Gender and Culture: International Experimental Evidence from Trust Games

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Gender is rarely included as a factor in economics models. However, recent work in experimental economics, as well as in psychology and political science, suggests that gender is an important determinant of economic and strategic behavior.

We examine gender differences in bargaining using the "trust game" introduced by Joyce Berg et al. (1995).[1] In this two-person game, the "proposer" is given a choice of sending some, all, or none of his or her $10 experimental payment to an anonymous partner, the "responder." The experimenter triples any money sent. The responder then chooses how much of his or her total wealth (his or her $10 experimental payment plus the tripled money) to return to the proposer. Any money the responder does not return may be kept (thus the responder is playing a dictator game with his or her endowment plus three times the amount the proposer sent). The unique subgame-perfect Nash equilibrium is for the proposer to send no money and for the responder to return none.

For U.S. subjects, Berg et al. found that 30 of 32 proposers deviated from this economic equilibrium and sent some money to their partners (the average amount sent was $5.16). In sending money, proposers are trusting that their partners will return some money to them. In addition, 24 out of 32 of responders who received money returned some (the average amount returned was $4.66). In returning money, responders are reciprocating the proposer's actions.

In this paper we look for gender differences in this game. We use data previously collected from four countries (the United States, China, Japan, and Korea) and report gender differences in proposer (trusting) behavior and responder (reciprocating) behavior. We find no significant effect of gender on amount sent by proposers (trust behavior). However, we find that women return (reciprocate) significantly more of their wealth than men, both in the United States and internationally.

I. The Impact of Gender in Previous Experiments

Catherine Eckel and Philip Grossman (1999) review a budding literature on gender in experimental economics. For purposes of this paper, we focus on their discussion of differences in bargaining.

In ultimatum games in the laboratory, gender has been observed to influence a variety of decisions.[2] Eckel and Grossman (1998b) demonstrate *chivalry* (men accept lower offers from women than from men) and *solidarity* (women accept lower offers from women than from men). Sara Solnick (1998) finds, in contrast, that players of both sexes demand more

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[1] This game is similar to the trust game in David Kreps (1990) and the peasant–dictator game in John Van Huyck et al. (1995). All have the same prediction that play should end immediately, even though strict Pareto improvements to payoffs can be found in later stages. For a detailed comparison of the games see Berg et al. (1995).

[2] In the ultimatum game, one player (the proposer) makes an offer to another (the responder) of how to divide a fixed amount of money. The responder can accept or reject the proposer's offer. If the offer is accepted, the money is divided as proposed; if the offer is rejected, both players earn zero. The unique subgame-perfect equilibrium of this game is for the proposer to offer the responder ε and for the responder to accept.

from women than from men. Both studies found that offers were lower to women than to men, and that offers from women and men were not significantly different.

Other researchers have investigated gender effects in the dictator game.[3] Eckel and Grossman (1998a) found that women give more than men in these games, while Gary Bolton and Elena Katok (1995) found no significant difference. James Andreoni and Lise Vesterlund (1998) compared gender behavior in dictator games as the monetary value of the tokens being divided was varied among players. They found that women gave more overall and were more likely to divide tokens evenly despite different monetary values, while men became less generous as the value of their tokens increased relative to the value of the responder's tokens. Finally, Eckel and Grossman (1996) examined gender differences in a punishment game, where subjects could choose to divide evenly a $10 (or $12) pie with someone who had previously been ungenerous with another subject, or an $8 pie with someone who had previously been generous. They found that women were at least as likely as men to punish ungenerous counterparts by choosing to divide the $8 pie.

As Eckel and Grossman (1999) have observed, the findings regarding gender seem to be conditional on the level of risk present in the experiment. In decisions where risk is involved, such as for the proposer in ultimatum games, there appear to be no systematic differences in behavior across genders. However, for decisions involving no risk, such as for dictators or "punishers," women tend to be more generous and socially oriented in their behavior. In this paper, we examine behavior in an experiment involving both risky and riskless decisions. Proposers take a risk by sending money to the responder. Responders face no risk when deciding how much money, if any, to return. Our results are consistent with Eckel and Grossman's distinction. We find a significant gender difference in the riskless reciprocity decisions and no difference in the risky trusting decisions.

