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ABSTRACT

Understanding Trust*

Several papers study the effect of trust by using the answer to the World Values Survey (WVS) question “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?” to measure the level of trust. Glaeser et al. (2000) question the validity of this measure by showing that it is not correlated with senders’ behaviour in the standard trust game, but only with his trustworthiness. By using a large sample of German households, Fehr et al. (2003) find the opposite result: WVS-like measures of trust are correlated with the sender’s behaviour, but not with its trustworthiness. In this paper we resolve this puzzle by recognizing that trust has two components: a belief-based one and a preference based one. While the sender behaviour’s reflects both, we show that WVS-like measures capture mostly the belief-based component, while questions on past trusting behaviour are better at capturing the preference component of trust.

JEL Classification: G10, G30 and Z10
Keywords: trust, trust game and trustworthiness

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Since Arrow (1972) remarked that "It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence," economists have started paying attention to the effect of trust on economic activity and development. In an influential paper, Knack and Kneefer (1996) find that a country's level of trust is indeed correlated with its rate of growth and this correlation persists even after controlling for quality of law enforcement (Knack and Zak (1999). Since these early contributions, there have been around 7,000 papers analyzing the economic effects of trust. To measure trust, around 500 of these papers use the answers to the World Values Survey (WVS) /General Social Survey (GSS) question "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" to measure the level of trust.

Glaeser et al. (2000) question the validity of this measure of trust. In an experimental setting, they show that the answers to the WVS question are not correlated with the sender behavior in the standard trust game first introduced by Berg, Dickhaut and McCabe (1995). To the contrary, these answers are correlated to the receiver's behavior in the same game. Hence, they conclude that the WVS question is a measure of trustworthiness and not of trust. Fehr et al. (2003), however, challenge this result. By using a large sample of German households, they show that the sender behavior in a trust game is correlated with other survey-based measures of trust, which in turn are not correlated with trustworthiness.

These results raise several questions. Are survey-based measures good measures of trust, like Fehr et al. (2003) suggest, or not, as indicated by Glaeser et al. (2000)? More specifically, given its preeminence in the literature, what is the WVS question measuring? Is it trust, trustworthiness, or neither of the two? Why do Fehr et al.'s (2003) and Glaeser et al.'s (2000) results differ so much? How can we explain the correlation between the answer to the WVS trust question and individual (Guiso, Sapienza and Zingales 2007) or aggregate (Guiso, Sapienza and Zingales 2004 and 2006) economic choices?

Glaeser et al.'s (2000) dismissal of the WVS question hinges on the assumption that the Berg et al. (1995) trust game is indeed an accurate measure of trust. But, should we trust the trust game to measure trust correctly? More importantly how do we define trust? Since Glaeser et al. (2000), several experimental papers have shown that the sender's behavior in the trust game is affected by other motivations besides confidence in the receiver's trustworthiness, such as individual risk aversion (Karlan, 2005), reciprocity, and altruism (Cox, 2004, and Ashraf et al., 2006).

In light of these results, the act of trusting is now understood as the combination of the belief in other people's trustworthiness and the specific preferences of the sender (risk

aversion, reciprocity, altruism). It is useful to keep these two components separate because beliefs are more subject to updating and changing than preferences. It is important, thus, to find out what component of trust so defined (if any) is measured by the trust game and what component by the WVS question.

To answer this question in this paper we run a modified trust game where we ask the sender to report his/her beliefs about the receiver's behavior. By doing so, we can separate the sender's expectations about the receiver's behavior (the beliefs' component) from his actions, which are affected also by his utility function.

We find that the sender's expectation of receiver's trustworthiness is a good predictor of the quantity sent in the trust game and it is highly correlated with the trust question in the WVS, as well as other attitudinal questions on trust. Most interestingly, the expected trustworthiness is correlated with the WVS question when the sender is calculating the expected amount returned if he sends a larger amount of money. For smaller amounts at stake, the sender's expectation reflects more the anticipated level of retaliation rather than the general level of trust. This suggests the WVS question is a good measure of the expectation-component of trust in economically-relevant situations.

When we analyze the correlation between the sender's expectations of the receiver's trustworthiness with the sender's actual trustworthiness when he plays as a receiver, we find that players extrapolate their opponent's behavior from their own. This can explain why Glaeser et al. (2000) find that the WVS question is correlated with trustworthiness. In highly homogenous populations (Chicago MBAs, Harvard undergraduates) players tend to form their expectations by introspecting their own behavior. This inference is not true in very heterogeneous populations, like the German household sample used by Fehr et al. (2003). This can explain why they find no correlation between the answer to the survey-based measures of trust that capture the trust component of the beliefs of the subject and the trustworthiness of the subject.

The rest of the paper proceeds as follows. Section I describes the experimental design and presents some summary statistics. Section II analyzes the implications of the recent work on the trust game for the interpretation of the sender's behavior in the trust game and his expectations. Section III presents our results. Section IV concludes.

I. Experimental Design and Survey

The data for this experiment have been collected as part of the Templeton Chicago Longitudinal MBA Sample (TCLMS). All the Campus MBA students of the 2008 class at the Graduate School of Business at the University of Chicago were asked to complete a survey and play some games as part of a mandatory class. While participation was mandatory, the Institutional Review Board at the University of Chicago required that the subjects be offered the opportunity to opt out from the study, not consenting to the use of their data for research purposes. Out of 552 MBA students, 548 filled out the survey and 552 played the games. 502 (92.28%) consented to the use of both their survey and game data. For the purpose of this paper, we use the data from three basic sources: the trust game, a lottery game, and the survey, which are explained below.

A detailed description of the games played and of the full set of the questions asked is at http://www.kellogg.northwestern.edu/faculty/sapienza/htm/templeton/TCLP.htm.

A. The trust game

The trust game we used is a slightly modified version of the trust game initially designed by Berg, Dickhaut, and McCabe (1995). In this game a first mover is endowed with an amount of money y. The first mover decides how much to send, $s \in [0, y]$, to a second mover. Any amount sent is multiplied by three. The second mover then decides how much to return, $r \in [0, 3s]$, to the first mover. Consequently, the payoff of the first mover equals $y - s + r$, and that of the second mover equals $3s - r$. The amount sent is frequently referred to as a measure of trust, and the amount returned as a measure of trustworthiness.[1] In our experiment, first movers were endowed with \$50 and could send any multiple of \$5.

