

Social discounting and risk attitudes, time preferences and social preferences: An experimental study

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by

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Dedication

To my parents, husband, children and siblings.

DECLARATION

I, Celeste Campher, declare the following:

- I. The Doctoral Degree research thesis that I herewith submit for the Doctoral Degree qualification Philosophiae Doctor (PhD) Economics at the University of the Free State is my independent work, and that I have not previously submitted it for a qualification at another institution of higher education,
- II. I am aware that the copyright is vested in the University of the Free State,
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ABSTRACT

Altruism, the principle or practice of concern for the welfare of others, is a key element of human behaviour. It is vital to gain more knowledge on how altruism is associated with economic and other social preferences in order to get a more nuanced understanding of peoples' economic and social interactions. This thesis aims to extend research on social discounting in two areas, namely: how preferences for giving and social discounting differ in laboratory and field subjects, and how preferences for giving and social discounting are associated with various other economic and social preferences. The study comprises a series of conventional laboratory experiments and a set of artefactual field experiments with students and staff, respectively, from the University of the Free State in South Africa. These experiments employ social discounting tasks (SDT), multiple price lists (MPLs) for eliciting risk and time preferences, and ultimatum games (UG) and a trust games (TG) as tools for preference elicitation. Descriptive statistical analyses that investigate associations between key variables and appropriate regression models are employed in the thesis. A number of key findings are highlighted in the thesis. *First*, the thesis finds no consistent evidence of significant differences in preferences for giving and social discounting across laboratory and field subjects. *Secondly*, the thesis finds that the motivations for altruistic behaviour amongst laboratory and field subjects differ significantly with regard to the choice of recipients and the nature of the relationships with the recipients. The *third* finding suggests that risk and time preferences are correlated with altruism, as measured by giving and social discounting, but that this association is complex and non-linear in nature. *Finally*, the thesis provides evidence that altruism is associated with egalitarianism, reciprocity and, to a lesser extent, with trust, as well as with the trustworthiness. Giving and social discounting, therefore, are important features of human behaviour and requires further investigation pertaining to its economic and social consequences.

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CHAPTER ONE: GENERAL INTRODUCTION

1.1 Background

People often encounter the reality of making decisions that affect their own welfare and/or the welfare of other people. When such decisions are made, individuals' preferences play a significant role. At the same time, the subjective closeness or how socially distant the other person involved is to the decision maker, i.e. social distance (Trope & Liberman, 2003), is a determining factor of the willingness of the decision maker to sacrifice his or her own welfare. This reality qualifies the importance of altruism or selflessness, i.e. the principle or practice of concern for the welfare of others, in helping us understand or explain human behaviour. In addition, how altruism associates with other preferences (i.e. risk, time and other social preferences traits) is vital knowledge to build.

This general introduction to the thesis presents a brief description of the experimental measure of altruism adopted in this thesis, the problem statement, aim and objectives, as well as an outline of the methodological framework of the thesis. The chapter concludes with a brief summary of the organisation of the thesis.

1.2 The social discounting task: Giving and social discounting

The economic definition of altruism is described by Fehr and Fischbacher (2003) as “costly acts that confer economic benefits on other individuals”. This definition is consistent with the biological definition where Krebs and Davies (1993) refer to altruism as “acting to increase another individual’s lifetime number of offspring at a cost to one’s own survival and reproduction”. In this thesis, altruism is measured by giving and social discounting. According to Rachlin and Jones (2008), giving is measured as the amount of money a participant is willing to forego to give a fixed amount of money to another person at a specific social distance. Rachlin and Raineri (1992) first introduced the concept of social discounting as an individual’s willingness to forego an outcome for him/herself in exchange for a larger outcome for someone else. Simon (1995) incorporated the concept of altruism into utility functions and suggested that a person’s allocation of available goods can be described as (1) current consumption by the actual person, (2) consumption by the same person at later times [delay discounting], and (3) consumption by other people [social discounting].

Other early research studies using experimental economic games to explore altruism and other forms of human behaviour include, amongst others, Fehr and Gächter (2002), Frank, Gilovich, and Regan (1993), and Milinski, Semmann, and Krambeck (2002b). A common experimental tool used for this purpose is the dictator game.

