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Moral Hazard and Reciprocity

Marco Castillo* and Gregory Leo†

We investigate the motives behind reciprocal behavior by making selfish acts anonymous and not common knowledge. In one treatment, subjects were assigned to the role of proposer or responder and played a trust game with random matching for 20 rounds. In a second treatment, the modified game, the procedures were the same, but responders were allowed to choose with only 80% probability. With 20% probability, responders were restricted to keep any money passed. Only responders knew whether they were restricted or not. We find that the behavior of responders is different in this modified trust game. The fact that responders can hide selfish acts generates more selfish behavior. This in turn makes proposers less likely to pass money to responders, thereby destroying trust. We find important session effects in the standard trust game but less so in the modified game. Our experiments show that information conveyed in actions is important to subjects' decisions.

JEL Classification: C91, D82

1. Introduction

Since first introduced in the experimental literature, Berg, Dickhaut, and McCabe's (1995) investment game has consistently shown that people respond to kind actions with kind actions. The evidence that people trust and those entrusted tend to reciprocate generally holds across treatments and populations.[1] These results have been interpreted as evidence that positive reciprocity is an essential component of human behavior. However, there are concerns that evidence of reciprocity might be fragile (Cox and Deck 2005, 2006), sensitive to the experimental context (Levitt and List 2007), or an expression of reputational concerns (List 2006). This article investigates how the option to hide selfish behavior, or how moral hazard,

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* George Mason University, 4400 University Drive, MSN 1B2, Fairfax, VA 22030, USA; E-mail mcastil8@gmu.edu; corresponding author.

† University of California-Santa Barbara, 2127 N Hall, Santa Barbara, CA 93106, USA; E-mail gleo@umail.ucsb.edu.

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[1] Ortmann, Fitzgerald, and Boeing (2000) present results on investment games under several informational conditions. Burks, Carpenter, and Verhoogen (2003) show that trust holds, albeit less so, even when players play both roles. Croson and Buchan (1999) present evidence of trust in the United States, China, Japan, and Korea. Barr (2003) shows that trust diminishes with the variance on expected returns. Cardenas and Carpenter (2008) report several field experiments using the trust game. McCabe et al. (2001) show differences in brain imaging among those that reciprocate and those that do not. Bohnet et al. (2008) has also shown that trustors suffer from betrayal aversion, for example, fear of misplacing trust. Engle-Warnick and Slonim (2006) investigate behavior in indefinitely repeated versions of the trust game.

affects reciprocity. Moral hazard is an interesting case study because it should affect neither altruistic motives nor reciprocity but affects the information one's actions reveal.[2]

In the discrete trust game, Player 1 decides whether or not to pass an amount of money to Player 2. Any amount passed is increased by a factor larger than one. Player 2 decides whether to keep or share this increased amount of money. Not returning any money means that Player 1 earns nothing. The equilibrium of this game is for Player 2 to keep any money passed and for Player 1 not to pass any money at all. The observed behavior of Player 2 is puzzling because the decision is not strategic. Player 2 cannot influence game play because the game ends (in one-shot games) or subjects in the position of Player 2 face new proposers each time.[3]

We study a modified discrete trust game that randomly allows Player 2 to make a decision 80% of the time. Twenty percent of the time, Player 2 can only keep the money passed by Player 1, if any. While both players know of this possibility, only Player 2 knows whether it is taking effect or not. The new game prevents Player 1 from knowing whether Player 2's behavior to keep money is intentional or not.[4] Since the incentives in the modified trust game are similar to those of the standard trust game, equilibrium predictions are unaffected. Player 2's intentions are only important if he has concerns about the feelings of Player 1 or concerns about the image Player 1 forms of him.

Models of altruism and inequality aversion predict no change in behavior across treatments since Player 2 faces the same menu in both games. Guilt aversion predicts no variation across treatments because guilt is not dependent on others knowing the commission of an act. Reciprocity predicts that Player 2 must be more inclined to reciprocate in the modified game since Player 1 takes an extra risk on passing money to Player 2 in this game. The probability that Player 2 passes money back can decrease if Player 2 cares for Player 1's feelings of betrayal or if Player 2 cares about the beliefs others have of himself. For instance, Charness and Dufwenberg (2006) show that reductions in reciprocity can be self-fulfilling: If increased anonymity reduces the expectation of reciprocity then it is easier not to reciprocate.

