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# Masters Dissertation

# An Experimental Analysis of the Risk-Trust Confound



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**Abstract**

The notion of trust has great significance to an economy. Trust is known to be associated with efficient judicial systems, improved government functioning with lower corruption, and better financial outcomes (Johnson and Mislin, 2011). However, many researchers have argued that risk attitudes may confound the measurement of trust because trusting decisions involve outcomes that have only some probability of occurring. This study therefore seeks to question whether risk attitudes predict trusting decisions in the Berg, Dickhaut and McCabe (1995) Investment Game amongst students at the University of Cape Town in 2016. The statistical method adopted is maximum likelihood estimation which accounts for subject errors in decision making. This study finds that having additional information on the past behaviour of trustees does not affect the trusting behaviour of trustors. In addition, the presence of a human trustee, versus a computer, is found to significantly influence behaviour and decisions made by trustors in the trust game. It is also found that subjects are, on average, risk averse with 62% of subjects exhibiting high levels of risk aversion, and females being more risk averse than males. Subjects were also found to subjectively distort probabilities, where subjects would overweight low probabilities and underweight moderate to high probabilities. Expected Utility models and Rank-Dependent Utility models show that risk and trust are statistically significantly related and that the reasons for trusting one's partner may have arisen out of an inner need to simply trust that person. In addition, risk preferences were able to predict trusting decisions in the environment of risk *and* the environment of trust. Risk and trust therefore go hand-in-hand and it can be argued that trusting decisions are perceived as decisions involving risk. This study therefore finds that trusting decisions are in fact confounded by risk attitudes, so that a subject may be seen as trusting when actually they are just risk-seeking, or seen as non-trusting when they are just simply risk averse.

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# 1 Introduction

The act of trusting another person involves putting oneself in an exposed situation and making oneself vulnerable to another person's actions. Specifically, Fukuyama (1995) defines this act as "the expectation . . . of regular, honest, and cooperative behaviour, based on commonly shared norms", which he believes leads to improved cooperative behaviour and hence, a better society. The potential vulnerability and exploitation involved in trusting another person suggests a certain level of riskiness when one decides whether to trust or not. Eckel and Wilson state that the decision to trust is similar to "placing a risky bet on the trustworthiness of an anonymous counterpart" (2004, 447). They go on to explain that trusting can involve a person giving up their assets to another, but that it is not guaranteed that this asset will ever be returned to them.

This level of uncertainty, where a person's decisions can be affected by the outcome of someone else's, means, as explained by Houser, Schunk, and Winter (2010) [henceforth, HSW], that trusting decisions occur in an environment of strategic uncertainty. On the other hand, risky decisions are made in an environment of state uncertainty and depend on probabilities, the outcomes of which tend to be outside the control of the individual. There is therefore perfect information concerning the probability of possible outcomes with respect to risky decisions, and imperfect information over the probability of someone else's decisions with respect to trusting decisions.

Attitudes toward risk are important factors to consider when making inferences about trust. An individual may appear to be more trusting because he or she actually trusts more or it may be because he or she is more willing to take a risk or a gamble. For different levels of trust across two communities, to what extent is that difference driven by varying levels of risk aversion? For example, suppose two different individuals trust the same amount of money to another person. Does this necessarily mean that they both have the same level of trust? Or could one individual be more inherently trusting than the other, but their greater level of risk aversion tempers any urge that they might have to send more money?

Eckel and Wilson (2004) explain that risk preferences may not be the only factor determining an individual's decision to trust. Other factors include social distance and knowledge of one's partner, since anonymity of that partner may increase the riskiness of a trusting decision. Cook and Cooper (2003) describe an individual's decision to trust as him or her deciding whether or not to take a risk on another person. Ben-Ner and Putterman (2001) explain that trust depends on an individual's past experience with trusting another person, their personal preferences, and his or her willingness to take a risk. Risk preferences may therefore influence the decision to trust.

In addition, individuals can form subjective probability judgements over outcomes in a trust environment. Choices made may then depend on the extent to which people over- or underweight probabilities. For example, suppose that there is a small chance of a subject receiving a bad outcome when making a trusting decision. If this subject overweights the likelihood of the bad outcome, then he or she may perceive a greater chance of receiving that bad outcome than is objectively true and hence be less willing to trust; the opposite holds if the subject underweights this probability.

This study aims to investigate whether or not risk and trust are related and whether subjects subjectively distort probabilities when making choices under risk. It has been argued that trust and risk are very closely related: specifically, risk attitudes may affect whether an individual chooses to trust, and to what degree. To the extent that this is true, there is the risk-trust confound.

Section 2 below details the literature on the risk-trust confound. Section 3 outlines the experimental design. A detailed description of the statistical analysis follows in Section 4. Section 5 provides the results and section 6 a discussion of these results. Lastly, Section 7 concludes.

## 2 Literature Review

The risk-trust confound has been researched by various authors such as Eckel and Wilson (2004), Schechter (2007), and HSW, to name a few. All of these studies investigated whether trust measurements were correlated with risk measurements.

A commonly-used way to measure trust in an experimental setting, and an instrument used by all of the above, is the Investment Game[1] of Berg, Dickhaut, and McCabe (1995) [BDM]. In this game, two anonymous players are paired together. Both players in each pair receive an endowment of $10. The first player (the trustor) has to decide how much of this $10 to send to his or her partner: all, none, or any integer amount. The amount sent is then tripled before being received by their partner. This partner, the second player (the trustee), then has the option of sending back all, none, or any integer amount of the tripled amount. Decisions made by each player can be interpreted as acts of trust and trustworthiness respectively: Ashraf, Bohnet, and Piankov (2006) label the amount sent by the first player as trust, and the amount returned by the second player as a proportion of what he or she was initially sent, as trustworthiness. Berg et al. (1995, 127) explain that "sending $1 may signal a very weak belief in reciprocity; at the other extreme, sending $10 may signal a strong belief in reciprocity".

BDM state the payoffs of each player to be as follows: Player 1 earns their initial $10 minus the amount that he or she decides to send to Player 2, plus the amount that Player 2 decides to return to him or her; Player 2 earns $10 plus the tripled amount that he or she receives minus the amount that he or she decides to send back to Player 1. Taking this into account, they explain that if subjects have a strictly increasing indirect utility function for wealth and want to maximise this, then second players will have a dominant strategy to keep the entire tripled amount that they receive. Thus, if first players predict such an action by their partner, then they would initially choose to send nothing. This, BDM acknowledge, is the subgame perfect equilibrium of this strategic interaction.

[1] The Investment Game of Berg, Dickhaut and McCabe (1995) is now commonly referred to as the Trust Game and will be referred to as such henceforth.

The above-mentioned researchers have argued that risk attitudes may confound this measure of trust derived from the trust game because trusting decisions involve outcomes that have only some probability of occurring. Most of the research surrounding the risk-trust confound makes use of this trust game and varying measures of risk attitudes.

Specifically, Eckel and Wilson (2004) (row 2 of Table 1) made use of a modified trust game, which gave the trustor the binary option of sending all of their $10 endowment or none of it. The roles of trustor and trustee were randomly assigned to two paired individuals in different locations. Both players in each pair were also asked to predict the decisions of their partner and were asked what kind of situation this game reminded them of, to explore whether subjects thought of the interaction as an act of trust.

They then elicited risk attitudes using three measures. The first is the Zuckerman Sensation-Seeking Scale which measured each subject's willingness to partake in risky activities using a 40 question survey. The second is the Holt and Laury (2002) [HL] risk preference task which asked subjects to indicate their preferred option (A or B) for ten pairs of lotteries. Both options A and B in each lottery contained a high payoff and a low payoff. Option B's payoffs had greater variance than payoffs under Option A, and as a result made B the riskier choice. The probability of receiving the greater payoff in both options increased for each successive lottery choice. So a risk neutral subject would initially choose the safer option A and only switch over to the riskier option B when the expected value of B exceeds that of A. The third risk measurement was a card gamble, where subjects had the option of choosing $10 with certainty or taking the gamble, where the latter had probabilities designed to replicate the return distribution of the trust game. The gamble had earnings between $0 and $20, with an expected value of $10. Each of these three tasks were played in a fixed order throughout all sessions.

The experimental design of Eckel and Wilson (2004) had subjects divided into three treatments, each of which received differing amounts of information about their partner: treatment 1 received no information; treatment 2 received information on their partner's gender, favourite colour, interest in movies, and whether they liked dogs; and treatment 3 received a photograph of their partner.

Eckel and Wilson (2004) used, as dependent variables, three risk measurements: the Zuckerman Sensation-Seeking Scale, the HL risk task, and the card gamble. These risk regressions had demographic explanatory variables aimed at extracting the determinants of risky choice. They modelled the decision to trust using a Probit model in an attempt to find the determinants of trust. To investigate the relationship between trust and risk, they evaluated the correlation coefficient of each risk measurement with the decision to trust, in each treatment and in the sample as a whole.

They found no correlation between risk preferences and trusting decisions, and "little evidence that trust is related to survey or decision measures of general risk aversion" (Eckel and Wilson, 2004, 463). However, since there was no control for order effects, it may be difficult to disentangle risk effects on trust from possible order effects. One important finding is that the card gamble and the HL task were found not to be statistically significantly related to trust. The third measure, the Zuckerman Sensation-Seeking Scale, only became significant once expected returns were included in the model. However, Eckel and Wilson (2004, 464) explain that this model with expectations and beliefs could just "be a post hoc justification for the decision to trust". Another important finding is that the HL risk task, which was unable to predict trusting decisions, was also unable to predict decisions in a standard risk environment: namely, the "Thrill and Adventure Seeking" subscale of the Zuckerman Sensation-Seeking Scale that most resembled a gamble. Therefore, the HL measure of risk could not predict risky decisions in a purely risky environment.

Looking at the risk measurements, one might expect statistically significant correlations across measures for a single subject. However, no such correlations were found, with the exception of a positive and statistically significant correlation between the Zuckerman Sensation-Seeking Scale and the HL measure. The remaining weak correlations could be due to the fact that unincentivised tasks were used, so subjects had little motivation to provide accurate answers[2].

[2]This observation does not dismiss the Zuckerman Sensation-Seeking Scale measure but simply questions the measure in this particular experimental study.

Another issue concerning their design is the fact that the modified trust game gives subjects the option of sending all or none of their initial endowment. Using such a binary variable, as opposed to a continuous one, essentially limits the amount of information that could be extracted from the experiment and dilutes statistical power. It was also found that 38% of individuals participating in this experiment did not actually believe, and hence trust, that they were paired with a real human person (Eckel and Wilson, 2004). There was therefore a very low level of trust present in subjects participating in an experiment seeking to measure and analyse trust.

In another research study conducted in rural Paraguay, Schechter (2007) (see last row of Table 1) measured trust using the BDM trust game, but each subject now played the role of both the trustor and the trustee. When playing as trustors, subjects were asked how much of their endowment of 8000 Guaranies (the national currency of Paraguay) they would like to send to trustees, but these amounts were restricted to multiples of 2000, i.e. 0, 2000, 4000, . . . . As was done in the original trust game of BDM, amounts sent by trustors were tripled and received by trustees. In addition, subjects provided expectations using the strategy method[3] and indicated how much they would return for each possible amount that they could potentially receive.

Risk was measured using a risky gamble, designed to yield similar returns to those from trust games played in a previous game in rural Zimbabwe (Barr, 2003). The game involved giving each individual a fixed sum of money, again 8000 Guaranies, and allowing them to invest certain amounts of it in a risky gamble. The outcome of the investment, and hence players' payoffs, depended on the outcome of a roll of a die. These amounts replicated those that could be sent in the trust game, which was always played after the risk task. On completion of the risk task, players were given an IOU for their risk task winnings. Once they had completed both the trust game and the risk task, they were paid their total earnings in cash.

[3] The strategy method is where players indicate contingent decisions for all possible outcomes of play (Brandts and Charness, 2009). In this case, second players (trustees) indicated the amount that he or she would send back for every possible amount that he or she could potentially receive from first players (trustors) (Sapienza, Toldra, and Zingales, 2007). In Schechter (2007), trustees were asked how much they would send back to the trustor, given each of the four tripled amounts (0, 6000, 120000, 24000) that they could receive.

Schechter (2007) performed an OLS regression analysis with the following dependent variables: the amount bet in the risk task, the amount sent in the trust game with no control for the bet amount, and the amount sent with the control. Thereafter, additional controls were included to account for altruism and reciprocity. These occurred in the form of the following proxies: the share of money returned when playing the role of trustee, the average share returned by all trustees, the log of gifts in the form of farm production given to family and friends, and the log of donations in the form of time or money. It was found that altruism had little influence on the relationship between trust and risk. A more important finding was that increases in the amount bet by a subject in the risk task went hand-in-hand with increases in the amount that he or she sent in the trust game.

To distinguish between trust and risk, Schechter (2007) re-ran the OLS regressions with the following interaction variables: bet size and gender, bet size and education, and lastly, bet size and main language. However, the power of these tests was quite low which places limitations on conclusions that can be drawn from this analysis. On the whole, Schechter (2007) found that decisions made in the trust game do in fact depend on individuals' risk preferences, regardless of any other variables being added to the model.

There are two issues, however, that arise with Schechter's design. Firstly, there is the potential for order effects, since the risk task was always played prior to the trust game and it may have led subjects to frame the trust game as a gamble too. A second potential issue is wealth effects, which can be described as the effect on an individual's behaviour as a result of changes to one's level of wealth (Case, Quigley, and Shiller, 2005). This occurs here as subjects knew how much they had earned in the initial risk task before starting the trust game, and this could potentially influence decisions made in the latter. These issues make Schechter's conclusion that "Risk aversion plays an important role in determining play in the trust game" an uncertain one (2007, 284).

A third study was done by HSW (see row 4 of Table 1). Their approach involves "combining measures of individual risk attitudes with individual decisions in investment games that do and do not include a 'trust' component" (HSW, 2010, 4-5). They used two measurements and varied the order in which subjects completed each of them. The first measure is the BDM trust game for the trust component, where trustors were given the option of sending any amount of their endowment to their paired trustee. Again, the amount sent was tripled and received by trustees who then had the option of sending any amount back. The other measure is the HL risk task for the risk component. This measure was again a set of ten pairs of lottery choices for which subjects indicated their preferred choice between options A and B. However, the outcomes of each of the ten lotteries were reduced to form one scalar measure giving the number of safe choices that each subject made. HSW then divided this into three further scalar measures according to the various levels of risk: risk averse, risk neutral and risk seeking.

The experimental design of HSW divides the trust game into 4 treatments to create two trust treatments and two risk treatments. The trust treatments (Trust-1 and Trust-2) make use of human trustees in the trust game. The risk treatments (Risk-1 and Risk-2) make use of computer trustees in the trust game. Specifically, Trust-1 includes a standard trust game and no additional information is provided to subjects. Trust-2 also involves a standard trust game but with the addition of information in the form of past returns made by trustees in previous games run by BDM. In Risk-1, the computer plays the trust game in the role of trustee and additional information is again provided to trustors. Lastly, Risk-2 does have a human trustee but this individual does not make a decision in the trust game. Instead, the computer responds on his or her behalf. Once again, information on past returns was presented to trustors. A breakdown of these four treatments can be seen in Table 2 in the Experimental Design section.

In the two risk treatments, Risk-1 and Risk-2, the computer made a trustee decision, either in the absence of a trustee or on behalf of one. Trustors in these treatments were presented with a graph depicting the true return distribution of the computer. This information came from BDM and subjects were informed that the data were from past experiments using human players. An important difference between the four treatments is that in Risk-1 there is no human receiver and in Risk-2 the computer will make a decision on behalf of a passive receiver who will earn what the computer earns.

HSW ran this type of comparison to search for the existence of prosocial motivations, which lead individuals to act in a way that would benefit others. A comparison between the two risk treatments therefore provides a control for prosocial impulses that could potentially affect trusting decisions. This type of control helps to determine whether subjects appear more trusting because they *are* more trusting or because they are fulfilling a need to be kind to another person. Ashraf et al. (2006) explains that an individual may choose to trust another person because they enjoy trusting or because they enjoy being kind to other people and displaying unconditional kindness.

In addition, trustors in both risk treatments are supplied with information on past returns made by trustees in previous games played.[4] Comparing this to their trust treatments where only one of the two treatments are given this information, allows the study to account for differences in information conditions between treatments. BDM explain that subjects who did not have any additional information about their partner would fail to realise that partner's dominant strategy to keep all the money that he or she receives. They go on to say that having this information would therefore make first players more aware of this option and steer them towards choosing the subgame perfect equilibrium mentioned earlier, which is to not trust at all. On the other hand, the additional information provided could instead lead subjects to trust their partner more than they otherwise would have. Controlling for informational differences will therefore allow for such comparisons to be made.

The overall experimental design by HSW is powerful and effective and will therefore be replicated in this study aiming to differentiate risk from trust. The design is immune to order effects and controls were in place for informational differences and prosocial motivations. In addition, the design accounts for the issue of state vs strategic uncertainty mentioned earlier: specifically, decisions made in treatments Trust-1 and Trust-2 are made in an environment of trust, and hence strategic uncertainty, since both treatments involve the trustor playing against a human trustee; and decisions made in Risk-1 and Risk-2 are made in an environment of risk, or state uncertainty, since trustors play against a computer that responds according to a fixed distribution.

[4] Past returns information come from previous games conducted by Berg, Dickhaut and McCabe (1995).