In a perfectly standard dictator game the two players are to share a sum of money given to them by the experimenter (e.g. \$10) between themselves but only the dictator (proposer) can determine the size of the share. According to standard economic theory- based on assumptions of rationality and self-interest- a dictator should keep 100% of the endowment and give nothing to the recipient. However, this is not what is shown by the literature. For instance, Guala and Mittone (2010) show that only 40% of subjects playing the role of the dictator keep all the money to themselves, while the majority of participants give on average 20% of their endowment to the recipients. Engel's (2011) meta- analysis study reviews 131 research papers where the DG was employed with 616 different treatment effects and finds that dictators give on average 28.35% of their endowment pie to the recipients. In only 6 of the 616 treatments, dictators gave on average zero. The actions taken by the dictator in the DG may be indicative his/her preferences for altruism and fairness. A dictator who is willing to give of their endowment for the recipient is considered to be altruistic, while those who are concerned with an equitable outcome can be considered to be behaving fairly. In its standard form, the DG provides researchers with a simple and effective tool to observe and study these two real human behaviour phenomena. Over the years, researchers have used various versions of the standard dictator game such as one-shot games versus repeated games. A number of different treatment effects are applied to the standard dictator games in Engel's (2011) meta-analysis study. When manipulating for social distance, Engel's meta-study found a surprising negative effect with dictator generosity declining for recipients at close social distances. Empirically, researchers have manipulated social distance by experimentally inducing differences in the degree of anonymity between dictator and recipient. Examples of such experiments include Bechler *et al.* (2015), Bohnet *et al.* (1999), Brañas-Garza *et al.* (2010), Charness and Gneezy (2008), Goeree *et al.* (2010), Leider *et al.* (2009), and Margittai *et al.* (2015).

Jones and Rachlin (2006) measure social discounting as a participant's willingness to give a fixed amount (for example, €75 in figure 1 below) to another person, using a social discounting task (SDT). The SDT has become a common instrument used in psychology and behavioural psychology experiments as a tool to measure altruism.

Figure 1: Jones and Rachlin’s (2009) Social Discounting Task

Choices	Option A:	Option B:	Preferred Option (circle A or B)
1	€85 for you alone	€75 for person #1 on the list	A B
2	€75 for you alone	€75 for person #1 on the list	A B
3	€65 for you alone	€75 for person #1 on the list	A B
4	€55 for you alone	€75 for person #1 on the list	A B
5	€45 for you alone	€75 for person #1 on the list	A B
6	€35 for you alone	€75 for person #1 on the list	A B
7	€25 for you alone	€75 for person #1 on the list	A B
8	€15 for you alone	€75 for person #1 on the list	A B
9	€5 for you alone	€75 for person #1 on the list	A B

Source: Jones and Rachlin (2009:64)

In laboratory experiments that implement social discounting tasks (SDT), researchers have attempted to measure the relationship between altruism and social distance, and whether social distance can be used as a predictor in a person’s social interactions. In a typical SDT experiment (e.g. Jones & Rachlin, 2006; Olson *et al.*, 2016; Locey & Rachlin, 2011), subjects are asked to imagine a list of people at a number of social distances, ranging from #1 closest to #100 furthest, and to choose between a declining amount of money for themselves and a fixed amount of money for the recipient at each social distance. An example of the task used by Jones and Rachlin (2009) to measure the relationship between social discounting and social distance is shown in Figure 1. In all the research papers on social discounting reviewed for this thesis, participants in these studies indicated that they would be much more generous to those close to them and much less generous to the socially distant. Such studies include, amongst others, Belisle *et al.* (2019), Booysen *et al.* (2018), Bradstreet *et al.* (2012), Ito *et al.* (2011), Jones and Rachlin (2006 & 2009), Leider *et al.* (2009), Locey *et al.* (2013), Locey and Rachlin (2013 & 2015), Margittai *et al.* (2015), Osiński (2009), Rachlin and Jones (2008), Soutschek *et al.* (2016), Strombach *et al.* (2013 & 2016), Yi *et al.* (2011 & 2016), Wu *et al.* (2019), and Ziegler

and Tunney (2012). Sharp *et al.* (2012) interpret such form of discounting to mean that most people assign more value to the welfare of close affiliates than they do to the welfare of distant affiliates. These studies validate Rachlin and Jones's (2006) original result that rewards to others are discounted with increased social distance, and one can argue that the use of the social discounting task to measure associations between altruism and social distance is well documented.

