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To trust, or not to trust: Cognitive reflection in trust games☆

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ABSTRACT

We present results from two studies that show a positive relation between cognitive reflection and trusting behavior, but no significant relation with trustworthy behavior. Our finding holds regardless of individual distributional social preferences and risk aversion. Our results add to a growing body of literature that illustrates the role of cognitive ability in helping explain outcomes in economic experiments.

1. Introduction

Trust is essential for the consummation of exchange and subsequent realization of gains (Smith, 1759). Arrow (1972) argued that trust is indispensable for the proper functioning of any economic system: *"Virtually every commercial transaction has within itself an element of trust… It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence"* (p. 357). Relatedly, trust has been shown to impact economic variables such as growth and financial development (Algan and Cahuc, 2010) as well as entrepreneurship and trade (Guiso, Sapienza and Zingales, 2004, 2006). In sum, trust is seen as the lubricant that facilitates exchange in society so its relevance cannot be overstated.

In this paper, we propose a microeconomic analysis of the determinants of trust. We build on the experimental economics literature that has developed (Berg, Dickhaut and McCabe, 1995) and extensively studied (see meta-analysis by Johnson and Mislin, 2011) incentivized behavioral measures of trust and trustworthiness. Interestingly, there is evidence of a relation between the behavioral measure of trust developed in the lab and macroeconomic variables. For example, Johnson and Mislin (2011) found a positive correlation between GDP in a given country and the experimental measure of trust of a sample of its population.

Although a number of personal characteristics ranging from personality traits to education may affect trusting behavior, we focus on the role of cognitive ability. This is motivated by the fact that previous research has reported preliminary evidence of a positive correlation between intelligence and generalized trust (i.e. trust in other members of the society) (Sturgis, Read and Allum, 2010; Hooghe, Marien and de Vroome, 2012; Carl and Billarri, 2014). Generalized trust is a self-reported measure of trust, which is assessed by non-incentivized survey questions such as "How often do you trust others?" Recently, Carl and Billari (2014) have shown that there exists a positive correlation between generalized trust and measures of intelligence in a large, nationally representative sample of U.S. adults. Their measures of intelligence were both objective and subjective: subjects were evaluated on the basis of exactly how they responded to a verbal test, or the perception of an interviewer regarding how well they understood the questions asked. We extend this research by studying a behavioral measure of trust that was elicited in a controlled and incentivized environment. In addition, we consider whether a validated and widely used measure of cognitive ability: the Cognitive Reflection Test (CRT) can explain trust or trustworthiness behavior in our particular experiment.

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Our work also contributes to the growing body of research on the relation between cognitive abilities and economic behavior in the experimental economics literature. A large number of experimental studies have used the CRT (Frederick, 2005) both because of its short duration and its unprecedented success in predicting economic decisions (e.g. Oechssler, Roider, and Schmitz, 2009). For example, student performance in the CRT has been shown to correlate positively with earnings in experimental asset markets (Corgnet et al., 2015b) and other individual tasks and games involving risk and time preferences (Frederick, 2005; Oechssler, Roider, and Schmitz, 2009; Brañas-Garza, García-Muñoz, and Hernán-González, 2012). The CRT has also been shown to be positively correlated with general measures of intelligence such as the SAT (Frederick, 2005).

The CRT may be an especially relevant measure of cognitive ability for the study of strategic economic decisions (e.g. trust) because it simultaneously captures the ability to engage in reflective processes and execute computational tasks measured in standard intelligence tests (e.g. SAT or Raven matrices; Toplak, West and Stanovich, 2011). In the CRT, respondents are given three questions to which there is an intuitive (automatic) yet incorrect answer. However, with a little deliberation (or cognitive reflection) subjects can override the intuitive response and figure out the correct answer.

In this paper we employ two studies to look at the relation between cognitive reflection and trust. In the first part we examine data from a trust study that uses the standard CRT measure. In the second, we use an augmented version of the CRT (Toplak, West and Stanovich, 2014) as well as elicit subjects' distributional social preferences à la Bartling et al. (2009) and risk attitudes (Holt and Laury, 2002). We find a positive relation between scores on both CRT tests and trust, but not a significant relation with trustworthiness. Our results are robust to whether participants play only one role (Study 1) or both (Study 2) and also whether the game is implemented as a direct-response (Study 1) or strategy method (Study 2). Finally, these results hold when controlling for social preferences and risk aversion (Study 2).

