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4.4.06...FORTHCOMING IN ECONOMIC INQUIRY

When are Women More Generous than Men?

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and  
Cary A. Deck\*

RRH: Cox & Deck: Gender and Generosity

When are Women More Generous than Men?

Previous research on gender differences in behavior has led to seemingly contradictory findings about generosity. From data generated by 290 subject pairs, we find that women are more sensitive than men to the costs of generous actions when deciding whether or not to be generous. The factors that affect the level of generosity observed in our experiments are reciprocal motivation, the level of money payoffs, and the level of social distance in the experimental protocol. The relatively greater sensitivity of women to the costs of generous behavior can explain most of the apparent inconsistencies in previously-reported findings.

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## I. INTRODUCTION

Gender's impact on behavior and decision-making continues to be a topic of much debate and scrutiny. As evidence one need look no further than the firestorm stemming from comments by Lawrence Summers, the President of Harvard University, about the potential role that gender differences play in academia.<sup>1</sup> There is considerable experimental evidence that behavior varies with gender. For example, Gneezy and Rustichini (2004) find that by the time they are nine years old, boys are already more competitive than girls. Harbaugh, Niederle, and Vesterlund (2005) find that by fourth grade boys are more confident about their own abilities. Neiderle and Vesterlund (2005) report a similar difference for college students.<sup>2</sup> The real impacts of gender differences are wide-ranging. Rask and Tiefenthaler (2004) examine the gender gap in undergraduate economics majors. They find that female students are more responsive to their grades in principles classes when deciding whether to enroll in advanced economics courses than are their male counterparts, which could explain why average GPAs are typically higher for female economics majors. Understanding gender differences not only affects how one approaches social issues such as why relatively fewer women pursue careers in the hard sciences (President Summers' controversial question), but it can have strategic effects as well. Should a firm send a male or a female representative to handle a bargaining negotiation with a supplier? What about negotiating a dispute within the firm? Based upon a field experiment, Landry, Lange, List, Price, and Rupp (2005) find that contributions to a public good are higher when the solicitor is an attractive female. This could suggest that women should lead high profile charity fundraising. In a National Public Radio interview, Helen Fischer argued that more and more businesses are trying to understand the "natural talents" of women and maintained that those businesses that do know how to use this "resource" are "winning."<sup>3</sup>

Several laboratory studies have found significant gender differences even in simple games, however apparently contradictory evidence exists as to the magnitude and direction of these gender differences.<sup>4</sup> This paper compares behavior across genders for two basic allocation decisions that have been widely studied in the laboratory, a dictator game and a trust game.<sup>5</sup> In a dictator game the allocation decision stands alone, while the allocation decision is preceded by another person's action in the trust game. In the trust game a player could be faced with the same allocation decision as a dictator but only as the result of another person's decision. Observed behavioral differences between these two decision contexts can be used to identify reciprocal behavior (see Cox 2004 and Cox and Deck 2005). The difference between being a dictator and responding to the action of another may alter behavior as the opportunity to act reciprocally could increase the subjective payoff of a jointly beneficial money payoff outcome.

Other factors that have been found to influence behavior include social distance and the payoff level. Hoffman, McCabe, Shachat, and Smith (1994) and Cox and Deck (2005) show that varying the social distance involved in the experimental protocol can cause economic agents to choose differently over the same set of monetary outcomes. A low social distance, in which agents' identities are more closely associated with their actions, increases the social cost of selfish behavior. Behavioral effects from situational features such as the ability to reciprocate and the social distance are consistent with an economic model that views decisions as not being based solely on monetary outcomes. Of course, the monetary stakes involved in the allocation decision are also a cost of being generous.

Previous research examined the effects of gender in allocation games but led to mixed findings. In ultimatum games, Eckel and Grossman (2001) and Solnick (2001) find that males and females make identical offers but Eckel and Grossman find that women are more willing to

accept unfair offers while Solnick finds no second mover gender difference. In dictator games Bolton and Katoc (1995) find no gender differences while Eckel and Grossman (1998) report that women are more generous than men in a high social distance environment. Also, under a high social distance protocol, Cox (2002) reports that men act reciprocally while women do not in the investment game. However, Croson and Buchan (1999) and Chaudhuri and Gangadharan (2003) find that women are more likely to behave generously in an investment game. In another study, Andreoni and Vesterlund (2001) demonstrate that the relative price of generosity interacts with gender. In their study of dictator games, male proposers are more sensitive to the price of allocating money to their counterparts than are women.

This study seeks to identify gender differences in behavior in trust and dictator games by systematically comparing actions taken in allocation decisions across several contexts with varied costs of generosity. The next section describes the experiments used to compare the behavior of men and women. The results of the experiments are then presented followed by a further investigation of the treatment effects. A separate section contains a discussion of the implications of the results, including a reconciliation of previously reported disparate findings.

We find that women are more responsive to the total economic and social costs of generosity than are men, and thus behavioral gender differences are dependent on the decision context. Thus there is no simple answer to the question: “Are women more generous than men?” The answer is neither “yes” nor “no”; it is, instead, much more subtle and interesting than that.

