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Trust Games Measure Trust

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Abstract: The relationship between trust and risk is a topic of enduring interest. Although there are substantial differences between the ideas the terms express, many researchers from different disciplines have pointed out that these two concepts become very closely related in personal exchange contexts. This raises the important practical concern over whether behaviors in the widely-used "trust game" actually measure trust, or instead reveal more about risk attitudes. It is critical to confront this question rigorously, as data from these games are increasingly used to support conclusions from a wide variety of fields including macroeconomic development, social psychology and cultural anthropology. The aim of this paper is to provide cogent evidence on the relationship between trust and risk in "trust" games. Subjects in our experiment participate either in a trust game or in its risk game counterpart. In the trust version, subjects play a standard trust game and know their counterparts are human. In the risk version, subjects know their counterparts are computers making random decisions. We compare decisions between these treatments, and also correlate behavior with subjects' risk attitudes as measured by the Holt and Laury (2002) risk instrument. We provide evidence that trusting behavior is different than behavior under risk. In particular, (i) decisions patterns in our trust and risk games are significantly different; and (ii) risk attitudes predict decisions in the risk game, but not the trust game.

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I. Introduction

The relationship between trust and risk is a topic of enduring interest. There are of course differences between the ideas the terms express. Nevertheless, many researchers from different disciplines have pointed out that these two concepts become very closely related in personal exchange contexts (see, e.g., Ben-Ner and Putterman, 2001; Cook and Cooper, 2003; Hardin, 2002). This raises the important practical concern over whether behaviors in the widely-used trust game (Berg et al., 1995) actually measure trust, or instead reveal more about risk attitudes. It is critical to confront this question rigorously, as data from these games are increasingly used to support conclusions from a variety of fields including game theory, macroeconomic development, social psychology and cultural anthropology (Ostrom and Walker, 2002; Seligman, 1997). The aim of this paper is to provide cogent evidence on the relationship between trust and risk in "trust" games.

Recent research on the trust or risk question has either examined the correlation between survey measures of risk attitudes and decisions in trust games (Eckel and Wilson, 2004), or has provided direct comparisons of "investment" decisions in otherwise identical games of trust or risk (Kosfeld et al., 2005). The former find little evidence that risk attitudes correlate with trusting decisions, while the latter find that the distribution of trusting decisions is statistically identical to the distribution of risky decisions. While these findings are not necessarily inconsistent, there has not existed rigorous evidence to reconcile them. In this paper we seek to provide such evidence. We report results from otherwise identical "trust" and "risk" games, and correlate decisions in each of these games with a widely used measure of subjects' risk attitudes.

Eckel and Wilson (2004) provide a comprehensive analysis of the way behavior in two-person sequential, binary trust games correlates with a variety of behavioral and survey-based risk measures. Among their behavioral measures is a binary "risk" game that is similar to their binary trust game (but has a coarser payoff space), as well as a Holt and Laury (2002) measure of risk attitudes. They find no evidence that any of their risk measures predicts the decision to trust, and they conclude that subjects do not treat decisions involving trust in the same way that they treat decisions involving risk.

The comprehensive evidence provided by Eckel and Wilson (2004) is persuasive. However, one open issue not addressed in that paper is whether the risk measures they elicit would be able to predict decisions in a "risk" game otherwise identical to their trust game. If the measures do not predict risky decisions, then it is unclear how to interpret the failure of measured risk attitudes to predict trusting decisions.[1]

We are aware of only one study, Kosfeld et al. (2005), in which researchers directly compare behavior between a trust game and its risk game analogue[2]. In their "trust" version, an investor and trustee were randomly paired, and the former endowed with 12 "monetary units" (MUs). The investor chooses to send either 0, 4, 8 or 12 MUs to the trustee, this amount is tripled, and the trustee is given the opportunity to return any integer amount from zero to their entire amount available (e.g., if the investor sends zero the trustee can return any amount between zero and 12). In their "risk" version, all subjects were investors with the same choices as in the trust game, but where a random

[1] A similar point can be made of Glaeser et al. (2000), who investigate (and find limited evidence for) correlations between survey-based attitudinal measures of trust and decisions in trust games. They do not address risk, in that they do not investigate correlations between their survey responses and decisions in otherwise identical trust and risk games.

