

Trust and Reciprocity in an Endogenous Social Context

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Abstract

BERG, DICKHAUT, AND MCCABE [1] were the first to study experimentally the “investment game” or “trust game,” and demonstrated that behavior in the lab was inconsistent with the subgame-perfect equilibrium outcome under the assumption that subjects care only about their own monetary outcomes. To investigate the hypothesis that social norms influence behavior, they considered a treatment in which subjects were told information about how previous subjects had played the game. We revisit the idea that relative trust matters by introducing a variation on the trust game in which two subjects each act as trustors with the same trustee. We find evidence that this competition does increase levels of trust, as well as earnings for the trustor. However, we find that the trustor who does succeed in establishing himself as more trusting than another trustor does not profit from this; in fact, on average, trustors who are less trusting walk away from the experiment with higher earnings.

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1 Introduction

BERG, DICKHAUT, AND MCCABE [1] introduced the “investment game” or “trust game” as a vehicle for investigating the role of trust and trustworthiness in the context of economic exchange. In their original implementation, two subjects are paired anonymously by the experimenter. They are seated in separate rooms, never see each other, and interact solely through decisions placed in a locked mailbox in a double-blind experiment. One subject, the trustor, is given an amount of money by the experimenter. The trustor can choose to send all, part, or none of his endowment

to his counterpart, the trustee, with whom he has been paired. Any amount sent is trebled by the experimenter before being given to the trustee. The trustee then can choose to return any part of the trebled amount to the trustor, and keeps the rest for himself. At this point, the interaction ends. Both subjects are aware of the structure of the game before making their choices.

In this game, the unique subgame perfect equilibrium, under the assumption that individuals care only about their own monetary payoffs, is for the trustor to send zero dollars to the trustee, and for the trustee never to return any money if any is sent. Berg et al find, on the contrary, that most trustors do send money, and most trustees do return at least a part of the money that is sent, even though the interaction is anonymous, and, because of the double-blind protocol, even the experimenters do not know the choices made by the subjects. This experiment can be taken as the first clean laboratory demonstration suggesting that trust and trustworthiness are operative concepts in how people formulate economic decisions. A significant literature has developed studying trusting, trustworthy, and other-regarding behaviors in the investment game.¹

In this paper, we focus on reciprocity as a motivating concept underlying the results Berg et al report. When reciprocity is an operational principle in decision-making, perceived kindness is met with kindness and perceived unkindness is met with unkindness (e.g., FALK ET AL [2]). In applying reciprocity, perceptions matter; an act which one person considers kind need not be considered kind by another, and an action which may be kind in one setting may seem unkind in another. When interacting in daily life in the field, contextual clues ranging from social customs to body language can help a decision-maker infer the extent to which an action is kind. In a double-blind laboratory experiment playing a highly stylized game, determining the kindness of an action is more problematic. Sending five dollars could be construed either as kind or unkind.

Berg et al addressed this issue in part by implementing a “social history” treatment. In a second round of investment game experiments, subjects were first given summary information about how the previous groups had played the game. They found that this influenced the distribution of amounts sent. In their no history treatment, they found the amounts sent were not distinguishable from the uniform distribution, suggesting that, in the absence of clear guidance on how to play the game appropriately, trustors played more or less randomly. With the social history, trustor decisions exhibited greater dispersion. This is consistent with a hypothesis that at least some trustors systematically responded to the information, with many choosing to increase the amounts sent in order to appear to be more trusting than the historical average. They found that trustors earned more in the social history treatment, which was driven almost exclusively by greater amounts returned by trustees to trustors.