## II. EXPERIMENTAL DESIGN

Groups of between 12 and 20 subjects were recruited for a one hour experiment. Each subject was paid a \$5 show-up fee and seated at a computer terminal with privacy screens on three sides. The subjects read computerized directions describing how decisions would be made

in the extensive form game and how the dollar payoffs would be determined.<sup>6</sup> After completing the directions, the subjects answered a quiz that was checked by an experimenter.<sup>7</sup> A subject was randomly assigned one role and played one game, one time.

We here eschew the task of providing a general definition of generous behavior that could be applied in all contexts in favor of providing an un-nuanced definition that can easily be applied to interpret data from the experiments we discuss. Within this context, the “generosity” or “generous behavior” of some subjects can be clearly identified as follows. Consider those decision tasks where the decision-maker makes either *the only* choice or *the last* choice that determines the division of a given amount of money between himself and another subject in the experiment. A subject making such a decision is “generous” if she rejects the alternative that maximizes her money payoff (and thereby minimizes the other’s payoff) in favor of an alternative feasible choice that gives the other subject more than the minimum possible amount of money. In our binary choice experiment, a subject either does or does not make *the* generous choice. Other experiments that we discuss give the subjects more than two alternatives. For such experiments, if subject A gives to subject B more of a given total amount of money than subject C gives to subject D then we say that subject A is more generous than subject C (in that experiment). When providing an answer to a question about whether women or men are more generous in our binary-choice context, we will compare the percentages of generous choices made by subjects of the two sexes. Conclusions about the relative generosity of males and females in multiple-choice contexts require use of measures such as mean amounts of money given to paired subjects.

#### Economic and Social Costs and Benefits of Generous Behavior

In many experiments involving generosity there are various types of costs of generous or ungenerous behavior. Generous behavior has a monetary cost. For example, in a dictator game the amount of money that the dictator allocates to the paired subject is the monetary cost of generosity. In our *binary* dictator games the monetary cost of the generous action, giving the other subject 37.5% of the total payoff, is varied by changing the dollar amount of the total payoff. A similar monetary cost treatment is also introduced in the trust game.

Monetary costs are not the only possible source of utility or disutility from choosing among more and less generous alternatives; if they were then all subjects would behave as the self-regarding or “economic man” model predicts by choosing the least generous alternative available. Generous behavior can increase utility if the decision-maker has altruistic preferences. Ungenerous behavior can decrease utility if the decision-maker experiences guilt or shame. For example, a person responding to a kind action of another person may feel guilt from acting ungenerously when he or she had the opportunity to repay the kind action with a generous response. We vary some possible effects of altruism and anticipated guilt on behavior in the experiment by including or excluding the possibility that the decision-maker is responding to a kind action by another person. Another possible source of disutility from ungenerous behavior is shame that may be experienced if others can observe one’s behavior. We vary some possible effects of anticipated shame on behavior by changing the level of social distance between the decision-makers and others, including the experimenters as observers.

#### Game Structure: Dictator and Trust Games

In some settings a person may wish to be generous because of reciprocal motives. Specifically, a previous action by another party that is kind or helpful may trigger a social norm making the decision-maker feel obliged to respond in a generous manner. If such a norm is



activated in the experimental environment, then ungenerous behavior becomes more costly and hence should be observed less frequently. Generous behavior could still be observed in the absence of such reciprocal motivations if the decision-maker has altruistic other-regarding preferences. To explore the increased level of generosity from reciprocity, two different extensive form games are included in this study. The games are shown in Figure 1. The number at a node indicates which player (or “mover”) makes a decision at that point in the game. The top number at an outcome is mover 1’s dollar payoff and the bottom number is mover 2’s dollar payoff. In the dictator games shown in the top part of Figure 1, mover 1 chooses between keeping all the money and keeping only 62.5% of the money while allocating the remaining 37.5% to the other player.<sup>8</sup> In the dictator game, generous behavior cannot be attributed to reciprocal motives because the other player has not taken (and cannot take) an action that benefits the decision-maker. In the trust game, shown in the bottom part of Figure 1, a decision-maker at node ② faces the same allocation decisions as in the dictator game at node ① if and only if the other player has *not* previously opted for an equal split of a smaller pie.<sup>9</sup> Because the only difference between the trust and dictator games for subjects choosing between the generous action ((7.5, 12.5) or (15, 25) depending on payoff level) and the ungenerous action ((0, 20) or (0, 40) depending on payoff level) is the presence or absence of the prior move by the paired subject, the difference between response rates in the two games provides a test for the significance of positive reciprocity as a motive for behavior in the trust game (Cox and Deck 2005).

#### Payoff Level: Low or High

The monetary component of the cost of generosity is the amount of money that an agent has to forego by choosing a generous action. As shown in Figure 1, the high payoff level has a

direct cost of \$15.00 for generosity while the cost in the low payoff level is \$7.50. Because a higher payoff level generates a greater cost, one should expect (weakly) less generous behavior in such an environment.