[2] In their interesting study of trust and betrayal, Bohnet and Zeckhauser (2004) do not elicit independent measures of subjects' risk attitudes. Consequently, they are unable to draw inferences with respect to the role of risk preferences in explaining behavior in their games.

mechanism - not a person – determined the return amount. Moreover, the random process mimicked the distribution of returns in the "trust" condition, and the investors knew that this was the case. The authors report that the distribution of investor decisions between the two treatments are statistically identical (p = 0.77), both with medians of eight.[3]

Although noteworthy as a study that formally compares behavior in analogous trust and risk environments, one should interpret the Kosfeld et al. (2005) results with caution. One reason is that their sample size is relatively small, with 29 and 30 subjects in the trust and risk games, respectively. Another reason is that, even if the distributions are in fact identical, this of course does not imply that trust and risk are the same. Indeed, at the individual level one might still find that risk measures predict play in the risk game, but not in its trust game counterpart.

In this paper, we combine the strategies of the experimental studies mentioned above to provide cogent evidence on the relationship between trust and risk. Subjects in our experiment participate either in a trust game or in its risk game counterpart. In the trust version, the subject played a standard trust game and she knew her counterpart was human; we call this the human treatment. In the risk version, the subject knew her counterpart was a computer making random decisions; we call this the computer treatment. In addition, we measure each subject's risk attitudes using the risk instrument proposed by Holt and Laury (2002, henceforth HL).

[3] Also related to our work is Dohmen et al. (2006). Using survey data on risk and trust attitudes from the German Socio-Economic Panel (GSOEP), they analyze how these attitudes are passed from parents to children, and also their correlation among spouses. Their results suggest that risk and trust are two independent attitudes and that they are transmitted separately from parents to children. It turns out that this separation is in line with our experimental findings.

Our hypotheses are (i) the investment distributions differ between the human and computer treatments, and (ii) the HL measurements correlate with decisions in the computer treatment, but not in the human treatment. In fact, we find statistically significant differences in the distributions of investor decisions between the trust and risk games. While the means of the distributions are statistically identical, the dispersion of decisions under trust is significantly greater, with clear clustering at sending zero and sending everything. Moreover, we find that risk attitudes as measured by HL are significant predictors of decisions in the "risk" game, but are uncorrelated with decisions in the "trust" game.

II. Experiment Design

The study was conducted in November 2005 in the experimental laboratory of the Sonderforschungsbereich 504, a research center at the University of Mannheim. In nine sessions, a total of 117 subjects participated in the study. All subjects were recruited from the general student population. The experiment is computerized and consists of two treatments, a human interaction treatment (H) and a computer interaction treatment (C). Each treatment consists of a HL risk attitude elicitation and an investment game. Half of our subjects completed the HL elicitation first, and the other half the investment game first. We found no evidence of order effects.

First we describe the choice tasks used to estimate subjects' degrees of risk aversion. The task is a replication of the price list procedure used by Holt and Laury (2002). It involves ten choices between the paired lotteries described in Table 1. The payoffs are the same in all 10 choice situations and they are less variable than the potential payoffs for option B. While in the first row, the probability of the high payoff for both options is 10%, it increases to 100% in the last row. A very risk seeking person should switch to option B early, and an extremely risk averse person should switch over by decision 10 in the bottom row. Following Holt and Laury (2002), payoffs for each subject were determined by randomly implementing one of the ten lotteries and paying according to the subject's decision on that lottery.

< Insert Table 1 here >

The other part of our experiment is an investment game, and we implement this game differently according to whether it is the human (H) or computer (C) treatment. The human treatment follows the procedures of the standard trust game (Berg, Dickhaut, McCabe, 1995). Participants are randomly and anonymously paired, and each is endowed with 10 experimental currency units (ECU). Subjects exchange ECU for Euros at rate € 1 = 2 ECU at the experiment's conclusion. Each investor can send some, all or none of her endowment to her counterpart, the trustee. The experimenter triples the amount sent and provides that amount to the trustee, who can then return some, all or none of the tripled amount to the investor. "Trust" is typically measured as the amount investors send in this game. Many have pointed out that, to the extent that investors treat the investment decision as "risky", this measure of "trust" might in fact be better characterized as a measure of risk attitudes.

Our computer treatment allows us to address this issue directly. The investment game in this treatment varies from the first in only one respect: the investor is matched with the computer, who is playing the role of the trustee. Participants have full information about the treatment. In particular, they know whether their counterpart is a computer or another person in the lab. In addition, participants in the computer treatment are shown a graph with the distribution from which the computer draws when it decides about how much to return to the investor. This distribution is taken from Berg, Dickhaut and McCabe (1995), and investors are informed that the distribution is based on previous experiments with human subjects.

III. Results

In this section we first describe our subjects' risk attitudes as elicited by the HL task. Then we describe the distribution of investor decisions in our human and computer investment game treatments, and show that they are different. Finally, we show that risk attitudes are significantly correlated to decisions in the "risk" game with computer counterparts, but not correlated to decisions in the "trust" game with human counterparts.

