

Trust and Trustworthiness in a Sequential Bargaining Game

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ABSTRACT

We use a two-person extensive form bargaining game to explore individuals' trusting and reciprocal behavior and how those relate to their scores on a trust survey. In keeping with prior research, we find that the 'self-interested' outcome is rejected by a majority of individuals. People who score high on the trust survey are both trusting and are also trustworthy, in that they reciprocate others' trust. But people with low-trust scores often exhibit trust but are not trustworthy. These 'inconsistent trusters' seem to be interested in exploiting the trust and trustworthiness of others in increasing their own payoff. Copyright © 2003 John Wiley & Sons, Ltd.

KEY WORDS trust; reciprocity; social values orientation; sequential game; bargaining

INTRODUCTION

The 'homo-economicus' assumption of economics perceives humans as acting out of pure self-interest in economic transactions. A large number of prior studies, however, demonstrate that actual behavior often deviates from the self-interested predictions by exhibiting notions of trust and reciprocity.¹ These studies also document the presence of heterogeneous subjects with diverse social preferences when it comes to questions of trust and reciprocity. McCabe, Rassenti, and Smith (1998, p. 22), for instance, comment:

Reciprocity and its origins in trust and/or punishment is in need of being modeled to account for a variety of behavioral reputational types: those who offer cooperation on the basis of pure trust, those who require

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¹The literature in this area is voluminous. Representative publications are Berg et al. (1995), Camerer and Weigelt (1988), Chaudhuri et al. (2002), Cox (2002), Dufwenberg and Gneezy (2000), Gneezy et al. (2000), and McCabe et al. (1998). Camerer (2001, Chapter 3) provides a thorough review of much of the existing literature in economics. Kramer (1999) provides an extensive literature review from the perspective of psychology and organizational behavior.

the prospect of punishment, those who defect when cooperation is offered and those who, faced with defection, tend to respond with punishment.²

In the current study we undertake a preliminary exploration of some issues related to prior findings on trust and reciprocity. Can the trusting moves one often observes in such games be explained as ‘pure trust?’ Do those who trust also reciprocate the trust of others?³ We test to see if a trust score, calculated for each individual using the Social Values Orientation survey,⁴ is correlated with trusting and reciprocal moves in a two-person extensive form game (described below). What we find is that people with high scores on the trust survey are both trusting and trustworthy in that they trust others and also reciprocate others’ trust. But people with low trust scores may show trust, yet are often not trustworthy in that they often do not reciprocate the trust of others. Rather these ‘inconsistent trusters’ seem interested in exploiting the trust and trustworthiness of others in increasing their own payoff.

We should point out at this juncture that the findings that we report in this paper are very much in the nature of a preliminary exploration of issues relating to trust and trustworthiness—specifically whether the two are related or not. Our results are probably better viewed as initial conjectures in need of further analysis rather than definitive conclusions. They also provide directions for future research which we discuss at length in Section 4 of the paper.

In the game that we use (see Figure 1), individual rationality suggests one outcome but players may achieve a better monetary outcome if they are motivated by trust and reciprocity. In this game, Player 1 moves first and chooses one of two strategies: Top or Bottom. Player 2 gets to see what Player 1 chose and responds by picking either Left or Right. The payoffs are denoted in dollars and cents and were paid to the subjects in cash at the end of the experiment. The subgame perfect equilibrium (using backward induction) in this game is for Player 1 to choose Top and Player 2 to choose Left. This nets \$2.50 for Player 1 and \$1.25 for Player 2.⁵ This outcome is indicated in the figure as the SPE outcome.

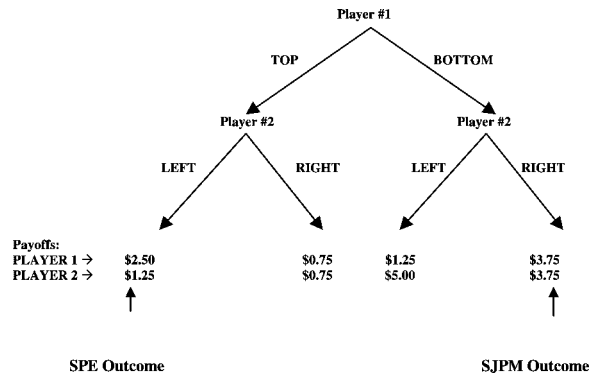


Figure 1. Payoffs of Player 1 and Player 2

²MCCabe et al. (1998) is not the first paper to make this point. Many others have done so. Messick and McClintock (1968) is one of the earliest studies to make this point about different types of players. See also Kuhlman et al. (1986) for similar arguments. We have chosen to use this quote from McCabe et al. (1998) because it provides a nice segue to the phenomenon we wish to study.