Our results show that subjects in the role of Player 2 do not increase the frequency of returned money in the modified game. If anything, the evidence is consistent with a shift towards more selfish behavior. This, in turn, produces a significant decline in the amount of money passed by subjects in the role of Player 1 in the modified game. The standard game presents an increase in selfish actions as the game progresses. This suggests that reputational concerns are at play (Camerer and Weigelt 1988). The fact that the modified game produces more selfish behavior suggests that actions carry meaning, and that models with interdependent preferences (Levine 1998) or models where individuals derive utility from beliefs are important.

Despite the fact that the behavior of players is affected by the level of anonymity of their actions, our results also show that trust and reciprocity persist. Behavior of subjects in the role of Player 2 in both games converges to a level of reciprocity significantly above zero.

Research on reciprocal motives and fairness concentrates on the consequences of menus available to first movers on second movers' behavior (Kagel, Kim, and Moser 1996; Brandts and Solà 2001; Charness and Rabin 2002; Falk, Fehr, and Fischbacher 2003; Cox and Deck 2005). Our article studies second movers' behavior instead by directly manipulating their

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[2] People might not like to be perceived as selfish or might want to minimize the feelings of betrayal imposed on others.

[3] In repeated interaction conditions with adverse selection, Camerer and Weigelt (1988) have shown that reputational equilibria emerge. Neral and Ochs (1992) present evidence contradicting the qualitative predictions of a reputational model.

[4] This might also increase a sense of anonymity between subjects and the experimenter.

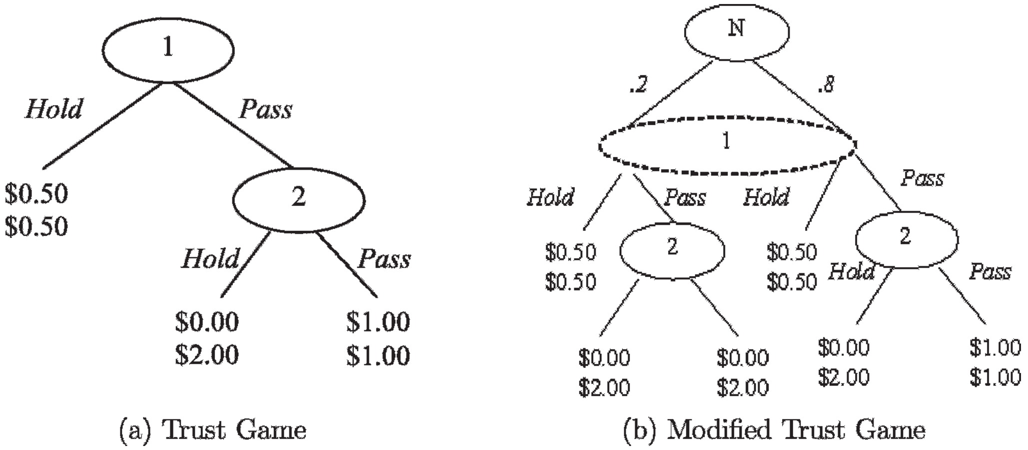


Figure 1. Games

menus.[5] We believe that studying the robustness of second movers' behavior to available menus is important. Our study shows that the meaning of one's behavior is important to first as well as second movers. Indeed, simple introspection suggests that second movers might act upon concerns of the image they portray (to their partner or the experimenter) or about the feelings of proposers whose trust is betrayed (Bohnet et al. 2008).

The article is organized as follows. Section 2 presents the modified trust game and how it relates to theories of behavior in games. Section 3 describes the experiment and protocols. Section 4 presents the main results, and section 5 concludes.

2. Theory and Hypotheses

Figure 1 illustrates the games used in the experiments. Figure 1a presents a standard trust game. Player 1 chooses either to keep the original endowment of $0.50 or to send it to Player 2. The $0.50 is multiplied by three before reaching Player 2.[6] Player 2 has to decide whether to keep the received $1.50 or to return 2/3, $1.00, of it. The payoffs if Player 2 keeps the money are $0.00 for Player 1 and $2.00 for Player 2. If $1.00 is returned, both players earn $1.00. This version of the trust game is special in that Player 2 has to decide between passing back 2/3 of the money received or nothing at all. Most evidence on trust games shows that subjects tend to return just enough to make Player 1 break even. We do not view this is as a disadvantage of the design since it will allow us to see Player 2's behavior when nonselfish behavior is costly.