With these measures, their statistical analysis involved pooling the data and using a probit model with the dependent variable of whether to invest or not. They also conducted a probit analysis on the restricted sample of individuals who chose to invest a positive amount, with the dependent variable being the decision to invest 4 or more experimental currency units. Mean amounts sent in the trust game in trust treatments did not vary with risk attitudes but in the risk treatments, the mean amounts sent increased as risk moved from risk averse to risk seeking, i.e. risk seeking individuals were more inclined to invest higher amounts in the risk treatments. Participation in risk tasks also increased as individuals became more risk tolerant. In addition, they found that decisions made in the two trust treatments with human partners differed significantly to decisions made in the risk treatments with computer partners: the trust treatments had subjects usually deciding to send zero or all of their endowment while the risk treatment had subjects usually wanting to send half. Making a decision to send money in an environment of trust with another human being, was therefore much more volatile and uncertain than making the same decision in an environment of risk with no other person involved.

Besides Eckel and Wilson (2004), HSW, and Schechter (2007), there were other studies that investigated the risk-trust confound. The first of these is Ashraf, Bohnet, and Piankov (2006) who found that risk had no significant effect on trusting decisions. Ashraf et al. (2006) (first row of the literature review table) measured trust using the BDM trust game as well as the Dictator Game[5] and the Triple Dictator Game[6]. Risk was measured using 6 risky choice tasks where subjects had to indicate for each whether they preferred the gamble or the certain amount. Ashraf et al. (2006) analysed the data using multivariate regressions for the amount sent with controls for expectation of returns, unconditional kindness and risk preferences.

Evans and Krueger (2011) found that risk attitudes do affect an individual's decision to trust. They measured trust using the BDM trust game where subjects played the role of trustor and the role of trustee was simulated. They measured risk using relative contributions of cost (the cost of trusting

[5] Dictator Game is where the subject plays the role of dictator, with the option of sending any amount of their endowment to a partner (Ashraf et al., 2006).

[6] The Triple Dictator Game is identical to the standard dictator game except that the amount sent to the recipient is tripled.

but being betrayed) and benefit (the benefit from that trustee reciprocating trust). Cost and benefit are considered to be two elements of potential payoffs when the first player exhibits trust, which was manipulated by Evans and Krueger (2011) to form a single index of risk[7]. This index could either be high or low. They found that low risk was conducive to trust. However, the fact that this was an unincentivised experiment with hypothetical payoffs and that the generated risk index may not have sufficiently captured risk preferences, leads one to question these findings.

A summary of the above-mentioned literature on the risk-trust confound can be found in Table 1 below. Four of the studies made use of the standard BDM trust game whilst the remaining three studies made use of modified versions of the game. Most of the literature made use of the HL risk task (4 occurrences) or involved placing a bet; the exception being Evans and Krueger (2011) who combined the cost associated with trusting but being betrayed, and the benefit from trusting and having that trust be reciprocated, into a single risk index. One other risk measure was the Zuckerman Sensation-Seeking Scale used by Eckel and Wilson (2004, 2006). All of the studies were incentivised, except for Evans and Krueger (2011) who made use of hypothetical stakes. Three studies found a significant relationship between risk and trust, while two studies found none. These opposing views on the risk-trust confound therefore suggests that further research on this topic is required. This paper will thus explore this issue further.

[7] If the trustor chooses not to trust, the game comes to an end. If, however, the trustor chooses to trust, the game moves into a second stage and the trustee has to choose between reciprocity and betrayal. Evans and Krueger (2011) state that payoffs in the trust game when the first player chooses to trust depends on three elements: cost, benefit and temptation. They explain that the first two elements correspond to a subject's vulnerability whilst the third corresponds to expectations and the temptation for a trustee to defect. They define a trustor's cost as the difference in outcomes between being betrayed and having decided not trust. They define a trustor's benefit as the difference in outcomes between the trustee reciprocating trust and the trustor choosing not to trust at all. Risk was then calculated as the ratio of cost to benefit. Low risk was defined in the ratio $\frac{5}{15}$ and high risk in the ratio $\frac{15}{5}$.

## Table 1: Review of Experimental Literature on the Risk-Trust Confound

| Study | Sample (size) | Trust Elicitation Method | Risk Elicitation Method | Initial Endowment | Amounts sent in TG (multiplication)[1] | Statistical Methods | Correlation: Risk & Trust |
|---|---|---|---|---|---|---|---|
| Ashraf, Bohnet & Piankov (2006) | Students in SA, USA, & Russia (359) | BDM TG[2], Dictator Game[3] & Triple Dictator[4] | Choose gamble or certain amount for 6 risky choices | 100 CUs[5] for trustors only | 0,10, 20, ..., 100 CU (triple) | Multivariate analysis: amount sent; controls for expectations, kindness & risk | No |
| Eckel & Wilson (2004) | Students in Virginia & Texas (232) | Modified Trust Game[6] | ZSSS[7], HL[8], Card Gamble | $10 for both roles (earned in survey) | $0 or $10 (double) | Probit: decision to trust. OLS: ZSSS & HL. Probit: card gamble. Risk-trust correlations. | No |
| Evans & Krueger (2011) | Students at various universities (418) | Modified Trust Game[9] | Cost and benefit combined into a single index | $20 = 20 points for sender (hypothetical stakes) | All or nothing of initial varying payoff (unknown) | Logistic regression: choosing to trust. Logistic regression with clustered observations: low and high risk | Yes |
| Houser, Schunk & Winter (2009) | Students at University of Mannheim (291) | BDM TG[2] | HL[8] | 10 ECUs[5] for all players | 0,1, 2, ..., 10 ECUs (triple) | Probit on pooled data: decision to invest. Probit on group who contributed a positive amount: decision to invest 4 or more | Yes, in some treatments |
| Schechter (2007) | Adults in rural Paraguay (188) | BDM TG[2] | Bet 8000 Guaranies on the roll of a dice | 8000 Guaranies for risk task and senders in trust task | 0, 2000, ..., 8000 Guaranies (triple) | OLS: amount bet in risk game; amount sent in TG with no control for bet amount; amount sent with control. Bet amount-interactions. | Yes |

Notes to Table 1:
[1]Amount sent and multiplication imposed by experimenter in Trust Game.
[2]BDM TG: Berg, Dickhaut & McCabe (1995) Trust Game.
[3]Dictator Game: subject plays the role of dictator who has the option of sending any amount of their endowment to a partner (Ashraf et al., 2006).
[4]Triple Dictator: identical to standard dictator game except that the amount sent by the dictator to the recipient is tripled (Ashraf et al., 2006).
[5]Experimental currency units.
[6]Modified Trust Game differs from BDM in 3 ways: trustors can only send all or nothing; amount sent is doubled; and the decision is framed as a loan.
[7]ZSSS: Zuckerman Sensation-seeking scale.
[8]HL: Holt & Laury Risk Task (2002).
[9]Trustor roles only; trustee roles simulated. Each round had varying payoffs (5, 10, 15, 20).
[10]Each subject played the role of sender and then receiver. Senders also stated how much they expected would be returned to them using the Strategy Method.

# 3 Experimental Design

## 3.1 Trust Elicitation Method

To elicit trusting decisions, the subjects played the trust game by BDM. All subjects, both trustor (player 1) and trustee (player 2), received an initial endowment of R100. Trustors played first and could send any positive integer amount (R0, R1, R2, . . . ) of their endowment to their randomly assigned partner, the trustee. This amount was then tripled by the experimenter before being received by the trustee. The trustee could then send any integer amount back to the same trustor, which ranged from zero to the tripled amount. Trust was measured according to how much the trustor chose to send to the trustee. This marked the end of the trust task, which will be referred to as Task T.

Task T is a replication of HSW who used four trust treatments as part of their experimental design. Details on these treatments are provided below and a condensed overview is given thereafter in Table 2.

1. Task T: Treatment 1

Two players were randomly paired to play the standard BDM trust game (discussed above). Players did not know who their partner was. No information was given to subjects about past return distributions, i.e. amounts sent by second players back to first players.

2. Task T: Treatment 2

Two players were again randomly and anonymously assigned to each other to play the same trust game. However, now players were shown return distributions made by subjects in the original BDM study, thereby keeping to the experimental design of HSW. A graph appeared on-screen to show trustors how trustees behaved in the previous BDM study. The graph shown to subjects can be found in the appendix (Figure A1).

3. Task T: Treatm.ent 3

In this treatment there was no second player (i.e., no trustee), so every participant assumed the role of trustor. The trustor decided how much to send and the computer determined the trustor's earnings on the basis of the return distribution in BDM. The trustor was shown the return distributions from BDM before he or she made a choice.

4. Task T: Treatment 4

This treatment is the same as above, except that there was now a second player (i.e., a trustee) but this player was passive in the sense that he or she did not make a decision. Specifically, after the trustor decided how much to send, this amount was received by the trustee but the computer determined the trustor's earnings on the basis of the return distribution in BDM. So the trustor and trustee earned according to the trustor's decision and the computer's decision on behalf of the trustee. Once again, the trustor was shown the return distributions from BDM before he or she made a choice.

An important difference between these last two treatments is that in treatment 3 there was no human receiver (the computer made the player 2 decision). In treatment 4, the computer made a decision on behalf of a passive receiver (the computer again made the player 2 decision but a human player 2 received whatever the computer had earned).

Table 2: Breakdown of Experimental Treatments

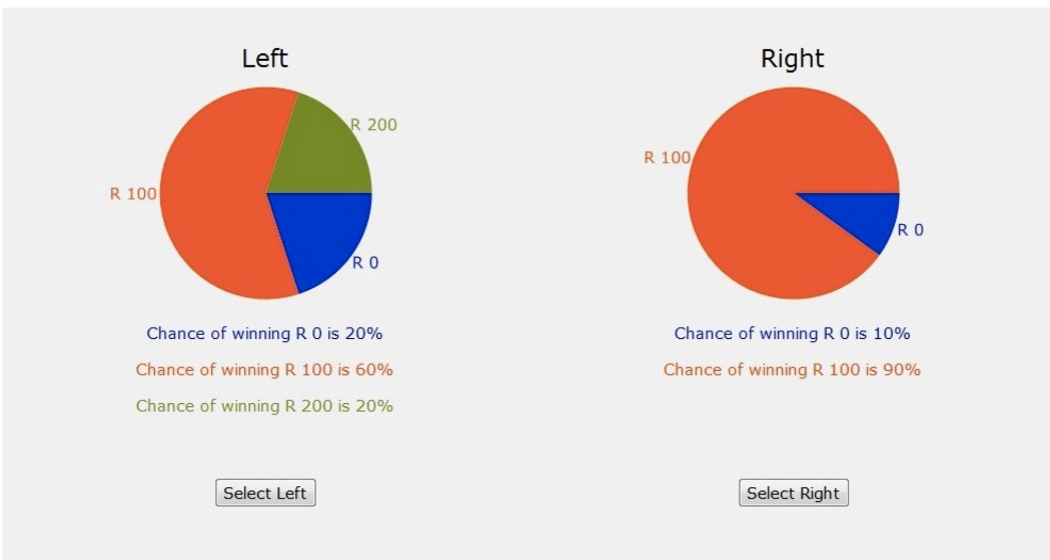
| Treatments in study | Treatments in HSW[1] | Trustor | Trustee | Receiver | Information[2] |
|---|---|---|---|---|---|
| Treatment 1 [T1] | Trust-1 | Human | Human | Human | No |
| Treatment 2 [T2] | Trust-2 | Human | Human | Human | Yes |
| Treatment 3 [T3] | Risk-1 | Human | Computer | N/A | Yes |
| Treatment 4 [T4] | Risk-2 | Human | Computer | Human | Yes |

Notes: [1]Treatments come from research study by Houser, Schunk, and Winter (2010).
[2]Information provided in the form of a histogram showing past return distributions made by trustees in previous runs of the BDM trust game.

## 3.2 Risk Elicitation Method

The risk task, which will be referred to as Task R, was based on Hey and Orme (1994) and was used to elicit participants' risk preferences. Subjects needed to make choices between two lotteries (i.e., probability distributions over monetary amounts) on each computer screen. This setup was identical to the risk preference task used by Harrison, Hofmeyr, Ross, and Swarthout (2017) [HHRS]. Each lottery was presented using a pie graph and accompanying text to indicate the probabilities and prizes for each choice to be made. Participants made 40 choices in total in this task. Figure 1 below shows the screen presented to subjects for this task.

Figure 1: Screenshot of Task R




The size of the prizes ranged from R0 to R280 and the probabilities ranged from 0 to 1 in increments of 0.05. This risk preference task therefore makes use of much larger lottery prizes and greater variation in the probabilities than most other studies, where the latter helps to detect any potential probability weighting (HHRS).

The lottery pairs present in Task R were based on those developed by Loomes and Sugden (1998), and are aimed at testing different stochastic specifications of choices in an environment of risk. Their lottery pairs accommodated various risk preferences and a varied probability space. The pairs were also designed in a way that would generate common-ratio tests of expected utility theory. An issue in Loomes and Sugden (1998), however, is that subjects faced the same set of lottery prizes across all of their choices. Task R therefore improves upon this by using four different prize contexts: (R0, R140, R280), (R40, R80, R240), (R20, R100, R220), and (R60, R120, R180), and by doing so helps identify the utility function and the probability weighting function.

One of the 40 choices presented to subjects was randomly selected for pay out at the end of the task. The chosen lottery was played out to determine the subjects' winnings for that task.

### 3.3 Disentangling Trust and Risk

The above two tasks and between-subject experimental design allow for disentangling risk and trust. The experimental treatments in Task T are designed in such a way that they act as controls for factors such as information and prosocial impulses. The first two treatments can be thought of as two trust treatments. Treatment 1 involved a standard trust game whilst treatment 2 built on this by providing subjects with additional information on past returns made in previous runs of the game. Amounts returned in both of these treatments were determined by a human trustee. These treatments therefore fall under the environment of strategic uncertainty.

The third and fourth treatments can be thought of as two risk treatments. Subjects in treatment 3 faced a basic decision problem under risk since the trust game that they played did not involve a human trustee partner. The computer made the decision instead. This trustor was also given additional information on past returns made. Treatment 4, on the other hand, did involve a human trustee but this trustee did not make a decision. The computer made a decision for the trustee and he or she received any amount that the computer earned on his or her behalf. Trustors were also given additional information on past returns. Amounts returned were generated by a computer rather than by another human. Treatments 3 and 4 therefore fall under the environment of state uncertainty.

The design of the trust game procedures allows for comparison between the above-mentioned environments of risk and trust. Comparing treatments 1 and 2 with 3 and 4 allows one to analyse whether decisions differ between the environments of state uncertainty and strategic uncertainty.

Treatment 1 does not provide any additional information to subjects in the trust game whilst treatments 2, 3 and 4 provide trustors with past returns made by trustees in previous games played. Therefore, treatment 1 essentially allows for a control of information provided to participants playing the trust game. Additionally, since information is provided to treatments 2, 3 and 4, one can analyse where the risk measures do and do not predict decisions: if risk measures predicted decisions in T3 and T4 (environments of state uncertainty) but not in T2 (an environment of strategic uncertainty), then one can conclude that this cannot be due to differences in information.

Treatments 1, 2 and 4 all include a human trustee. However, in treatment 4, this trustee is passive and does not make any decision. The computer makes a decision on the trustee's behalf and he or she then receives the earnings of the outcome of the game. Treatment 4 therefore serves as a control for prosocial impulses: if risk measures help to explain decisions made in this treatment but not in any of the other treatments involving a human trustee (T1 or T2), then it could be said that decisions are motivated by a certain need to trust another person rather than he or she trusting due to the existence of the other person in treatment 4.

## 3.4 Experimental Sample

The experimental sample consists of 202 students at the University of Cape Town (UCT). Specifically, 49 students participated in treatment 1, 70 in treatment 2, 36 in treatment 3, and lastly, 49 students participated in treatment 4. These students were recruited through the use of a recruitment poster emailed to UCT students. All of the experiments were conducted on UCT's upper campus in the Commerce computer lab, where a total of 12 sessions were held across 3 weeks in August of 2016. Each session usually comprised 18 participants and had 1 experimenter and 2 research assistants. Each experimental session lasted approximately 45 minutes. Four sessions were allocated to treatment 2 as it would contain the most information-rich data since it comprised two human partners. The remaining treatments with two human subjects were allocated 3 sessions each. Lastly, treatment 3 was allocated 2 sessions as it only involved one player. Dividing the 12 sessions in such a way allows for greater information to be collected to help answer the research question of whether or not trust and risk are significantly related. A detailed summary of experimental session dates, times and treatment allocations can be found in the appendix, Table A1.

On entering the lab, subjects were seated at computers separated by partitions. Each subject received a fixed show-up fee of R20 which was paid to them at the end of the session. Subjects signed an informed consent form and were shown an introductory presentation explaining the procedure of the session and the two computerised tasks that they would complete: namely, Task T and Task R. Half of the participants completed Task T before Task R and the remaining participants completed Task R prior to Task T, in an attempt to guard against potential order effects.

After the introductory explanation, subjects were given a detailed presentation of the first task and were then allowed to complete the task. Thereafter they were presented with a detailed explanation of the second task. Once subjects were done with this task, they were asked to complete a short written questionnaire that captured their demographic information. Whilst busy with this, their total payment was determined by the experimenter. Each subject's earnings were paid out immediately and in cash. Subjects earned, on average, R127 for Task T and R120 for Task R, excluding the show-up fee. Taking the R20 show-up fee into account, subjects earned on average a total of R267.