Subjects were then asked to make three decisions. In the first decision all players had to decide how much of their initial endowment of \$50 they wanted to send to the receiver. In the second decision all players were asked to indicate how much they expected the second mover would return using the strategy method (Selten, 1967). In other words, subjects were offered an array like the one in Figure 1 and had to indicate how much they thought the second mover would return for each possible amount sent (multiples of five between \$0 and \$50). In order to motivate subjects to answer accurately, they earned \$10 for each question

[1] For a discussion on whether this game really captures trust see Glaeser et al. (2000) and Cox (2004).

where their expectation fell within ten percent of the actual response (i.e. if $r - 0.1 \times 3s \leq E[r] \leq r + 0.1 \times 3s$).

In the third decision all players acted as receivers and were asked to submit their decision also using the strategy method. That is, they indicated how much they were willing to return for each possible amount sent without knowing how much the first mover actually sent.[2] Hence, each subject played the trust game twice, one time in the role of the sender and the other in the role of the receiver. Subjects were randomly re-matched so when they played as senders and receivers they played with a different person. Anonymity was insured due to the large size of the sample.

The three decisions were made sequentially by subjects: first they all played the trust game in the role of the sender, then they elicited their beliefs about the behavior of the receiver, and third they played the trust game in the role of the receiver. The three were independent decisions. In between decisions, there was no feedback given with respect to the behavior of other subjects. Furthermore, when making a decision they did not know what the future decisions would be. However, subjects did know that they would make three decisions and that their actions in one would not affect their payoff in the future. This design guarantees that all subjects make their decisions in the same order and with the same information. The subjects' earnings were determined by randomly selecting one of the three decisions.

Finally, to facilitate any calculations subjects might have wanted to make during the second choice, the computer screen provided two buttons that when enabled instantly calculated the subject's payoff and the payoff of the opponent.

A fundamental difference between the standard trust game by Berg, Dickhaut and McCabe (1995) is that all subjects in our experiment played both the roles of sender and receiver. Moreover, our subjects were asked to make decisions behind the veil of ignorance, namely, before the role of either sender or receiver was assigned to them. Beliefs elicitation in the second decision is also a rather new feature of our game with respect to the standard

[2] Although the use of the strategy method may elicit strategies that differ from those used in a strictly sequential environment, in games of low complexity, the strategy method seems to have no significant effect on subjects' decisions (Brandts and Charness, 2000). For example, Vyrastekova and Onderstal (2005) find that the strategy method has no significant effect on the behavior in the trust game.

trust game. We also implemented an incentive compatible mechanism to reward subjects' accuracy of beliefs.

B. Behavior in the trust game

Table 1 – Panel A reports the main features of the behavior of the subjects in our sample. The average amount sent is $18.82, which is 37.64% of the senders' initial endowment. On average, the amount returned is $18.02, which is 26.7% of the amount received. The expected amount returned is on average equal to $20.91 (31.6% in percentage terms), i.e. above the actual amount returned.

The relationship between the expected amount returned and the actual amount returned can be clearly seen from Table 1 – Panel B. Both the quantity and the proportion returned are strictly increasing in the amount sent, denoting a certain degree of reciprocity and so are the expected amount returned, suggesting that subjects expected the degree of reciprocity. That the expected proportion returned is always 5% higher than the actual proportion returned suggests that the subjects were overly optimistic about the receiver's trustworthiness, but they guessed the slope of reciprocity exactly right.

C. The risk aversion game

To measure subjects' levels of risk aversion toward small gambles we follow Holt and Laury (2002). Subjects were asked to choose 15 times between a lottery where they could win an amount with certainty, in Option A, ranging from $50 in the first setting up to $120 in the fifteenth setting, with increments in multiples of five; or either $200 or zero with equal probability in Option B. At the end of the game one of the fifteen settings was randomly chosen and subjects were paid according to their decision (and the lottery drawn) in that setting.

According to the payoffs in this lottery, an extremely risk averse individual should always choose Option A, whereas an extreme risk seeking individual should always choose Option B. In between, as the certain amount increases, a subject should cross over from Option B to Option A. The less risk averse the subject is, the later the switch will occur. Notice that a risk neutral individual should choose Option A ten times, and switch in the eleventh choice to Option B. We can use the number of times the safe amount was chosen as

an individual's measure of risk aversion. Alternatively, if we hypothesize a constant relative risk aversion utility function we can infer the subject's coefficient of relative risk aversion (CRRA) following Holt and Laury (2002). We hypothesize a constant relative risk aversion utility function of the form: $u(x) = x^{1-r}$ where r is the coefficient of relative risk aversion. Then, given the payoffs of the different lotteries and the hypothesized utility function, we find each subject's constant relative risk aversion r according to his/her crossover point from the safe option to the risky one[3].

Table 1 – Panel C displays the number and percentage of students for each possible number of risky choices. The students who made 0 risky choices in the lottery are 42 (8.37% of the sample), and they are therefore considered to be the most risk averse students. The mode is at 10 risky choices, with 107 students (21.31% of the sample). As explained above, 10 risky choices is equivalent to risk neutrality. Overall, only 58 students (11.55%) exhibit risk loving behavior, whereas 337 students (67.13%) are risk averse.

D. Survey questions

In the survey, subjects were asked several questions regarding trust. First, we asked subjects the standard World Values Survey question: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" We provided three answers for subjects to choose among them: i) Most people can be trusted, ii) Can't be too careful, iii) Don't know. As it is shown in Table 1 – Panel D, a bit more than half of the subjects in the sample (58.86%) answered that most people can be trusted.

Subjects were also asked the following question: "Suppose that a new and very desirable dorm/apartment has become available. The University of Chicago organizes a lottery to assign it among the many applicants. How confident are you that the allocation will be fair?" The choice of answers was: i) Not at all, ii) Not much, iii) Quite a lot, iv) A great deal, v) I don't know. We asked this question to elicit (in an indirect way) their trust towards us, the experimenters. 90% of the students answered that they trust the University of Chicago quite a lot (42.74%) or a great deal (47.24%). Only 1% does not trust it at all.

[3] 23 subjects were removed because they switched options more than one time.

Another question was: "Suppose that while walking on Michigan Avenue in Chicago you lose your wallet with $1,000 dollars inside. A random person that you do not know finds it. He or she does not know you, but he or she is aware that the money belongs to you and knows your name and address. He or she can keep the money without incurring any punishment. According to you, what do you think is the probability he or she will return the money to you? (Report a number between 0 and 100, where 0 means that the money won't be returned for sure and 100 means that it will be returned for sure.)" On average students thought that they had a 34.87% chance of getting their wallet back. The mode is at 50%. Only 36% thought that the probability was less than 25%.