### Social Distance: Low or High

In our terminology, social distance refers to the degree of social separation between the decision-maker and other parties including the other player, the other subjects in the experiment, and the experimenters. Potential costs of not being generous include the decision-maker's belief about the perception that others have of him or her, how the decision-maker's interactions with people who have observed the decision are affected, and any emotional response such as shame or embarrassment felt by the decision-maker. The less social distance between the decision-maker and others, the greater the possible social cost associated with ungenerous behavior.

In all of our laboratory sessions subjects were anonymously matched with someone else in the lab and never learned the identity of their counterparts. Subjects in treatments with low social distance entered their names in their computers prior to making decisions. Hence, these subjects knew that their names were associated with their decisions. At the end of the experiment, these subjects were individually called by name and privately handed their earnings by the experimenter. In contrast, all personal identification of the decision-makers was eliminated in the high social distance treatments. Under the high social distance protocol, subjects drew unmarked sealed envelopes containing keys labeled with alphanumeric identification codes. These identification codes were the subjects' private information. Instead of entering their names in the computers, subjects entered these identification codes. At the conclusion of a high social distance session, subjects were escorted to a separate room where they could use their keys to open locked mailboxes that contained sealed envelopes with their

earnings. The experimenters were not present when the subjects opened their key envelopes, entered their identification codes, or retrieved their payoffs. This process was explained to the subjects in a handout that was read aloud to assure all subjects that no one would ever know the personal decision of any subject. The low social distance sessions always involved exactly twelve subjects. In contrast, high social distance sessions had between fourteen and twenty subjects, and thus a lower probability that any two specific subjects would be anonymously paired, thus further increasing the social distance above that in the low social distance protocol.

### Experimental Treatments

The experimental design includes five treatments that vary the economic and social costs of generosity. To identify a treatment we use R, for reciprocity, or D, for dictator, depending on the type of decision the second mover (in the trust game) or only mover (in the dictator game) is making. Also, we use a \$ superscript for high stakes payoffs or a \$ subscript for low stakes payoffs, and an S superscript for high social distance procedures or an S subscript for low social distance procedures. Table 1 lists all the treatments and the numbers of subject pairs that participated in each treatment.<sup>10</sup>

### Collecting Gender Data

In order to determine if gender influences the decision to be generous, one must be able to identify the sex of the decision-maker. In the low social distance protocol, gender data collection is trivial because payoffs are made face to face. However, under the high social distance protocol the experimenter only knows the alphanumeric code associated with a decision. Collection of gender data in this environment required supplementary procedures. After collecting their payoffs from mailboxes, subjects exited the mailbox room and deposited their keys in one of two appropriately labeled containers positioned on opposite sides of the hallway.

One container was labeled “Men’s Keys” and the other was labeled “Women’s Keys.” The experimenters watched from a distance to ensure that subjects dropped their coded keys in the appropriate containers. This viewing distance was sufficiently great so that the experimenters could not observe the key codes but could make sure the subjects approached the right containers. Subjects in both social distance environments were *not* informed prior to making their decisions that gender data would be recorded.

### III. EXPERIMENT RESULTS

The data on generosity consist of 128 choices between keeping all the money and allocating 37.5% of it to the other player.<sup>11</sup> The raw data are reported in Table 2.

Data reported by Brown-Kruse and Hummels (1993) and Cox (2002) suggest that men are more generous than women. However, data reported by Nowell and Tinker (1994), Eckel and Grossman (1998), Croson and Buchan (1999), and Chaudhuri and Gagadharan (2003) suggest the opposite. Based on the data reported in Table 2, there is no clear pattern of relative generosity by men and women. To explore these seemingly contradictory patterns, our analysis first focuses on the within-gender impact of varying the cost of generosity. Table 3 reports the results of pairwise tests of the null hypothesis that varying the cost of generosity has no impact on behavior versus the two-sided alternative that the costs do affect behavior. The figures above the diagonal are  $p$ -values for male test results and the figures below the diagonal are female test  $p$ -values.

The first striking feature in Table 3 is that for men the decision about whether to be generous does not depend on reciprocal considerations, the level of payoffs, or the social distance. As explained in Cox (2004) and Cox and Deck (2005), if reciprocity influences

behavior then there should be a significant difference in behavior between a trust game and the corresponding dictator game in the high social distance, low money payoff comparison ( $R_S^S$  vs.  $D_S^S$ ) or the low social distance, high money payoff comparison ( $R_S^L$  vs.  $D_S^L$ ) or both. For men, this is clearly not the case as the  $p$ -values are 0.457 and 0.999, respectively. Similarly, based on comparison of high payoff, high social distance ( $R^{SS}$ ) data with low payoff, high social distance ( $R_S^S$ ) data, changes in the level of monetary payoff do not significantly change the behavior of men ( $p$ -value = 0.35). Based on a comparison of high payoff, high social distance ( $R^{SS}$ ) data with high payoff, low social distance ( $R_S^L$ ) data, the level of social distance is also found not to influence the behavior of men ( $p$ -value = 0.682). In fact no combination of these factors strongly influences male behavior, as evidenced by the absence of significant  $p$ -values above the diagonal in Table 3.