Summary statistics in the first part of Table 3 below show that the minimum and maximum ages of subjects were 18 and 31 respectively, with a mean age of 21 years. The decomposition of racial groups and other binary variables is given in the second part of Table 3. A majority of the sample was African (see Figure A2) and 53% was female. Lastly, 39% of the sample fell under the Commerce faculty whilst the least represented faculty was Law at approximately 7%.

Table A2 in the Appendix shows the breakdown of summary statistics by experimental treatments. Balance tests indicate no significant differences in the composition of age ($p < 0.17$), gender ($p < 0.19$), race ($p < 0.16$), and language ($p < 0.38$) between the four treatments. Significant differences were, however, found between treatments with respect to faculty ($p < 0.015$) and so caution is advised with regards to validity of results.

Table 3: Summary Statistics of Variables

| Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| Age | 21.30 | 2.36 | 18 | 31 |
| Total Income | 2786.87 | 3814.99 | 0 | 30000 |
| Risk Game Earnings | 119.80 | 90.55 | 0 | 280 |
| Trust Game Earnings | 127.36 | 61.18 | 10 | 390 |
| Total Winnings | 266.55 | 114.89 | 30 | 680 |

| Variable | Percentage of sample |
|---|---|
| **Gender** | |
| Female | 53.00% |
| Male | 47.00% |
| **Race** | |
| African | 48.22% |
| White | 21.32% |
| Coloured | 17.26% |
| Indian/Asian | 13.20% |
| **Four Main Languages** | |
| English | 70.79% |
| IsiXhosa | 8.91% |
| IsiZulu | 5.94% |
| Afrikaans | 1.98% |
| **Faculty** | |
| Commerce | 39.11% |
| Humanities | 22.77% |
| Engineering | 13.86% |
| Science | 8.91% |
| Health Sciences | 7.92% |
| Law | 7.43% |

# 4 Statistical Analysis and Specifications

The statistical method used in this study is the maximum likelihood estimation of structural models of latent choice processes. These structural models allow estimation of risk preferences from observed subject data. The maximum likelihood method is useful in that it makes use of all possible available data to estimate the risk preference parameters and precision of all estimates (HHRS). Hey and Orme (1994) describe the method as an extremely efficient way to locate the maximum of the log-likelihood with the least amount of human intervention. A theoretical explanation of this method follows below.

Suppose the utility of income is defined by a power utility function with constant relative risk aversion. Then from Wakker (2008), the utility function is:

$$U(y) = \begin{cases} y^r & \text{if} \quad r > 0 \\ ln(y) & \text{if} \quad r = 0 \\ -y^r & \text{if} \quad r < 0 \end{cases}$$

where $y$ is the value of the lottery prize and $r$ is the parameter of interest. Under expected utility theory, the shape of the utility function defines risk preferences. Specifically, if $r > 1$ the utility function is convex, indicating risk-loving behaviour. If $r = 1$ then this points toward a linear utility function and risk neutral preferences. Or if $r < 1$ then the utility function is concave, indicating risk averse behaviour.

Since the risk preference task in this study, Task R, has three potential outcomes, the expected utility of each lottery $i$ is defined as follows:

$$EU_i = \sum_{j=1,2,3} [\ p(y_j) \times U(y_j)\ ] \tag{1}$$

where $y_j$ is the lottery outcome and $p(y_j)$ is the probability associated with that outcome.

To estimate the value of $r$, the expected utility of each lottery pair is calculated for an initial estimate of $r$. An index $\nabla EU$ of the difference is then generated where:

$$\nabla EU = EU_R - EU_L \tag{2}$$

The $\nabla EU$ index is an index based on latent preferences which shows the differences between expected utilities of the right and left lottery options presented to subjects. The index is linked to an individuals' choices through the cumulative Normal distribution function, $\Phi(\nabla EU)$. This transforms the $\nabla EU$ from a range of $(-\infty; \infty)$ to the range of $(0; 1)$, which then gives the Probit link function

$$Pr\ (\text{choosing right lottery}) = \Phi\ (\nabla EU) \tag{3}$$

This equation illustrates that the right lottery will be chosen if $\Phi\ (\nabla EU) > \frac{1}{2}$.

The likelihood of subjects' responses in the risk preference task is conditional on expected utility theory and the power utility function both being true. Since this likelihood depends on values for $r$, the log-likelihood function conditional on $z$ and $X$ can be written as:

$$ln\ L_i^R\ (r; z, X) = \sum_i \left[\ \left( ln\Big\{\Phi(\nabla EU)\Big\} \times I(z_i = 1)\right) + \left( ln\Big\{1 - \Phi(\nabla EU)\Big\} \times I(z_i = 0)\right)\ \right] \tag{4}$$

where $I(\cdot)$ is the indicator function and where $z_i = 1$ represents the right lottery being chosen and $z_i = 0$ represents the left lottery. In addition, the $X$ variable contains subject demographics and information such as age, gender, race, etc.

The maximum likelihood estimation method will seek to estimate the equation $r = r_0 + r_\beta \cdot X$ (where $r$ is the risk preference parameter, $r_0$ is a fixed parameter, and $r_\beta$ is the coefficient vector linked to the above-mentioned $X$ variable) and thereby makes the parameter of interest $r$ a linear function of observed individual characteristics. So for the case of no observable characteristics (i.e. a homogenous sample), the equation would read: $r = r_0$. Each estimate for $r$ will include a standard error that reflects uncertainty with regards to the true value of $r$.

Trust will be included in the analysis as $T$ with other explanatory variables. The regression equation therefore becomes $r = r_0 + r_T \cdot T + r_\beta \cdot X$ where $r_T$ measures the marginal effect between trust and risk, and vector $X$ includes demographic variables. The risk preference parameter, $r$, will determine whether or not there exists a significant relationship between risk and trust, whilst controlling for other factors.

This estimation method also allows for behavioural errors made by subjects when making a choice. This can occur, for example, if a subject intended to choose the left lottery but instead chose the right lottery accidently. Other such errors, from Hey and Orme (1994), include misunderstanding the experiment, pressing the wrong button on the keyboard, or being in a hurry to complete the task. Estimation will therefore make use of the contextual utility behavioural error specification of Wilcox (2011), which will allow for robust inferences. This type of error specification normalises the $\nabla EU$ index into the $[0, 1]$ interval. It also incorporates the behavioural error term $\mu$ from Fechner (1966), which implies that as the $\nabla EU$ index becomes smaller, subjects become more likely to make errors. The index $\nabla EU$ therefore becomes

$$\nabla EU = \frac{\left[\frac{EU_R - EU_L}{\lambda}\right]}{\mu} \tag{5}$$

where $\lambda$ is the normalising term and $\mu$ is the Fechner error term.

For this new index, as $\mu \to 0$ it becomes a deterministic choice model so that the choice made by a subject will be based on the expected utility of the two lotteries that they face. On the other hand, when $\mu \to \infty$ it will be the case that $\nabla EU \to 0$ and so the choice made by the subject can be considered random since there is now equal probability of choosing either the left or right lottery. Lastly, when $\mu = 1$ we return to the previous index from Equation (2): $\nabla EU = EU_R - EU_L$. From this we can conclude that the Fechner error term $\mu$ flattens the probit link function as it increases. From this, the new conditional log-likelihood function can be written as:

$$ln\ L_i^R\,(r, \mu; z, X) = \sum_i \left[\ \left(ln\Big\{\Phi(\nabla EU)\Big\} \times I(z_i = 1)\right) + \left(ln\Big\{1 - \Phi(\nabla EU)\Big\} \times I(z_i = 0)\right)\ \right] \tag{6}$$

To estimate the parameter of interest capturing risk preferences, $r$, and the Fechner error term, $\mu$, the above equation will be maximised.

This study will also focus on another model of choice under uncertainty: the rank-dependent utility model of Quiggin (1982). This model states that risk preferences are determined by the shape of the utility function, as well as the probability weighting function [PWF]. Putting these two together gives the rank-dependent utility function

$$RDU_i = \sum_{j=1,...,n} \left[ \; w(y_j) \times U(y_j) \; \right] \tag{7}$$

with the weights $w_j = \pi(p_j + ... + p_n) - \pi(p_{j+1} + ... + p_n)$ for $j = 1, \ldots, n-1$ and where $w_j = \pi(p_j)$ for $j = n$. The variable $j$ takes on values that rank potential outcomes from the worst possible outcome to the best. The function $\pi(p)$ is a specific PWF.

For example, the PWF by Tversky and Kahneman (1992) [henceforth, TK] can be written as

$$\pi(p) = \frac{p^\gamma}{\left[ \; p^\gamma + (1-p)^\gamma \; \right]^{\frac{1}{\gamma}}} \tag{8}$$

for $0 < p < 1$. This function allows for the S-shaped and inverse S-shaped forms. Gonzalez and Wu (1999) find that it is usually the case that $0 < \gamma < 1$. This then gives rise to its inverse S-shape where low probabilities are overweighted until the point where $\pi(p) = p$. Thereafter, moderate to high probabilities are underweighted.

So this estimation method assumes a rank-dependent utility model, with a power utility function, contextual error specification, and the TK PWF. Then the rank-dependent utility index, similar to the index under expected utility, becomes

$$\nabla RDU = \frac{\left[ \frac{RDU_R - RDU_L}{\lambda} \right]}{\mu} \tag{9}$$

As occurred under the expected utility model, subject choices are linked to the RDU index through the cumulative Normal distribution. This is then used to estimate the parameters $r$, $\mu$, and the parameter in the TK PWF, $\gamma$.

Another two PWFs that will be used are the Power function and Prelec (1998) [henceforth, Prelec] function. The Power PWF replaces the prizes in the power utility function with probabilities, and is

$$\pi(p) = p^{\gamma} \tag{10}$$

and the Prelec PWF is

$$\pi(p) = exp\left[\, -\eta\left(-\, ln\; p\right)^{\gamma}\,\right] \tag{11}$$

for $0 < p < 1$, $\eta > 0$ and $\gamma > 0$.

The power PWF can be linear, concave, or convex, and so probabilities can either be linearly weighted, overweighted, or underweighted. This PWF does not allow for the S-shape forms or inverse S-shapes of the TK PWF. The Prelec PWF, on the other hand, does allow for this. In addition, the two parameters of the Prelec PWF allow for the separate specification of concavity and location: $\gamma$ controls the PWF's concavity whilst $\eta$ controls the location of the inflexion point relative to the 45° line (Al-Nowaihi and Dhami, 2010).

This study will therefore use both the expected utility model and the rank-dependent utility model. Both take into account potential subject error. These models will be used to analyse risk preferences amongst subjects in the experimental sample and its potential association with trust decisions in Task T.

# 5 Results

In this section, an exploratory analysis of the data is conducted: section 5.1 gives an overview of trust findings and 5.2 of risk findings. Thereafter, the risk-trust confound is investigated in section 5.3 and results from the Expected Utility Model and the Rank-Dependent Utility Model are presented.

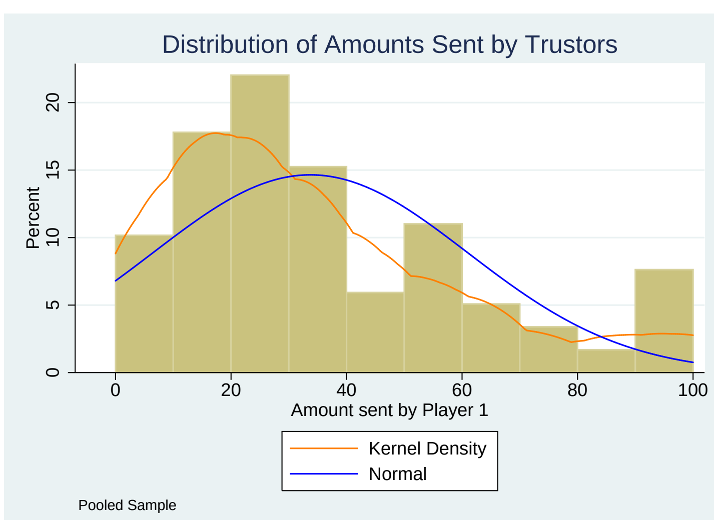
## 5.1 Exploratory Analysis of Trust Data

### 5.1.1 Amounts Sent in the Trust Game

Initial analyses on the pooled dataset show that trustors sent on average R34 of their R100 endowment to trustees and trustees (excluding second players in treatments 3 and 4) returned on average R37. Relatively speaking, trustees usually returned on average 33% of what they received from trustors. Table 4 provides further means and standard deviations for the overall sample.

A distribution of amounts sent for the pooled sample can be seen in Figure 2 below. Lower amounts were sent to trustees more often than higher amounts, as seen in the heavy left tail of the distribution, with the exception of sending half or the whole R100 endowment. A majority of the sample, 22% of subjects, chose to send between R20 and R30, out of R100 to their trustee partner. The least chosen amounts to send to one's partner varied between R60 and R90.

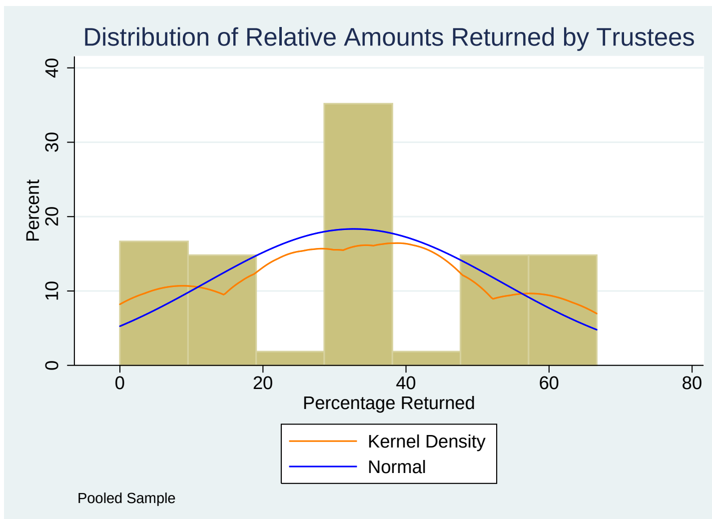
Figure 2: Distribution of amounts sent in pooled sample



#### 5.1.2 Amounts Returned in the Trust Game

In absolute terms (Figure A3) more than 60% of trustees returned less than R50. In relative terms, Figure 3 shows that the amount returned by trustees as a percentage of how much they received is evenly and symmetrically distributed. The large centre mass represents 35% of trustees who chose to return approximately 33%, or a third, of what they received from trustors. A smaller proportion chose to return less than 20% and an even smaller proportion chose to return more than 50%.

Figure 3: Distribution of Relative Returns in pooled sample




#### 5.1.3 Amounts Sent by Subject Demographics

Further exploratory analysis on the pooled data was done by inspecting the amounts sent for different factors of subject demographics. The histogram for the average amount sent according to subject age can be seen in Figure A4. Similar levels of trust were found in individuals between the ages of 20 and 23. Older subjects (aged 29 and above) displayed the greatest amount of trust.

Based on average amounts sent by trustors, a statistically significant difference (t-test, $p < 0.001$) between trusting decisions of males and females was found: Figure A5 in the Appendix shows that females sent on average R32 to their partners whilst males sent on average R36. Figure A6 shows that the most trusting population group is Whites who sent on average R49. The least trusting racial groups are Coloureds and Indians. Tests indicate a statistically significant difference between amounts sent by Whites and non-Whites (t-test, $p < 0.001$). These results confirm similar findings by Ashraf et al. (2006) who discovered a statistically significant difference in trusting behaviour between South African Whites and non-Whites.

#### 5.1.4 Amounts Sent by Treatment

Trust data for each treatment can be seen in Table 4. The largest amount sent by trustors occurred in treatment 1, the basic trust game, where R36 was sent on average by player 1s. The smallest average amount sent was R30, indicating that the lowest level of trust occurred in treatment 4 where the computer played on behalf of a passive human trustee. Amounts sent in treatment 1 differed significantly with amounts sent in treatment 2 (t-test, $p = 0.0658$) and treatment 4 (t-test, $p < 0.001$): trusting decisions made in a standard trust game were significantly different to decisions made in the same game with additional information and a game where the computer played on behalf of a human trustee. Amounts sent in treatment 4 also differed significantly with amounts sent in treatment 2 (t-test, $p < 0.001$) and treatment 3 (t-test, $p < 0.001$): decisions made with a passive human trustee were significantly different to decisions made when playing with an active partner and playing against the computer with no human partner.