Finally, we asked our students "How good are you at detecting people who are trustworthy?" And the possible answers were: i) Not good at all, ii) Not very good, iii) Good, iv) Very good, v) I don't know. 90% of the students answered that they were good (60%) or very good (30%) at detecting people who are trustworthy. Table 1 – Panel E provides the correlation among these key variables.

II. What Does the Trust Game Measure?

The World Values Survey question on trust aims at measuring generalized trust, namely the expectation of the respondent regarding the trustworthiness of other individuals. Implicit in Glaeser et al. (2000) is the assumption that the sender's behavior in the Berg et al.'s (1995) trust game is measuring only the expectation about the receiver's trustworthiness. As Karlan (2005) shows, however, the sender's behavior is affected by risk aversion. Even if individuals should be risk neutral for small gambles, they are not. Hence, if we want to extract the trust component in the amount sent in a trust game, we should at the very minimum control for risk aversion.

In addition, the senders' behavior in the trust game is indicative of the senders' expectations only if people have selfish expectations. However, if people had selfish expectations they would always return zero, but this is neither the case in any of the trust game's results reported in the literature, nor our case. In fact, it is remarkable that 90% of the MBA students (a group not normally recognized for their altruism) in one of the most economically-minded MBA program in the world actually sent back a positive amount.

Starting with Rabin (1993), but also in Fehr, Gächter, and Kirchsteiger (1997), Levine (1998), Fehr and Schmidt (1999), Bolton and Ockenfels (2000), Charness and Rabin (2002) and Andreoni and Miller (2002), researchers have interpreted the behavior of the receiver in the trust game as an indication of other regarding preferences (altruism, reciprocity, inequity aversion or guilt). Cox (2004), for instance, finds evidence of reciprocity and altruism. If subjects have other regarding preferences when they play as receivers, however, it is likely that they have other regarding preferences when they play as senders too. Indeed, when we tried to rationalize each sender's behavior as an optimal choice given his/her expectation and his/her level of risk aversion, we could not make sense of it unless we hypothesized that the sender had some form of "other regarding preferences". Individual choices can be explained as rational ones only if we assume – following Fehr and Schmidt (1999) – that the sender's expected utility depends not only on his/her payoff, but also on the comparison between his/her payoff and his/her opponent's payoff[4]. If the sender has other regarding preferences, however, his/her choices of the quantity sent do not only reflect his/her level of trust toward the receiver, but also the fact that he/she compares his/her payoff with that of his/her opponent.

For our purpose, it is useful to divide the concept of trust into two components: belief-based trust and preference-based trust. In theory the two are clearly distinct. Per given type of preferences, an individual who has higher expectations about other people's trustworthiness will send more. Similarly, per given level of expectations a more altruistic individual will send more. To isolate these two components we use the amount a sender expects to receive for a given amount sent. This expectation should be unaffected by the sender's utility function and should be a true measure of the receiver's expected level of trustworthiness of the receiver.

This expectation does not need to be a constant proportion across the amount sent (in fact it is not). For low amounts of money sent, one would expect that the receiver would retaliate out of rage for the stinginess of the sender. Hence, not only is it important to determine whether the WVS question is related to the expectation of trust at all, but it is also important to establish to what expectation it is connected to. Is it connected to the expectation expressed for low amounts or large amounts?

[4] Calculation available from the authors.

III. Results

Table 3 tries to replicate Glaeser et al.'s (2000) results on the sender's behavior with the variables at our disposition, which are defined in Table 2. Instead of the financial generosity to the poor, or hours spent volunteering used by Glaeser et al., as a proxy for altruism we use a measure of unconditional cooperation derived from an n-version of a prisoner's dilemma game.[5]

On average, women send 10% less than men and this effect is statistically significant at the 5% level. Older people send less, white people more, and so do American citizens, but all these effects are economically small and not statistically significant. Subjects who exhibit unconditional cooperation send on average 13% more than subjects who defect, this effect is statistically significant at the 5% level.

In the four columns of Table 3, we insert four different measures of trust. Only one is statistically significant. This result is not very different from Glaeser et al. (2000): in their case, only two of the four measures of trust they include in their regressions are statistically significant. The only difference from Glaeser et al.'s results and ours is that the significant

[5] In order to observe the subjects' willingness to cooperate, we had them play a social dilemma based on the commonly-used linear public good game (Marwell and Ames, 1981; Isaac, Walker, and Thomas, 1984). Subjects were randomly assigned into groups of eight and given an endowment of \$50. Each subject then decided whether to contribute c to the public good. Contributions to the public good are costly to the subject but increase the earnings of others. Specifically, subject i's earnings equal $\$50 - c_i + 0.3 \times \sum_j c_j$. Unlike in most public good experiments, the contribution decision was binary: subjects could contribute either all their endowment or nothing, $c \in \{\$0, \$50\}$. Note that overall payoffs are maximized if all eight subjects contribute \$50. However, since an individual receives only \$15 for his \$50 contribution, he maximizes his monetary payoff by not contributing. The experiment was designed to elicit the willingness of subjects to conditionally cooperate. For this purpose we used a variation of the design employed by Fischbacher, Gächter, and Fehr (2001). Subjects made two contribution decisions: first an "unconditional" decision and after that a "conditional" one. The unconditional decision was simply to either contribute the \$50 to the public good or not. For their conditional decision, we used the strategy method (Selten, 1967) to allow subjects to condition their contribution on the number of group members contributing to the public good. Specifically, subjects had to indicate whether they would contribute their \$50 if x other group members also contributed theirs, and x varied from 0 to 7. To determine each subject's payoff, one of the two decisions was randomly selected. If the unconditional decision was chosen then that subject's payoff was given by his unconditional decision and the unconditional decision of the other seven group members. If the conditional decision was chosen, the subject's payoff was given by his conditional decision and the other's unconditional decision. All subjects made both decisions without knowing what others in their group did. Furthermore, when making their unconditional decision, subjects were not aware their second decision would be a conditional one.

measures in Glaeser et al.'s are two attitudinal survey questions that ask specifically about trust in strangers[6], whereas in our case the significant trust measure is the WVS question.

Since Glaeser et al. (2000), several experimental papers have shown that the sender's behavior in the trust game is affected by other motivations besides trust, such as individual risk aversion (Karlan, 2005) and reciprocity and altruism (Cox, 2004, and Ashraf et al., 2006). If we define trust as the expectation that the receiver will behave nicely vis-à-vis the sender, the sender's behavior is not just a measure of trust. It is a combination of trust, risk aversion, and other regarding preferences. A more accurate measure of the expectation that the receiver will behave nicely is the expected return elicited by subjects in the trust game.