Figure 1b illustrates a modified version of the trust game. The main difference between the standard trust game and ours is that Nature randomly chooses whether Player 2 will be able to respond to Player 1. In particular, only 80% of the time is Player 2 allowed to respond to Player 1. Another important feature of the modified trust game is that Player 1 is unaware of whether

[5] Andreoni, Castillo, and Petrie (2003) show that much can be learned about responders' preferences by manipulating the menus available to them.

[6] Player 2 also starts with an endowment of $0.50.

the decision to hold was made by Nature or Player 2. Only decisions to pass reveal that Player 2 could choose and that he chose to return.[7] Finally, it is not irrelevant whether Player 2 cannot choose or Player 2's decision is reversed. In the second case, the implicit cost of reciprocity is affected.[8]

The unique equilibrium of both the standard and modified game is the same: Player 2 keeps any money received, and Player 1 never sends money to Player 2. The prediction for the standard game has been contradicted many times, and there are many theories explaining it. First, subjects in the role of Player 2 might have altruistic preferences or have aversion to inequality (Bolton and Ockenfels 2000; Fehr and Schmidt 1999; Cox 2004). If so, lopsided payoffs of \$2.00 for oneself and \$0.00 for the other might be less attractive than equal payoffs of \$1.00. Second, subjects in the role of Player 2 might have reciprocal preferences (Rabin 1993). Player 1 risks losing money each time he passes money to Player 2. Player 2 might therefore feel obliged to return the favor.

In the modified game, the predictions of consequentialist theories of behavior differ from theories allowing reciprocal motives, procedural rationality, or intentions. For instance, altruism and inequality aversion predict that behavior of subjects in the role of Player 2 will remain the same across games. This is so because, conditional on being able to choose, Player 2 faces the same consequences in both games. A consequence of these theories is a deterioration of trust since Player 1 now faces lower expected rates of return. However, the added risk faced by Player 1 makes the act of passing money all the more commendable. Theories of reciprocity would then imply that Player 2 would tend to pass money back more frequently (Cox, Friedman, and Sadiraj 2008).

Players might be betrayal averse (Bohnet et al. 2008) and therefore guilt averse (Charness and Dufwenberg 2006). In this case, Player 2 might decide not to pass money back, since subjects in the role of Player 1 will not know whether Player 2 or Nature chose to hold. That is, Player 2 might save Player 1 the disutility of knowing that his trust was betrayed. It is also possible that guilt considerations produce a multiplier effect since guilt is expected to decrease the more Player 2 believes Player 1 believes betrayal will occur (Charness and Dufwenberg 2006). This theory suggests that an opposite result will occur where guilt aversion produces higher levels of reciprocity in the modified game.[9]

Finally, behavior of responders might depend on their capacity to signal their own preferences (Benabou and Tirole 2006; Andreoni and Bernheim 2009). Unobservable selfish behavior reduces the cost of misconduct on reputation and might hurt reciprocity. Importantly, signaling theories predict that unobservable good actions might also hurt reciprocity by lowering the returns to being nice.[10]

[7] The decision by responders can be equated to that of a proposer in the dictator game (Cox 2004). The decisions of responders in our game are then identical to those of dictators in Andreoni and Bernheim (2009).

[8] We have collected pilot data on an investment game in which Nature moves after a decision by the responder has been made. We found that responders tried to compensate for Nature's actions by slightly increasing the amounts returned.

[9] If Player 1 believes that Player 2 will be more likely to reciprocate, Player 2 will feel more guilty when acting selfishly. Charness and Dufwenberg (2006) show that preplay cheap talk can produce this kind of effect and support partnerships through manipulation of expectations. By reducing the expectation of reciprocity, the intervention of nature in this game could have the opposite result.

[10] These theories have testable implications in other games. For instance in an ultimatum game, preventing proposers from knowing whether rejections or acceptances of offers are chosen or not might increase acceptance of unfair actions and therefore increase the frequency of equilibrium play. This might also explain the differences in behavior between the market and the laboratory.

3. Experimental Design and Procedures

Our data were collected at the Georgia Institute of Technology. Subjects were volunteers from undergraduate economics classes. A total of 160 subjects participated in the experiment, 90 in the standard trust game and 70 in the modified trust game. Each session of the experiment lasted about 45 minutes. Subjects earned on average $16.50 (standard deviation $7.60) plus a $6 show-up fee. Georgia Tech is primarily an engineering school, and the average number of men in a session was 73%.