Table 4: Trust Results by Treatment

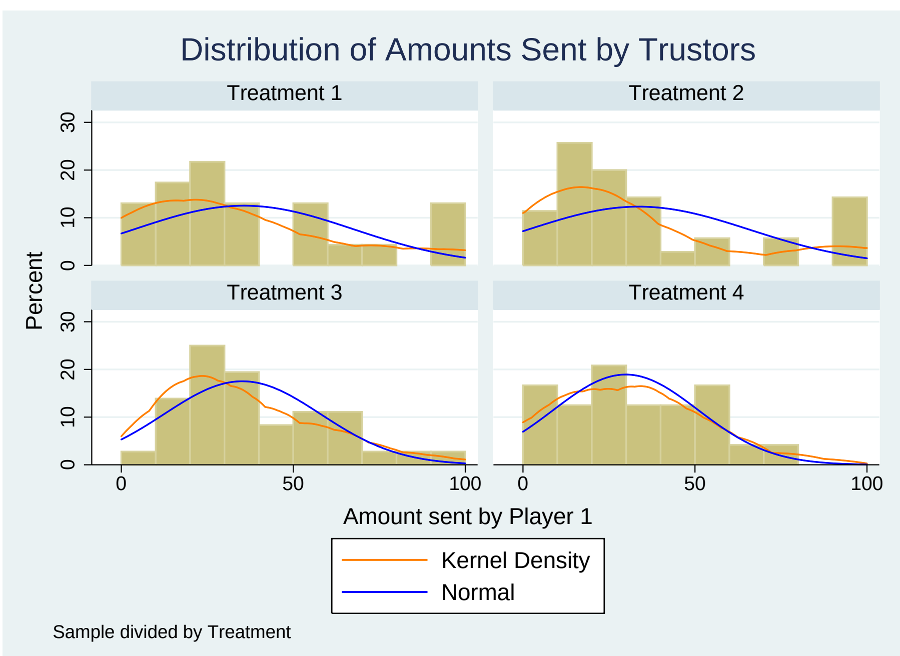
| | Mean | Std. Dev | Min | Max | Observations |
|---|---|---|---|---|---|
| **Overall Sample** | | | | | |
| Amount sent by Player 1 | 33.74 | 27.24 | 0 | 100 | 118 |
| Tripled amount received by Player 2 | 105.61 | 95.04 | 0 | 300 | 59 |
| Amount returned by Player 2 | 37.17 | 40.36 | 0 | 150 | 54 |
| Percentage returned[1] | 32.73 | 20.72 | 0 | 66.67 | 54 |
| **Treatment 1** | | | | | |
| Amount sent by Player 1 | 35.65 | 31.85 | 0 | 100 | 23 |
| Tripled amount received by Player 2 | 108.75 | 93.86 | 0 | 300 | 24 |
| Amount returned by Player 2 | 49.29 | 46.67 | 0 | 150 | 21 |
| Percentage returned[1] | 36.05 | 21.42 | 0 | 66.67 | 21 |
| **Treatment 2** | | | | | |
| Amount sent by Player 1 | 33.63 | 32.36 | 0 | 100 | 35 |
| Tripled amount received by Player 2 | 103.46 | 97.15 | 0 | 300 | 35 |
| Amount returned by Player 2 | 29.45 | 34.33 | 0 | 150 | 33 |
| Percentage returned[1] | 30.61 | 20.30 | 0 | 66.67 | 33 |
| **Treatment 3** | | | | | |
| Amount sent by Player 1 | 35.19 | 22.77 | 0 | 100 | 36 |
| **Treatment 4** | | | | | |
| Amount sent by Player 1 | 29.88 | 21.08 | 0 | 80 | 24 |

Notes: [1]Percentage of tripled amount received by Player 2 that Player 2 decided to return to Player 1.

The amount that player 2 then returned to player 1 is captured as a percentage in the same table: the percentage of the tripled amount received by the trustee that this trustee then sent back to the trustor. These amounts were calculated only for treatments 1 and 2 where human trustees were present. The highest return percentage can be seen in treatment 1, indicating that a greater level of trustworthiness took place in the standard trust game with no additional information. A lower level of trustworthiness occurred in treatment 2 where trustors were provided with additional information on the past behaviour of trustees. The difference in trustworthiness between these two treatments was found to be statistically significant (t-test, $p < 0.001$). Trustworthiness decisions in treatments 3 and 4 were made by the computer and followed a fixed distribution extracted from the original BDM Trust Game.

Histograms of amounts sent for each treatment are presented below. Figure 4 shows that amounts sent in treatments 1 and 2 follow a similar distribution with an almost identical large mass at both right tails. Fewer subjects chose not to trust in treatment 2 compared to 1. Tests indicate no significant difference between mean amounts sent in treatments 1 and 2 (t-test, $p = 0.1316$). Fisher's Exact Test indicates no statistically significant relationship between amounts sent by trustors and those trustors belonging to treatments 1 and 2 ($p = 0.763$). These results, in addition to the visual similarity of the two distributions, imply that having the additional information on past returns did not markedly affect trusting decisions. A similar such finding was discovered by HSW, who found that the prior information given to subjects in the 3 treatments did not differ from the prior information that subjects already had.

Figure 4: Distribution of amounts sent



The distributions of treatments 3 and 4 also closely resemble one another. A similar finding was uncovered by HSW where the distributions of treatments 3 and 4 (Risk-1 and Risk-2 in HSW) display more mass at the centre and less at the tails than for treatments 1 and 2 (Trust-1 and Trust-2 in HSW). This indicates that the distributions of the former two treatments have greater variance than the distributions for the latter two.

Tests for differences in means show a statistically significant difference between mean amounts sent in treatment 3 and mean amounts sent in treatment 4 (t-test, $p < 0.001$). Based on this, the presence of a human trustee in treatment 4 therefore does change the trusting behaviour of individuals compared to playing the game in treatment 3 without a human partner: trustors playing with no human trustee (treatment 3) chose to send significantly more than trustors whose computer partner earned winnings on behalf of a passive human trustee. This is in contrast to what was found by HSW, who discovered that the presence of a human receiver did not change behaviour. These findings, on the other hand, suggest that prosocial impulses may in fact influence the trusting behaviour of subjects.

## 5.2 Exploratory Analysis of Risk Data

This section gives the exploratory findings of the risk preference parameter $r$. The parameter is initially modelled in Table 5 using the expected utility theory model, with contextual error specification, to obtain an estimate for risk parameter $r$ for the pooled dataset. Thereafter, a kernel density plot gives the distribution of risk preferences and Table 6 gives additional risk estimates in more detail.

### 5.2.1 Risk Preferences for Pooled Sample

A basic regression analysis was conducted on the pooled sample in Table 5. This made use of the power utility function with contextual error specification. Individual clustering was taken into account since each subject made multiple choices across 40 lottery pairs. The regression equation is $r = r_0$, stemming from the previously-stated equation $r = r_0 + r_\beta \cdot X$ that has been altered to accommodate for homogenous preferences. This model gives the estimates: $r = 0.047$ and $\mu = 0.262$. The value of $r$ suggests high relative risk aversion. Error term $\mu$ is positive and statistically significant. Consequently, this means that individuals in this specific sample were found to have made behavioural errors in the risk task, Task R.

Table 5: ML[1] Estimation using Expected Utility Theory and homogenous preferences

| | Pooled |
|---|---|
| **Power Function Parameter ($r$)** | 0.047 |
| | (0.05) |
| **Error ($\mu$)** | 0.262*** |
| | (0.02) |
| N | 8080 |
| Log-Likelihood | -4740.412 |

* p<0.10, ** p<0.05, *** p<0.01

Coefficients presented and standard errors in brackets.

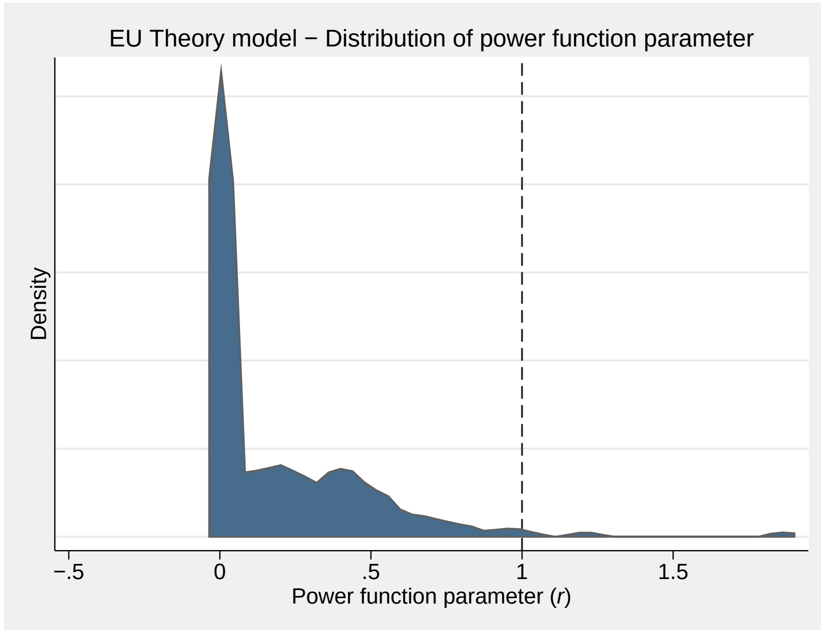
Results pooled across all individuals.

Clustering at individual level taken into account.

[1]Maximum Likelihood estimation method.

The kernel density in Figure 5 below shows the distribution of risk parameter $r$. Most subjects are found to be risk averse. This is in line with the literature which finds that, on average, subjects act as risk averse individuals (Eckel and Wilson (2004), Holt and Laury (2002), HSW, Sapienza, Toldra, and Zingales (2007)). In particular, 62% of the pooled sample (Figure A11 of Appendix) displayed high levels of risk aversion. Approximately 3 individuals exhibited risk neutral behaviour and only 1 out of 202 individuals exhibited risk seeking behaviour. The average value of $r$ for the pooled sample is 0.047 (see Table 6).

Figure 5: Distribution of Risk Parameter r




### 5.2.2 Risk Preferences by Gender

Females displayed greater risk aversion than males. Table 6 gives the mean values of $r$ for males and females as 0.2 and 0.0002 respectively (see also Table A3 for regression output). This points toward high risk aversion for females and females being more risk averse than males. The difference in risk preferences between genders is statistically significant (Fisher's Exact Test, $p < 0.001$). Similar results were discovered by Schechter (2007), who found that males were less risk averse than females. Eckel and Wilson (2004) also found that in all of their risk measurements, men were more risk-seeking on average and more likely than females to take a risky gamble.

### 5.2.3 Risk Preferences by Treatment and Player

On average, second players (receivers) were less risk averse than first players (senders). Subjects in treatments 2 and 3 displayed greater risk aversion than subjects in treatments 1 and 4 (see Table 6). The greatest aversion to risk was exhibited by treatment 3 participants ($r = 0.0002$) who played the trust game with no human partner and in a pure risk environment. Table A6 in the Appendix gives interaction results between the amount sent in the trust game and the four treatments. It shows that amounts sent and each treatment is significantly related to risk preferences.

Table 6: Risk Preferences Results

| | $r$ | $N$ |
|---|---|---|
| Overall Sample | 0.0469 | 8080 |
| Males | 0.2005 | 3760 |
| Females | 0.0002 | 4240 |
| Player 1[1] | 0.0004 | 4760 |
| Player 2 | 0.1198 | 3320 |
| Treatment 1 | 0.1286 | 1920 |
| Treatment 2 | 0.0059 | 2800 |
| Treatment 3 | 0.0002 | 1440 |
| Treatment 4 | 0.1419 | 1920 |

Notes: [1]Risk parameters estimated on player 1s only.

## 5.3 Analysis of Risk and Trust

This section focuses on the research question and aims to investigate the risk-trust confound. Regression models using Expected Utility theory and Rank-Dependent Utility theory will be presented and analysed to estimate the relationship between trusting behaviour and risk preferences. Using both utility functions and probability weighting in this way guards against a potential bias of estimates that may arise when one ignores probability weighting. If it is present, then one should apportion risk preferences into their respective utility or probability weighting components (HHRS). This then allows for stronger inferences to be made about risk and trust.

### 5.3.1 Expected Utility [EU] Theory Model

In this section, EU models are presented. These models make use of the Power Utility function and the contextual error specification. Results are given in Table 7 and Table 8.

#### 5.3.1.1 EU Heterogenous Models

The EU model in Table 7 takes into account observed heterogeneous preferences. It includes explanatory variables and the trust variable, the latter of which indicates the willingness of player 1s to trust: trustors who send a higher amount to their partner display greater levels of trust, while trustors who send lower amounts display lower levels of trust. In this regression equation, parameter $r$ is estimated as a function of certain demographic variables as well as the amount sent in the trust game, a binary variable for whether the risk game was played first, and dummy variables for three of the four treatments. The demographic variables are student age (defined between the ages of 18 and 24), White population group, and male. This model therefore captures the marginal effects between trust and risk, whilst controlling for other potential factors.

Every variable in this model is statistically significant. The estimate on the amount sent by trustors, as a fraction of the trustor's endowment, is 0.193 with a standard deviation of 0.02. This positive coefficient is interesting because it shows that subjects who chose to send more in the trust game were found to be less risk averse: that is, more trusting individuals displayed more risk-seeking behaviour. This variable is significant at the 1% level and implies a statistically significant relationship between risk and trust in the pooled sample. This result suggests that trust measurements are in fact being confounded by risk preferences and that a game designed to measure trust is not actually measuring trust in and of itself.

The positive coefficient on age means that as students become older, their risk preferences become more risk-seeking. Being male is also associated with greater risk-seeking behaviour. White individuals were significantly more risk averse than those belonging to any other racial group. There is an order effect present as subjects who played the risk task first had significantly different risk preferences, and were more risk-seeking, than those who played the trust game first. Subjects who were in treatments 1, 2 and 3 were significantly more risk-loving than subjects in treatment 4.

Table 7: ML[1] Estimation using EU and heterogeneous preferences (marginal effects)

| | Pooled[2] | |
|---|---|---|
| **Parameter** ($r$) | | |
| Student Age | 0.087*** | (0.01) |
| White | −0.068*** | (0.01) |
| Male | 0.111*** | (0.01) |
| Risk Task played first | 0.019*** | (0.00) |
| Fraction Sent | 0.193*** | (0.02) |
| Treatment 1 | 0.106*** | (0.01) |
| Treatment 2 | 0.067*** | (0.01) |
| Treatment 3 | 0.048*** | (0.00) |
| Constant | −0.106*** | (0.01) |
| **Error** ($\mu$) | | |
| Constant | 0.206*** | (0.01) |
| N | 4640 | |
| Log-Likelihood | -2669.7676 | |

* p<0.10, ** p<0.05, *** p<0.01. Standard errors in brackets. Clustering at individual level and heterogeneous preferences taken into account.

[1]Maximum Likelihood estimation method.

[2]Results pooled across all individuals.

[3]Amount sent: fraction of R100 endowment that trustors sent to trustees.

#### 5.3.1.2 EU Heterogenous Models: Risk and Trust Environments

Lastly, dividing the sample into decisions made by a computer and decisions made by a human, breaks it down into an environment of risk and of trust respectively. These results can be seen in

Table 8. Once again, order effects are present: playing the risk task first in an environment of risk significantly increases one's preference for risk, whilst playing the risk game first in an environment of trust makes one significantly more averse to risk.

Table 8: ML[1] Estimation using EU for Risk and Trust Environments

| | Trust Environment[2] | Risk Environment[3] |
|---|---|---|
| **Power Function Parameter ($r$)** | | |
| Student Age | 0.000 | 0.074*** |
| | (0.00) | (0.00) |
| White | 0.024*** | −0.133*** |
| | (0.00) | (0.00) |
| Male | 0.146* | 0.035*** |
| | (0.08) | (0.00) |
| Risk Task played first | −0.024*** | 0.013*** |
| | (0.00) | (0.00) |
| Fraction Sent | 0.242*** | 0.130*** |
| | (0.04) | (0.00) |
| Constant | 0.000*** | 0.033*** |
| | (0.00) | (0.00) |
| **Error ($\mu$)** | | |
| Constant | 0.220*** | 0.190*** |
| | (0.02) | (0.02) |
| N | 2320 | 2320 |
| Log-Likelihood | -1360.1191 | -1303.2208 |

* p<0.10, ** p<0.05, *** p<0.01. Standard errors in brackets. [1]Maximum Likelihood estimation.

[2]Includes Treatments 1 and 2. Represents environment of strategic uncertainty.

[3]Includes Treatments 3 and 4. Represents environment of state uncertainty.

The estimate on trust in the environment of trust is 0.242 and in the environment of risk it is 0.13. Results show that risk and trust are statistically significantly related in both the environment of risk and the environment of trust. Risk preferences therefore predicted decisions in the purely risky environment, as one would expect. However, risk also played a role in predicting decisions made in environments involving trust. This therefore suggests that trusting decisions are in fact confounded by risk preferences.

A relationship therefore does exist between trusting decisions and risk preferences: using Expected Utility Theory and the power utility function with contextual error specification, one can conclude that trusting behaviour and risk preferences are in fact significantly related. Hence, measurements of trust are confounded by an individual's risk preferences.

### 5.3.2 Rank-Dependent Utility [RDU] Theory Model

The Rank-Dependent Utility model builds on the Expected Utility model above by taking into account probability weighting. RDU models give a better sense of the relationship between risk and trust as decision-making could potentially be influenced by the way in which subjects perceive probabilities. The following PWFs will be used in the RDU analysis: the TK PWF from equation 8 above, the Power function from equation 10, and the Prelec function from equation 11. RDU models are estimated and presented in the section below.

#### 5.3.2.1 RDU Homogenous Models

Using these three PWFs, as well as the power utility function and contextual error specification, RDU models for the pooled sample, assuming homogenous preferences, are estimated and presented in Table 9. The estimates for $r$ across all three models are statistically significant and imply that the relationship between risk and trust is influenced by the curvature of the utility function.

For the first column in Table 9, making use of the power PWF, the $\gamma$ estimate is 1.413, which is significantly different from 1 ($p = 0.042$). This indicates a large underweighting of all probabilities and this can be seen in Figure 6. For the second column, the $\gamma$ estimate of the TK PWF is 0.808 and this significantly differs from 1 ($p < 0.001$). The result is an inverse S-shape, with an overweighting of low probabilities and an underweighting of moderate to high probabilities. This can be seen in the second row of Figure 6. Subjects were therefore inflating the probability of a rare chance: trustors perceived the probability of receiving nothing in return from trustees as being higher than it actually was. The third column of the table uses the Prelec PWF and produces estimates $\gamma = 0.762$ and $\eta = 0.984$. While $\gamma$ was found to significantly differ from 1 ($p < 0.001$), $\eta$ was not ($p = 0.7351$). The estimate for $\gamma$ indicates that the PWF is strictly concave for low probabilities and strictly convex for high probabilities. This gives rise to the similar inverse S-shape seen with the TK PWF.