In Table 4, we test whether it is indeed the case in our experiment that the sender's behavior is a combination of his/her expectation, risk aversion, and altruism. To this purpose, we regress the sender's behavior on the expected return (as expressed by the same subject), his/her risk aversion obtained from the lottery game in the way of Holt and Laury (2002), and the degree of altruism, measured from the 8-person prisoners' dilemma.

In the first column, we regress the amount sent on the total expected return (across all the possible conditional strategies). As in Karlan (2004), more risk averse individuals send less. A one-standard deviation increase in risk aversion decreases the quantity sent by 15%. This effect is statistically significant at the 1% level.

The expected return also has an important effect on the sender's behavior. A one standard deviation increase in the expected return increases the amount sent by $3, equal to 16% of the amount sent on average. Finally, altruism increases the amount sent. A one standard deviation increase in altruism increases the amount sent by 10%.

These effects remain even if we substitute the total expected return with the expected return given the different possible amounts sent. The only difference is that for a low amount sent (between 5 and 15) the effect of the expected return is not significant.

The results in Table 4 raise an important question: given that the decision to trust is the combination of many different factors, if we want to use the trust game to develop a measure of trust, should we consider the quantity transferred or the expectation? For a measure to be useful, it must be able to predict behavior in different contexts. Since we know

[6] The questions are: i) "You can't trust strangers anymore. Do you agree or disagree?", ii) "When dealing with strangers, one is better off using caution before trusting them. Do you agree or disagree?"

that the willingness to reciprocate or punish are very much context-dependent, in this paper we want to explore whether the expectation about others' trustworthiness reflects an individual characteristic that is fairly stable across different environments.

For this reason, in Table 5 we analyze the relationship between the senders' expected returns and survey-based measures of trust. Even if risk aversion and altruism should not affect the expected returns (at least in an expected-utility framework), in the regressions in Table 5 we control for them. For low levels of the quantity sent, none of these variables is significant. This is not surprising because if a subject sends a small amount of money, he/she is probably not really testing the trustworthiness of his/her opponent, because the temptation to keep everything, when everything is $5, is not a big one. Hence, only the expected amount returned when the amount sent is relatively large is a legitimate measure of trust. This is what we observe from the data. For amounts sent bigger than $30, the expected return is positively and significantly correlated with the trust of the WVS question. The effect is large. A subject who is trusting according to the WVS question expects a return that is 14% higher than a non trusting person. Consistent with our priors, both risk aversion and altruism are generally not significant.

In Table – 5 Panel B, we check the robustness of these results to the insertion of other possible determinants, like age, gender, race, U.S. nationality, and inequity aversion. The effect of the WVS trust on the expected return is unchanged. Interestingly, when we control for risk aversion the gender difference in the amount sent disappears, suggesting the whole gender effect is due to differences in risk aversion.

Glaeser et al. (2000) find that the WVS measure of trust is correlated with trustworthiness rather than trust. In light of our results, one possible explanation of their findings is that people extrapolate other people's behavior from their own. If this is the case, a subject's expectations are highly correlated with his/her own trustworthiness and so are all the measures of trust, such as the WVS measure.

To test this proposition, in Table 6 we regress the expected return on all the variables used in Table 5 – Panel B plus the subject's own behavior as a receiver. As the Table shows, the behavior as a receiver is highly significant and swamps the effect of all the other variables. While in the two panels in Table 5 the R-squared of the regressions was at most

3%, the R-squared in Table 6 is between 33% and 42%. Hence, a person's expectations are highly correlated with his own behavior.

Table 6 looks at whether the WVS trust question is correlated with trustworthiness. Once again, for high levels of the quantity sent subjects' trustworthiness is correlated with their answers to the WVS question. A subject's answer to the WVS question that most people can be trusted returns on average 20% more than a subject who answers negatively. The correlation between the WVS trust question and trustworthiness identified by Glaeser et al. (2000), thus, is likely to capture the extrapolation of the subject's behavior.

Comparing the different results

So far we have only been able to account for Glaeser et al.'s results. But how do we explain that Fehr et al. (2003) do not find any correlation between survey-based measures of trust and trustworthiness? We think that the differences in the three papers' results can be explained on the basis of two differences in the sample: the degree of homogeneity and the degree of mutual knowledge among subjects. The Glaeser et al. (2000) sample, composed of Harvard undergraduates, is very high on both dimensions: students know each other well and they are relatively similar. Our sample, made up of students who just started their MBA program, is intermediate in both dimensions: students know each other somewhat and they are relatively similar, albeit one third is international. Fehr et al. (2003), composed of random German households, is very low in both dimensions.

Why do we care? In a sample where the knowledge of the other anonymous players is very high, the expectations about the receiver behavior will not differ very much across individuals, hence the sender behavior in the trust game will be mostly driven by altruism and risk aversion. This is the reason why the WVS question, which we found to be correlated with expectations, does not have any explanatory power on the sender behavior in the Harvard undergraduate sample. By contrast, in our sample, where students just arrived and did not know each other well, the WVS question has some explanatory power on the sender behavior, when we do not control for expectations. Unfortunately, Fehr et al. (2003) do not ask the WVS question to their sample. That similar questions they ask do have explanatory power in their sample, however, is not surprising because the degree of knowledge is very low and thus expectations are likely to differ widely.

By contrast, the degree of homogeneity of the sample explains why in some cases the WVS question predicts trustworthiness and in others not. In a homogenous sample, players extrapolate their opponent's behavior from their own (see Table 6). Hence, a survey-based measure which captures expectations (like the WVS question) is highly correlated with a player's own behavior. By contrast, in a very heterogeneous sample this extrapolation is unlikely to take place. This explains why the WVS question is correlated with trustworthiness in the Glaeser et al. (2000) sample and in our sample, but similar questions are not correlated with trustworthiness in the Fehr et al. (2003) sample, in which subjects differ greatly.

It is also interesting, that questions regarding past trusting behavior explain the sender's behavior in the Fehr et al. sample even after controlling for the true expectations. This is consistent with the idea that the actual trusting behavior is a composition of expectations and preferences and that different survey questions are good at separating these different components. WVS-like questions are good at capturing the expectation component of trust, while questions on past trusting behavior are good at capturing the preference component of trust.

IV. Conclusions

Glaeser et al. (2000) question the validity of the WVS measure of trust by showing that it is not correlated with senders' behavior in the standard trust game. They also show that the WVS question is a better measure of the receiver's trustworthiness in the trust game. These results have called into question the use of the WVS question as a reasonable proxy for trust. By using a large sample of German households, Fehr et al. (2003) find the opposite result: WVS-like measures of trust are correlated with the sender's behavior, but not with its trustworthiness.