III.1. Subjects' Risk Attitudes

In total, we observe 117 subjects. Their risk aversion is measured according to Holt and Laury (2002) as the (last) point where a subject switches from option A to option B.[4] Very risk seeking subjects have a low switchpoint, and risk averse subjects a high switchpoint. We find a mean switchpoint of 5.75, suggesting that subjects are risk averse on average. Similar to Holt and Laury we also find that more than two thirds of the subjects (72%) choose more than 4 safe choices, which is the predicted switchpoint of a

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[4] The vast majority of our subjects (96%) switched only once. As in Holt and Laury (2002), we find that the analysis reported in this paper changes very little if we drop subjects who switch from B back to A.

risk neutral subject. 37 (32%) of our subjects are female, and female participants are on average more risk averse (mean switchpoint: 6.03) than male participants (mean switchpoint: 5.63); although this difference is statistically insignificant. Figure 1 displays the distribution of risk attitudes for our 117 participants.

< Insert Figure 1 here >

III.2. Investments in the Risk and Trust Games

Panels A and B of Figure 2 are histograms of investment decisions in the human (n=48) and computer (n=69) treatments, respectively. The histograms are strikingly different both visually and statistically (p=0.03, Kolmogorov-Smirnov test). These differences are not related to differences in central tendencies. The means of the human and computer distributions are 5.17 and 4.42, respectively, and these are not statistically different (p=0.2, double-sided t-test.) Moreover, the medians of the distributions are 5 (H) and 4 (C), and these are not statistically different (p=0.19, Mann-Whitney). As is visually clear, the source of the distributions' differences lies in their dispersions. The distribution of decisions in the computer treatment resembles a standard bell-curve, while when the counterpart is human the distribution is bimodal, with clustering at the boundaries of giving nothing and giving everything.[5] Consequently, the variance of the H distribution is statistically significantly larger than that of the C distribution (13.44 and 7.23, respectively, p=0.01, Variance ratio F-test.)

[5] Clustering at boundaries in trust games has been reported by others, see, e.g., Kosfeld et al., 2005. See also the survey by Camerer (2003).

< Insert Figure 2 here >

There are two primary reasons that the distributions between these two games could differ. One, consistent with our hypothesis, is that people make risky decisions in the computer treatment systematically differently than trusting decisions in the human treatment. Another is that both games reveal risky decisions, but the probabilities relevant for the human game are systematically different than the objective probabilities provided to subjects in the computer game. A difference in probabilities could reasonably be expected to lead to differences in distributions of decisions, even when decisions in both games are fundamentally risky.[6]

An advantage of collecting the HL risk attitudes data is that we can provide evidence on the validity of this second possibility. In particular, if both the computer and human treatments are perceived as games of risk then, even if the probabilities differ, the HL data would be expected to correlate with either both (if HL in fact correlates with risky decisions in these environments) or neither (if HL measures do not for some reason correlate with behavior in this task.) However, if it were found that HL risk measures correlate with decisions in the computer task, but not the human task, then this would provide evidence that decisions in the computer treatment were treated as "risky", while decisions in the trust treatment with human counterparts were not.

Unsurprisingly, we are not able to detect simple linear relationships between subjects' HL risk attitudes and their decisions in trust or risk games (the simple

[6] Other reasons are that small differences in instructions could change subjects understanding of the task, or perhaps that subjects playing games with computers perceive the experimenter as their counterpart, and they treat the experimenter differently than other subjects. We will not attempt to address these alternative (and in our view implausible) interpretations of our results.

correlation coefficients are small and insignificantly different from zero). Instead, we adopt a type-classification approach to discerning relationships between risk attitudes and decisions in games. Type-classification has proven to be a powerful procedure to discerning economic relationships that are not apparent in pooled analyses (see, e.g., Houser et al., 2004), and we find the same here.

We begin by classifying subjects according to their degree of risk aversion. There are very many ways that one might do this[7], so our approach is to draw our classifications directly from Holt and Laury (2002). In particular, HL draws attention to two particularly interesting patterns: four safe followed by six risky (switch at the fifth gamble), and six safe followed by four risky (switch at the seventh gamble). Theory predicts the former pattern for risk neutral subjects, and the latter pattern for subjects who are risk averse in a way that is consistent with what has been found in various econometric analyses of auction data (Holt and Laury (2002), p. 1646). We follow this approach directly, and classify subjects into three risk preference categories: those who switch at or before the fourth HL gamble (risk seeking); those who switch at the fifth or sixth HL gamble (risk neutral); and those who switch at or after the seventh HL gamble (risk averse).