Although the social discounting literature is relatively small, the consistency of the results across studies and now populations suggests that the social discounting task may be assessing something fundamental about the manner in which humans make choices about sharing within social networks. The SDT also allows the experimenter to gain a nuanced understanding of personal interactions in social relationships amongst the subject pool, especially where detailed information on recipient characteristics is collected, as is the case in this study. The experiment in this paper collects a variety of detail on the nature and quality of the relationship between the sender and recipient by using a questionnaire.

In this thesis three measures of altruism are estimated with the aid of data collected in the Social Discounting Task. The use of these multiple measures of altruism, i.e. crossover value, k' , and AUC allows for robustness checks in the actual analysis. A monetary value for the crossover value is estimated as the mean point at which a subject switched from choosing option A (selfish option) to option B (sharing option) for each social distance – and is captured as such in the task-level data set (i.e. for each social distance table). The social discounting functions determined from the crossover values, and which are used to estimate social discounting rates, the second measure of altruism employed in this study, is assumed to be hyperbolic (Jones & Rachlin, 2006), and expressed as follows:

$$v_{i,j} = \frac{A_i}{1 + k'N_{i,j}},$$

where v_{ij} represents the value that person i attaches to the welfare of person j , A_i represents the value person i associates with her own welfare, and N_{ij} is the rank person i assigns to person j among i 's full list of associated people. The constant k' , one aggregate measure of altruism, measures the steepness of discounting and the greater k' is, the greater the degree of social discounting and the lower the degree of altruism (Sharp *et al.*, 2012). Another aggregate

measure of altruism, i.e. Area under the curve (AUC) is derived from each participant's series of crossover values. The AUC index is a normalised measure not dependent on functional form (Myerson *et al.*, 2001) and is constructed for each subject by making use of the Excel solver toolkit of Reed, Kaplan and Brewer (2012). The value of this index varies from 1.0 (no discounting) to 0.0 (complete discounting) (Locey *et al.*, 2011). The k' and AUC are both measures of the same phenomenon, social discounting, however, since AUC has less discriminant ability than k' , the analysis will include the use of both variables.

1.3 Rationale for the study

There is increasing evidence that human behaviour and decision making are influenced by various preferences such as patience, risk tolerance, fairness, generosity and trust, to name but a few. Research that makes use of experimental games such as the SDT to elicit preferences and to investigate associations amongst preferences has made significant strides, particularly in the field of social discounting research. According to Tiokhin *et al.* (2019), there are over 50 published research papers in the last decade that have documented findings on the social discounting phenomenon in laboratory or field settings. The standard social discounting protocol, namely the social discounting task, has been used in its standard form to assess altruism (Rachlin & Jones, 2006), as well as in modified versions to measure the relationship between social discounting and time discounting, and probability discounting (Bialaszek *et al.*, 2019; Bickel *et al.*, 2014; Jin *et al.*, 2017; Jones & Rachlin, 2009; Osiński & Karbowski, 2017; Yi *et al.*, 2011). However, there are still some research gaps that motivate the current study:

First, comparative social discounting studies employing the SDT as a measure of altruism amongst both laboratory and field subjects are limited. Although previous studies on social discounting all confirm this behavioural bias, the majority of these studies were conducted with laboratory subjects only, namely university students. According to Tiokhin *et al.* (2019:3), “of 43 groups of participants from 21 publications, 40 groups were from the USA and/or university students”. Laboratory subject pools represent a very limited sample of the overall population and as such cannot be relied upon to infer assumptions about human behaviour on the whole. *Secondly*, studies where economics preferences such as risk attitudes and time preferences, as well as other social preferences are elicited alongside measures of altruism, with a focus on determining whether the latter is associated with the former preference sets are limited.