³Chaudhuri et al. (2002) failed to find any correlation between trusting and reciprocal moves, a finding echoed in Abbink et al. (2000).

⁴A number of prior studies have used the same questionnaire, or minor variants thereof, to measure subjects’ trust. See among other Parks (1994), Parks et al. (1995, 1996), Yamagishi (1986), Yamagishi and Sato (1986), and Markóczy (2002).

⁵Suppose Player 1 chooses Top and places Player 2 at the Left node. At this node a rational Player 2 will choose Left over Right since the former yields \$1.25 while the latter yields \$0.75. On the other hand, if Player 1 chooses Bottom and puts Player 2 at the Right node then Player 2 will choose Left again since that nets her \$5.00 as opposed to Right which nets her \$3.75. Thus, knowing that Player 2 will respond with Left at either node, Player 1 should choose Top and put Player 2 at the Left node, because in this case following Player 2’s Left choice Player 1 gets \$2.50. On the other hand, if Player 1 chooses Right and puts Player 2 at the Right node, a choice of Left by Player 2 gets Player 1 only \$1.25. The {Top, Left} outcome is the subgame perfect outcome in this game.

However, there is a symmetric joint payoff-maximizing outcome at {Bottom Right} which nets \$3.75 for each player. This is indicated as the SJPM outcome. The problem with the SJPM outcome is that in order to attain this, Player 1 would have to make an explicitly trusting move of choosing Bottom at the beginning. The choice of Bottom requires trust because Player 2 can take advantage and respond with Left which gives \$1.25 to Player 1 and \$5.00 to Player 2. In that case Player 1 is better off at the SPE outcome where she gets \$2.50. However, if Player 2 reciprocates Player 1's trust by choosing Right after Bottom, then both players are better off, with each getting \$3.75, more than what they would get if the SPE outcome is reached. That is, Player 2 would have to think along the following lines 'I should choose Right in response to Player 1's choice of Bottom, and Player 1 is obviously trusting me to do so since she could easily have chosen Left and given me no more than \$1.25 at the SPE outcome.'

We proceed as follows. In Section 2 we describe the experimental procedure. We present our results in Section 3. Finally, in Section 4, keeping in mind the preliminary nature of this work, instead of offering concluding remarks, we discuss the limitations of the current study and suggest ideas for future research.

EXPERIMENTAL PROCEDURE

Seventy-six subjects participated in the study. They were recruited from among Wellesley College students (who are all female) via postings on an electronic bulletin board. We took care to recruit only an even number of subjects for each session. They were equally separated into two rooms upon arrival and prior to the beginning of the game or the reading of instructions. After the subjects were situated in their rooms, each subject was given the instructions that indicated a unique subject-identification number. This number was used to pair each subject with a distinct Player 1 or Player 2 partner in the other room. The subjects were first given the instructions⁶ necessary for filling out the trust survey. After everyone had filled out the trust survey, they were then given the instructions for playing the sequential game. The experiment lasted about 30 minutes and the average payoff was \$6.20.

Trust survey

We use the Social Values Orientation (SVO) Scale used by Yamagishi (1986) and Yamagishi and Sato (1986)⁷ to understand each subject's 'pure trust' levels and how this correlated with their Player 1 and Player 2 decisions. The SVO scale is considered a good predictor of one's predisposition to trust strangers and has been used by previous researchers to look at the correlation between trust and propensity to contribute to public goods⁸ and that between trust and the propensity to cooperate in a prisoner's dilemma game.⁹ The SVO scale that we use consists of five questions,¹⁰ each answered by choosing one of five options: strongly disagree; disagree; neutral; agree; and strongly agree. An answer of strongly disagree gets a 5 while strongly agree gets a 1 except for question 4, which is reverse scored. The lowest possible score is 5 (least trust) and the highest possible is 25 (most trust). The lowest score recorded in our study is 5 and the highest is 21. The

⁶A copy of the instructions including the trust survey and the record sheets used to record the data is available via e-mail (a.chaudhuri@auckland.ac.nz) from the corresponding author. A longer version of this paper (which includes all the instructions and the mechanics of the experiment in greater detail) is also available from the Social Science Research Network (SSRN) website by going to http://papers.ssrn.com/sol3/papers.cfm?abstract_id=370061.