Two sessions of the experiment had 14 subjects per treatment, two sessions had 16 subjects per treatment, and five sessions had 20 per treatment. Subjects were assigned one role, Player 1 or Player 2, which they kept throughout the experiment. They played 20 rounds of the trust game. Each round was played with a randomly chosen anonymous partner. Subjects never knew which person they were playing with and were guaranteed that their behavior was not going to be revealed to any other player. They were paid in cash at the end of the study by a person not involved in the calculation of payoffs or preparation of payment envelopes.

In each game, Player 1 decides whether to hold $0.50 or to pass it to Player 2. Player 2 receives three times that amount, $1.50, and decides whether to keep it all or return $1.00 and keep $0.50. The experiments are based on the strategy method; that is, Player 2 has to decide what to do *in the event that* $1.50 is received. In the modified trust game, Player 2 can only choose to return money if Nature chooses to do so. Nature allows Player 2 to choose with probability 0.8. If Nature does not allow Player 2 to return money, Player 2 has to keep any money sent by Player 1. While both Player 1 and Player 2 know that the decision of Player 2 could be decided by the computer, only Player 2 knows if this is the case. With this one exception, the two games were identical. All of the parameters of the experiment were known to all subjects. The actual decision screen for responders is shown in Figure 2.[11] In the case that Nature does not allow responders to decide, responders were forced to choose one of two identical decisions to insure that their behavior in the lab was similar to those making real choices.

The payoff structure of the trust and modified trust game is taken from Engle-Warnick and Slonim (2006). While this presentation of the game is restrictive, we consider it provides a simple environment in which to test the effect of privacy on decisions.

Before the experiment started, subjects were randomly assigned to rooms or treatments. Due to absenteeism, only one of all sessions failed to follow this protocol. In this case the treatment used was decided by flipping a coin. Subjects were assigned seats and identification numbers at random, and names were never recorded.[12] All interactions took place on a computer network, and each subject sat far apart from one other.[13] The monitor read the instructions out loud to the subjects, and subjects were taken through several examples of how payoffs were calculated. All the procedures were made clear to subjects at the beginning of the session including the care in protecting anonymity. Full instructions for the games are available from the authors.[14] After the 20 rounds of play, subjects were asked to fill out an online questionnaire while payments were prepared by an experimenter not present in the session.

[11] Roles were identified by a color, blue for senders and red for receivers. This was done to increase the neutrality of each of the roles.

[12] This was done to further protect subjects' anonymity.

[13] All the experiments used z-tree (Fischbacher 2007).

[14] Go to mason.gmu.edu/~mcastil8/Int_n.pdf and mason.gmu.edu/~mcastil8/Int_s.pdf.