Unlike men, women do base the decision of whether or not to be generous on the costs associated with the decision. Women are more likely to be generous when the stakes are lower, as evidenced in Table 3 by a  $p$ -value of 0.068 for a comparison of high payoff, high social distance ( $R^{SS}$ ) data with low payoff, high social distance ( $R_S^S$ ) data. Also, the frequency with which women are generous is inversely related to the social distance. This conclusion is supported by a  $p$ -value of 0.016 for a comparison of high payoff, low social distance ( $R_S^L$ ) data with high payoff, high social distance ( $R^{SS}$ ) data. With respect to reciprocity, the evidence is mixed. In the environment with low social distance and high payoffs, women do reciprocate: the  $p$ -value is 0.03 for a comparison of data from the trust game  $R_S^L$  with data from the dictator game

$D_s^S$ . However, when the levels of social distance and payoffs are reversed, women no longer reciprocate: the  $p$ -value is 0.87 for a comparison of data from  $R_s^S$  and with data from  $D_s^S$ .<sup>12</sup>

Additional econometric analysis also supports the conclusion that women are more responsive to the costs of generosity while the behavior of men can be described as cost-inelastic. A probit model, given by equation (1), is estimated treating the choice between generous and selfish options as a function of the level of the monetary payoffs, the opportunity to reciprocate, and the social distance in the experimental protocol. The estimating equation is

(1) Probability of Generous Behavior =

$$\Phi(\alpha + \beta_1\text{HP} + \beta_2\text{NR} + \beta_3\text{HSD} + \beta_4\text{F} + \beta_5\text{HPF} + \beta_6\text{NRF} + \beta_7\text{HSDF})$$

where  $\Phi$  denotes the cumulative density for the standard normal distribution.

In this specification HP and HSD are dummy variables that take on the value 1 for High Payoff and High Social Distance treatments, respectively, and 0 otherwise. NR is a dummy variable equal to one for the non-reciprocal environment of the dictator game. F is a dummy variable for gender that equals 1 for a female decision-maker and 0 for a male decision-maker. The terms HPF, NRF, and HSDF are interaction dummies that are the product of the female dummy variable F with the treatment dummy variables HP, NR, and HSD respectively. Table 4 reports the results of estimating equation (1) with the available data.

The estimation results imply that men do not alter their behavior in response to any of the experimental treatments while women clearly do. Formally, the hypothesis that  $\beta_1 = \beta_2 = \beta_3 = 0$  is not rejected at any standard confidence level based on a likelihood ratio test ( $LR$  test statistic = 2.37). Taking this finding into account, equation (2) is estimated.<sup>13</sup>

(2) Probability of Generous Behavior =  $\Phi(\alpha + \beta_4\text{F} + \beta_5\text{HPF} + \beta_6\text{NRF} + \beta_7\text{HSDF})$

The results of this estimation, also reported in Table 4, indicate that the behavior of female subjects conforms to the predictions of an economic model where the cost of generosity influences behavior. When the monetary cost associated with generosity increases, women become less generous:  $\beta_5 < 0$ . When the social cost of not reciprocating a kind action is eliminated, the rate of generous responses is reduced:  $\beta_6 < 0$ . When the level of social distance in the protocol is increased, the social cost of not being generous decreases and generous responses are observed less frequently:  $\beta_7 < 0$ .

Because male subjects do not react to the cost of generosity, their behavior is consistent with a model of behavior based solely on money payoffs, while women do tend to incorporate the cost of generosity into their decisions. Based upon these findings, it is not appropriate to talk about which gender is more generous without also specifying the cost of generosity. The positive and significant value of  $\beta_4$  should not be interpreted as indicating that women are generally more generous than men. Instead, the value of  $\beta_4$  should be interpreted as stating that when generosity is less costly ( $HP = NR = HSD = 0$ ) women tend to choose the generous response more frequently than men.

#### IV. FURTHER INVESTIGATION

In the high social distance treatment discussed above, subjects were from the same school, perhaps coming from the same classes. Those subjects entered the lab at the same time and waited together for the experiment to begin. Thus the subjects might have perceived some social connection with their counterparts, possibly lessening the degree of social distance. To address this concern, additional subjects played the low stakes versions of the trust game and the dictator game following the high social distance protocol detailed previously, but where

counterparts were located at different universities (the University of Arkansas and Indiana University) and had no contact with each other.<sup>14</sup>

The protocol for the geographically separated sessions was modified as follows. Subjects were informed by an experimenter that their counterparts were located in a lab at the other university; they were also informed of this feature in the directions and in the informed consent documentation.<sup>15</sup> The experiment was hand run; subjects were asked to complete a response form and return it in a sealed envelope. To implement the double blind payoff procedure, a monitor was randomly selected from among the subjects at each location. The role of the monitor is similar to that in Cox (2002; 2004). The monitor walked through the lab with a box full of identical large manila envelopes containing response forms and mailbox keys; subjects were allowed to take any one manila envelope from the box. After completing their response forms, subjects returned the forms to the manila envelopes and deposited the envelopes in the box at the front of the lab. After all envelopes had been returned, the monitor brought the box to another room for processing by the experimenters. The monitor also verified the e-mail communications between the two researchers reporting decisions in the two geographically separated laboratories. The subjects had been informed at the beginning of the experiment that they were free to ask the monitor any questions at any time about the procedures followed by the experimenter.