Previous research on social discounting and other economics and social preferences focuses mainly on the presence and extent of social discounting and its behavioural consequences, rather than attempting to explain the existence of these former mentioned preferences or links between social discounting and these preferences. Behavioural economics explores decision making and the motives underlying our decisions, as well as the preferences exhibited by our decisions. However, merely identifying and knowing about these preferences do not suffice for the further development of human behaviour theory. Since most preferences may be interrelated, research needs to investigate how other economic and social preferences are associated with altruism, measured here by estimates of giving and social discounting obtained with the aid of the social discounting task (SDT).

1.4 Aim and objectives

This thesis aims to extend the research on altruism in two areas, namely how preferences for giving and social discounting differ in laboratory and field subjects and how preferences for giving and social discounting are associated with various other economic and social preferences.

The main objectives of the study are:

- (i) To elicit preferences for giving and social discounting in a group of laboratory and field subjects in order to determine if [*Paper 1*]:
 - preferences for giving and social discounting differ amongst laboratory and field subjects.
 - the dynamics underlying giving by laboratory and field subjects play out differently in terms of the characteristics of the recipients selected at each social distance.
- (ii) To elicit risk and time preferences amongst a group of laboratory and field subjects alongside the SDT in order to determine if [*Paper 2*]:
 - risk aversion and patience are associated with giving.
 - risk aversion and patience are associated with social discounting.
- (iii) To implement the ultimatum (UG) and trust (TG) games alongside the SDT in a group of laboratory and field subjects in order to determine if [*Paper 3*]:

- preferences for giving and social discounting are associated with a set of social subject types.

1.5 Methodology

The discipline of economics has expanded from a field dominated by the use of uncontrolled field and market data to one which includes many modes of research to test theory and inform policy. The popularity of laboratory and field experiments in economics has grown, with each type of experiment generating its own set of advantages and disadvantages relative to the traditional reliance upon field and market data. Harrison and List (2004) define a conventional lab experiment as one that employs a standard set of subjects, an abstract framing, and an imposed set of rules. A common criticism amongst researchers of laboratory experiments is on the reliance on the use of students as experimental subjects. The argument is that conclusions drawn from laboratory experiments with student subjects only may differ from the real-life context. An artefactual field experiment is the same as the latter, but with a non-standard set of subjects. This type of experiment allows the researcher to test the validity of results amongst a “mixed” group of subjects and allows for generalizability on theories of human behaviour. The current study consists of a series of conventional laboratory experiments in the case of student subjects and a set of artefactual field experiments with staff subjects from the University of the Free State.

The use of experimental games by psychologists and economists has gained much attention of late and has grown in attractiveness as a research tool for the analysis of human behaviour and decision-making, as well as for eliciting various preferences that form the basis for the underlying motives behind most decision-making processes. Economic experiments differ from psychological experiments in a number of ways. Economists make use of defined scripts, repeated trials, monetary payments based on performance, and avoid deception when performing experiments (Hertwig & Ortman, 2001). Researchers including Wilcox (1993) and Harrison (1994) believe that unless subjects are offered an incentive compatible payment schedule, their responses will not represent what they would do if they were given the task for real. According to Read (2005) the use of monetary incentives in performing experiments can influence the behaviour of subjects in three ways, namely, “cognitive exertion”, whereby subjects put more thought into their decisions; “motivational focus”, with the incentive causing the subjects to change their goals; and “emotional triggers”, whereby the incentive acts as a

trigger or prerequisite for a response. Furthermore, economists usually argue that financial rewards create a more realistic environment within the lab (Rosenboim & Shavit, 2012), causing subjects to consider their decisions more carefully (Carpenter *et al.*, 2005). Psychologists, on the other hand, tend to believe that experimental subjects are generally intrinsically motivated and need no financial reward for decision-making (Camerer & Hogarth, 1999). Ben-Ner *et al.*, (2008) found that the average subject behaves essentially the same as a dictator in an incentivized experiment and in a hypothetical experiment without money. They argued that the impact of incentives on the generosity of a dictator is much more complex and that researchers should consider the importance of individual characteristics in decision-making behaviour. However, Bühren and Kundt (2015) conducted an experimental study on social preferences using dictator games and found differences in social preferences of subjects who received low-stakes monetary incentives as compared to subjects who received hypothetical rewards. The experiment conducted at the University of Hamburg involved 80 subjects making incentivized decisions and 70 subjects making hypothetical choices in a number of DG experiments. The study found the incentivized subjects to be slightly more generous compared to the hypothetical subjects.