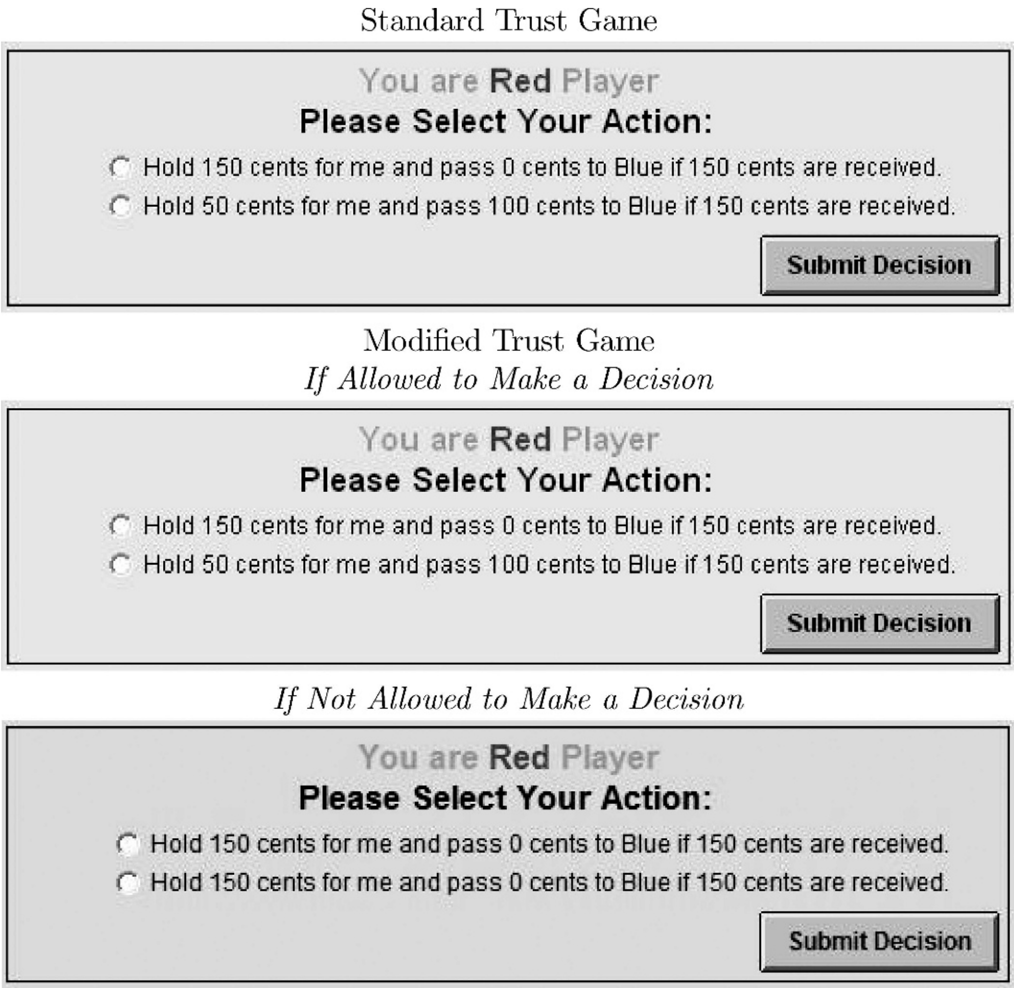


Figure 2. Decision Screen for Responders in Standard and Modified Games

Subjects were then handed their payment envelopes by an experimenter also not involved in their preparation. Subjects then checked their payments and were allowed to leave.

Payoff in each iteration of the game can add either \$1.00 or \$2.00. Thus, over the 20 iterations, subjects decided over the division of \$40. Subjects also earned a \$6 show-up fee.

4. Results

This section presents descriptive statistics and regression analysis on decisions made by Player 1 and Player 2.

Basic Results

Table 1 reports the summary statistics of the experiments. Subjects in the role of Player 1 in the standard game passed around 63% of the time, and subjects in the role of Player 2 passed

Table 1. Basic Results (Percent Choosing Pass (SD))

	Obs	Player 1	Obs	Player 2
Standard game				
Total	900	63.43 (48.20)	900	47.14 (49.96)
Session 1	140	56.43 (49.76)	140	50.71 (50.17)
Session 2	160	84.38 (36.42)	160	65.00 (47.85)
Session 3	200	72.00 (45.01)	200	38.00 (48.66)
Session 4	200	52.50 (50.06)	200	31.50 (46.57)
Session 5	200	62.50 (48.53)	200	46.00 (49.96)
Modified game				
Total	700	50.29 (50.03)	565	43.72 (49.65)
Session 1	140	51.43 (50.16)	114	43.86 (49.84)
Session 2	160	65.63 (47.65)	132	45.45 (49.98)
Session 4	200	43.00 (49.63)	151	33.11 (47.21)
Session 5	200	44.50 (49.82)	168	51.79 (50.12)
Across games comparisons *t*-test (*p*-value)				
Total		6.0947 (0.0000)		0.5226 (0.6013)

slightly above 47% of the time. Player 1, in the modified game, passed around 50% of the time, and Player 2 passed around 44% of the time conditional on being able to choose. The difference in behavior of Player 1 across games is statistically significant, while the behavior of Player 2 is not.[15] This seems to explain the difference in behavior by Player 1. The lack of reaction on the side of Player 2 across treatments contradicts reciprocity as a driving force behind the behavior of Player 2. This result is consistent with those obtained by Cox and Deck (2005). Table 1 shows important variation across sessions in both the standard and modified trust games. These differences are stronger in the standard game.