In this paper we resolve this puzzle by recognizing that trust has two components: a belief-based one and a preference based one. While the sender's behavior reflects both, we show that WVS-like measures capture mostly the belief-based component, while questions on past trusting behavior are better at capturing the preference component of trust.

We argue that the variability in each of these two components depends on the degree of homogeneity and the degree of mutual knowledge inside each sample. This aspect should be considered by any future research that would attempt to extrapolate actual trusting

behavior from games.

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Table 1: Summary Statistics

Panel A displays the means and standard deviations of key variables in the trust game: the amount sent by the sender, the amount returned by the receiver, the return ratio (i.e. amount returned by the receiver as a percentage of the amount received which equals the tripled amount a subject is sent), the average amount that senders expect to receive in return from the receivers, and the expected return ratio. These averages are weighted by the distribution of the amounts sent and therefore represent the true averages for a large enough sample. Panel B shows the number and proportion of students who send the different possible amounts, i.e. multiples of 5 between 0 and 50. We also show the average returned for every possible amount sent and the return as a percentage of the amount available to return for every possible amount sent. The table also shows the quantity expected in return and the proportion expected in return both conditional on the amounts sent. Panel C displays the number (and percentage) of students for each possible number of risky decisions chosen in the lottery game. The Constant relative Risk Aversion coefficient (CRRA) is calculated with the number of risky choices made by the subjects and following the technique by Holt and Laury (AER 2002). Panel D defines the main variables obtained from the survey and it displays some summary statistics on the several attitudinal questions related to trust. The first column contains the name of the variable, the second one the question asked in the survey, the third one all the possible answers, the fourth one the distribution of responses, the fifth one the mean and standard deviation. Panel E presents the raw correlations among the main variables. In each cell, the first number is the coefficient, the second is the p-value and the third is the number of observations.

Panel A: Averages of variables in the trust game

	Mean (std. dev.)
Amount sent	$18.82 (14.9)
Amount returned	$18.08 (10.07)
Amount returned as % of amount sent x3	26.7% (0.16)
Expected return	$20.91 (9.8)
Expected return as % of amount sent x3	31.6% (0.16)

Panel B: Quantities and percentages conditional on the amount sent in the trust game

Amount sent	Number of students (and proportion)	Average returned (in $)	Return as proportion of amount sent x3 (%)	Expected return (in $)	Expected return as proportion of amount sent x3 (%)
0	54 (10.76%)	0	.	0	.
5	63 (12.55%)	3.91	26.07	4.5	30.65
10	115 (22.91%)	8.14	27.13	10.09	33.66
15	42 (8.37%)	12.73	28.29	15.86	35.24
20	65 (12.95%)	18.6	31.00	22.10	36.84
25	39 (7.77%)	24.47	32.63	28.18	37.57
30	33 (6.57%)	30.64	34.04	35.15	39.05
35	9 (1.79%)	36.4	34.67	41.15	39.19
40	29 (5.78%)	41.83	34.86	46.74	38.95
45	7 (1.39%)	47.24	34.99	52.96	39.23
50	46 (9.16%)	53.93	35.95	60.40	40.26

Panel C: Lottery choices and risk aversion

Number of risky choices	Number of students (and %)	Average Relative Risk Aversion: CRRA
0	42 (8.37%)	0.7
1	3 (0.60%)	0.48
2	14 (2.79%)	0.44
3	12 (2.39%)	0.40
4	41 (8.17%)	0.36
5	52 (10.36%)	0.32
6	65 (12.95%)	0.27
7	33 (6.57%)	0.22
8	52 (10.36%)	0.16
9	23 (4.58%)	0.1
10	107 (21.31%)	0.034
11	37 (7.37%)	0.038
12	7 (1.39%0	-0.12
13	2 (0.40%)	-0.20
14	3 (0.60%)	-0.30
15	9 (1.79%)	-0.40

Panel D: Description and summary statistics of variables in the survey

Variable name	Question/Description	Answer range	Frequency (n. obs.)	Mean (std. dev.)
Trust	Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?	i) Most people can be trusted (1)	52.95% (269)	0.588 (0.492)
		ii) Can't be too careful (0)	37.01% (188)	
		iii) Don't know (.)	10.04% (51)	
Trust Chicago	Suppose that a new and very desirable dorm/apartment has become available. The University of Chicago organizes a lottery to assign it among the many applicants. How confident are you that the allocation will be fair?	i) Not at all (1)	0.79% (4)	3.364 (0.682)
		ii) Not much (2)	8.86% (45)	
		iii) Quite a lot (3)	41.14% (209)	
		iv) A great deal (4)	45.47% (231)	
		v) I don't know (.)	3.74% (19)	
Trust wallet	Suppose that while walking on Michigan Avenue in Chicago you lose your wallet with 1,000 dollars inside. A random person that you do not know finds it. He or she does not know you, but he or she is aware that the money belongs to you and knows your name and address. He or she can keep the money without incurring any punishment. According to you, what do you think it is the probability he or she will return the money to you?	Report a number between 0 and 100, where 0 means that the money won't be returned for sure and 100 means that it will be returned for sure.	Prob. < 25%: 36%	34.87 (23.00)
			Prob. between 25% and 49%: 24%	
			Prob. between 50% and 74%: 34%	
			Prob. between 75% and 100%: 6%	
Trust detect	How good are you in detecting people who are trustworthy?	i) Not good at all (1)	0.2% (1)	3.20 (0.61)
		ii) Not very good (2)	9.65% (49)	
		iii) Good (3)	56.69% (288)	
		iv) Very good (4)	29.92% (152)	
		v) I don't know (.)	3.54% (18)	

Panel E: Correlations among the trust questions of the survey and the quantity sent

	Amount sent	Trust WVS	Trust U. Chicago	Trust wallet	Trust detect
Amount sent	1 502				
Trust WVS	0.1175 (0.0123) 454	1 457			
Trust U. Chicago	0.0085 (0.8528) 483	0.1196 (0.0121) 440	1 489		
Trust wallet	-0.0199 (0.657) 502	0.2018 (0) 457	0.136 (0.0026) 489	1 508	
Trust detect	0.0785 (0.0843) 485	0.029 (0.5436) 440	0.0508 (0.271) 472	0.1383 (0.0021) 490	1 490

Table 2: Description of the variables

Panel A provides the definition, range of answers, frequency, means, and standard deviations of individual characteristics obtained from the survey and the other games. Panel B displays additional summary statistics on the variables described in panel A.