The social history treatment only offers an indirect view into the nature of reciprocity, insofar

¹Brief literature survey with appropriate citations is to be written. We implicitly acknowledge the extensive work of many researchers in this area in this preliminary draft.

as trustors are framed as “competing” against the fixed, exogenously-given standard of previous behavior. The treatment is unable to directly measure competition on kindness or trusting behavior, nor how a given trustee responds when trusted in different amounts by two competing trustees. To investigate the possibility of differential responses to endogenously-determined levels of trusting behavior, we consider a design in which two trustors simultaneously send amounts to the same trustees. We find that trustees do send more back to trustors who exhibit higher levels of trust. However, the amounts sent back to the more trusting trustor do not fully compensate his trust; in fact, we find that the less trusting trustor in a pair earns, on average, more than the more trusting trustor. While competition for trust does increase levels of trust overall, being trust, in and of itself, does not remunerate.

The rest of the paper is organized as follows. Section 2 describes the experimental protocol, with detailed descriptions of how we imitated the spirit of the original Berg et al “mailbox” protocol to maintain double-blindness. Section 3 presents the data and main results. Section 4 concludes with a brief discussion.

2 Design

2.1 Control treatment: the original investment game

We will refer to the original single-investor game as game S . Following Berg et al.’s convention, one player will be called the *trustor* and the other the *trustee*. The players never meet, see, or communicate with each other throughout the course of the game or immediately afterwards. Furthermore, each player has complete and perfect information regarding the structure of the game. Each of the players begins the game with \$7.50, given to them by the experimenters. The trustor is then given the opportunity to send some, none, or all of his or her endowment to the trustee. Suppose the trustor sends a . Formally, the trustor chooses the action

$$a \in A = \{0.00, 0.50, 1.00, \dots, 7.00, 7.50\}.$$

The amount sent by the trustor is tripled by the experimenters, so the trustee receives $3a$. The more money the trustor sends, the more he or she is said to place trust” in the trustee.

The trustee is then given the opportunity to send some, none, or all of the amount received, $3a$, back to the trustor. Note that the trustee cannot send any amount back in excess of what was received, $3a$; that is, the trustee cannot send his or her initial endowment of \$7.50 or any portion of it. Define

$$\Theta = \{0.00, 0.50, 1.00, \dots, 22.00, 22.50\}.$$

Then, the trustee chooses action

$$k \in \{\theta \in \Theta : \theta \leq 3a\}.$$

This time, the experimenters do not modify the amount received by the trustor, such that the trustor receives exactly what was sent, k . After the trustor receives whatever the trustee sent, the game ends. The earnings of the trustor are $7.50 - a + k$, and the earnings of the trustee are $7.50 + 3a - k$.

2.2 Experimental treatment: Multiple investors

The multiple-investor variant of the investment game will be referred to as game M . As in game S the players never meet, see, or communicate with one another during or after the game, and the players have complete and perfect information regarding the game's structure. Each of the players begins the game with \$7.50, given to them by the experimenters. Each of the trustors is then given the opportunity to send some, all, or none of his or her endowment to the trustee. Suppose the first trustor, trustor 1, sends a and the second trustor, trustor 2, sends b , where

$$b \in B = \{0.00, 0.50, 1.00, \dots, 7.00, 7.50\}.$$

The amount sent by each trustor is then tripled by the experimenters, such that the trustee receives $3a + 3b$. The trustor can discern which trustee sent which amount and to what that amount was tripled; furthermore, the trustees know this. Similar to before, the more money the trustor sends, the more he or she is said to place trust" in the trustee.

The trustee is then given the opportunity to send some, all, or none of the amount he or she received back to the trustors. As before, the trustee cannot send in excess of what he or she receives; that is, he or she cannot send his or her initial endowment, or any part thereof. The trustee can freely decide how to allocate the amount he or she received between the two trustors and him- or herself. In no way is the trustee constrained, except that the allocation must sum to $3(a + b)$. Let

$$\Omega = \{0.00, 0.50, 1.00, \dots, 44.50, 45.00\}.$$

Suppose the trustee sends x to trustor 1 and y to trustor 2, where

$$\begin{aligned} x &\in \{\omega \in \Omega : \omega \leq 3(a + b)\} \\ y &\in \{\omega \in \Omega : \omega \leq 3(a + b)\} \\ x + y &\leq 3(a + b). \end{aligned}$$

As before, the amount sent to each trustor is equal to the amount received by each trustor. After the trustors 1 and 2 receive what their trustee sent, x and y respectively, the game ends. The earnings of

trustor 1 are $7.50 - a + x$, the earnings of trustor 2 are $7.50 - b + y$, and the earnings of the trustee are $7.50 + 3(a + b) - x - y$.