All of the three economic experiments conducted in this study comprised of a detailed list of instructions for each experimental tool, entailed the incentivisation of the tasks according to a payment procedure which randomly selected a monetary award per task for all participants, and practiced no deception of participants. Most studies employing social discounting experiments do not provide real incentives. This study attempts to do that by conducting a social discounting experiment within the guidelines for Economics experiments. According to Hertwig and Ortman (2001), economists run experiments to either (1) test decision – theoretic or game – theoretic models; (2) explore the impact of institutional details and procedures; or (3) improve understanding of policy problems. These experiments entail either constructing small-scale abstractions of real-world problems, translating theoretical models into laboratory set-ups, or providing experimental subjects with instructions that supply descriptions of players, their action choices, and possible pay-offs (Hertwig & Ortman, 2001). The latter methodological design is applied in the study, whereby the data for the thesis are collected from laboratory and field subjects by employing (1) a social discounting task (SDT); (2) multiple price lists for eliciting risk and time preferences; and (3) an ultimatum game (UG) and a trust game (TG). *Paper 1* draws on the SDT data collected for the entire subject pool, while *Paper 2* employs the SDT data collected, together with the data collected on risk and time

preferences from the multiple price lists (MPL's). *Paper 3* is based on the data from the SDT, together with the data on the social subject types elicited from the UG and TG.

The methodology followed in this thesis is deductive by nature, whereby the hypotheses formulated in each of the three individual papers are empirically scrutinised using primary data collected from a laboratory and field subjects using various experimental tools. Descriptive statistical analyses that investigate associations between key variables and use Chi², t-tests and F-tests, and appropriate regression models are employed in the thesis.

1.6 Organisation of the thesis

The thesis is structured as follows: Chapter 1 focuses on the general introduction of the study. Chapters 2 to 4 comprise three individual research papers. Paper 1 entails a comparative study on the differences in altruistic behaviour of laboratory and field subjects and on the dynamics underlying the differences in altruistic behaviour in these two settings. Paper 2 empirically explores whether altruism is associated with risk and time preferences by employing an SDT to measure altruism, and separately eliciting risk and time preferences with a series of multiple price lists (MPLs). Paper 3 investigates associations between altruism, as measured by giving and social discounting, with social subject types uniquely identified in the study based on the strategy method responses of subjects in the UG and TG. Finally, Chapter 5 presents a brief integrated conclusion.

CHAPTER 2: PAPER 1

A comparative analysis of giving and social discounting amongst laboratory and field subjects in South Africa

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Abstract

The social discounting task (SDT) is an experimental tool widely used by researchers to measure social discounting. Comparative social discounting studies employing the SDT amongst both laboratory and field subjects are limited. The current study compares giving and social discounting amongst laboratory and field subjects at a South African university, using an incentivized SDT. The study finds that for both subject types, crossover values declined as social distance increased. However, field and laboratory subjects differ on two of the three measures of altruism, namely the crossover value and the social discounting rate (k'), but no statistical difference with respect to AUC (Area Under the Curve). Furthermore, the study attempts to investigate the dynamics underlying differences in altruistic behaviour amongst field and laboratory subjects by examining the differences in the characteristics of the recipients selected at each social distance for laboratory as opposed to field subjects. The study employed both descriptive statistical analysis and regression analysis models. Other comparative studies have not collected detailed information on recipient characteristics and as such, this component of this research represents a novel contribution. The two subject groups selected very different recipients, which imply that the causes and consequences of altruism are different among the two groups of subjects participating in this experiment.

1. Introduction

Altruism may depend directly on perceived social distance. The closer one feels to someone else, the more altruistic one would be towards him/her. Although in general most humans behave pro-socially, i.e. taking other people's interests into account, people are not generous to everyone alike and generosity declines as a function of social distance (Kurzban & Burton-Chellew, 2015; Rand & Nowak, 2013). Experiments undertaken by Jones and Rachlin (2006 & 2009) and Rachlin and Jones (2008) form the basis for the establishment of a scale by which social discounting, a situation where people assign more value to the welfare of close affiliates than they do to the welfare of distant affiliates (Sharp *et al.*, 2012) could be measured. One particular experimental instrument used by these authors for the purpose of measuring this kind of pro-sociality is the social discounting task (SDT).