⁷This trust scale was originally developed by Yukawa (1985), based on the factor analysis of 60 items related to trust.

⁸See Yamagishi (1986) and Yamagishi and Sato (1986).

⁹See Parks et al. (1995, 1996).

¹⁰(1) Most people tell a lie when they can benefit by doing so. (2) Those devoted to unselfish causes are often exploited by others. (3) Some people do not cooperate because they pursue only their own short-term self-interest. Thus, things that can be done well if people cooperate often fail because of these people. (4) Most people are basically honest. (5) One should not trust others until one knows them well.

average score is 12.9 with a standard deviation of 3.29. The median score is 13 (which is the modal score as well) with 15 people scoring 13 out of 25.

Sequential game overview

In the sequential game each subject played both roles of Player 1 and Player 2, except each player interacted with a different player in each role. This preserves the one-shot nature of the game allowing no scope for reputation building. The following scheme explains the pairing process, with eight subjects, numbered 1 through 8.

Room A Player 1	Room B Player 2	Room B Player 1	Room A Player 2
1	5	5	4
2	6	6	3
3	7	7	2
4	8	8	1

The game started with each subject recording her Player 1 decision (Top or Bottom) on the decision sheet and handing it in to the experimenter. The sheets were then passed to the designated Player 2 in the other room. After each subject looked at her pair member’s Player 1 decision, she responded with a Player 2 decision. This decision was recorded on the decision sheet and then passed back to the paired Player 1, so that the Player 1 would now know what her payoff was.

RESULTS AND ANALYSIS

Overview

A summary of the results from the 76 plays of the game are presented in extended form below. The figures in parentheses are the number of players (out of 76) and the percentage of players who chose this response, respectively. We have used thicker or thinner arrows to depict the relative frequencies of various moves.

As the results show, a majority of players—55 out of 76 (72.4%)—trusted in their first move by choosing Bottom rather than Top while the remaining 21 players (27.6%) chose Top in accordance with the SPE prediction. When the Player 1 did choose Top, in every single case, the paired Player 2 responded with Left thereby arriving at the SPE outcome. The SPE outcome of {Top, Left} thus came about in 21 out of 76 (27.6%) plays of the game. When the Player 1 made the trusting move of choosing Bottom, the paired Player 2 had the option of reciprocating Player 1’s trust by choosing Right or not reciprocating by choosing Left. In 25 out of 55 (45.5%) cases, the Player 2 chose to reciprocate Player 1’s trust by choosing Right. In the

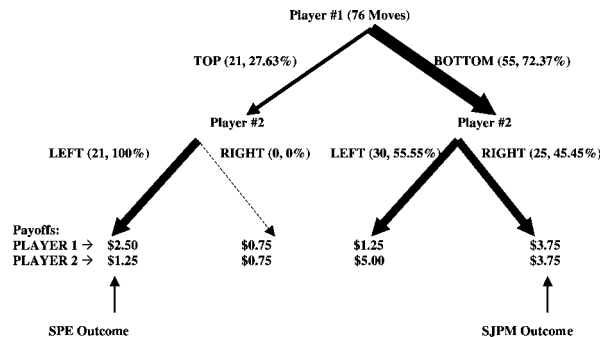


Figure 2. Frequency of moves

Table 1. Trust scores of consistent and inconsistent players

	Trust as Player 1 and reciprocate as Player 2 Consistent	Trust as Player 1 but not reciprocate as Player 2 Inconsistent
Number of people	21	18
Average trust score	14	11.61
Variance	8.5	14.72
<i>t</i> -statistic (31 df)	2.16	—
<i>p</i> (2-tailed)	<0.05	—
Wilcoxon <i>z</i> -statistic	2.97	—
<i>p</i> (2-tailed)	<0.01	—

remaining 30 out of 55 (55.5%) cases, Player 2 chose the non-reciprocal move of Left. Thus the SJPM outcome of {Bottom, Right} came about in 25 out of 76 (32.8%) plays of the game.