2.3 Protocol

In keeping with the tradition in the literature, sessions were run using a variant of the “mailbox” procedure from Berg et al. The sessions took place at the Memorial Student Center at Texas A&M University, which has a hotel wing with a hall of standard guest rooms which have been converted to conference rooms. The protocol employed a total of four rooms for sessions with game S , and five rooms for sessions with game M . In both treatments, subjects were received in a check-in room, and were directed to one of two (for game S) or three (for game M) rooms. At check-in time, rooms were identified by room numbers, and not the letters subsequently used in the instructions.

Each room corresponded to one role in the game. In place of the mailbox system, subjects went one by one into the remaining room, and made their decisions in private using a simple computer interface. The computer interface explicitly stated earnings consequences of choices not only for the participant, but also for his counterpart(s). In particular, when trustees made their allocations, their earnings from any choice, as well as the earnings of the trustor(s), were all displayed on the screen.

All sessions lasted between 45 minutes and an hour. The control treatment was run over the course of three sessions. The first session, on March 27, 2007, had 14 participants. The second session, also on March 27, had 16 participants. The third session was on March 30, 2007 and had 12 participants. The experimental treatment was run over the course of five sessions. The sessions were held March 20, the afternoon of March 22, the evening of March 22, March 23, and March 29, 2007. The sessions had, respectively, 15, 12, 15, 12, and 12 participants.

The Beginning of the Session As participants arrived, they were registered in the cashier room, where they drew a numbered chip from a bowl. For the control treatment, the first to arrive was sent to room A, the second was sent to room B, and so on, in an alternating pattern. Room A consisted of the trustors and room B consisted of the trustees. For the experimental treatment, the first to arrive was sent to room A, the second was sent to room B, the third was sent to room C, and so on. Rooms A and B consisted of the trustors and room C consisted of the trustees. The participants were simply directed to room numbers, as opposed to room letters, such that if they overheard a friend’s room assignment, they could not ascertain what that friend’s role was in the experiment.

At the start of the experiment, the experimenters joined the participants in their rooms, one per room. The experimenters asked the participants to turn off all electronics. The experimenters then

distributed the instructions, which the participants quietly read.

The Procedure for Trustors in the Experimental Treatment Once the participants in room A, who were trustors, had finished reading the instructions, they were called one at a time by their chip number to go the computer room to enter their decision into a computer. Before leaving room A, they picked up a sealed envelope which contained a sheet of paper with a PIN on it. The participants used this PIN to privately log on to the computer in a separate computer room across the hall. Then they indicated the amount out of \$7.50 they wished to send to the trustee (who was referred to as their counterpart in the control treatment and their counterpart C in the experimental treatment). They indicated this amount using what amounted to a slider on the computer screen with no default value. After they had done so, they were automatically logged off the computer and returned to room A. At that point, the experimenter would then call for the next participant to go to the computer room. Once all the participants in A had made their decisions, the experimenter in room A signaled the experimenter in room B to proceed by knocking on room B's door. The experimenter in room A then distributed payment receipts for the participants to complete while they waited for the decision of their counterpart(s).

In the experimental treatment, the participants in room B, also trustors, followed the exact procedure as those in room A. Once the participants in room B had all made their decisions, the experimenter in room B signaled the experimenter in room C to proceed by knocking on room C's door.