Table 2 details the relationship between subjects' risk types and their investment decisions in the computer and human treatments. For each type, we report mean, median, high, low, and whether a subject invested more than 1/3 of his/her endowment.[8] First note that 72% of subjects in the computer condition invested four or more, while only 56% did so in the human condition. This difference is significant (p=0.07, two-sided t-test). In the human condition, neither mean nor median investment amount displays a systematic

[7] For example, there are 121 unique ways to assign three risk-preference types based on HL switch patterns.
[8] Using a cut-point of 20% or 40% leaves our results nearly unchanged.

relationship with risk type (see fn. 9), and about one-half of each risk type invests four or more. In pairwise comparisons, the fraction of subjects investing four or more is statistically identical between types in the human condition (the minimum *p*-value is 0.19 among the three pairwise, two-sided t-tests).

< Insert Table 2 here >

Results for the computer treatment are starkly different. Note first that both mean and median contributions increase as subjects' risk preferences change. Means range from 4.7 to 5 to 5.9 as risk type increases from risk averse to risk seeking. Medians vary from 4 to 5 to 6 for those same respective types, and this ordered relationship is statistically significant (p<0.08, Jonckheere test[9]). Strikingly, fully 90% of the risk seeking types invest significant amounts (four or more) in the computer game, while this is true for only about 2/3 of HL risk averse subjects. Moreover, just 58% of the risk seeking subjects in the human treatment invested four or more, and the difference is statistically significant (p=0.04, two-tailed Mann-Whitney test).

To further assess the significance of the relationship between subjects' HL-derived risk type and their investment decision, we now turn to a probit regression analysis of these same data.

III.3. Risk and Investment Decisions

[9] Jonckheere (1954) develops a non-parametric test for ordered relationships. In the case of two samples it reduces to the Mann-Whitney test. In our case the null hypothesis is that there are no systematic relationships among the medians of the different types' investment distributions, against the alternative that the medians are ordered from risk-averse (lowest) to risk-seeking (highest). The *p*-values for this test are 0.078 in the computer treatment, and 0.131 in the human treatment.

We conducted a simple probit regression of whether a subject invests 4 or more Euro on dummies for risk types as well as gender and age. Neither gender nor age are statistically significant, and we removed them from the analysis. Table 3 reports the resulting coefficient estimates.

< Insert Table 3 here >

The key result is that, in the computer treatment, the probability of investing 4 or more Euro is significantly higher (about 26 percentage points, $p = 0.04$) for strongly risk seeking subjects than for subjects in the risk averse group. On the other hand, an HL classification of strong risk aversion does not predict investments in the human treatment. Thus, this analysis provides convergent evidence that subjects' HL risk type predicts investment in the computer but not human treatment.

IV. Conclusion

This paper provided new evidence on the interpretation of investment decisions in trust games. Many have pointed out similarities between trusting and risky decisions, and have questioned whether trust games measure trust as distinct from risk, or are more appropriately viewed as measuring risk attitudes. To step towards addressing this issue, we examined behavior in investment games in two treatments: one where the subject knew her counterpart was human and the other where she knew her counterpart was a computer programmed to make return decisions according to a known random process derived from previous human decisions. In addition, we elicited risk attitudes from each of our subjects using the Holt and Laury (2002) procedure.

We found that the distribution of “risky” decisions with computer counterparts differed significantly from the distribution with human counterparts. In contrast to the unimodal and bell-shaped distribution in the computer treatment, the human-counterpart distribution was bimodal, with clustering at the extremes of investing everything and investing nothing. Moreover, the HL risk attitude measurements are uncorrelated with trusting decisions involving humans, but are significant predictors of risky decisions in the computer treatment. In particular, we found that subjects classified as “risk seeking” by the HL procedure were significantly more likely to invest a significant amount when their counterpart was a computer, but not when their counterpart was a human.

Our results build on a previous literature providing evidence for differences between trust and risk. Taken together, research on this topic provides convergent evidence that trust games measure trust as distinct from risk, and that trusting decisions are implemented differently by the brain than risky decisions (see, e.g., McCabe et al., 2001). Additional laboratory research on the biological foundations of prosocial behavior, and the way in which it differs from behavior under non-social risk, holds the promise of illuminating appropriate mechanisms to promote efficiency in both personal and impersonal institution-mediated economic exchange.

Appendix: Instructions

An English translation of our original German instructions is given below.