Table 9: ML[1] Estimation using RDU and homogenous preferences for the pooled sample

| | Power PWF | TK PWF | Prelec PWF |
|---|---|---|---|
| **Power Function Parameter ($r$)** | 0.000** | 0.122** | 0.152*** |
| | (0.00) | (0.05) | (0.04) |
| **PWF Parameter ($\gamma$)** | 1.413*** | 0.808*** | 0.762*** |
| | (0.20) | (0.03) | (0.03) |
| **PWF Parameter ($\eta$)** | | | 0.984*** |
| | | | (0.05) |
| **Error ($\mu$)** | 0.356*** | 0.246*** | 0.237*** |
| | (0.04) | (0.02) | (0.02) |
| N | 8080 | 8080 | 8080 |
| Log-likelihood | -4731.4194 | -4704.1415 | -4693.3815 |

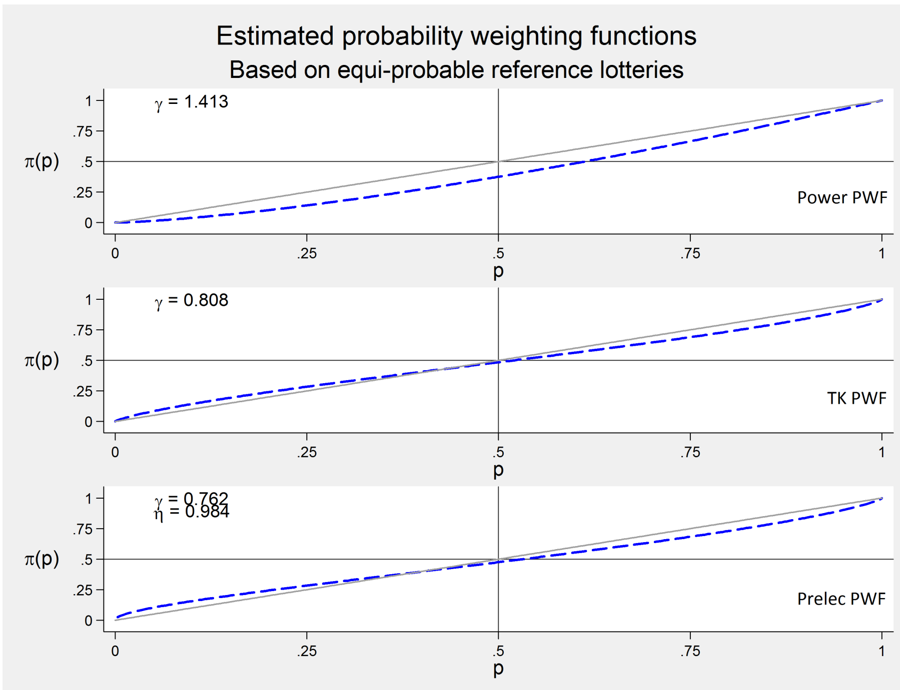
* p<0.10, ** p<0.05, *** p<0.01. Coefficients presented and standard errors in brackets.

Individual clustering and homogenous preferences.

[1]Maximum Likelihood estimation method.

The significance of $\gamma$ and $\eta$ across all three models implies that decisions are in fact influenced by the way in which individuals perceive probabilities. Probability weighting therefore does play a role and should be taken into account.

Figure 6: Estimated PWFs
for homogenous preferences




### 5.3.2.2 RDU Heterogenous Models

Further analysis on the pooled dataset was done in Table 10 by taking into account the same demographic and task variables used in the EU model. These include student age, being White, male, the fraction of amount sent in the trust game and whether the risk game was played first. In addition, dummy variables for each treatment were included in the regression equation but were omitted from the table below due to space. Only the two-parameter Prelec PWF was used in this analysis as it takes into account the inverse S-shape of the PWF and it has the highest log-likelihood of all three previously-estimated models. The model below therefore presents the marginal effects between trust and risk using this Prelec PWF.

Table 10: ML[1] Estimation using RDU and heterogenous preferences (marginal effects)

| | Prelec | |
|---|---|---|
| **Power Function Parameter ($r$)** | | |
| Student Age | 0.089 | (0.11) |
| White | −0.096 | (0.10) |
| Male | 0.047 | (0.08) |
| Risk Task played first | 0.026 | (0.09) |
| Fraction Sent | 0.181 | (0.14) |
| Constant | −0.071 | (0.15) |
| **PWF Parameter ($\gamma$)** | | |
| Student Age | 0.062 | (0.09) |
| White | −0.131 | (0.09) |
| Male | −0.090 | (0.10) |
| Risk Task played first | −0.002 | (0.10) |
| Fraction Sent | −0.116 | (0.15) |
| Constant | 0.877*** | (0.18) |
| **PWF Parameter ($\eta$)** | | |
| Student Age | −0.145 | (0.31) |
| White | 0.067 | (0.14) |
| Male | −0.395** | (0.18) |
| Risk Task played first | 0.142 | (0.19) |
| Fraction Sent | −0.395* | (0.22) |
| Constant | 1.409*** | (0.37) |
| **Error ($\mu$)** | | |
| Constant | 0.227*** | (0.02) |
| N | 4640 | |
| Log-Likelihood | -2605.2594 | |

* p<0.10, ** p<0.05, *** p<0.01. [1]Maximum Likelihood estimation.

Coefficients presented. Standard errors in brackets. Treatment dummies

excluded due to space constraints. See Appendix Table A7 for full set of estimates.

As was found with the EU model, a positive (but insignificant) relationship was discovered between the amount sent in the trust game and the curvature of the utility function, $r$. The amount sent is insignificant under $\gamma$ but significant under $\eta$. A comparison of this $\eta$ estimate across homogenous and heterogenous models indicates that when trust is not included in the regression equation (Table 9), low probabilities are overweighted. However, when trust is included in the model (Table 10), this overweighting becomes accentuated: the change in $\eta$ when trust is introduced essentially heightens an individual's risk aversion for low probabilities. That is, subjects overweight probabilities even more when they make a trusting decision compared to making a decision that does not involve trust. Hence the decision to trust is affected by the way in which individuals perceive probabilities.

#### 5.3.2.3 RDU Heterogenous Models: Risk and Trust Environments

Lastly, the environments of trust and of risk are explored under RDU theory in Table 11. It shows that in the trust environment, which comprises treatments 1 and 2, it is probability weighting that affects decisions since trust is only statistically significant under parameter $\eta$. In the trust environment, subjects are therefore overweighting the possibility of rare events and hence sending less because of an increased perceived riskiness of sending a larger amount. The opposite is true for the risk environment, which is made up of treatments 3 and 4. In this risky environment, where probabilities are objectively known, it is the utility function that is influencing decisions and not probability weighting. Subjects therefore do not perceive an increased riskiness when making trusting decisions where the probabilities of outcomes are known, but do experience an increased riskiness when they have to trust another person.

Table 11: ML[1] Estimation using RDU: Environments of Trust & Risk

| | Trust Environment[2] | | Risk Environment[3] | |
|---|---|---|---|---|
| **Power Function Parameter ($r$)** | | | | |
| Student Age | 0.000 | (0.00) | 0.088*** | (0.00) |
| White | 0.010 | (0.02) | 0.000 | (0.00) |
| Male | 0.201 | (0.12) | 0.015*** | (0.00) |
| Risk Task played first | −0.052 | (0.12) | −0.072*** | (0.00) |
| Fraction Sent | 0.106 | (0.21) | 0.154*** | (0.00) |
| Constant | 0.042 | (0.13) | −0.031*** | (0.00) |
| **PWF Parameter ($\gamma$)** | | | | |
| Student Age | 0.220* | (0.12) | −0.188 | (0.13) |
| White | −0.161 | (0.12) | 0.060 | (0.10) |
| Male | 0.022 | (0.12) | −0.180 | (0.14) |
| Risk Task played first | −0.197 | (0.13) | 0.182 | (0.14) |
| Fraction Sent | −0.158 | (0.14) | −0.237 | (0.21) |
| Constant | 0.773*** | (0.14) | 1.077*** | (0.28) |
| **PWF Parameter ($\eta$)** | | | | |
| Student Age | −0.016 | (0.26) | −0.836 | (1.03) |
| White | 0.178 | (0.21) | 0.845 ** | (0.38) |
| Male | −0.054 | (0.21) | −0.481 ** | (0.22) |
| Risk Task played first | 0.016 | (0.23) | 0.098 | (0.22) |
| Fraction Sent | −0.685*** | (0.24) | −0.096 | (0.41) |
| Constant | 1.250*** | (0.35) | 2.068* | (1.12) |
| **Error ($\mu$)** | | | | |
| Constant | 0.238*** | (0.02) | 0.249*** | (0.02) |
| N | 2320 | | 2320 | |
| Log-Likelihood | -1323.3638 | | -1263.2843 | |

* p<0.10, ** p<0.05, *** p<0.010. [1]Maximum Likelihood estimation method.

[2]The trust environment consists of treatments 1 and 2.

[3]The risk environment consists of treatments 3 and 4.

# 6 Discussion

This study aimed to analyse the relationship between risk preferences and trusting behaviour. It took into account various factors including potential subject error, probability weighting, and curvature of the utility function. The analysis finds that subjects make errors on average and that probability weighting plays a role in decision-making.

In terms of trust, it was found that the greatest level of both trust and trustworthiness occurred in treatment 1. Trustors were likely to trust their partner with more money when they were not influenced by additional information on that partner and when they knew that their partner was another human individual as opposed to a computer. Conversely, trustees were likely to return more money to their partner when they knew that their partner had made a genuine decision to trust them and had not made their choice on the basis of the additional information that was presented to them.

In general, trustors sent on average R34 to their trustee partner and trustees returned on average 33% of what they received from the trustor. It was found that providing additional information on trustees to trustors, in the form of a typical return distribution, does not significantly affect trusting decisions. This was also discovered by HSW. The presence of a human trustee, however, does affect trusting decisions and this result contradicts findings by HSW. Trustors who played against the computer sent significantly more than trustors who played with a human partner that they were not actively interacting with. Individuals were therefore more inclined to trust their money to a computer, who would not earn anything, over a human individual, who would get to keep their earnings based on the game. One interpretation of this is that subjects chose to trust their fellow human subjects less, possibility due to the fear of betrayal or deception that is not present in a computer that made decisions based on a fixed distribution. These potential concerns from trustors are deemed valid since only between 31% and 36% of the tripled amounts received by trustees was actually returned to trustors.

Male trustors were found to have sent significantly more to trustees than female trustors. In line with the literature, females displayed greater risk aversion than males and this difference was statistically significant. Females can therefore be interpreted as the less trusting and more risk averse gender, at least in this sample. Hence, females are more cautious and more reserved with regards to financial situations and decisions involving money.

In terms of risk, it was found that risk preferences of subjects varied between experimental treatments. There are two possible causes for this. Firstly, order effects were found and subjects who had played the risk task first and in an environment of risk exhibited significantly less risk aversion than subjects who had played the trust game first in the same environment. Conversely, subjects who had played the risk game first and in an environment of trust were found to be significantly more averse to risk. Order effects therefore played an important role in risk and trust measurements. Secondly, it is important to note that the lower level of risk aversion amongst treatments 1 and 4 may due to the fact that there was an uneven number of sessions in these treatments: treatment 1 had 2 sessions where Task R was played first and 1 where Task T was played first; treatment 4 had 2 sessions where Task T was played first and 1 where Task R was played first.

Results find that subjects who sent more in the trust game were less risk averse. That is, individuals who were more trusting exhibited greater risk-seeking behaviour. It was also found that risk preferences were able to predict decisions in the purely risky environment, where probabilities were objectively known, as one should expect. However, risk preferences were also able to predict decisions in the trust environment. Risk in this sample therefore helped to explain decisions made in an environment of risk and, at the same time, decisions made in an environment of trust. These results indicate a clear and significant relationship between risk and trust. Trust measurements are therefore being confounded by measures of risk so that low levels of trust may simply be due to an individual's high level of risk aversion.

Trust and risk were found to be linked through the curvature of the utility function as well as through subjective distortions of probabilities. Results from RDU models point toward PWFs with an inverse S-shape, emphasising an overweighting of low probabilities and an underweighting of moderate to high probabilities. This overweighting is accentuated when trust is introduced: subjects perceived increased risk when making a trusting decision and sent less as a result. Extracted from the histogram presented to subjects, trustors were provided with information that indicated, in previous runs of the trust game, that the likelihood of receiving nothing in return was 20% whilst the probability of receiving the full amount that they had sent was 3%. However, with probability weighting, these events were overweighted and essentially increased the riskiness of sending larger amounts by trustors. Probability weighting therefore does influence the determination of risk preferences and decisions are affected by an individual's perception of probabilities.

There are, however, limitations to this study. These include the fact that the sample consisted of students and is therefore not sufficiently representative of the population. One therefore has to question the external validity of this experiment and the accompanying results. Further research can be done to overcome this issue by seeking out subject participants from the general population rather than recruiting from a university. In addition, the four experimental treatments were not sufficiently balanced in terms of students' faculty departments. Future research should attempt to control for this, with safeguards in place to prevent over-sampling of any one specific faculty or through the use of sampling weights. One also has to question whether the rewards were sufficiently high enough so as to result in accurate and reliable responses. In comparison to the literature, prize amounts used in this study were sufficiently large and were therefore concluded as being sufficiently salient.

# 7 Conclusion

This study adds to the literature on the role of preferences in the level and extent of trust. The experimental design made use of four different trust game treatments, separated into two trust treatments and two risks treatments. The two trust treatments made use of human trustees and represented an environment of strategic uncertainty. The two risk treatments, on the other hand, represented an environment of state uncertainty and return decisions were made by a computer. The difference between treatments was as follows: T1 was a standard trust game with two human players; T2 was a standard trust game that provided trustors with additional information on past trustee behaviour; T3 had no human trustee and the trustor played solely against a computer; and lastly T4 involved the trustor playing against a computer that made decisions and earned money on behalf of a passive human trustee. Risk preferences were measured using a risk task based on Hey and Orme (1994) where subjects made choices between two lotteries.

Risk and trust were analysed using the Expected Utility Model and the Rank-Dependent Utility Model. Demographic variables, task variables, and treatment dummies were included in the analysis, in addition to the trust covariate, to allow for the estimation of the marginal effects between trust and risk. Risk and trust were found to be significantly related. Measures of trust are therefore confounded by risk preferences and varying levels of trust may actually have more to do with an individual's risk preference than their inherit trusting behaviour.

Individuals who are less trusting are also averse to risk. An individual who is actually very trusting could appear less willing to trust due to their high level of risk aversion, that essentially hinders their ability to trust a larger amount to another person. Analyses that evaluate trust without taking into account risk preferences, then only capture that the individual is less trusting and does not take into account the potential dampening effect that risk attitudes have on trusting behaviour.

Conversely, individuals who are observed to be more trusting or who are evaluated by typical trust measurements to exhibit greater levels of trust, may simply be more risk-seeking than others and hence display more trusting characteristics. Their preference towards risk amplifies their level of trust and hence makes it appear as though they are more trusting than they actually are. Risk preferences therefore need to be evaluated whenever one measures and analyses trust.

Trust and risk were discovered to be linked in two ways: through the curvature of the utility function and through probability weighting. Subjects overweight low probabilities and underweight moderate to high probabilities. This effect is accentuated when moving from decisions that do not involve trust to decisions that do. Individuals perceived an even greater riskiness when they had to make a trusting decision. Probability weighting therefore does influence the decision-making process and individuals do subjectively distort probabilities. In addition, risk preferences predicted trusting decisions in the environments of both risk and of trust. Risk therefore plays a role in risky decisions, but also underpins decisions involving trust. Hence, trusting decisions are often perceived by individuals as decisions involving risk.

This study adds to the literature investigating a potential relationship between risk preferences and trusting decisions. These results beg the question of what trust actually is. Does it mean overcoming risk aversion? Or is it some innate property that can be masked by risk aversion? There is a clear risk-trust confound: a subject may be classified as trusting when actually they are just risk-seeking, or seen as non-trusting when they are simply risk averse. It is therefore of vital importance to take into account individual risk preferences when making inferences about trusting behaviour, so as to avoid the risk-trust confound that is present in individuals.

