no longer risk for the proposer. We now find that the endowment effect is statistically significant. A standard deviation increase in one's sensitivity to being endowed with the hypothetical lottery ticket is associated with a 10% reduction in one's allocation to the second player.

[6] In unreported regressions we also included interactions between stakes and the endowment effect and the mean risk loving but found no significant differential effect of either variable in the high stakes treatment.

5 Tables

Table 1 - Summary Statistics of First-Mover Behavior

	10 Dollar UG	100 Dollar UG	10 Dollar DG	100 Dollar DG
Observations	19	20	19	21
Mean Allocation	0.45	0.41	0.33	0.25
Median Allocation	0.50	0.45	0.40	0.20
Minimum Allocation	0.20	0.10	0.00	0.00
Maximum Allocation	0.50	0.60	1.00	0.50
Standard Deviation	0.08	0.13	0.27	0.19
Rejection Rate	0 of 19	1 of 20	-	-
Highest Rejected Offer	NA	0.10	-	-
Wilcoxon	Z=1.20, p=0.23		Z=0.86, p=0.39	
Kolmogorov-Smirnov	KS=0.24, p=0.50		KS=0.24, p=0.53	

TABLE 2 - ANALYSIS OF FIRST-MOVER ALLOCATIONS

(The dependent variable is the fraction of endowment allocated to the second player)

	UG	DG	DG - outlier
Stakes	-0.0005	0.0004	0.0003
	(0.0003)	(0.001)	(0.001)
Mach Score	-0.001	-0.001	-0.001
	(0.001)	(0.003)	(0.003)
Age	-0.01	-0.03	-0.06
	(0.02)	(0.06)	(0.05)
Female	0.01	-0.02	0.0005
	(0.03)	(0.08)	(0.08)
Schooling (years)	0.008	-0.02	0.05
	(0.03)	(0.07)	(0.05)
Family Income (measured in $100k)	0.03	-0.10***	-0.09**
	(0.02)	(0.04)	(0.04)
Non-white	0.15***	-0.02	-0.04
	(0.06)	(0.11)	(0.10)
Number of Siblings	-0.02*	-0.04	-0.06
	(0.01)	(0.05)	(0.05)
Endowment Effect (Risk A – Risk B)	-0.004	-0.04***	-0.05***
	(0.008)	(0.02)	(0.02)
Mean Risk ((Risk A + Risk B)/2)	-0.01	-0.04	-0.004
	(0.02)	(0.03)	(0.02)
Constant	0.71	1.74**	1.29**
	(0.38)	(0.72)	(0.63)
Wald chi^2	18.23	21.81	27.90
N	37	40	39

(Note: we use the interval estimator and report robust standard errors in parentheses. *** indicates significant at 99%, ** significant at 95%, and * significant at 90%).

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