Instructions for Human Interaction Game (Player 1)

Thank you for coming. These instructions explain how the experiment works.

You have been randomly selected as player 1. Another participant of the experiment has been randomly assigned to you, s/he takes the role of player 2. Both you and your counterpart receive 10 experimental currency units, dubbed ECU.

The game is very short and simple: You have the possibility to transfer some of your 10 ECU to player 2. Then player 2 has the possibility to send some of this money back to you. After the experiment, you will be able to convert your experimental money into real money, which we will pay out in cash. The exchange rate is 1 € = 2 ECU.

And here are the details of the experiment: First, you have the opportunity to transfer all, some, or none of your 10 ECU to player 2. Each unit you send will be tripled. So, if you send 5 ECU, for example, player 2 will receive 3 * 5 ECU = 15 ECU.

The amount that you send will be displayed on the screen of player 2. Player 2 then has the possibility to send some of the money back to you. She/he can choose the amount from any number between zero and the tripled amount you have transferred to her/him. In the aforementioned example this means that player 2 would be able to send back to you any amount between 0 ECU and 15 ECU. The amount that player 2 sends back to you will not be tripled again.

The experiment ends after the decision of player 2. Your payoff is equal to your initial 10 ECU minus the amount you transfer to player 2 plus the amount you receive from player 2. That is, if you send 5 ECU and player 2 sends you 7 ECU back, then your earnings are 10 ECU – 5 ECU + 7 ECU = 12 ECU. 12 ECU corresponds to 6 €. Hence, your earnings would be 6 € in this example.

The game is played exactly once. You will not interact with your counterpart again in today's experiment.

Please do not talk with anybody during the experiment and please raise your hand, should you have any questions.

You are a participant of a scientific experiment sponsored by the German National Science Foundation. All data that you provide cannot be associated with your person and will be treated confidentially.

Instructions for Interaction Game (Player 2)

Thank you for coming. These instructions explain how the experiment works.

You have been randomly selected as player 2. Another participant in this experiment has been randomly assigned to you, and s/he will take the role of player 1. Each of you will receive 10 experimental currency units of money, dubbed ECU.

The game is very short and simple: Player 1 has the opportunity to transfer some of his/her 10 ECU to you. Then, you have the opportunity to send some of this money back to player 1. After the experiment, you will be able to convert your experimental money into real money, which we will pay in cash. The exchange rate is 1 € = 2 ECU.

Here are the details of the experiment: First, player 1 has the opportunity to transfer all, some, or none of her 10 ECU to you. Each unit that player 1 sends to you will be tripled by the experimenters. So, if player 1 sends 5 ECU, for example, you will receive 3*5 ECU = 15 ECU.

The amount sent by player 1 will be displayed on your computer screen. You have the opportunity to send some of the money back to player 1. You can send back any amount between zero and the entire tripled amount. In the aforementioned example this means: If player 1 sends 5 ECU to you and you receive 15 ECU, then you will be able to send back to player 1 any amount between 0 ECU and 15 ECU. The amount that you send back will not be tripled.

The experiment ends after you decide how much to send back to player 1. Your payoff is equal to your initial 10 ECU plus the amount you receive minus the amount you send to player 1. For example, if player 1 is sends 5 ECU to you and you send 7 ECU back, then you earn 10 ECU + 15 ECU - 7 ECU = 18 ECU. 18 ECU corresponds to 9 €. Hence, you earn 9 €.

The game is played exactly once. You will not interact with your counterpart again in today’s experiment.

Please do not talk with anybody during the experiment and please raise your hand, should you have any questions.

You are a participant of a scientific experiment sponsored by the German National Science Foundation. All data that you provide cannot be associated with your person and will be treated confidentially.

Instructions for Computer Interaction Game (Player 1)

Thank you for coming. These instructions explain how the experiment works.