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# Appendix

## Part A: Results

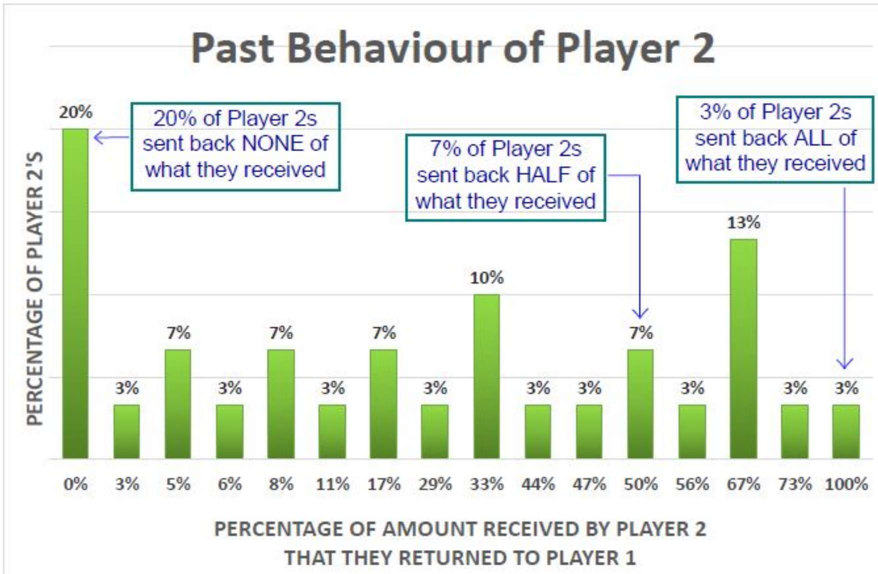
### Part A1: The Experiment and Experimental Sample

Table A1: Details of Experimental Sessions

| Session | Date | Time | Treatment | Order[1] | Number of Subjects |
|---|---|---|---|---|---|
| 1 | 10/08/2016 | 14h00 | 1 | RG | 18 |
| 2 | 11/08/2016 | 14h00 | 2 | TG | 17 |
| 3 | 11/08/2016 | 16h00 | 2 | RG | 18 |
| 4 | 16/08/2016 | 14h00 | 3 | TG | 18 |
| 5 | 16/08/2016 | 16h00 | 3 | RG | 18 |
| 6 | 17/08/2016 | 14h00 | 1 | TG | 16 |
| 7 | 17/08/2016 | 16h00 | 1 | RG | 14 |
| 8 | 18/08/2016 | 14h00 | 2 | TG | 17 |
| 9 | 18/08/2016 | 16h00 | 2 | RG | 18 |
| 10 | 23/08/2016 | 14h00 | 4 | TG | 12 |
| 11 | 24/08/2016 | 14h00 | 4 | RG | 18 |
| 12 | 25/08/2016 | 14h00 | 4 | TG | 18 |

Notes: [1]Risk Game [RG] or Trust Game [TG] played first to guard against potential order effects.

Figure A1: Histogram shown to subjects in Treatments 2, 3 and 4




Note: Return distributions by subjects in original Berg et al. (1995) game

Figure A2: Experimental Sample divided by Racial Groups

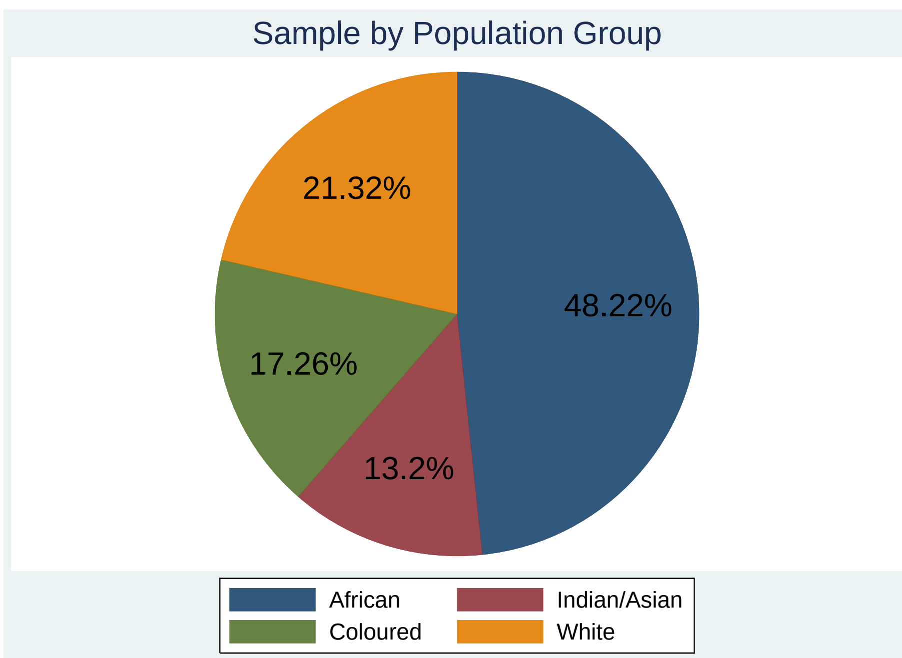


Table A2: Summary Statistics of Variables by Treatment

| Variable | Treatment 1 | Treatment 2 | Treatment 3 | Treatment 4 |
|---|---|---|---|---|
| Age | 21.42 | 21.20 | 21.47 | 21.19 |
| Total Income | 3371.28 | 2242.65 | 3327.27 | 2610.43 |
| Risk Game Earnings | 120.83 | 123.43 | 110.00 | 120.83 |
| Trust Game Earnings | 136.49 | 134.20 | 98.78 | 129.87 |
| Total Winnings | 274.48 | 277.63 | 228.78 | 270.81 |
| Variable | | | | Percentage of sample |
| **Gender** | | | | |
| Female | 58.33% | 55.07% | 60.00% | 39.58% |
| Male | 41.67% | 44.93% | 40.00% | 60.42% |
| **Race** | | | | |
| African | 51.06% | 48.53% | 54.29% | 40.43% |
| White | 21.28% | 26.47% | 25.71% | 10.64% |
| Coloured | 19.15% | 14.71% | 8.57% | 25.53% |
| Indian/Asian | 8.51% | 10.29% | 11.43% | 23.40% |
| **Four Main Languages** | | | | |
| English | 72.92% | 64.29% | 77.78% | 72.92% |
| IsiXhosa | 10.42% | 10.00% | 5.56% | 8.33% |
| IsiZulu | 2.08% | 5.71% | 11.11% | 6.25%% |
| Afrikaans | 4.17% | 2.86% | 0% | 0% |
| **Faculty** | | | | |
| Commerce | 37.50% | 34.29% | 30.56% | 54.17% |
| Humanities | 27.08% | 18.57% | 38.89% | 12.50% |
| Engineering | 12.50% | 10.00% | 11.11% | 22.92% |
| Science | 18.75% | 10.00% | 2.78% | 2.08% |
| Health Sciences | 2.08% | 12.86% | 11.11% | 4.17% |
| Law | 2.08% | 14.29% | 5.56% | 4.17% |