2. Study 1: A first look at the relation between CRT, trust and trustworthiness

2.1. Methods

As part of a project studying communication and trust, we recruited 80 subjects (52.50% female) to participate in a baseline treatment. We conducted a total of 6 independent sessions with either 12 or 14 subjects in each session. Subjects were recruited from a database of more than 2000 students at Chapman University. A subset of the whole database received invitations at random for participating in the current study. The experiment lasted for one hour and subjects earned an average of $14.25 including a $7 show-up fee.

2.1.1. Measurement of trust

In this study, we use the game of trust described in Charness and Dufwenberg (2006, 2010). In the first stage of the game, player A decides whether to play *In* or *Out*. If player A chooses *Out* then the game is over and each player earns $5. If player A chooses *In* then player B has to select either *Don't* or *Roll*. If player B chooses *Don't* then player B gets $14 whereas player A gets nothing. If player B chooses Roll, then the roll of a six-sided die decides whether the final outcome of the game is a success or a failure. If it is a success (which occurs with probability 5/6) player A gets $12 and player B gets $10, and if it is a failure player A gets nothing while player B gets $10. The payoffs of the game are described in Fig. 1. This game can be seen as a game of trust à la Berg, Dickhaut and McCabe (1995) where player A is the trustor and player B is the trustee. The decision for player A to trust thus corresponds to choosing *In* and the decision for player B to be trustworthy corresponds to choosing *Roll*. This game slightly differs from the standard trust game because of the role of chance. As a result, if player A gets zero payoff in this game (s)he does not know whether this is due to player B choosing *Don't* roll the die or if it is due to bad luck in the *Roll*.

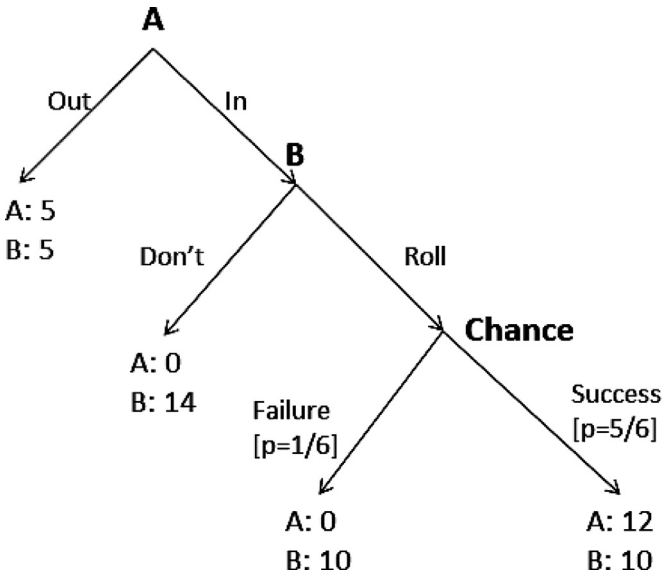

Fig. 1. The Charness–Dufwenberg (2006, 2010) Trust game.

Upon arrival, subjects were randomly assigned to one of two separate rooms. All subjects in each room were assigned the same role (e.g. Player A) and were informed that they would be matched with a player in another room playing a different role (e.g. Player B). In contrast to Charness and Dufwenberg (2006, 2010), the game was not played using a strategy-method procedure. Instead, subjects in the role of player B were asked to *Roll* or *Don't roll* only if player A, who they had been matched with, had chosen *In*.

2.1.2. Measurement of cognitive reflection

In addition to playing the trust game, we asked subjects to complete the CRT. We list the CRT questions below:

(1) A bat and a ball cost $1.10 in total. The bat costs a dollar more than the ball. How much does the ball cost? ____ cents [Correct answer: 5 cents; intuitive answer: 10 cents]
(2) If it takes 5 machines 5 min to make 5 widgets, how long would it take 100 machines to make 100 widgets? ____ min [Correct answer: 5 min; intuitive answer: 100 min]
(3) In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? ____ days [Correct answer: 47 days; intuitive answer: 24 days]

Our measure of cognitive reflection is given by the total number of correct answers ($mean \pm SEM = 1.52 \pm 0.18$ for females, 1.95 ± 0.19 for males; Mann–Whitney–Wilcoxon test, $p = 0.102$). As is standard practice, the cognitive reflection test was not incentivized (Frederick, 2005; Brañas-Garza, Kujal and, Lenkei, 2015). Also as expected, males performed better in the test than females (Frederick, 2005; Bosch-Domènech et al., 2014).

2.2. Results

The distribution of CRT scores along with the relative frequency of trust (*In*) and trustworthy choices (*Roll*) is displayed in Table 1.

In Table 2 we report the regression analysis of the *Trust* decision (coded as a dummy that takes value 1 if Player A chose *In* and 0 otherwise) on CRT scores and gender using a probit regression with robust