Panel A: Description of survey and games data

Variable name	Question/Description	Answer range	Frequency (n. obs.)	Mean (std. dev.)
Age	The age of each subject	Integer from 22 to 38	508	28.31 (2.47)
Gender	The gender of each subject	Male (0) Female (1)	350 male 158 female	0.31 (0.46)
White race	Whether the subject is of white race or not	White (1) Other (0)	223 white 285 non-white	0.43 (0.49)
Siblings	How many siblings do you have?	Integer from 0 – 13	508	1.58 (1.36)
US nationality	Country of citizenship	US (1) Other (0)	308 from US 200 not	0.60 (0.48)
Risk Aversion	CRRA calculated as in Holt and Laury (2002)	Option A or Option B in 15 different lotteries	480	0.203 (0.228)
Unconditional kindness	Unconditional cooperation choice, from the cooperation game	Cooperate (1) Defect (0)	160 cooperate 342 defect	0.31 (0.46)
Inequity aversion	Inequity averse (all types): prefers symmetric outcomes, prefers advantageous outcomes, envious types (dislikes disadvantageous inequality), guilty types (dislikes advantageous inequality)	Inequity averse of any type (1) No inequity averse (0)	138 inequity averse 370 not	0.27 (0.44)

Panel B: Additional summary statistics on survey and games data

Variable name	Mean	Std. Dev.	Median	Min	Max	N. obs.
Risk Aversion	0.203	0.2285	0.22	-0.4	0.7	480
Unconditional kindness	0.319	0.4664	0	0.00	1	502
Inequity aversion	0.272	0.4453	0	0	1	508
Age	28.319	2.4784	28.08	22.83	38.42	508
Gender	0.311	0.4634	0	0	1	508
White race	0.439	0.4968	0	0	1	508
Siblings	1.5866	1.3654	1	0	13	508
US nationality	0.6063	0.4891	1	0	1	508

Table 3: Determinants of the quantity sent in the trust game

This table, replicating Glaeser et al. (2000), reports several OLS regressions of the quantity sent in the trust game on its possible determinants. All the variables are defined in Table 1D and Table 2. Robust standard errors are in parentheses. The symbols *,**,*** indicate statistical significance at the 10, 5, and 1 percent levels.

Quantity sent in the trust game	1	2	3	4
Gender	-3.07**	-3.62**	-3.34**	-3.08**
	(1.46)	(1.45)	(1.42)	(1.45)
Age	-0.31	-0.18	-0.17	-0.07
	(0.28)	(0.28)	(0.28)	(0.29)
White race	1.11	1.81	1.09	1.48
	(1.52)	(1.5)	(1.47)	(1.51)
US nationality	0.8	1.79	1.74	1.83
	(1.51)	(1.5)	(1.47)	(1.5)
Unconditional kindness	4.01***	3.63**	3.83***	4.05***
	(1.53)	(1.5)	(1.47)	(1.49)
Trust WVS	2.89**			
	(1.39)			
Trust U. Chicago		0.13		
		(0.99)		
Trust wallet			-1.04	
			(3.1)	
Trust detect				1.82*
				(1.1)
Constant	24.49***	21.56**	22.28**	12.98
	(8.26)	(8.8)	(8.33)	(9.39)
N. observations	454	483	502	485
R-squared	0.044	0.038	0.033	0.041

Table 4: Determinants of senders' behavior in the trust game

This table reports the OLS estimates of several regressions of the quantity sent in the trust game on its three main determinants: risk aversion, the sender's expectation in returns, and altruism, which we measure as unconditional kindness (see Table 2). In the first column the expected return is the total expected returns across all the possible amounts sent weighted by the probability that amount is sent, while in the other columns we use the expected returns for the different possible amounts sent (recall that we asked subjects to make their choices according to the strategy method proposed by Selten (1967). When we introduce risk aversion the number of observations decreases because we eliminated 22 of the subjects with inconsistent preferences (they switched more than once in their lottery choices). All the variables are defined in Table 1 – Panel D and Table 2. Robust standard errors are in parentheses. The symbols *,**,*** indicate statistical significance at the 10, 5, and 1 percent levels

Quantity sent by the first mover in the trust game											
	With total exp return	With exp. Ret. If send 5	With exp. Return If send 10	With exp. Return If send 15	With exp. Return If send 20	With exp. Return If send 25	With exp. Return If send 30	With exp. Return If send 35	With exp. Return If send 40	With exp. Ret. If send 45	With exp. ret. if send 50
Risk Aversion (CRRA)	-12.48 (3.09)***	-13.50 (3.12)***	-13.30 (3.13)***	-13.34 (3.12)***	-12.60 (3.09)***	-12.56 (3.1)***	-12.12 (3.12)***	-11.86 (3.07)***	-12.31 (3.12)***	-12.47 (3.08)***	-12.60 (3.07)***
Expected return	0.34 (0.07)***	-0.16 (0.21)	0.12 (0.11)	0.11 (0.08)	0.20 (0.06)***	0.22 (0.05)***	0.21 (0.04)***	0.20 (0.03)***	0.17 (0.03)***	0.17 (0.03)***	0.15 (0.02)***
Unconditional kindness	4.17 (1.5)***	4.18 (1.52)***	4.18 (1.52)***	4.20 (1.52)***	4.16 (1.52)***	4.08 (1.51)***	4.53 (1.49)***	4.25 (1.48)***	4.25 (1.49)***	4.05 (1.47)***	4.04 (1.46)***
Constant	13.32 (1.87)***	21.33 (1.52)***	19.41 (1.69)***	18.86 (1.77)***	16.10 (1.89)***	14.20 (1.81)***	12.98 (1.87)	11.97 (1.78)***	12.31 (1.74)***	11.39 (1.71)***	11.44 (1.72)***
R2	0.105	0.059	0.061	0.063	0.081	0.101	0.111	0.126	0.126	0.139	0.142
N. obs.	480	480	480	480	480	480	480	480	480	480	480

Table 5: Trust and Expected returns

These tables report the OLS estimates of the expected return on the level of trust expressed in the questionnaire, their risk aversion, and their unconditional kindness. In Panel B we conduct a robustness check by including several individual characteristics. All the variables are defined in Table 1 – Panel D and Table 2. Robust standard errors are in parentheses. The symbols *,**,*** indicate statistical significance at the 10, 5, and 1 percent levels.