[3] In the dictator game, one player, the allocator, is given a fixed amount of money to divide between himself and another player, the recipient. The allocator chooses a division, and the money is divided as proposed. This is not a game in the formal sense, but rather an individual decision problem.

II. Experimental Design and Procedure

The experimental design used in this study involves an examination of culture, communication, and the social distance between players. For purposes of this study, these factors are treated as nuisance variables, and are controlled for in the analysis. A complete discussion of the experimental design and procedures can be found in Buchan et al. (1998); here we present a shortened version. Experimental instructions are available from the authors upon request.

Subjects are randomly assigned to the roles of proposer or responder and are directed to separate rooms. There they receive instructions for the trust game and are paid their endowment in local currency. Proposers are instructed to place any money they wish to send to their partner in an envelope. Monitors collect the envelopes and take them to the experimenter, in a different room, who records the amount of money sent. She then triples the amounts sent by proposers, places the tripled money into envelopes, and sends these envelopes into the respondents' room via another monitor. The respondents receive their envelopes, and decide how much of their own experimental fee plus any tripled money received to return to their partners. Monitors collect the envelopes from the responders and give them to the experimenter. The experimenter records any amounts returned, places the money back into the proposers' original envelopes, and sends them back to the proposers' room for distribution. The experiment is then concluded; subjects turn in a post-experimental questionnaire and leave with their earnings.

This procedure, though elaborate, ensures a double-blind experiment. Throughout the experiment, subjects remain unaware of their partners' identities (and thus their genders), and the experimenter who is recording amounts sent and returned is also unaware of the subjects' identities. The anonymity afforded by this procedure helps to reduce inclinations on part of subjects to "please the experimenter" (i.e., to behave in what they

believe is the manner expected by the experimenter). Thus a double-blind experiment provides an environment in which self-interested behavior is as uninhibited as possible within a controlled setting (Elizabeth Hoffman et al., 1994). It also likely reduces "face-saving" behavior on the part of subjects—behaviors that might be especially prevalent in East Asian countries (Michael Bond and Kwang-Kuo Hwang, 1996). Any deviations from the self-interested equilibrium that appear in this environment are strong indicators of real tendencies on the part of the subjects to be trusting and cooperative, rather than impression-management techniques.

A total of 186 subjects participated in this experiment: 48 students from Nankai University in China, 50 students from Seoul National University in Korea, 44 students from Tokyo University in Japan, and 44 students from the University of Pennsylvania in the United States. Subjects were randomly recruited sophomore or junior economics or business students, who completed the experiment for course credit and for actual monetary earnings.[4]

III. Experimental Results

A. *Description of the Data*

For purposes of analysis, monetary amounts across the four countries have been standardized on a scale from 0 to 1,000 units. Our dependent variables are the amounts sent by proposers and the proportions returned by responders. We calculate the proportion returned as the amount responders returned divided by their total wealth (three times the amount the proposer sent plus the endowment). Across all countries and cultures, the mean amount sent by proposers was 671.91 units (out of 1,000 units), and only three of the 92 proposers sent nothing to their partners.[5] Ten responders returned zero (three of whom had received zero). The average proportion returned was 31.2 percent. Seventy-eight responders out of 92 (85 percent) returned at least as much as had been sent, while the remaining 15 percent returned less than had been sent.

TABLE 1—GENDER BY ROLE AND COUNTRY

Role and gender	Number of subjects				
	China	Japan	Korea	United States	Total
Proposers					
Male	18	20	25	7	70
Female	6	2	0	15	23
Responders					
Male	16	18	23	9	66
Female	8	4	2	13	27

Of the four countries, women had the highest representation among the U.S. subjects. The numbers of women and men in each role of the experiment are detailed in Table 1.