The Procedure for Trustees in the Experimental Treatment In room C, the participants had already read the instructions and filled out their receipts by the time it was their turn to proceed to the computer room. After receiving the signal, the experimenter in room C called the participants to go to the computer room one at a time by their chip number. Prior to leaving the room, the participants in room C also picked up an envelope with a PIN, which they used to log in to the computer. The computer grouped the participants according to the order in which they logged on to the computer, which was random. They then indicated by sliders with no defaults how much to send back to their counterparts. After doing so, the computer automatically logged them out and printed a sheet indicating their earnings for the experiment. They then took the sheet to the cashier's room and the cashier paid them in private. After all of the participants in room C had made their decisions and left, the experimenter in room C signaled the experimenter in room B to continue by knocking on room B's door.

The End of the Experimental Treatment The experimenter in room B then called the participants in room B to the computer room one at a time by chip number. In the computer room, they

logged on again using their PIN and the computer printed a sheet indicating their earnings which they took to the cashier room. The cashier then paid them the amount shown on the sheet in private and then they left. Once all of the participants in B were gone, the experimenter in room B signaled the experimenter in room A to continue by knocking on room A's door.

The experimenter and participants in room A proceeded exactly as the participants in room B did. When all the participants in room A had left, the session ended.

The Control Treatment For the control treatment, room B is populated with trustees, who proceeded exactly as described above for room C. Once the participants in room B have left, the experimenter in B knocked on room A's door to signal the experimenter in A to proceed. The experimenter and participants in room A proceeded exactly as described above for room A in the experimental treatment.

3 Results

3.1 Data

We summarize the data visually with the same style of graph used by Berg et al. Figure 1 presents the results from the 21 pairs in the bilateral game *S*. The open circles depict the amount sent to the trustee by the trustor. The bars show how much the trustor received after tripling. The filled, smaller circles indicate the amount of money the trustee sent to the trustor.

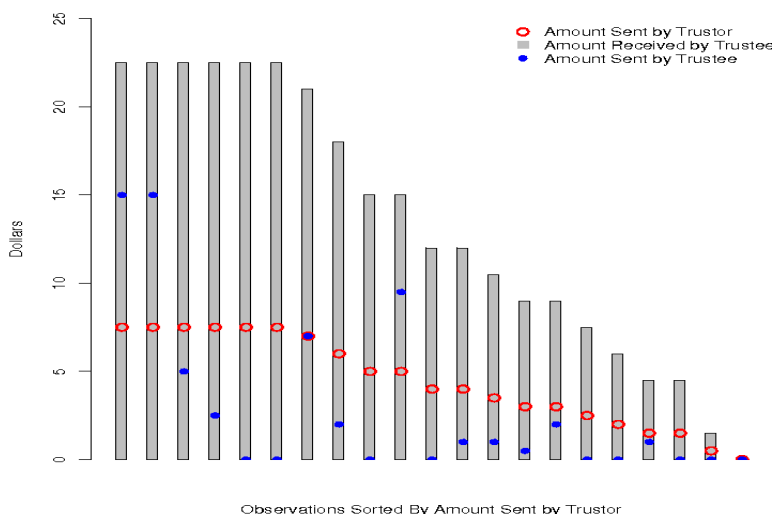


Figure 1: Data for the original investment game

Figure 2 gives the results from the 22 triads in game *M*. Since there are two trustors in this game, the individual trustor decisions, tripled amounts, and returns are shown separately in each

triad. The first bar in a pair is the amount the trustee received from the more trusting trustor, that is, the trustor who sent the most, and observations are sorted first by the amount sent by the more trusting trustor.