## Part A2: Average Amounts Sent and Returned

Figure A3: Distribution of absolute amounts returned in pooled sample

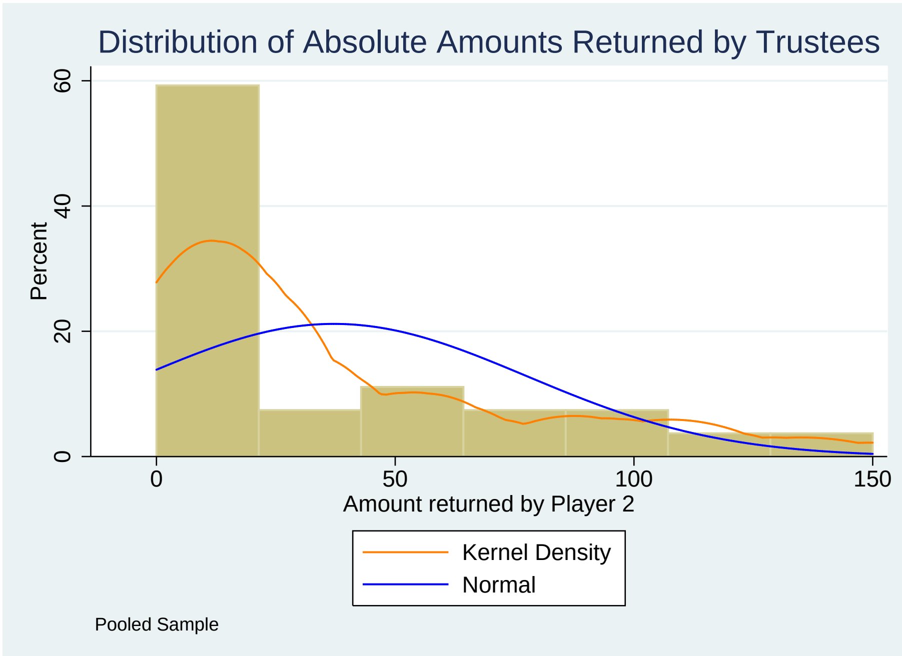



Figure A4: Average Amount Sent by Age

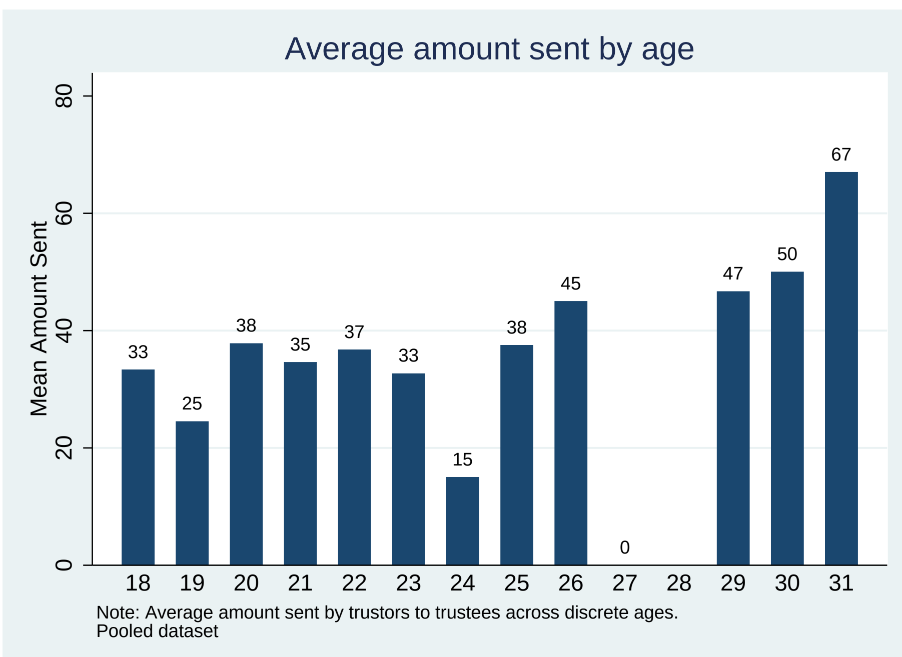


Figure A5: Average Amount Sent by Gender

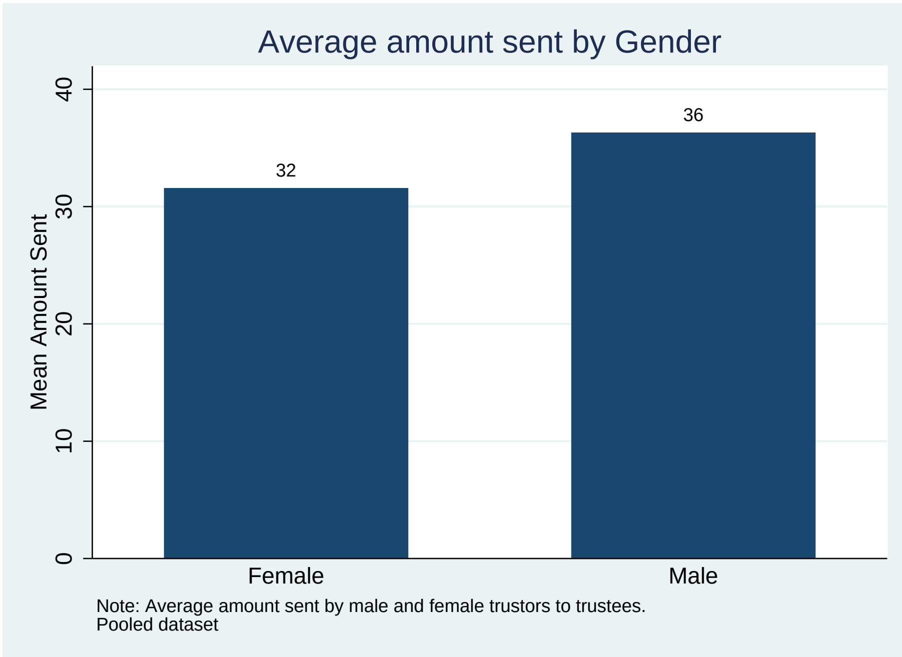



Figure A6: Average Amount Sent by Population Group

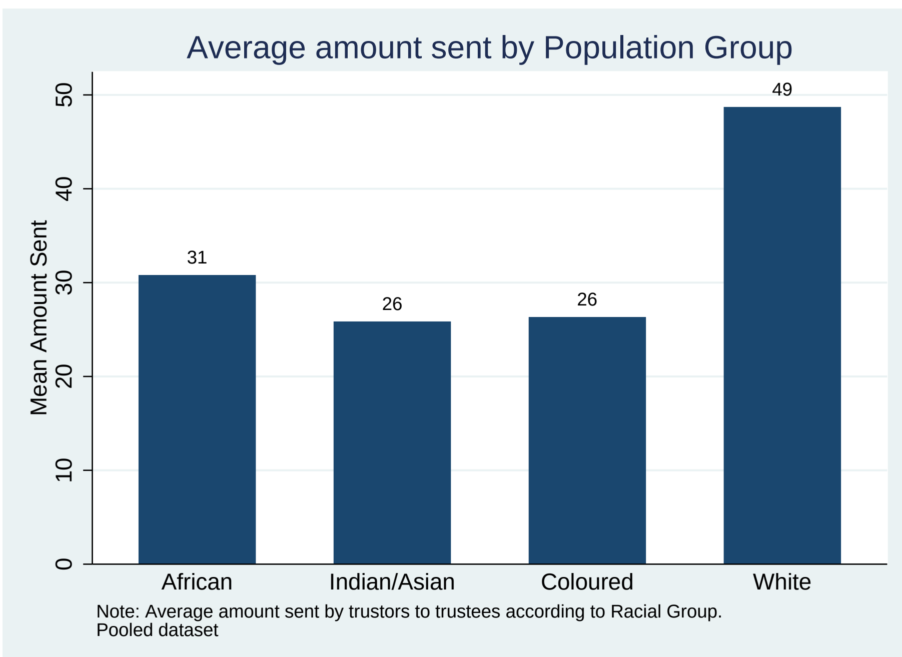


Figure A7: Average Amount Sent by Language

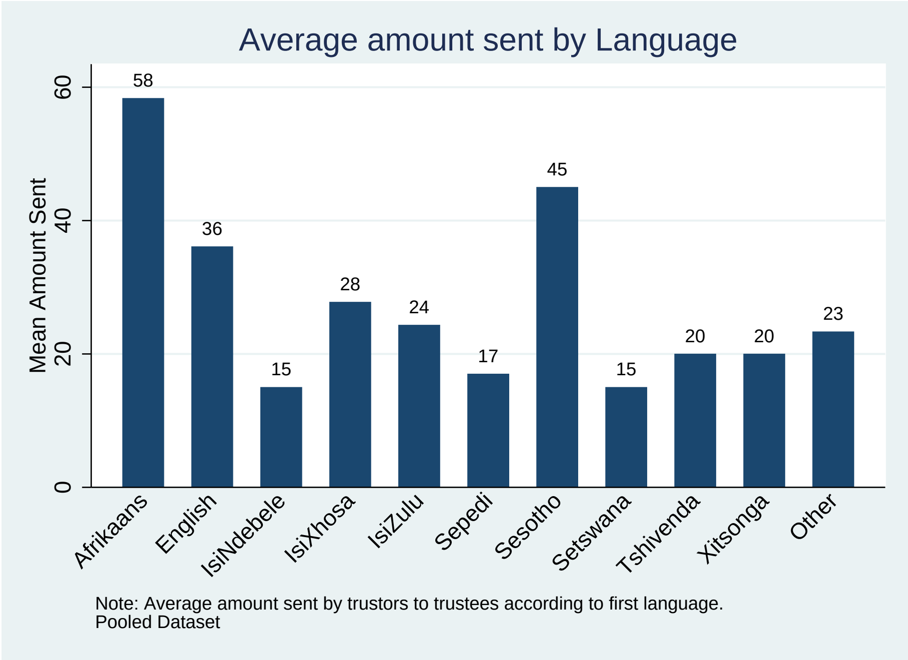



Figure A8: Average Amount Sent by Faculty

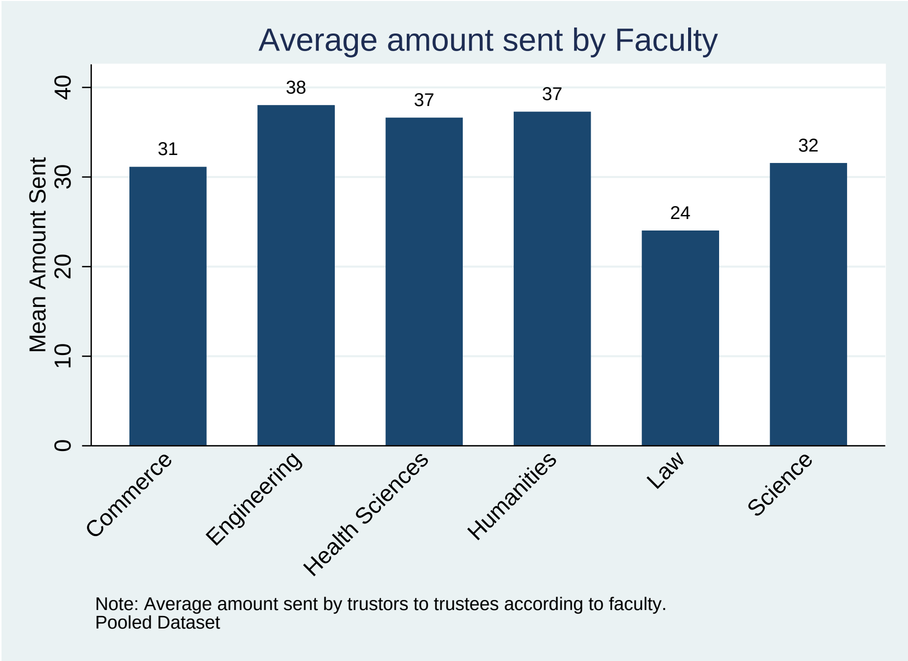


Figure A9: Average Amount Sent by Financial Situation

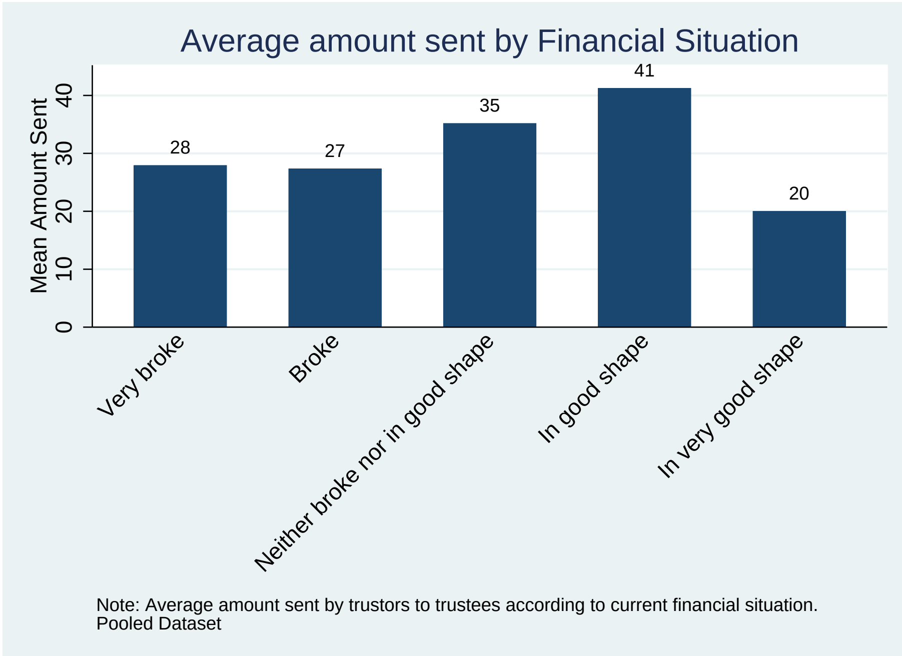



Figure A10: Distribution of absolute amounts returned

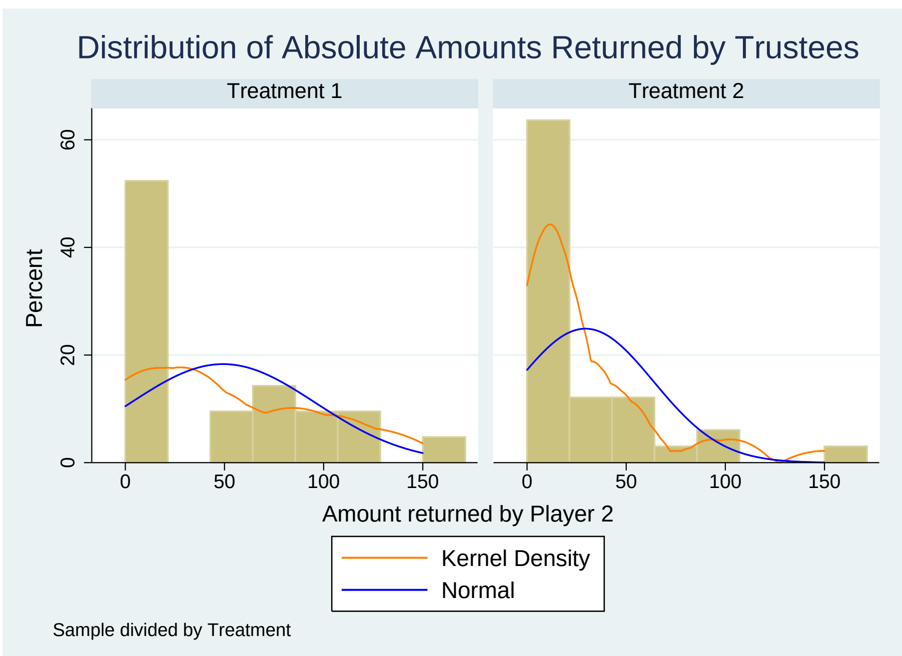
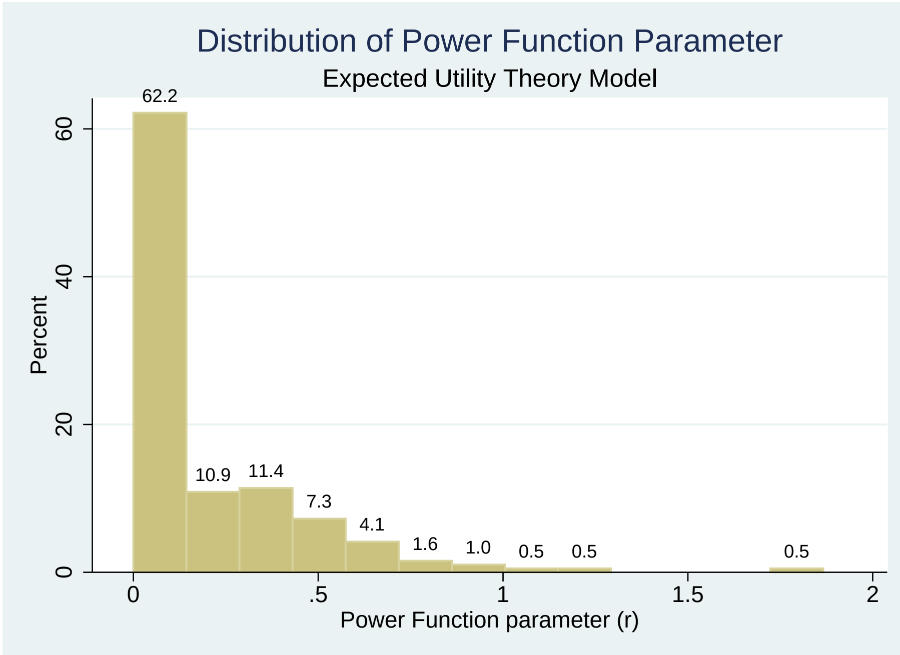


Figure A11: Distribution of Risk parameter $r$



## Part A3: Expected Utility Theory Regression Output

Table A3: ML[1] Estimation using EU
and homogenous preferences by Gender

| | Males | Females |
|---|---|---|
| **Power Function Parameter ($r$)** | 0.201*** | 0.000*** |
| | (0.07) | (0.00) |
| **Error ($\mu$)** | 0.229*** | 0.248*** |
| | (0.03) | (0.02) |
| N | 3760 | 4240 |
| Log-Likelihood | -2281.3207 | -2395.3492 |

* p<0.10, ** p<0.05, *** p<0.01. Coefficients presented. Standard errors in brackets. Individual clustering and homogenous preferences.

[1]Maximum Likelihood estimation method.

Table A4: ML[1] Estimation using EU
and homogenous preferences by Treatment

| | Pooled | Treatment 1 | Treatment 2 | Treatment 3 | Treatment 4 |
|---|---|---|---|---|---|
| **Power Function** | | | | | |
| **Parameter ($r$)** | 0.047 | 0.129 | 0.006 | 0.000 | 0.142 |
| | (0.05) | (0.09) | (0.08) | (0.00) | (0.11) |
| **Error ($\mu$)** | | | | | |
| Constant | 0.262*** | 0.236*** | 0.254*** | 0.250*** | 0.267*** |
| | (0.02) | (0.03) | (0.03) | (0.03) | (0.05) |
| N | 8080 | 1920 | 2800 | 1440 | 1920 |
| Log-Likelihood | -4740.4119 | -1139.7167 | -1598.2757 | -815.09628 | -1174.0199 |

* p<0.10, ** p<0.05, *** p<0.01. Coefficients presented and standard errors in brackets.

Individual clustering and homogenous preferences. [1]Maximum Likelihood estimation method.

Table A5: ML[1] Estimation using EU
and homogenous preferences for Player 1s

| | Player 1 | | | | |
|---|---|---|---|---|---|
| | Pooled | Treatment 1 | Treatment 2 | Treatment 3 | Treatment 4 |
| **Power Function** | | | | | |
| **Parameter ($r$)** | 0.000 | 0.152 | 0.000 | 0.000 | 0.045 |
| | (0.00) | (0.15) | (0.00) | (0.00) | (0.16) |
| **Error ($\mu$)** | | | | | |
| Constant | 0.278*** | 0.280*** | 0.257*** | 0.250*** | 0.255*** |
| | (0.02) | (0.05) | (0.04) | (0.03) | (0.06) |
| N | 4760 | 960 | 1400 | 1440 | 960 |
| Log-Likelihood | -2777.2775 | -596.06203 | -798.39722 | -815.09628 | -558.71116 |

* p<0.10, ** p<0.05, *** p<0.01. Coefficients presented and standard errors in brackets.

Individual clustering and homogenous preferences. [1]Maximum Likelihood estimation method.

Table A6: ML[1] Estimation using EU
and homogenous preferences: Interaction Models

| | No Interaction | Interaction |
|---|---|---|
| **Power Function Parameter ($r$)** | | |
| Fraction Sent | 0.157* | 0.424*** |
| | (0.09) | (0.02) |
| Treatment 2 | -0.151*** | -0.035*** |
| | (0.04) | (0.01) |
| Treatment 3 | -0.151*** | -0.036*** |
| | (0.04) | (0.01) |
| Treatment 4 | -0.114*** | -0.036*** |
| | (0.04) | (0.01) |
| Treatment 2 × Fraction Sent | | -0.253*** |
| | | (0.02) |
| Treatment 3 × Fraction Sent | | -0.424*** |
| | | (0.02) |
| Treatment 4 × Fraction Sent | | -0.377*** |
| | | (0.02) |
| Constant | 0.151*** | 0.036*** |
| | (0.04) | (0.01) |
| **Error ($\mu$)** | | |
| Constant | 0.234*** | 0.249*** |
| | (0.02) | (0.02) |
| N | 4720 | 4720 |
| Log-Likelihood | -2740.5469 | -2736.5865 |

* p<0.10, ** p<0.05, *** p<0.01.

[1]Maximum Likelihood estimation method.

## Part A4: Rank-Dependent Utility Theory Regression Ouput

Table A7: ML[1] Estimation using RDU (marginal effects) [full model][2]

| | Prelec | |
|---|---|---|
| **Power Function Parameter ($r$)** | | |
| Student Age | 0.089 | (0.11) |
| White | −0.096 | (0.10) |
| Male | 0.047 | (0.08) |
| Risk Task played first | 0.026 | (0.09) |
| Fraction Sent | 0.181 | (0.14) |
| Treatment 1 | 0.208 | (0.15) |
| Treatment 2 | 0.052 | (0.09) |
| Treatment 3 | 0.081 | (0.12) |
| Constant | −0.071 | (0.15) |
| **PWF Parameter ($\gamma$)** | | |
| Student Age | 0.062 | (0.09) |
| White | −0.131 | (0.09) |
| Male | −0.090 | (0.10) |
| Risk Task played first | −0.002 | (0.10) |
| Fraction Sent | −0.116 | (0.15) |
| Treatment 1 | −0.001 | (0.16) |
| Treatment 2 | −0.060 | (0.15) |
| Treatment 3 | −0.032 | (0.17) |
| Constant | 0.877*** | (0.18) |
| **PWF Parameter ($\eta$)** | | |
| Student Age | −0.145 | (0.31) |
| White | 0.067 | (0.14) |
| Male | −0.395** | (0.18) |
| Risk Task played first | 0.142 | (0.19) |
| Fraction Sent | −0.395* | (0.22) |
| Treatment 1 | 0.035 | (0.24) |
| Treatment 2 | 0.035 | (0.16) |
| Treatment 3 | 0.181 | (0.25) |
| Constant | 1.409*** | (0.37) |
| **Error ($\mu$)** | | |
| Constant | 0.227*** | (0.02) |
| N | 4640 | |
| Log-Likelihood | -2605.2594 | |

* p<0.10, ** p<0.05, *** p<0.01.

Coefficients presented. Standard errors in brackets.

[1]Maximum Likelihood estimation.

[2]Full model of Table 10.

# Part B: Introduction and Task Instructions

## Part B1: Introduction Presentation Slides

### Introduction

### Welcome

- Hello everyone and welcome to today's research session.
- Thank you for agreeing to take part in this study, your views and choices will be very informative and helpful.
- Before we get started I would like to explain how things are going to work.
- When I have finished this short explanation I will ask you to read and sign a consent form.
- Once that is done, we can begin with the tasks.

### 2 Tasks and a Questionnaire

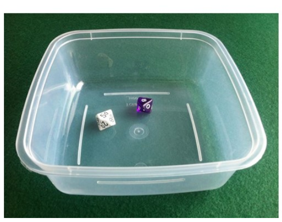
- You will take part in 2 tasks and you will have the opportunity to earn money in each task.
- One of the tasks requires you to make choices between lotteries with varying prizes and chances of winning. You will make 40 of these choices.
- The other is a simple, one-round decision-making task.
- Once you have completed the 2 tasks, you will need to fill out a short questionnaire.
- Once this is done, we will pay you your earnings and you will be free to leave.

### Earnings

- You will be paid R20 just for participating in today's session.
- At the end of each task, we will determine your earnings for it.
- Your final earnings for the two tasks and for participating in the study will be paid to you at the end of the session.
- To determine your earnings for one of the tasks, we will ask you to roll some dice.
- Let's go through a quick explanation of the dice you will roll.

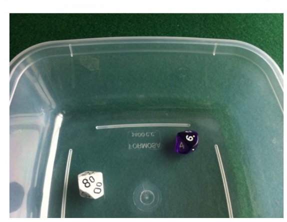
### 10-sided dice

- At the end of today's session we will ask you to roll some dice into a plastic bowl which you can see below.
- Two of the dice that you will roll are 10-sided dice and these are used to select a number between 1 and 100.
- Every number between 1 and 100, and including 1 and 100, is equally likely to occur.
- An example of a dice roll is shown below.



### 10-sided dice

- Let's look at a close-up of the 10-sided dice.
- As you can see, one of the 10-sided dice has sides which increase in multiples of 10: 00, 10, 20, 30, 40, 50, 60, 70, 80 and 90.
- The other 10-sided dice has sides which increase in multiples of 1: 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9.
- You will roll the two 10-sided dice together and add the numbers on the two dice to select a number between 1 and 100.
- In the example below, the number that was rolled is 86 (80 + 6).



### 10-sided dice

- To tell the difference between a 6 and a 9 there is a dot at the base of the number.
- The number in the picture below is therefore a 6.
- 9 looks different because there is a dot at the base of the 9.
- This is shown in the picture below.

### 10-sided dice

- To roll a number between 1 and 9 you need to roll 00 and a single number between 1 and 9.
- As you can see in the picture below, the number that was rolled is 5 (00 + 5).
- In the case where you roll 00 and 0, this will be treated as 100.
- This is shown in the picture below.

### Consent Form

- We have now finished the introductory explanation.
- To continue with today's session I need you to read and sign the consent form which is in the folder in front of you.
- This form explains your rights as a research participant and by signing it, you give your consent to participate in the study.
- If you have any questions please raise your hand and someone will come to answer them.
- You may read through the consent form now.

## Part B2: Risk Task Instructions

### Task Instructions

### Introduction

- In this task you will choose between lotteries with varying prizes and chances of winning.
- On each computer screen you will be presented with a pair of lotteries and you will need to choose one of them.
- There are 40 pairs of lotteries in this task.
- For each pair of lotteries, you should choose the lottery that you would prefer to play.
- You will actually get the chance to play one of the lotteries you choose, and you will be paid according to the outcome of this lottery.
- So you should think carefully about which lottery you prefer in each pair.

## Computer Display

- All of the choices in this task will be made on a computer.
- This is what the computer display will look like:


- The display on your screen will be larger and easier to read.

## Computer Display

- On the computer screen there are two lotteries: a "Left" lottery and a "Right" lottery.
- Let's look at the Left lottery together.
- For the Left lottery there is a 20% chance of winning R0,
  a 60% chance of winning R100,
  and a 20% chance of winning R200.
- The coloured areas of the pie chart and the text below the pie chart represent these chances.


## The Left Lottery


- As you can see, 20% of the pie chart is blue and this means you have a 20% chance of winning R0.
- This is what the blue text below the pie chart tells you: "Chance of winning R0 is 20%".
- Similarly, 60% of the pie chart is red which means there is a 60% chance of winning R100.
- This is what the red text below the pie chart tells you: "Chance of winning R100 is 60%".
- Finally, 20% of the pie chart is green which means there is a 20% chance of winning R200.
- This is what the green text below the pie chart tells you: "Chance of winning R200 is 20%".

## The Right Lottery

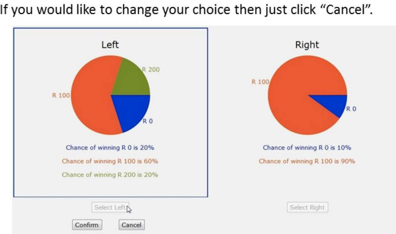
- If we look at the Right lottery we see that there is a 10% chance of winning R0 and a 90% chance of winning R100.
- 10% of the pie chart is blue and this means there is a 10% chance of winning R0.
- This is what the blue text below the pie chart tells you: "Chance of winning R0 is 10%".
- 90% of the pie chart is red which means there is a 90% chance of winning R100.
- This is what the red text below the pie chart tells you: "Chance of winning R100 is 90%".