The results of these sessions are reported in Table 5. While nominally there is less generosity in the treatment with geographically-separated subjects, the difference is not significant for men or women in either game. Further, the increased physical distance does not change the previous conclusion that neither men nor women reciprocate with a high social distance protocol ( $p$ -values of 0.581 and 0.858 respectively). The geographical separation also



does not change the relative generosity of men and women as reported in Table 2. These results suggest that standard double blind payoff procedures are sufficient to create substantial social distance between subjects.

## V. DISCUSSION

This study finds that women are more responsive to the total economic and social costs of generous behavior than are men. Similar conclusions about the greater responsiveness of women to the decision context have been drawn by Cadsby and Maynes (1998) in the context of public goods games and Eckel and Grossman (1996) in the context of punishment games. Such responsiveness by women to the total economic and social costs of generosity may explain why previous studies have drawn different conclusions about whether men or women are more generous. For example, if the subset of data reported in this study in which low social distance and high payoff levels is considered, women would be found to reciprocate while men would be found not to reciprocate. If, instead, attention were restricted to the subset of data drawn from the low payoff and high social distance environment, then neither sex would be found to reciprocate. To ascertain if this finding does reconcile the seemingly inconsistent conclusions in previous studies, we examine the relationship between the experimental designs and results of those studies most similar to our own.

Eckel and Grossman (1998) find that women are more generous than men in a dictator game with high social distance and low payoffs, which is the same nominal pattern that we observed in our  $D_s^S$  treatment (see Table 2). However, using the results from our probit estimation, the null hypothesis that all of the “direct” and “crossed” female dummy variables are equal to zero ( $\beta_4 + \beta_6 + \beta_7 = 0$ ) cannot be rejected at standard significance levels in a two-tailed likelihood ratio test. The dictator games of Bolton and Katoc (1995) involved \$10 and employed

single blind payoff procedures. Hence, using our labeling of treatments, their design would be considered to be a (non-reciprocal) dictator game with low payoffs and low social distance ( $D_{SS}$ ). While we do not address this treatment directly, we would expect to see a higher rate of female generosity in their treatment than in either our high payoff, low social distance ( $D_S^{\$}$ ) or low payoff, high social distance ( $D_S^S$ ) treatment because lower stakes reduce the cost of generosity and lower social distance increases the social cost of ungenerous choices. It would *not* be surprising to observe the absence of a gender effect in  $D_{SS}$ , as reported by Eckel and Grossman, because there is none in our  $D_S^S$  or  $D_S^{\$}$  treatments. However the likelihood ratio test statistic for testing the null hypothesis that the sum of the dummy variables for “female” and “female & non-reciprocal game” equals 0 ( $\beta_4 + \beta_6 = 0$ ) is 3.33 which, has a  $p$ -value of 0.068. Chaudhuri and Gangadharan (2003) studied the investment game<sup>16</sup> using low payoffs and a single blind payoff (low social distance) protocol, an  $R_{SS}$  treatment. Based on our results, each of these features should increase the relative generosity of female subjects. Given that we found women to be more generous than men in the high payoff, low social distance ( $R_S^{\$}$ ) treatment (see Table 2), our results can explain their finding that women are more generous than men. This is also supported by the fact that the female dummy variable ( $\beta_4$ ) is significantly greater than 0 (see Table 4).

Our results seem to be at odds with data reported by Cox (2002), but a close look proves interesting. Using data from an experimental design involving the investment and dictator games, Cox (2002) reports that men reciprocate and women do not in a high social distance environment. In the investment game, the first mover could send any amount from his/her \$10 endowment, in whole dollar units, (weakly) between \$0 and \$10. Any amount sent was

multiplied by 3 by the experimenter. The second mover also was given a \$10 endowment and could return any of the tripled amount received to the first mover. Hence, *only if* the first mover sent all \$10 in the investment game did the second mover have \$40 to divide between the paired subjects. Also, *only in* case the first mover chose to send his/her entire \$10 endowment to the paired second mover was there the possibility that the first mover could end up with zero payoff as a result of the second mover's decision. In contrast, in the trust game with high payoffs shown in Figure 1, the second mover either has to choose "exit" (which corresponds to sending \$0 in the investment game) or choose "engage," which exposes him/her to the risk of ending up with \$0 while the second mover gets \$40 (which corresponds to sending all \$10 in the investment game). Interestingly, if one considers only the observations in Cox (2002) in which the first mover sent all \$10 to the second mover, then a pattern of behavior similar to our results for the high payoff, high social distance ( $R^{SS}$ ) treatment emerges.<sup>17</sup> Based on this subset of data, a Wilcoxon rank test rejects the hypotheses that either gender reciprocates at the 5% significance level. We also find that neither gender reciprocated in a high social distance context (see Table 3). This may suggest that *complete* trust elicits different responses due to emotions or social norms than does *partial* trust. However, a test of that is beyond the scope of this paper.