Panel A: Basic specification

Expected Returns										
	Expected return if send 5	Expected return if send 10	Expected return if send 15	Expected return if send 20	Expected return if send 25	Expected return if send 30	Expected return if send 35	Expected return if send 40	Expected return if send 45	Expected return if send 50
Trust WVS	0.35 (0.33)	-0.02 (0.64)	0.32 (0.94)	0.47 (1.15)	1.24 (1.4)	3.31 (1.64)**	4.18 (1.94)**	4.49 (2.26)**	5.09 (2.5)**	7.08 (2.86)**
Risk Aversion	-0.09 (0.76)	-1.92 (1.37)	-2.33 (2.08)	-6.35 (2.31)***	-6.84 (2.74)**	-9.25 (3.5)***	-10.11 (4.19)**	-10.06 (5.18)*	-7.56 (5.55)	-7.47 (6.64)
Unconditional kindness	-0.25 (0.37)	0.05 (0.7)	-0.12 (1.03)	-0.23 (1.25)	0.01 (1.51)	-1.99 (1.73)	-1.03 (2.03)	-1.19 (2.38)	-0.59 (2.64)	-0.72 (3.02)
Constant	4.28 (0.31)***	10.15 (0.62)***	15.83 (0.91)***	22.78 (1.11)	28.31 (1.35)***	34.88 (1.6)***	40.29 (1.9)***	45.94 (2.29)***	50.98 (2.46)***	57.43 (2.8)***
R2	0.003	0.005	0.004	0.016	0.016	0.03	0.028	0.022	0.016	0.02
N. obs.	408	408	408	408	408	408	408	408	408	408

Panel B: Robustness check

Expected Returns										
	Expected return if send 5	Expected return if send 10	Expected return if send 15	Expected return if send 20	Expected return if send 25	Expected return if send 30	Expected return if send 35	Expected return if send 40	Expected return if send 45	Expected return if send 50
Trust WVS	0.35	0.01	0.33	0.48	1.21	3.30	4.17	4.48	5.02	7.01
	(0.33)	(0.65)	(0.95)	(1.17)	(1.42)	(1.66)**	(1.96)**	(2.28)**	(2.52)**	(2.88)**
Risk Aversion	-0.34	-2.21	-2.71	-6.34	-6.72	-8.62	-10.07	-10.09	-7.2	-6.51
	(0.72)	(1.4)	(2.11)	(2.39)***	(2.83)**	(3.58)**	(4.25)**	(5.28)*	(5.67)	(6.73)
Unconditional kindness	-0.27	0.05	-0.1	-0.21	-0.03	-2.1	-1.29	-1.51	-0.94	-1.11
	(0.38)	(0.72)	(1.06)	(1.28)	(1.54)	(1.77)	(2.08)	(2.42)	(2.69)	(3.08)
Age	0.05	0.04	0.05	0.07	0.3	0.41	0.52	0.67	0.89	1.01
	(0.06)	(0.12)	(0.17)	(0.22)	(0.25)	(0.3)	(0.35)	(0.41)	(0.44)**	(0.53)*
Gender	0.41	0.19	0.57	-0.03	0.21	-1.11	-0.26	0.07	-0.51	-1.55
	(0.36)	(0.7)	(0.98)	(1.24)	(1.47)	(1.76)	(2.08)	(2.42)	(2.7)	(3.05)
White race	-0.51	-1.21	-1.08	-0.21	0.56	0.73	-0.43	-0.05	0.26	1.3
	(0.37)	(0.72)	(1.02)	(1.26)	(1.53)	(1.8)	(2.07)	(2.43)	(2.71)	(3.02)
US nationality	0.39	0.42	0.4	-0.26	0.09	-0.04	1.74	1.66	2.49	1.88
	(0.38)	(0.74)	(1.08)	(1.37)	(1.63)	(1.96)	(2.21)	(2.56)	(2.84)	(3.23)
Inequity averse	-0.04	-0.22	-0.61	-0.12	0.07	0.98	1.32	2.06	1.27	2.08
	(0.37)	(0.71)	(1.01)	(1.2)	(1.37)	(1.65)	(1.9)	(2.23)	(2.44)	(2.79)
Constant	2.78	9.37	14.62	20.98	19.41	22.94	24.45	25.53	24.10	26.98
	(1.78)	(3.53)***	(5.13)***	(6.73)***	(7.56)**	(9.1)**	(10.63)**	(12.41)**	(13.44)*	(16.04)*
R2	0.013	0.012	0.008	0.017	0.018	0.036	0.033	0.028	0.024	0.029
N. obs.	408	408	408	408	408	408	408	408	408	408

Table 6: Expected returns and trustworthiness

This table reports the OLS estimates of several regressions of the quantity sent in the trust game. All the variables are defined in Table 1 – Panel D and Table 2. Robust standard errors are in parentheses. The symbols *,**,*** indicate statistical significance at the 10, 5, and 1 percent levels.

Expected Returns										
	Expected return if send 5	Expected return if send 10	Expected return if send 15	Expected return if send 20	Expected return if send 25	Expected return if send 30	Expected return if send 35	Expected return if send 40	Expected return if send 45	Expected return if send 50
Trust WVS	0.49 (0.26)*	0.32 (0.5)	0.49 (0.76)	0.25 (0.96)	0.23 (1.11)	0.91 (1.31)	1.19 (1.54)	0.87 (1.74)	0 (1.96)	1.76 (2.34)
Risk Aversion	0.17 (0.65)	-1.01 (1.16)	-0.16 (1.79)	-2.93 (2.09)	-0.95 (2.37)	-2.46 (3.12)	-3.77 (3.4)	-3.49 (4.09)	-1.32 (4.56)	2.08 (5.83)
Unconditional kindness	-0.60 (0.31)*	-0.63 (0.55)	-1.36 (0.81)*	-1.49 (1.03)	-1.96 (1.17)*	-4.53 (1.42)***	-3.49 (1.62)**	-3.60 (1.87)*	-3.09 (2.08)	-4.11 (2.48)*
Age	-0.01 (0.05)	-0.05 (0.09)	-0.08 (0.14)	-0.06 (0.18)	0.03 (0.19)	0.06 (0.23)	0.11 (0.26)	0.05 (0.29)	0.17 (0.32)	0.33 (0.41)
Gender	0.29 (0.29)	0.2 (0.54)	0.65 (0.81)	0.59 (0.97)	0.61 (1.09)	-1.52 (1.26)	-1.35 (1.47)	-0.79 (1.67)	-1.88 (1.92)	-2.93 (2.27)
White race	-0.37 (0.28)	-0.53 (0.54)	-0.36 (0.79)	0.64 (1.01)	1.68 (1.21)	2.94 (1.46)**	1.8 (1.61)	1.69 (1.81)	2.33 (2.00)	4.30 (2.38)*
US nationality	0.31 (0.31)	0.65 (0.58)	0.46 (0.86)	-0.5 (1.14)	-0.28 (1.3)	-0.08 (1.6)	1.46 (1.78)	1.39 (1.93)	2.32 (2.14)	1.06 (2.55)
Inequity averse	-0.26 (0.29)	-0.69 (0.54)	-1.13 (0.77)	-0.97 (0.99)	-1.43 (1.13)	-0.76 (1.33)	-0.39 (1.51)	-0.32 (1.83)	-1.43 (1.97)	-0.37 (2.37)
Amount returned if sent 5,…,50	0.56 (0.05)***	0.59 (0.04)***	0.61 (0.05)***	0.55 (0.05)***	0.62 (0.05)***	0.61 (0.05)***	0.61 (0.05)***	0.63 (0.05)***	0.61 (0.05)***	0.59 (0.05)***
Constant	2.46 (1.57)	6.62 (2.81)**	10.27 (4.16)**	14.32 (5.72)**	12.00 (6.22)**	14.93 (7.3)**	15.10 (8.3)*	18.43 (8.75)**	18.28 (9.82)*	16.88 (12.42)
R2	0.355	0.4	0.371	0.328	0.391	0.377	0.393	0.413	0.406	0.368
N. obs.	436	436	436	436	436	436	436	436	436	436