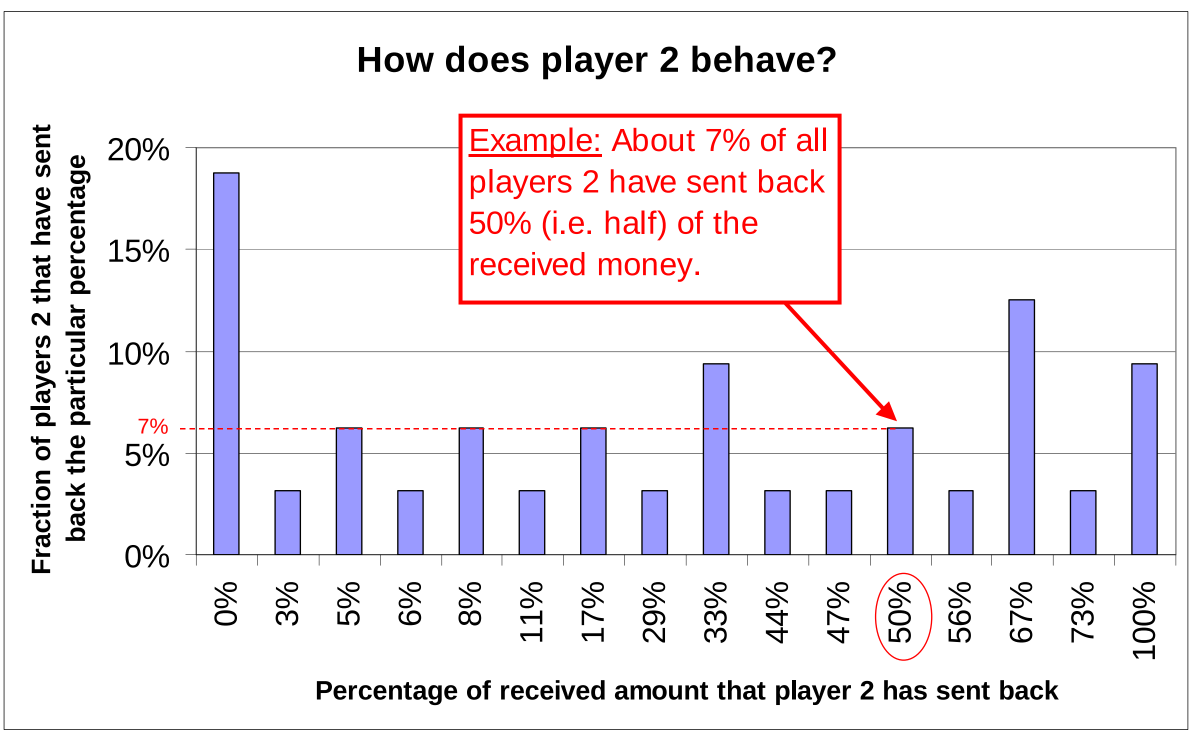
You have been selected as player 1; the computer has been assigned the role of player 2, that is your counterpart in this experiment is the computer. Each of you, i.e. you and player 2 (the computer) receive 10 experimental currency units, dubbed ECU.

The game is very short and simple: You have the possibility to transfer some of your 10 ECU to the player 2, the computer. Then, the computer has the possibility to send some of this money back to you. After the experiment, you will be able to convert your experimental money into real money, which we will pay out in cash. The exchange rate is 1 € = 2 ECU.

And here are the details of the experiment: First, you have the opportunity to transfer all, some, or none of your 10 ECU to player 2, the computer. Each unit you send will be tripled. So, if you send 5 ECU, for example, player 2 will receive 3 * 5 ECU = 15 ECU. Player 2, the computer, then has the possibility to send some of the money back to you. The amount sent back can be any number between zero and the tripled amount you have transferred to her/him.

How does player 2 decide about how much to send back to you?

The computer draws the amount to send back to you from the distribution shown in the picture below. This distribution is calculated from the results of numerous previous runs of this experiment, in which two humans interacted, i.e. both, player 1 and player 2 were humans.



The picture shows: The probability that the computer does not send back any money is about 18% (since the value of 0% on the x-axis is associated with a value of about 18% on the y-axis). The probability that the computer sends back 50% of the received money is about 7% – and so on.

The experiment ends after the decision of player 2. Your payoff is equal to your initial 10 ECU minus the amount you transfer to player 2 plus the amount you receive from player 2. That is, if you send 5 ECU and player 2 sends you 7 ECU back, then your earnings are 10 ECU – 5 ECU + 7 ECU = 12 ECU. 12 ECU corresponds to 6 €. Hence, your earnings would be 6 € in this example.

The game is played exactly once. You will not interact with your counterpart again in today's experiment.

Please do not talk with anybody during the experiment and please raise your hand, should you have any questions.

You are a participant of a scientific experiment sponsored by the German National Science Foundation. All data that you provide cannot be associated with your person and will be treated confidentially.

Instructions for the Lottery Game

Thank you for coming. These instructions explain how the experiment works.

In this part of the experiment, you have to answer 10 lottery questions that the computer presents to you. Each lottery question is a paired choice between two lotteries, "Option A" and "Option B." You will make ten choices between lotteries.

A short example illustrates the procedure. Let us assume that the computer presents you the following two options.