We cannot explain why Croson and Buchan (1999) find that women are more generous than men in an investment game experiment that can be characterized as high payoff, high social distance (corresponding to our  $R^{SS}$  treatment). It is possible that some aspect of their experimental protocol or perhaps the density of the message space affects males and females differently. Their study did not vary the level of payoffs, the opportunity to reciprocate, nor the level of social distance, so we cannot determine if the relative patterns of behavior in our experiment would hold in their environment.

The experiments reported in this paper examine some potential reasons for generous behavior such as shame (which may vary with the social distance in the protocol) and guilt (which may differ between trust and dictator games). However, this study does not address other motivations for generous behavior such as envy and compassion which could affect males and females differently. Similarly, the behavior may differ in repeated interactions where social norms and strategic concerns can differ. Thus additional research is needed to fully understand the conditions in which there are significant gender differences in generous behavior.

For example, in public goods experiments the results might not show the same absolute or relative levels of generosity by gender. However, one would expect the same pattern of comparative statics across treatments within a gender. While few gender studies have examined social distance, payoff levels, or reciprocity, there is at least one that did. Brown-Kruse and Hummels (1993) compare contributions to a public good across two levels of social distance. In one treatment, the groups are anonymously matched (corresponding to our low social distance treatment) while in a second treatment social distance is decreased as the group members interact prior to the decision task. This interaction is a deliberate attempt by the researchers to form a community relation among the decision-makers. In the first period, male behavior did not vary across treatments but females were more generous in the lower social distance community treatment, which is consistent with our findings.<sup>18</sup>

Andreoni and Vesterlund (2001) consider a variant of the dictator game in which a subject allocated tokens which could be redeemed for cash at a role-specific rate. By varying these exchange rates and the number of tokens, Andreoni and Vesterlund (2001) observed decisions across eight budget constraints. They concluded that men are more sensitive to variations in the price of altruism, which is implemented by varying the conversion rates

between a dictator's tokens and a recipient's tokens. Our experimental design does not address the type of price elasticity of altruism question that is addressed in the Andreoni and Vesterlund experiment because the own-payoff cost of transferring  $\$X$  ( $= \$7.50$  or  $\$15$ ) to the other subject is always  $\$X$  in all of our treatments. In contrast, a different feature of the Andreoni and Vesterlund experimental design is comparable to our design. This is the feature in which they vary the payoff level while holding constant the social distance and the (absence of) reciprocal motivation. Specifically, their budget #5 is similar to our low payoff, high social distance dictator game ( $D_s^s$ ) treatment and corresponds to the standard dictator game of dividing  $\$10$ . In this case they find no gender difference. Their budget #4 corresponds to a standard dictator game involving only  $\$6$ . In this case, they report that women are more generous than men. The gender difference between the budget #4 and #5 treatment effect is in the direction that is consistent with our results: their female subjects were more responsive than their male subjects to a change in payoff levels.

As noted above, the Andreoni and Vesterlund (2001) data indicate that men's responses in distribution experiments are more price elastic and women's responses are more income elastic. Our data also indicate that women's responses are more income elastic: women are more responsive to variations in the total cost of the generous response than are men. These results provide further support for the general conclusion that the relative responsiveness of males and females varies across treatments. That is, women are more responsive to some changes in the environment while men are more responsive to others.

## VI. CONCLUSION

This study reports the results of a series of experiments designed to explore gender differences in generosity. The results indicate that women tend to be more generous than men

when: (1) the social distance is low, (2) the total monetary cost of generosity is low, and/or (3) there is an absence of reciprocal motivation. Thus, depending on the decision context, women may appear to be more or less generous than men because men are relatively less responsive to changes in the total economic and social costs of generous behavior. This finding helps to explain why previous studies have drawn seemingly contradictory conclusions.

Of course, the motivations explored in this paper represent only a partial list of factors that could influence generosity. As this paper helps demonstrate, one should be cautious about drawing general conclusions about gender differences that are independent of decision context. For example, it is not the case that women are more generous in dictator games, irrespective of other aspects of the decision task. In this same vein, results that hold in controlled environments such as experimental laboratories may not hold in some non-laboratory environments. However, Laury and Taylor (2004) do report that laboratory behavior in a public good experiment predicts who will contribute to a naturally-occurring public good.

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#### Footnotes

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<sup>1</sup> A transcript of the January 2005 speech is available at <http://www.president.harvard.edu/speeches/2005/nber.html>.

<sup>2</sup> In both studies males are reported to be somewhat overconfident.

<sup>3</sup> The interview aired on December 15, 2004 as part of All Things Considered. The audio segment is available at <http://www.npr.org/templates/story/story.php?storyId=4229951>. A more detailed discussion can be found in Fischer (1999).

<sup>4</sup> For example, in an experiment on voluntary contributions to a public good, Brown-Kruse and Hummels (1993) find that men are more generous while Nowell and Tinker (1994) conclude the opposite. Cadsby and Maynes (1998) draw a third conclusion from a series of public good experiments: men and women are equally generous.