Consistency between trust and reciprocity

One striking aspect of the data is the large inconsistency between 72% of players making the trusting move as Player 1 and only 45% of players reciprocating trust as Player 2. Nearly half of the players, therefore, seem to have different behavioral allegiances in each play of the game. Thirty out of 55 subjects behave inconsistently in that they choose to trust in their first move but do not reciprocate others' trust in their second move. Twenty-five out of 55 players, however, are consistent in choosing the trusting move as Player 1 and the reciprocal move as Player 2.¹¹

In order to look at what sets these two groups apart, we divided the players into two smaller sub-groups—those who were consistent with their trust (who had trusted as Player 1 and reciprocated as Player 2) and those who were inconsistent (who had trusted as Player 1 but not reciprocated as Player 2). We then compared the trust scores of these two groups. Table 1 presents the results. The consistent players ($n = 21$) have an average trust score of 14 while the inconsistent ones ($n = 18$) average 11.61, a statistically significant difference using a *t*-test ($t = 2.16$, 31 df, $p < 0.05$), or the non-parametric Wilcoxon test ($z = 2.97$, $p < 0.01$).

There is another way of looking at this distinction between consistent and inconsistent players. Let us examine the subsample of 55 subjects who chose the trusting move of Bottom as Player 1. Then let us look at how many of those subjects faced a trusting move of Bottom as Player 2. This leaves us with 39 subjects. The question is does the trust score predict well how these players behaved as Player 2? The answer is an emphatic 'yes.' We run a binary probit regression with Player 2's choice on the left-hand side and the trust score on the right-hand side. A choice of Left (the non-reciprocal move) by Player 2 is assigned a value of '0' while a choice of Right (the reciprocal move) gets a value of '1.' Table 2 presents the results. The

Table 2. Probit regression dependent variable: probability of reciprocation

	Coefficient	Standard error	<i>t</i> -statistic	<i>p</i>
Trust score	0.137	0.066	2.08	0.037
Constant	-1.67	0.879	-1.90	0.057
Pseudo- R^2	0.09	—	—	—

¹¹Bear in mind that each player plays once as Player 1 and once as Player 2.

coefficient of the trust-score variable is positive and significant. An increase in the trust score significantly increases a subject's probability of reciprocation. If we compute the marginal effects, then we find that a 1-point increase in the trust score increases the probability of reciprocation by 5.4%. Thus, subjects with high trust scores are more likely to choose the trusting move of Bottom as Player 1 and to reciprocate trust as Player 2.

Probing a little deeper into the choices of players with high and low trust scores, we find the following. There are 46 players who scored more than the average of 12.9 (the 'high trusters') on the trust survey and 30 who scored less than the average (the 'low trusters'). Among the high trusters, there were 16 people (34.8%) who were consistent in that they chose the trusting move of Bottom as Player 1, and the reciprocal move of Right against Bottom as Player 2. Among the low trusters, only 5 out of 30 (16.7%) were consistent. If we use a sample proportions test, then this difference in consistency is significant at the 0.08 level using a 2-tailed test and at the 0.05 level using a 1-tailed test. The corresponding z statistic is 1.81, which corresponds to 46.5% of the area under the normal curve.^{12,13}

Discussion of our results

We find that in the first move roughly the same proportion of 'high trusters' and 'low trusters' (we are using the mean score as the cut-off between high and low trust so that we can include all 76 subjects) chose the trusting response of Bottom. Twenty-two out of 30 'low trusters' (73.3%) and 33 out of 46 'high trusters' (71.7%) chose Bottom as Player 1. In the second move, however, we see more reciprocal behavior from the high trusters. Those who reciprocated as Player 2, therefore, were more likely to have been driven by their pure trust levels compared to those who trusted at the first move but then maximized their payoff at the second move with no consideration of reciprocity. These low trusters seem less motivated by pure trust than by their interest in exploiting the trust and trustworthiness of others to increase their own payoff. It seems to us that the low trusters engage in the following course of action. As Player 1 they repose trust on the other player, hoping for reciprocity from her and consequently the bigger (SJPM) payoff of \$3.75. However, as Player 2 (and facing a trusting move of Bottom from Player 1) they choose not to reciprocate and choose Left, thereby grabbing the larger payoff of \$5.00 for themselves. This yields these players the maximum possible payoff of \$8.75. In the event of arriving at the SJPM outcome twice, the maximum a player can get is \$7.50 (\$3.75 twice). Therefore, by taking a calculated risk, these low trusters can increase their payoff by \$1.25.