## Your Lottery Earnings

- The amount that you earn from a lottery will be determined by the draw of a random number between 1 and 100.
- Each number between 1 and 100, and including 1 and 100, is equally likely to occur.
- You will draw this number yourself by rolling two 10-sided dice.
- One of the 10-sided dice has sides which increase in multiples of 10: 00, 10, 20, 30, 40, 50, 60, 70, 80 and 90.
- The other 10-sided dice has sides which increase in multiples of 1: 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9.
- You will roll the two 10-sided dice together and add the numbers on the two dice to select a number between 1 and 100.
- For example, suppose the one 10-sided dice lands on 70 and the other 10-sided dice lands on 5.
- Then we will select number 75.
- We will work through an actual example of this later.

## Choices

- Now, suppose that you prefer the Left lottery in the example below.
- To choose the Left lottery just click the button saying "Select Left".
- This is what the display will then look like if you choose the Left lottery.
- You can then click the button saying "Confirm" to move on to the next screen with a new pair of lotteries.
- If you would like to change your choice then just click "Cancel".



## Choices

- Suppose instead that you prefer the Right lottery in the example below.
- To choose the Right lottery just click the button saying "Select Right".
- This is what the display will look like if you choose the Right lottery.
- You can then click the button saying "Confirm" to move on to the next screen with a new pair of lotteries.
- If you would like to change your choice then just click "Cancel".


## Total Number of Choices

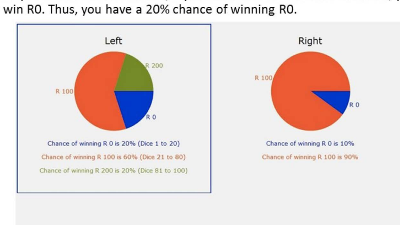
- You will need to make 40 choices across 40 screens.
- On each screen there is a different lottery pair and you will need to choose either the Left lottery or the Right lottery.
- The Rand amounts under the lotteries change on each screen.
- In addition, the chances of winning the Rand amounts change for each lottery on each screen.
- So please pay careful attention when making each choice.
- At the end of the session today we will determine your earnings for this task in the following way.

## Payment

- First, you will select one of the lottery pairs from this task by rolling a 4-sided dice and then a 10-sided dice.
- You will roll the 4-sided dice to select 10 lottery pairs.
- If the dice lands on 1, you will select lottery pairs 1-10; if the dice lands on 2, you will select lottery pairs 11-20; if the dice lands on 3, you will select lottery pairs 21-30; and if the dice lands on 4, you will select lottery pairs 31-40.
- You will then roll the 10-sided dice to select one lottery pair from this set of 10 pairs.
- For example, if the 4-sided dice lands on 3, you will select lottery pairs 21-30.
- If you then roll a 7 on the 10-sided dice, you will select lottery pair 27.
- Once you have selected the lottery pair, we will look at the choice that you made: the Left lottery or the Right lottery.
- We will then determine your winnings from this lottery by rolling two 10-sided dice, as explained earlier.
- Let's see what this means for the example we looked at earlier.

## Payment

- Suppose that the lottery pair we looked at earlier gets selected for payment when you roll the 4-sided dice and then the 10-sided dice.
- And suppose that you chose the Left lottery on this screen.
- For the Left lottery there is a 20% chance of winning R0, a 60% chance of winning R100, and a 20% chance of winning R200.
- You will now roll two 10-sided dice to determine your earnings.
- As you can see on the screen, if you roll a number between 1 and 20, you will win R0. Thus, you have a 20% chance of winning R0.




## Payment

- If you roll a number between 21 and 80 you will win R100. Thus, you have a 60% chance of winning R100.
- Finally, if you roll a number between 81 and 100 you will win R200. Thus, you have a 20% chance of winning R200.
- Suppose you roll the two 10-sided dice and one 10-sided dice lands on 60 while the other 10-sided dice lands on 7.
- Then we will select number 67.
- Because 67 is between 21 and 80, you will win R100.


## Payment

- Thus, payment for this task is determined by three things:
  1. The lottery pair that is chosen to be played out using the 4-sided dice and the 10-sided dice.
  2. Your choice of the Left lottery or the Right lottery in each pair.
  3. The outcome of that lottery when you roll the two 10-sided dice.
- All winnings will be paid in cash at the end of today's session.

## Choose the Option you Prefer

- The lottery you prefer in each pair is a matter of personal taste.
- The person next to you may have different tastes so their choices should not matter to you.
- Please work silently and make your choices by thinking carefully about each lottery.
- Since there is a chance that any one of your 40 choices could be selected for payment, you should approach each pair of lotteries as if it is the one that you will be paid for.
- If you have any questions please raise your hand and someone will come to answer them.
- You may begin the task.

# Part B3: Trust Task Instructions for Treatments 1 and 2

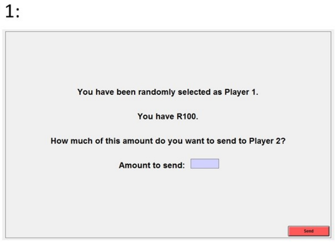
Task Instructions

## Introduction

- This task consists of a single round in which you are matched with another randomly selected person.
- The decisions that you and the other person make will determine the amounts of money earned by each of you.
- In each pair, one of you will be randomly assigned to the role of Player 1, and the other will be assigned to the role of Player 2.
- Both of you will be given R100.
- Player 1 will be asked how much of this amount (if any) he/she would like to send to Player 2 and how much, therefore, he/she would like to keep.
- The amount that is sent will be tripled and received by Player 2.
- Player 2 will then decide how much money (if any) to send back to Player 1 and, therefore, how much to keep.

## Computer Display for Player 1

- Player 1 and Player 2's decisions will be made on a computer.
- This is what the computer display will look like for Player 1:

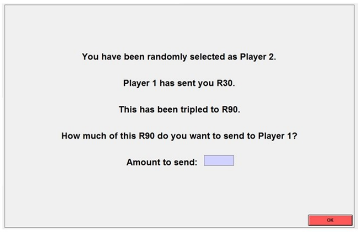



## Player 1

- Player 1 has R100 and must decide how much (if any) to send to Player 2 and how much, therefore, to keep for himself/herself.
- Player 1 can only send whole number amounts.
- Some examples of what can be sent: R0, R1, R2, …, R100.
- The amount that Player 1 keeps for himself/herself, Player 1 will take home.
- The amount sent to Player 2 will be tripled.
- For example, if Player 1 **sends R10**, Player 2 will receive **R30** and Player 1 will, therefore, **keep R90**.
- Or, if Player 1 **sends R30**, Player 2 will receive **R90** and Player 1 will, therefore, **keep R70**.

## Computer Display for Player 2

- This is what the computer display will look like for Player 2, if Player 1 sent R30:

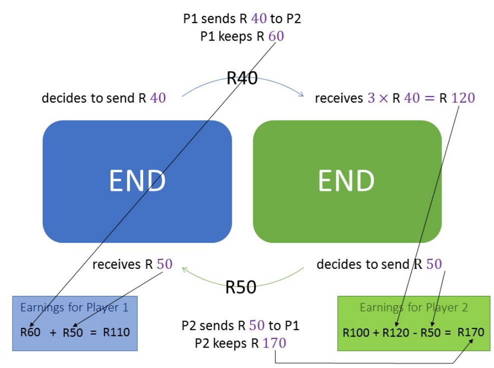



## Player 2

- Player 2 must decide how much of the tripled amount to send to Player 1 and, therefore, how much to keep for himself/herself.
- Player 2 can only send whole number amounts (R0, R1, R2, ….).
- The amount that Player 2 keeps for himself/herself, Player 2 will take home.
- The amount that Player 2 sends to Player 1, Player 1 will take home.
- For example, suppose Player 2 received the tripled amount of **R30** from the earlier example. If Player 2 **sends R20** to Player 1 then Player 1 takes home R20 and Player 2 **keeps R10**.
- Or, suppose Player 2 received the tripled amount of **R90** from the earlier example. If Player 2 **sends R30** to Player 1 then Player 1 takes home R30 and Player 2 **keeps R60**.

## Payment

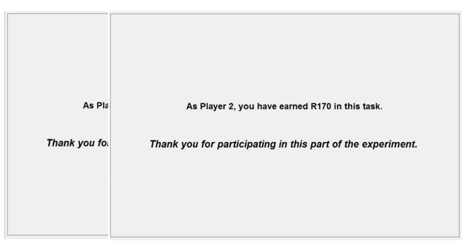
- If you are Player 1, you will earn:
  - The money you decided to keep for yourself when asked how much you would like to send to Player 2, PLUS
  - The money Player 2 decided to send you from the tripled amount they received.
- If you are Player 2, you will earn:
  - How much of the tripled amount of money sent to you that you decide to keep, PLUS
  - Your initial R100.
- All winnings will be paid in cash at the end of this task.




Note: This slide contained animations.

## Computer Display for P1 and P2

This is the computer display for Player 1 / This is the computer display for Player 2




Note: This slide contained animations.

## Your Choice

- The choice you make is a matter of personal taste.
- The people next to you may have different tastes so their choices should not matter to you.
- Please work silently and make your choice by thinking carefully about your decision.
- Remember that your payment will depend on the choice you make and the choice the other player makes, so think carefully about the decision you want to make.
- If you have any questions please raise your hand and someone will come to answer them.
- You may begin the task.

# Part B4: Trust Task Instructions for Treatment 3

## Task Instructions

## Introduction

- This task consists of a single round in which you are matched with the computer.
- The decision that you make, and the computer's response to it, will determine the amount of money earned by you.
- You will be assigned to the role of Player 1, and the computer will be assigned to the role of Player 2.
- You will be given R100 and will be asked how much of this amount (if any) you would like to send to the computer and how much, therefore, you would like to keep.
- The amount that is sent will be tripled and the computer will then determine how much money (if any) to send back to you, based on decisions made by Player 2s in previous runs of this task.

## Computer Display for Player 1

- Player 1's decision will be made on a computer.
- This is what the computer display will look like for Player 1:


Note: This slide contained animations.

## Player 1

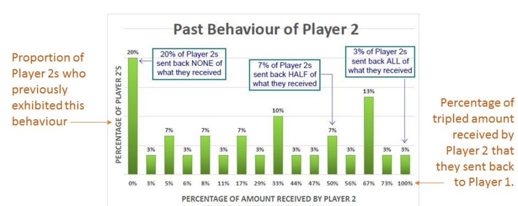
- Player 1 has R100 and must decide how much (if any) to send to Player 2 and how much, therefore, to keep for himself/herself.
- Player 1 can only send whole number amounts.
- Some examples of what can be sent: R0, R1, R2, …, R100.
- The amount that Player 1 keeps for himself/herself, Player 1 will take home.
- The amount sent to Player 2 will be tripled.
- For example, if Player 1 **sends R10**, this amount will be tripled to **R30,** and Player 1 will, therefore, **keep R90**.
- Or, if Player 1 **sends R30**, this amount will be tripled to **R90,** and Player 1 will, therefore, **keep R70**.

## Payment

- As Player 1 you will earn:
  - How much you decided to keep for yourself when asked how much you would like to send to Player 2, PLUS
  - How much the computer decided to send you from the tripled amount received.
- All winnings will be paid in cash at the end of today's session.

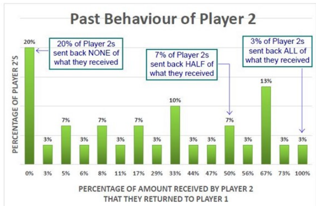
## Information provided to Player 1

- Player 1 will also receive additional information in a histogram.
- The horizontal axis gives the percentage of the tripled amount received by player 2 that they sent back to player 1.
- The vertical axis gives the proportion of player 2s who exhibited this behavior.



## Information provided to Player 1

- The amount that Player 2 (the computer) returns to Player 1 will follow this distribution.
- For example:
  - The probability that the computer does not send back any money is 20%.
  - And the probability that the computer sends back 50% of the received money is 7%.
  - Lastly, the probability that the computer sends back all the money is 3%.




## Computer Display for P1

This is an example of the final computer display for Player 1, if Player 1 sends R30:

> **You sent the computer R30.**
>
> **This was tripled to R90.**
>
> **Out of this, the computer has returned R45 to you.**
>
> **You have therefore earned R115 in this task.**
>
> ***Thank you for participating in this experiment.***

## Your Choice

- The choice you make is a matter of personal taste.
- The people next to you may have different tastes so their choices should not matter to you.
- Please work silently and make your choice by thinking carefully about your decision.
- Remember that your payment will depend on the choice you make and the computer's decision, so think carefully about the decision you want to make.
- If you have any questions please raise your hand and someone will come to answer them.
- You may begin the task.

# Part B5: Trust Task Instructions for Treatment 4

## Task Instructions

## Introduction

- This task consists of a single round in which you are matched with another randomly selected person.
- In each pair, one of you will be randomly assigned to the role of Player 1, and the other will be assigned to the role of Player 2.
- Player 1 will make their own decision and the computer will make a decision for Player 2.
- The decisions that Player 1 and the computer make will determine the amounts of money earned by each of you.
- Both of you will be given R100.
- Player 1 will be asked how much of this amount (if any) he/she would like to send to Player 2 and how much, therefore, he/she would like to keep.
- The amount that is sent will be tripled and received by Player 2.
- The computer will then decide how much money (if any) to send back to Player 1, based on decisions made by Player 2s in previous runs of this task. Any amount the computer chooses to keep, Player 2 will get to keep.

# Computer Display for Player 1

- Player 1's decisions will be made on a computer.
- This is what the computer display will look like for Player 1:

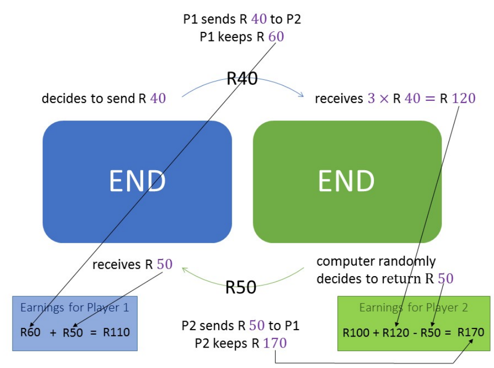

Note: This slide contained animations.

# Player 1

- Player 1 has R100 and must decide how much (if any) to send to Player 2 and how much, therefore, to keep for himself/herself.
- Player 1 can only send whole number amounts.
- Some examples of what can be sent: R0, R1, R2, …, R100.
- The amount that Player 1 keeps for himself/herself, Player 1 will take home.
- The amount sent to Player 2 will be tripled.
- For example, if Player 1 **sends R10**, this amount will be tripled to **R30,** and Player 1 will, therefore, **keep R90**.
- Or, if Player 1 **sends R30**, this amount will be tripled to **R90,** and Player 1 will, therefore, **keep R70**.

# Payment

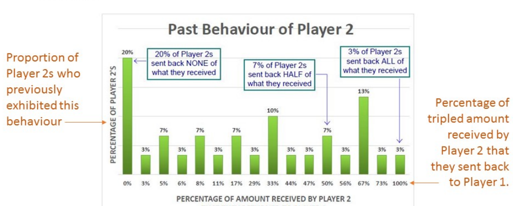
- As Player 1 you will earn:
  - How much you decided to keep for yourself when asked how much you would like to send to Player 2, PLUS
  - How much the computer decided to send you from the tripled amount received
- If you are Player 2, you will earn:
  - How much of the tripled amount sent to you that the computer decides to keep on your behalf, PLUS
  - Your initial R100.
- All winnings will be paid in cash at the end of today's session.




Note: This slide contained animations.

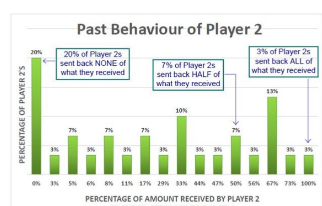
# Information provided to Player 1

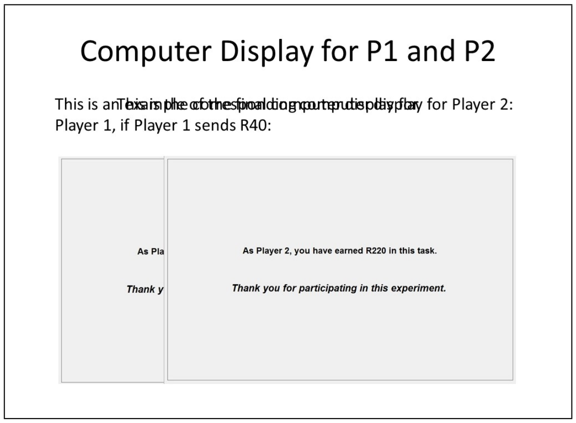
- Player 1 will also receive additional information in a histogram.
- The horizontal axis gives the percentage of the tripled amount received by Player 2 that they sent back to Player 1.
- The vertical axis gives the proportion of Player 2s who exhibited this behavior.




# Information provided to Player 1

- The amount that Player 2 (the computer) returns to Player 1 will follow this distribution.
- For example:
  - The probability that the computer does not send back any money is 20%.
  - And the probability that the computer sends back 50% of the received money is 7%.
  - Lastly, the probability that the computer sends back all the money is 3%.






Note: This slide contained animations.