<sup>5</sup> See McCabe and Smith (2000) and Cox and Deck (2005) for studies that explore issues of reciprocity and cooperation using the trust game. The trust game itself is a binary version of the investment game of Berg, Dickhaut and McCabe (1995) which has also been widely used to explore trust and reciprocity.

<sup>6</sup> Potentially charged terms such as game, play, and generosity were not used with the subjects. For example, the game was referred to as a decision tree and players were referred to as decision-makers. Also, decisions were made by mouse clicks on unnamed branches.

<sup>7</sup> The directions and the quiz are available from the authors and online at <http://comp.uark.edu/~cdeck/expinfo.htm>.

<sup>8</sup> “Mover 2” has no decision to make in a dictator “game.”

<sup>9</sup> Since only one person makes a decision in the dictator game, the payoff order is the reverse of the order in the trust game where the same decision is faced by the second mover.

<sup>10</sup> Conducting experiments under all eight possible treatment combinations (a complete 2x2x2 design) is not necessary to identify primary treatment effects. In fact only four treatments are necessary, and the five treatments in Cox and Deck (2005) that were used to explore reciprocity and identify why behavior in  $R_S^S$  and  $R_S^S$  differed are sufficient to identify treatment effects in the present paper. Data for the other three treatments could, however, enrich the story as follows. For females: (1) would testing data for  $R^{SS}$  vs.  $D_{SS}$  look like  $R^{SS}$  vs.  $D_S^S$  or  $R^{SS}$  vs.  $D_S^S$ ; (2) would testing data for  $R^{SS}$  vs.  $R_{SS}$  add further support to the consistent conclusions from testing  $R^{SS}$  vs.  $R_S^S$  and  $R^{SS}$  vs.  $R_S^S$ ; and (3) would testing data for  $D^{SS}$  vs.  $D_{SS}$  show a significant effect? For males, would testing data for  $R_{SS}$ ,  $D_{SS}$ , and  $D^{SS}$  vs. data for the five treatments now reported yield any significant results?

<sup>11</sup> Some of these data, aggregated across gender, were previously reported in Cox and Deck (2005). Approximately half of the first movers in the trust game treatments chose to end the game by opting for an equal split of a smaller amount of money rather than giving the second movers the opportunity to act generously. Hence, the number of observations on generous behavior in the trust game treatments is approximately half the number of subject pairs in the treatment. The proportions of women who chose to engage the second mover in each treatment were as follows:  $R^{SS}$  (7/22);  $R_S^S$  (14/22);  $R_S^S$  (9/20). The proportions of men who chose to engage the second mover in each treatment were as follows:  $R^{SS}$  (13/26);  $R_S^S$  (7/20);  $R_S^S$  (17/31).

<sup>12</sup> A similar pattern is found in the first mover data mentioned in footnote 11. There is no treatment effect on male first movers in the trust game. Female first movers are more likely to engage the second mover in the low social distance treatment than in the high social distance

treatment (p-value = 0.0346). While females were nominally more likely to engage the second mover in the low payoff environment, this difference was not significant (p-value = 0.3796).

<sup>13</sup> In the remainder of the paper, references to the probit model and its parameters are to specification (2) in which  $\beta_1 = \beta_2 = \beta_3 = 0$  is imposed.

<sup>14</sup> These two treatments were selected because they are directly comparable to two of the treatments presented in Table 1.

<sup>15</sup> No subject questioned the existence of the subjects at the other location.

<sup>16</sup> The investment game (Berg, Dickhaut, and McCabe, 1995) is an extension of the trust game with a denser message space. In the investment game, a first and second mover are each endowed with \$10. The first mover can keep all of her \$10 or send any whole dollar amount to the paired second mover. Any amount sent is tripled by the experimenter. Finally, the second mover can keep all of any tripled amount received or return any whole dollar part of it to the paired first mover.

<sup>17</sup> These results are based on a relatively small sample size because only 13 observations in each of the games in Cox (2002) involved decisions where keeping \$40 was feasible.

<sup>18</sup> Subjects in Brown-Kruse and Hummels (1993) were in same sex groups and the decision task was repeated over several rounds.

## Captions and Notes for Figures

### FIGURE 1

#### Extensive Form Games Involving Cooperation

Notes:

- ① denotes the first mover's decision node and
- ② denotes the second mover's decision node.

Tables

TABLE 1  
Experimental Treatments

| Treatment     | Decision Type | Monetary Payoff | Social Distance | Number of Subject Pairs |
|---------------|---------------|-----------------|-----------------|-------------------------|
| $R_{\S}^S$    | Reciprocity   | Low             | High            | 51                      |
| $D_{\S}^S$    | Dictator      | Low             | High            | 37                      |
| $R_{\S}^{\$}$ | Reciprocity   | High            | Low             | 42                      |
| $D_{\S}^{\$}$ | Dictator      | High            | Low             | 24                      |
| $R^{\$\$}$    | Reciprocity   | High            | High            | 48                      |

Notes: As detailed in Cox and Deck (2005), the existence of reciprocity can be explored by comparing  $R_{\S}^S$  with  $D_{\S}^S$  or  $R_{\S}^{\$}$  with  $D_{\S}^{\$}$ . The effects of changing the monetary cost and social distance are directly measured by comparing  $R^{\$\$}$  with  $R_{\S}^S$  and  $R_{\S}^{\$}$ , respectively.