Thus we find that players who have high-trust scores tend to be more consistent in trusting as Player 1 and reciprocating as Player 2 than players with low-trust scores. These 'high trusters' offer trust and reciprocity unconditionally. The 'low trusters,' on the other hand, are more self-interested and seem to be looking for ways to exploit the trust and reciprocity of others to enhance monetary payoffs. As Kramer (1999, p. 3) points out, the trust exhibited by the 'high trusters' 'can be conceptualized as a social orientation toward other people and towards society as a whole,' while the trust of 'low trusters' can be 'conceptualized more as a calculative orientation towards risk.' The latter group's decision to make a trusting move initially by

¹²If the two relevant sample proportions are p_1 (16 out of 46 in this case) and p_2 (5 out of 30), and the two samples have n_1 ($= 46$) and n_2 ($= 30$) members respectively, then the corresponding test-statistic is

$$z = \frac{p_1 - p_2}{\sqrt{\frac{p_1^*(1-p_1)}{n_1} + \frac{p_2^*(1-p_2)}{n_2}}} = 1.81$$

¹³The usual practice in such cases is to use a median split and look at those above and below the median. This is problematic for us since there are 15 people who scored the median of 13 and we would have to exclude them in any median split analysis. If we do carry out a median split then we find the following. Excluding those 15 subjects who are at the median, we get 30 subjects who scored below the median and 31 who scored above the median. Out of the 30 subjects below the median, five were consistent while out of the 31 above the median eleven were consistent. Once again, using a sample proportions test, we get a test-statistic of 1.71 (corresponding to 45.6% of the area under the normal curve) which is significant at 0.09 level using a 2-tailed test and at the 0.05 level using a 1-tailed test.

choosing Bottom is in the nature of a gamble based on calculations of expected reciprocation by the pair member, rather than trust per se. Eckel and Wilson (2002), Chaudhuri and Gangadharan (2002), and Bohnet and Zeckhauser (2003) also report that for some people the decision to trust is related to risk attitudes. This latter group of subjects, to use McCabe et al.'s (1998) language, would probably reciprocate only if the person who trusted them in the first place can punish them in case of non-reciprocity.

Dawes and Thaler (1988, p. 195) provide an anecdote that nicely sums up this insight that some players are consistent while others are more opportunistic:

In the rural areas around Ithaca it is common for farmers to put some fresh produce on the table by the road. There is a cash-box on the table, and customers are expected to put money in the box in return for vegetables they take. The box has just a small slit, so money can only be put in, not taken out. Also, the box is attached to the table, so no one can (easily) make off with the money. We think that the farmers have just about the right model of human nature. They feel that enough people will volunteer to pay for the fresh corn to make it worthwhile to put it out there. The farmers also know that if it were easy enough to take the money, someone would do so.

There are three main insights arising from this current study. First, trust and trustworthiness are fundamentally different constructs. See Chaudhuri et al. (2002) for further elaboration of this point. What prior studies (such as Berg et al., 1995, or Gneezy et al., 2000) have interpreted as trust has two distinct components. One is 'pure trust' while the other is an element of calculated risk taking or a predilection for accepting a gamble. The former component is definitely a 'social virtue' (as defined by Fukuyama, 1995), the latter probably not.

Second, we find that when it comes to the idea of social capital (see Putnam, 2000 or Fukuyama, 1995)¹⁴ it is trustworthiness that is more important and relevant rather than trust. If one is trustworthy, then one is definitely trusting, but a trusting individual is not necessarily trustworthy.