Camerer and Weigelt (1988) present evidence consistent with reputation building in a repeated trust game with adverse selection. Our game is one with unobserved actions rather than unobserved types, but more importantly, matching is random.[16] Random matching should make reputational considerations irrelevant. However, Mailath and Samuelson (2006) show that reputation building is possible in infinitely repeated games with moral hazard.[17] But, if reputational effects were in action, this would require that Player 2 in the modified game reciprocates more frequently than in the standard game. That is, if Player 2 wishes to create a good reputation in the modified game, he needs to reciprocate more frequently. We do not observe this behavior on average but will explore it in more detail below. If subjects balance the costs and benefits of sustaining a reputation, we should expect that the probability of rematching will affect play. Finally, theories explaining audience effects, which are also based on signaling arguments, suggest that any increase in anonymity will decrease the level of reciprocity. The next two sections investigate individual behavior more in detail and the reasons behind the apparent lack of treatment effects in the aggregate data.

[15] Results that acknowledge the lack of independence across decisions will be presented below.

[16] The experiment used the *absolute strangers* option available in z-tree. This option maximizes the number of rounds that elapse between two players' interactions. Subjects were aware that pairing was random and that two subjects would never interact in two consecutive rounds.

[17] Duffy and Ochs (2009) test this hypothesis in the case of the Prisoner's dilemma game with imperfect public monitoring and find little support for it.

Table 2. Probit on Decision to Pass by Player 1

Variables	(1)	(2)	(3)	(4)	(5)
Treatment	0.714 (0.312)	−0.447 (0.007)	−0.458 (0.005)	−0.574 (0.623)	−0.574 (0.623)
Period	−0.030 (0.000)	−0.031 (0.000)	−0.031 (0.000)	−0.031 (0.000)	−0.031 (0.000)
Period × treatment	−0.062 (0.111)				0.006 (0.921)
Size			−0.032 (0.302)	−0.035 (0.424)	−0.035 (0.424)
Size × treatment				0.006 (0.921)	
Proportion of men in session		−1.862 (0.008)	−1.746 (0.019)	−1.770 (0.029)	−1.769 (0.029)
Male		0.176 (0.347)	0.190 (0.311)	0.188 (0.311)	0.188 (0.311)
Constant	0.720 (0.000)	1.992 (0.000)	2.495 (0.000)	2.564 (0.010)	2.564 (0.010)
log-likelihood	−1045.7	−1030.8	−1027.8	−1027.8	−1027.8
N	1600	1600	1600	1600	1600

p-values in parentheses. Clustered errors by individual (80 clusters).

Individual Behavior

This section investigates the evolution of play across games and across roles. Table 2 presents a series of regressions on the decision of Player 1 to pass money to Player 2. All the regressions allow for correlation in decisions at the individual level. Due to the variation in size and composition of sessions, all the regressions have controls on these variables. Size is the number of participants in the session, and proportion of men is the proportion of men in the session other than the subject himself. Table 2 shows that behavior of Player 1 is different in the modified game (variable "Treatment" in Table 2). Player 1 tends to pass less frequently in the modified game. Regressions 4 and 5 in Table 2, however, indicate that the effect of treatment cannot be identified independently of the effect of size. Importantly, the gender composition of the room seems to have a more robust impact on the behavior of Player 1 than any other variable.

Table 3 reproduces the analysis of Table 2 for Player 2's decisions. As with Player 1, Player 2 reduces the frequency with which he passes money as the game progresses. Table 3 shows that the behavior of Player 2 is affected by size of the session and the proportion of men in the session. Both these variables have a negative effect on the behavior of Player 2. Table 3 shows that the behavior of Player 2 is affected by the ability to hide behavior. Regression analysis shows that this effect is conditional.

Table 3 also confirms that the behavior of Player 2 is strategic. Similarly, subjects react to the gender composition of the room. The experiment was not designed to test whether the size of the session had any effect on the level of trust and reciprocity. The effect of size might reflect a selection effect rather than treatment. For instance, larger sessions might be composed of subjects needing cash. While this might explain the behavior of subjects in the role of Player 2, it would also predict a similar effect in the behavior of subjects in the role of Player 1. We do not see that. Since subjects were randomly assigned to rooms, we would expect that selection effects manifest in the behavior of all subjects.