B. *Analysis of Gender*

There are two main results of this experiment. First, there is no significant gender-related difference in the amounts sent by proposers. Second, women responders return significantly more than male responders, even controlling for the amount received. These results are described in Table 2.

We first analyze the amounts sent (out of 1,000 units) by women and men in all four countries. The average amount sent by women is 630.4, and the average amount sent by men is 696.4. A Wilcoxon test finds no significant difference between these two samples, nor does a t test. Regressions of amount sent on gender, either alone or in combination with controls for the different treatments in the experiment and either with and without indicator variables for the countries, indicate no significant effect of gender. One collected measure from the post-experimental questionnaire that does have a significant and positive effect on

[4] To ensure equivalence in experimental conditions and procedures across the four countries studied, we employed a number of cross-cultural experimental controls suggested by Alvin Roth et al. (1991). These are discussed in depth in Buchan et al. (1998).

[5] The mean amount sent in the Berg et al. (1995) trust game was $5.16 (out of $10.00). The mean amount sent by the American subjects in our experiment was slightly higher, at $6.47 (out of $10.00). The difference is likely due to the added communication treatment in our experiment.

TABLE 2—AVERAGE AMOUNTS SENT AND RETURNED, BY GENDER

Gender	Amount sent[a]	Amount returned	Proportion returned[b]
Men	696.4	928.0	28.6
	(286.1)	(688.7)	(17.8)
Women	630.4	1,215.1	37.4
	(260.6)	(603.1)	(13.8)
Total	680.1	1,013.5	31.2
	(280.1)	(674.2)	(17.1)

Notes: Amounts sent are out of 1,000 units; the proportions returned are reported as percentages. Numbers in parentheses are standard deviations.

[a] The gender-related difference in amounts sent is not statistically significant.

[b] The gender-related difference in the proportion returned is statistically significant ($p = 0.0183$).

TABLE 3—REGRESSIONS OF PROPORTION RETURNED ON GENDER AND OTHER CONTROL VARIABLES

Independent variable	Regression (i)	(ii)	(iii)	(iv)	(v)
Intercept	0.3299**	0.3307**	0.3352**	0.1294**	0.1004†
Gender[a]	0.0443*	0.0469*	0.0603**	0.0523**	0.0726**
Social distance		0.0124	0.0147	0.0147	−0.0098
Discussion		−0.0106	−0.0117	−0.0281†	−0.0172
China			0.0272	0.0136	0.0367†
Japan			0.0311	0.0260	
Korea			0.0072	0.0132	
Amount sent				0.0003**	0.0003**
Adjusted R^2:	0.0464	0.0345	0.0484	0.2852	0.4481
Number of observations:	93	93	93	93	46

Notes: Regressions (i)–(iv) were run on the entire sample of responders in all four countries; regression (v) uses only the data from China and the United States.

[a] Female = 1.

† Statistically significant at the 10-percent level.

* Statistically significant at the 5-percent level.

** Statistically significant at the 1-percent level.

the amount proposers send is the amount they expect to have returned to them (proposers completed these questionnaires after they sent their money but before receiving anything from the respondents). However, there are no differences between men's and women's expectations in this setting.[6]

We next turn to our analysis of the proportion returned by responders. The average proportion returned by women is 37.4 percent, and the corresponding proportion for men 28.6 percent. A Wilcoxon test finds that women return a significantly higher percentage than men ($p = 0.0183$) as does a t test.

Table 3 presents results for a number of regressions of proportion returned on gender and other control variables. In all these regressions, gender has a significant impact on the proportion that responders return; specifically, women return a significantly higher proportion than men. Regressions (i)–(iv) control for the treatment responders were in, the country they were from, and the amount that was sent to them. Notice that women return a significantly higher proportion, even in this last regression, which controls for the amount they received.

Interestingly there is a significant effect of the amount sent (out of 1,000) on the proportion returned. As proposers send more to responders, responders reciprocate by returning not just more absolutely, but by returning a higher proportion. This suggests that responders are not simply using a rule that says, for example, "reimburse the proposer by returning the amount sent," but instead are rewarding proposers for their trust. The final regression, (v), uses only the data from China and the United States (since there were relatively few women in the experiments run in Japan and Korea) with similar results.[7]

What might be causing female responders to return more than male responders? Two explanations come to mind. First, it might be that women are simply more altruistic than men. Second, it might be that women are more likely to reciprocate than men. The next section discusses these two explanations and suggests evidence for each.