Finally, based on our findings we can say that the Social Values Orientation scale (and possibly other surveys of this type) can be used as a good predictor of trustworthy behavior but not necessarily of trusting behavior. Glaeser et al. (2000, p. 841) make this same point when they say, 'standard survey questions about trust do not appear to measure trust. However they do measure trustworthiness, which is one ingredient of social capital.'

CONCLUDING REMARKS AND SUGGESTIONS FOR FUTURE RESEARCH

In this preliminary study on trust and reciprocity we find the existence of two different types of players: (1) 'high trusters,' who are both trusting and trustworthy, and are more likely to be driven by their pure trust levels; and (2) 'low trusters,' who do not reciprocate others' trust and whose own trust can be interpreted as a calculated risk rather than pure trust. The findings of this study are more in the nature of conjectures rather than definitive conclusions and as such must be interpreted with a degree of caution. The study suffers from limitations and leaves a number of questions unanswered which do, however, point the way for future research in the area. We address these questions below.

The first issue is the ability of the SVO scale to measure trust. While the instrument does seem to capture trustworthiness, it is not very clear whether the scale is a good measure of trust even though a number of prior studies have utilized the scale for this purpose. In analyzing our data, we did not find a significant correlation

¹⁴Putnam (2000, Chapter 8, pp. 136–137) comments, 'Other things being equal, people who trust their fellow citizens volunteer more often, contribute to charity, participate more often in politics and community organizations, serve more readily on juries, give blood more frequently, comply more fully with their tax obligations, are more tolerant of minority views, and display many other forms of civic virtue.' A growing body of research suggests that 'social capital' as embodied in the tendencies to 'trust' and to 'reciprocate' the trust of strangers influence a wide range of economic phenomena and activities. See, for instance, Fukuyama (1995), La Porta et al. (1997), and Knack and Keefer (1997).

between the trust score of a subject and her probability of choosing the trusting move of Bottom as Player 1. Neither did we find a significant correlation between a subject's trust score and her propensity to reciprocate a trusting move by her pair-member. The trust instrument that we have used seems to contain two factors—one reflecting trust in others and the other trustworthiness. In principle, one could factor analyze the instrument to recover those factors. But, given the shortness of the SVO scale, this might be difficult. There is potentially scope for developing a different instrument that might be a better predictor of behavior. In a follow-up study, one could use the new measure of trust and trustworthiness to classify participants in appropriate ways into three categories: (1) high trust/high trustworthiness; (2) high trust/low trustworthiness; or (3) low trust/low trustworthiness. (Based on our results, high trustworthiness seems to imply high trust, and so we can possibly rule out a low trust/high trustworthiness category.) Then we can see if the subjects in the various categories do indeed exhibit the kinds of behaviors consistent with the predictions of our model. This would require further, and more sophisticated, psychometric work in the area. Additional experiments with such a new instrument along with multiple games with different payoff structures might be better able to tease out various nuances of behavior regarding trust and trustworthiness and would definitely be a promising line on inquiry.¹⁵ Two interesting recent papers—one by Eckel and Wilson (2002) and the other by Bohnet and Zeckhauser (2003)—take a step in this direction. Both of these papers try to tease out nuances in trusting behavior into two components—one of which might be explained as 'pure' trust and the other as a predilection for risk or accepting a gamble.

The second concern is in regard of possible experimenter demand effects.¹⁶ Given that the subjects in our study filled out the trust survey immediately prior to taking part in the bargaining game, this might actually have affected their decisions in the game. Future studies should consider a counter-balanced design, where half the subjects fill out the trust survey before playing the sequential game while the other half fills it out afterwards. Alternatively, one can administer the trust survey in combination with other personality tests to the subjects so as not to alert the subjects to the research question under study.

However, the findings reported in this paper will hopefully provide an impetus to further psychometric work in the area, which can explore these issues relating to trust and reciprocity in greater depth.

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¹⁵We thank the editor, J. Frank Yates, and an anonymous referee for pointing out the need for further psychometric work in developing an instrument that might better be able to distinguish between trust and trustworthiness. In making the arguments contained in this paragraph we have borrowed liberally from the editor's comments contained in his personal correspondence with us.

¹⁶We thank an anonymous referee for alerting us to this possible experimenter demand effect.

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