Option A	Option B
With a 50% chance, you will receive 2€, and with a 50% chance you will receive 10€.	With a 50% chance, you will receive 5€, and with a 50% chance you will receive 7€.

Consider a ten-sided die. Option A pays 2 € if a toss of a ten-sided die lands on 1 - 5, and it pays 10 € if the result is 6-10. Option B yields 5 € if the result is 1 - 5, and it pays 7 € if the toss results in 6-10. Let us now assume that you prefer option A to option B. We will throw a ten-sided die at the end of the experiment, and, if the die yields a 7, you will receive 10 €.

Recall, that you will be presented with ten of these decisions in total on one screen. Since only one of the decisions will be played for real payoff, another toss of a ten-sided die will decide at the end of the experiment which of the ten decisions will be paid out.

To summarize, you will make ten choices: for each decision row you will have to choose between Option A and Option B. You may choose A for some decision rows and B for other rows, and you may change your decisions and make them in any order. When you are finished, we will come to your desk and toss the ten-sided die to select which of the ten decisions will be used. Then we will toss the die again to determine your money earnings for the Option you chose for that Decision. Earnings for this choice will be added to your previous earnings, and you will be paid all earnings in cash when we finish.

Please do not talk with anybody during the experiment and please raise your hand, should you have any questions.

You are a participant of a scientific experiment sponsored by the German National Science Foundation. All data that you provide cannot be associated with your person and will be treated confidentially.

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Table 1: Lottery choices in the HL risk elicitation procedure

Option A	Option B
10% of €2.00, 90% of €1.60	10% of €3.85, 90% of €0.10
20% of €2.00, 80% of €1.60	20% of €3.85, 80% of €0.10
30% of €2.00, 70% of €1.60	30% of €3.85, 70% of €0.10
40% of €2.00, 60% of €1.60	40% of €3.85, 60% of €0.10
50% of €2.00, 50% of €1.60	50% of €3.85, 50% of €0.10
60% of €2.00, 40% of €1.60	60% of €3.85, 40% of €0.10
70% of €2.00, 30% of €1.60	70% of €3.85, 30% of €0.10
80% of €2.00, 20% of €1.60	80% of €3.85, 20% of €0.10
90% of €2.00, 10% of €1.60	90% of €3.85, 10% of €0.10
100% of €2.00, 0% of €1.60	100% of €3.85, 0% of €0.10

Table 2: Risk types and investment decisions in the human and computer treatments

Computer treatment

Risk attitude	Mean investment [€]	Median investment [€]	Lowest investment [€]	Highest investment [€]	Investment ≥ 4 €		Investment < 4 €	
					%	n	%	n
Risk averse	4.7	4	0	10	63.2%	12	36.8%	7
Risk neutral	5.0	5	1	10	66.7%	20	33.3%	10
Risk seeking	5.9	6	0	10	90.0%	18	10.0%	2
Total	5.2	5	0	10	72.5%	50	27.5%	19

Human treatment

Risk attitude	Mean investment [€]	Median investment [€]	Lowest investment [€]	Highest investment [€]	Investment ≥ 4 €		Investment < 4 €	
					%	n	%	n
Risk averse	3.6	3	0	10	44.4%	8	55.6%	10
Risk neutral	5.1	5	0	10	66.7%	12	33.3%	6
Risk seeking	4.7	5	0	10	58.3%	7	41.7%	5
Total	4.4	4	0	10	56.3%	27	43.8%	21

Table 3: Probit regressions of making an investment of 4 or more

Computer treatment

	Coefficient	Std. Err.	z	P>|z|
Risk neutral	0.0947	0.3771	0.25	0.802
Risk seeking	0.9455	0.4819	1.96	0.050
constant	0.3360	0.2935	1.14	0.252

Note: # observations = 69   Pseudo $R^2 = 0.0617$

Human treatment

	Coefficient	Std. Err.	z	P>|z|
Risk neutral	0.5704	0.4258	1.34	0.180
Risk seeking	0.3501	0.4700	0.74	0.456
constant	-0.1397	0.2965	-0.47	0.637

Note: # observations = 48   Pseudo $R^2 = 0.0280$

Figure 1: Distribution of the HL risk measure (all subjects)