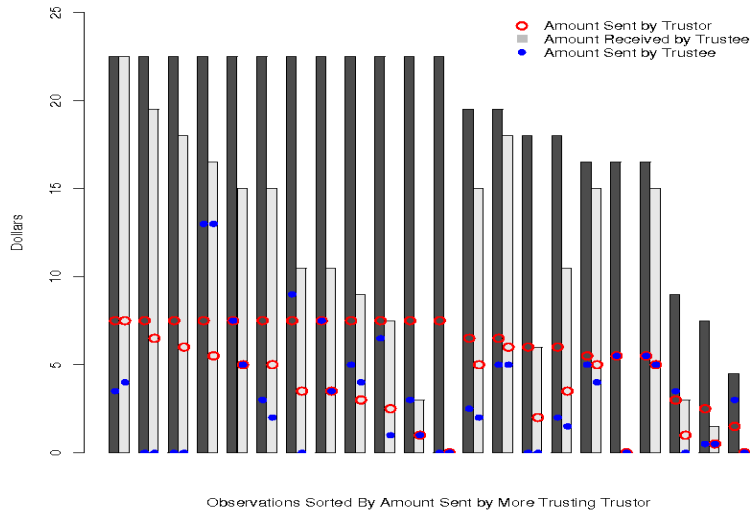


Figure 2: Results for the multiple-trustor investment game

3.2 Analysis

Result 1 The results in game *S* replicate the main findings of Berg et al’s No History treatment.

The two main findings of Berg et al’s No History treatment are that trustors send positive amounts, and that trustors earnings, on average, are less than their endowment. Since Berg et al gave trustors an endowment of \$10 while trustors in game *S* were endowed with \$7.50, we express trustors’ choices and earnings as percentages of the endowment.

Berg et al report that trustors sent, on average, 51.6% of the endowment, with the median amount sent being 50%. In game *S*, trustors sent on average 59.4% of the endowment, with the median amount sent being 53.3%. Our trustors are slightly more trusting than those in Berg et al, but the difference is not statistically significant. Being trusting, however, does not pay. In Berg et al, trustors median and average earnings were 95% of the endowment. In game *S*, trustors earnings average 66.7% of the endowment, with median earnings equal to 79.7% of the endowment; this is noticeably lower than the results in Berg et al, but only approaches statistical significance at standard levels (the *p*-value for Wilcoxon rank-sum test is 0.135).

Result 2 Trustors send and earn more in game *M*.

The 44 trustors in game *M* send on average 65.3% of their endowment, with the median amount sent being 73.3% of the endowment. Therefore, there is evidence in favor of the competition

hypothesis. Trustor earnings average 77.7% of the endowment, with median earnings being 86.7% of the endowment. Mean amounts sent and earnings are not statistically different between games M and S .

Result 3 Distinguishing oneself as being more trusting does not pay; earnings for the more trusting trustor in game M are lower than their less trusting counterpart's.

In 21 of the 22 triads in game M , the two trustors sent different amounts. We discard the one case in which the trustors both sent the same amount, and compute the difference in earnings between the more trusting and less trusting trustor in the same triad. On average, the more trusting trustor earned \$1.05 less than the less trusting trustor, with the median difference in earnings being \$1.00. The mean earnings difference is statistically different from zero (p -value for the two-sided t -test is .075). In only two-thirds of the triads (14 of 21) does the trustee send more in absolute terms to the more trusting trustor. Overall, trustees send on average only \$1 more to the more trusting trustor.

4 Conclusion

Taken together, Results 2 and 3 present a different conclusion than Berg et al. In their Social History treatment, trustors were in essence competing with the social history in demonstrating their willingness to trust. We find evidence that when this competition is made endogenous, trustors do compete by sending more of their endowment. However, this does not imply that successfully distinguishing oneself as being more trusting necessarily results in increased earnings, as Result 3 shows. The overall increased earnings derive directly from the fact that the increased amounts sent result in larger budgets for the trustee to work with. This is different from Berg et al's conclusion that the increased earnings enjoyed by trustors came from more generous paybacks by the trustees.

The data generally support a notion of reciprocity in the investment game as being proportional to the amount of trust. Being more trusting than some given standard, defined endogenously here as the amount sent by the other trustor in a triad, does not remunerate at a higher rate, nor is there evidence that trustees reward the more trusting trustor with a payback while punishing the less trusting trustor with no return.

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