IV. Summary and Discussion

Two main results emerge from this experiment. The amount of trust exhibited in this game (the amount sent) is not significantly

[6] One concern is that there are extremely few women in the samples from Japan and Korea; however, similar analyses using only data from the United States and China yield the same results.

[7] Regressions run for each country individually also yielded similar results.

different between men and women. However, women exhibit significantly more reciprocity in this game (by returning a higher proportion of their wealth).

There are two possible explanations for this latter result. First, it may simply be that women are more altruistic than men (i.e., women care more about their partner's consumption than men do), and thus they return a higher proportion of their earnings. Some experimental evidence suggests that this might be the case (e.g., Eckel and Grossman, 1998a). However, if this were so we would expect to see a significant gender effect in both amounts sent and proportion returned—not only in the latter. Alternatively, as Andreoni and Vesterlund (1998) suggest, it may be that women are more altruistic when the costs and benefits of giving are symmetric, but men may be more altruistic when the benefit of giving is higher than the costs. Specifically, Andreoni and Vesterlund find that, while women give significantly more when costs and benefits are symmetric ($t = 2.26$ and $t = 1.42$ for their budget 4 and 8), when the value of giving is three times the cost of giving (as in our proposer's situation), men give significantly more than women ($t = 1.96$ for their budget 1). However, the data in our experiment do not demonstrate this pattern. While women are more altruistic than men in the second stage, in the first stage (where the money sent is tripled), men's contributions are the same as those of women's.

However, our experiment is different in an important respect from this previous work in that subjects were not simply playing a series of dictator games. Instead, they were linked in an important way: the amount the responder returned went back to the proposer who had created the pie to be divided in the first place. Our results suggest that a different motive, reciprocity, could be driving the differences between male and female behavior in this setting.[8] This explanation involves women being more likely to reciprocate than males, rather than being simply more altruistic. This is consistent with results from Eckel and Grossman (1996), who showed that women were as likely as men, or more likely, to reciprocally punish (reward) unfair (fair) behavior in others.[9]

Some evidence in favor of reciprocity is provided by the post-experimental questionnaires. While waiting to receive money from the proposers, responders were asked how obligated they felt to return at least as much to the proposer as the proposer sent to them. Women felt significantly more obligated than men to do so ($X^2 = 12.65$, $p = 0.049$), with 57 percent of women saying they felt "extremely obligated," compared with only 24 percent of men. This supports the explanation of women being more likely to reciprocate than men, independent of their altruistic leanings.

Finally, our findings are consistent with the relationship suggested by Eckel and Grossman (1999) between risk and gender. In our experiment, proposers, who were facing substantial risk in sending money to the responders, did not exhibit gender-related differences in their behavior. In contrast, when making a riskless decision, female responders returned significantly more than their male counterparts.

While economic models have previously been gender-blind, evidence presented in this and other research suggests that the models should be expanded to incorporate systematic effects of characteristics such as gender in settings like bargaining, where issues of trust and reciprocity are likely to have an impact.

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[8] Recent models of reciprocity include Bolton (1991), Matthew Rabin (1993), Bolton and Axel Ockenfels (1998), and Ernst Fehr and Klaus Schmidt (1998). None includes gender as a variable in the analysis.

[9] Recent work in other fields also suggests that women might be more likely to reciprocate than men. In linguistics, Deborah Tannen (1990) suggests that women tend to engage in reciprocal discussion (e.g., you tell your story, then I'll tell mine) while men tend to engage in hierarchical discussion. Experiments in sociology suggest that, for an equal fixed wage offered by an experimenter, female subjects do more work than male subjects (Denise Bielby and William Bielby, 1988). We thank Sara Solnick for bringing this latter result to our attention.

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