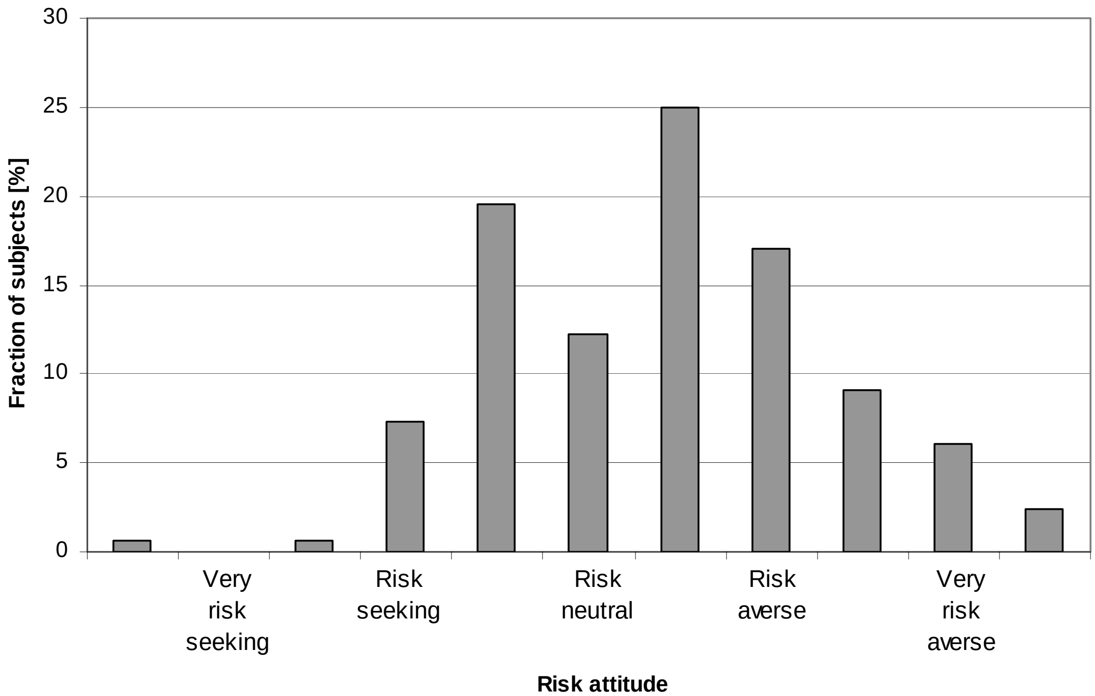
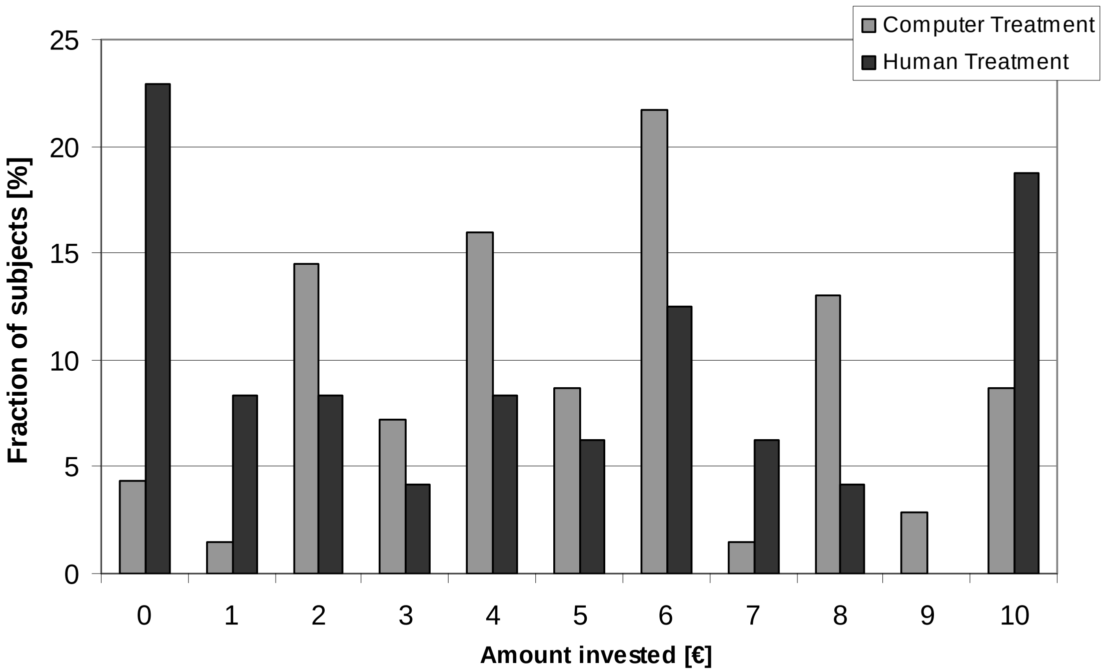


Figure 2: Distribution of investment decisions in the human and computer treatments



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