Table 7: Trustworthiness and trust

This table reports the OLS estimates of several regressions of the quantity returned in the trust game. All the variables are defined in Table 2. Robust standard errors are in parentheses. The symbols *,**,*** indicate statistical significance at the 10, 5, and 1 percent levels.

	Amount returned if send 5	Amount returned if send 10	Amount returned if send 15	Amount returned if send 20	Amount returned if send 25	Amount returned if send 30	Amount returned if send 35	Amount returned if send 40	Amount returned if send 45	Amount returned if send 50
Trust WVS	-0.18	-0.46	0.07	1.24	1.97	4.49***	5.67***	6.57***	9.09***	10.79***
	(0.34)	(0.67)	(0.94)	(1.18)	(1.41)	(1.64)	(1.96)	(2.27)	(2.60)	(2.93)
Constant	3.99***	8.37***	12.70***	17.92***	23.45***	28.10***	33.29***	38.30***	42.38***	48.14***
	(0.26)	(0.53)	(0.77)	(0.97)	(1.18)	(1.32)	(1.60)	(1.86)	(2.13)	(2.38)
Observations	454	454	454	454	454	454	454	454	454	454
R-squared	0.001	0.001	0.000	0.003	0.005	0.017	0.019	0.019	0.028	0.031

Figure 1: Elicitation of senders' expectations of receivers' returns

This figure reports the screen subjects faced when they had to decide their expectations.

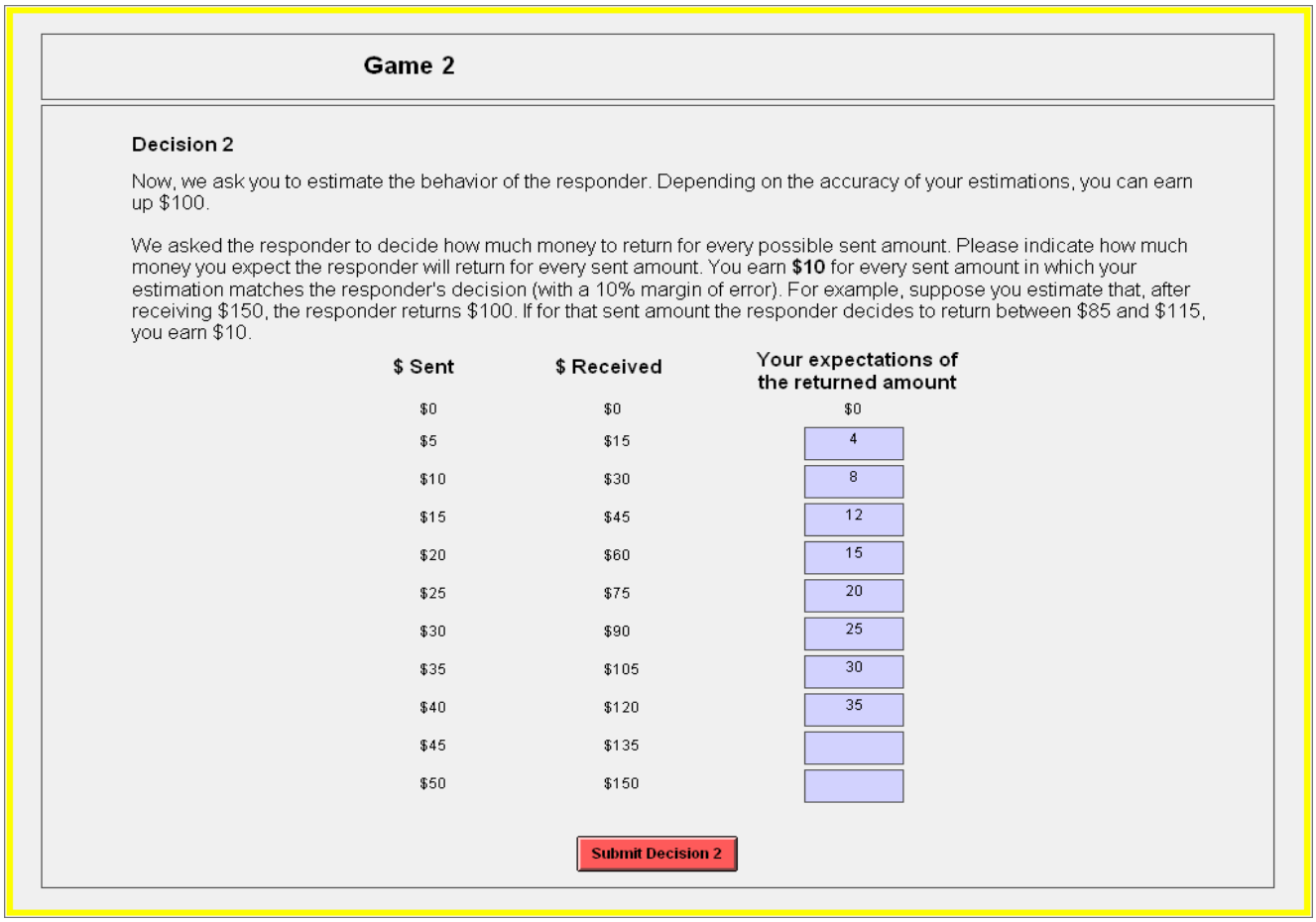

Figure 2: Expected and actual proportion of money returned in the trust game as a function of the amount sent.

The black line represents the proportion of the amount sent that on average the subjects expected to receive for given amounts sent. The red line is the actual proportion of the amount sent that on average subjects received when they sent that corresponding amount.