TABLE 2  
Across - Gender Comparisons of Generous Behavior

| Treatment  | Frequency of<br>Female Generosity | Frequency of<br>Male Generosity | Nominally More<br>Generous Gender |
|------------|-----------------------------------|---------------------------------|-----------------------------------|
| $R_s^S$    | 5/10                              | 4/16                            | Female                            |
| $D_s^S$    | 7/15                              | 8/22                            | Female                            |
| $R_s^{\$}$ | 6/9                               | 6/12                            | Female                            |
| $D_s^{\$}$ | 3/14                              | 5/10                            | Male                              |
| $R^{SS}$   | 1/8                               | 5/12                            | Male                              |

Notes: The numerator is the number of people who acted generously and the denominator is the total number of people who had the opportunity to behave generously.

TABLE 3  
Within Gender Treatment Effects

|         | Males    | $R_s^s$ | $D_s^s$ | $R_s^s$ | $D_s^s$ | $R^{ss}$ |
|---------|----------|---------|---------|---------|---------|----------|
| Females |          |         |         |         |         |          |
|         | $R_s^s$  | -       | 0.457   | 0.172   | 0.192   | 0.350    |
|         | $D_s^s$  | 0.870   | -       | 0.440   | 0.467   | 0.761    |
|         | $R_s^s$  | 0.462   | 0.341   | -       | 0.999   | 0.682    |
|         | $D_s^s$  | 0.143   | 0.153   | 0.030** | -       | 0.696    |
|         | $R^{ss}$ | 0.068*  | 0.074*  | 0.016** | 0.524   | -        |

Notes: The table entries are p-values associated with testing the null hypothesis that the proportion of subjects acting generously is identical in the two treatments being compared versus the two-sided alternative. Given the binary nature of the data, the analysis uses a z-statistic. \* indicates significance at the 10% level and \*\* indicates significance at the 5% level. Comparisons above the main diagonal are of male subjects while comparisons of female subjects are presented below the diagonal. The two treatments being compared are given by the row and column headings.



TABLE 4  
Probit Estimation

| Parameter                             | Equation (1) |                |         | Equation (2) |                |         |
|---------------------------------------|--------------|----------------|---------|--------------|----------------|---------|
|                                       | Estimate     | Standard Error | p-value | Estimate     | Standard Error | p-value |
| Intercept ( $\alpha$ )                | -0.4752      | 0.6136         | 0.4387  | -0.2822*     | 0.1499         | 0.0597  |
| High Payoff ( $\beta_1$ )             | 0.3859       | 0.4683         | 0.2049  | -            | -              | -       |
| Non-reciprocal ( $\beta_2$ )          | 0.1965       | 0.3376         | 0.2803  | -            | -              | -       |
| High Distance ( $\beta_3$ )           | -0.1211      | 0.4775         | 0.3999  | -            | -              | -       |
| Female ( $\beta_4$ )                  | 2.0102**     | 1.0165         | 0.0480  | 1.8172**     | 0.8240         | 0.0274  |
| High Payoff & Female ( $\beta_5$ )    | -1.8463**    | 0.8101         | 0.0113  | -1.4604**    | 0.6611         | 0.0136  |
| Non-reciprocal & Female ( $\beta_6$ ) | -0.7979*     | 0.5056         | 0.0573  | -0.6014*     | 0.3763         | 0.0550  |
| High Distance & Female ( $\beta_7$ )  | -1.1038*     | 0.8199         | 0.0891  | -1.2250**    | 0.6665         | 0.0330  |

Notes: The p-values reported for  $\alpha$  and  $\beta_4$  are for a null hypothesis that the coefficient is equal to zero versus the two sided alternative. For the remaining parameters the alternative hypothesis is that the value of the parameter is less than zero as the dummy has a value of one when the economic or social costs of ungenerous behavior are lower. \* indicates significance at the 10% level and \*\* indicates significance at the 5% level.

TABLE 5  
Effect of Geographical Separation on Frequency of Generosity

| Treatment | Female        |                     |         | Male          |                     |         |
|-----------|---------------|---------------------|---------|---------------|---------------------|---------|
|           | Same Location | Different Locations | p-value | Same Location | Different Locations | p-value |
| $R_s^S$   | 5/10          | 3/9                 | 0.463   | 4/16          | 2/12                | 0.595   |
| $D_s^S$   | 7/15          | 6/20                | 0.313   | 8/22          | 5/20                | 0.426   |

Notes: The p-values associated with testing the null hypothesis that the proportion of subjects of a particular gender acting generously is identical in the two geographical conditions being compared versus the two-sided alternative. Given the binary nature of the data, the analysis uses a z-statistic. As in table 2, bold entries denote a nominally greater rate of generosity by that gender in the given treatment.