Figure 3 presents the distribution of individual return rates. An individual return rate is simply the number of times a responder chose to pass back over the number of possible choices. The rates are grouped in 20% intervals to make the patterns of behavior clear and to be able to conduct statistical tests. Figure 3a compares the distribution of return rates across treatments

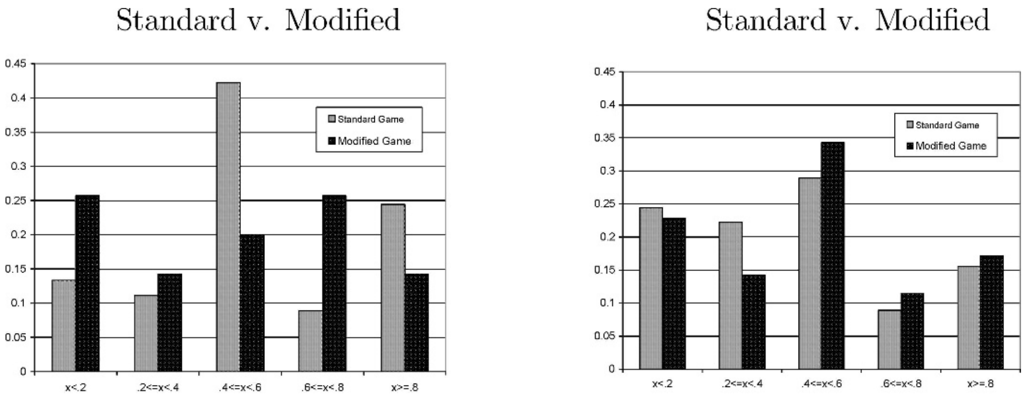
Table 3. Probit on Decision to Pass by Player 2

Variables	(1)	(2)	(3)	(4)	(5)
Treatment	0.061 (0.936)	−0.078 (0.623)	−0.097 (0.550)	−2.226 (0.045)	−2.226 (0.045)
Period	−0.022 (0.001)	−0.022 (0.001)	−0.022 (0.001)	−0.022 (0.001)	−.022 (0.001)
Period × treatment	−0.005 (0.905)				0.120 (0.056)
Size			−0.045 (0.153)	−0.091 (0.028)	−0.091 (0.028)
Size × treatment				0.117 (0.056)	
Proportion of men in session		−1.324 (0.051)	−1.186 (0.078)	−1.530 (0.022)	−1.530 (0.022)
Male		0.048 (0.776)	0.049 (0.773)	0.010 (0.955)	0.010 (0.955)
Constant	0.106 (0.392)	1.054 (0.061)	1.772 (0.020)	2.195 (0.002)	2.195 (0.002)
log-likelihood	−999.3	−988.5	−982.1	−974.7	−974.7
N	1465	1465	1465	1465	1465

p-values in parentheses. Clustered errors by individual (80 clusters).

for the first 10 rounds of play. There is a stark difference in the distribution of behavior of responders across treatments. This difference is statistically significant ($\chi^2(4) = 9.21$, *p*-value = 0.06). The distribution of return rates in the modified game shifts to the left. Figure 3b shows that the differences in behavior disappear as the game progresses. We do not find statistical differences in the behavior of responders over the last 10 rounds of play ($\chi^2(4) = 1.02$, *p*-value = 0.91). The results in Figure 3a are consistent with subjects having different motivations behind their behavior. Some subjects opt to pass less frequently to Player 1, while some other subjects opt to pass to Player 1 more frequently. Importantly, Figure 3 shows that regardless of the treatment and the version of the game, over half of the subjects have a rate of return above 50%.

Overall, this section shows that the ability of responders to hide selfish behavior is detrimental to reciprocity and trust. It provides evidence that the signaling ability of actions affects behavior. However, the evidence shows that despite the added opportunities to behave selfishly, a considerable amount of nonselfish behavior remains.



a. First 10 Round b. Last 10 Rounds

Figure 3. Distribution of Individual Return Rates

5. Conclusions

Why do people reciprocate? In an attempt to answer this question, we investigate the behavior of second movers in the trust game when they can hide selfish behavior from first movers. This simple modification allows us to distinguish how much of the behavior consistent with reciprocal preferences is indeed due to reciprocity. We find that when second movers are allowed to hide their actions, a reduction in reciprocal behavior is observed. While the magnitude of the effect is important, we observe that reciprocal behavior still remains significant across games.

We consider our approach to be promising because it directly studies the behavior of second movers by altering their choice set. This approach then permits us to observe behavior that is not consistent with either inequality aversion, reciprocity, or guilt aversion. However, it is consistent with caring about others and caring what others think of them. The evidence suggests that the signaling power of actions affects behavior.

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