To date, most of the economic experiments employing social discounting tasks used laboratory subjects (students) as their main participants and these experiments can be classified as conventional based on the taxonomy of experimental design (Harrison & List, 2004). Recently Romanowich and Igaki (2017), for example, employed the SDT to test the effect of reward magnitude, alcohol and cigarette use on social discounting amongst 569 US and Japanese university students. Yi *et al.* (2016) used 50 undergraduate university students to complete the SDT while engaging in episodic future thinking about themselves and others, while Ma *et al.* (2015) measured differences in social distance-dependant pro-social behaviour amongst rural- and urban-reared students in China. Margittai *et al.*'s (2015) study investigated how a stressful experience influenced social discounting immediately after the experience, and within an hour after the stressful experience. Participants in the study were male only, German-speaking students, not enrolled for either Psychology or Economics study programmes from the Heinrich Hein University Düsseldorf. Strombach *et al.* (2013) employed the SDT with 206 students from Germany and China in order to measure the effect of cultural differences on generosity; and Ziegler and Tunney (2012) employed the SDT, together with a delay discounting task with 70 undergraduate students from the universities of Nottingham and Lincoln to determine whether there is an association between the delay choices people make for themselves and those made for others at different social distances. Jones and Rachlin (2006; 2008a; 2009) and Rachlin and Jones (2008b) used undergraduate students from the USA in all their experiments, while Osinski (2009) conducted the SDT experiment with 200 full-time students from the USA and Japan.

Experiments that are limited to a particular subject pool, and which make generalisations from their results about other groups in other social contexts are questionable (Carpenter *et al.*, 2004). A common criticism of the relevance of conclusions drawn from laboratory experiments is that one needs to undertake an experiment with “real” people and not just with students (Harrison & List, 2004). The argument is proposed that if the researcher believes that students are not representative and expects different results from a different set of subjects, then the experiment should be conducted with a different set of subjects. Subjects’ responses and behaviour may differ due to the real-life context in which the experiment is conducted; differences in the socio-demographics; their social and cultural beliefs; and their relationship to the experimenter or other participants (Carpenter *et al.*, 2004). There is an increasing number of other social discounting studies though in which field subjects are recruited in framed field experiments. Pornpattananankul *et al.* (2017) used Strombach *et al.*’s (2014) research design and employed the SDT amongst 39 older adults and 39 younger adults from Singapore in order to measure the impact of age on social discounting. Sharp *et al.* (2012) applied the social discounting paradigm to boys who were 2nd to 12th graders recruited through community organisations to investigate the relations between social discounting, age and externalising behavioural problems. Bradstreet *et al.* (2012) chose pregnant women to analyse social discounting amongst smokers, non-smokers and quitters. Yi *et al.* (2011) assessed delay, probability and social discounting amongst active methamphetamine users versus non-drug users.

However, comparative social discounting studies employing the SDT amongst both laboratory and field subjects are limited. The most recent study by Tiokhin *et al.* (2019) employed an adapted SDT amongst semi-literate, rural subjects from Bangladesh and Indonesia and US college undergraduates in order to test the validity versus generalizability of theories on human behaviour. The participants in Boyer’s *et al.* (2012) experiment were urban dwellers in Yueyang (China), ranging from students to employees, middle-class college students from the US as well as Kenyan herders. The study measured differences in time discounting; social discounting and generalised social trust amongst the subjects who were from different cultural backgrounds and found a highly significant effect of the location of the subjects on social discounting. This paper builds on this limited literature and involves the employment of an incentivised social discounting task among both field and laboratory subjects. This paper sets out by describing the altruistic behaviour of laboratory versus field subjects in South Africa as measured by giving and social discounting. Furthermore, the study attempts to investigate the

dynamics underlying differences in altruistic behaviour amongst field and laboratory subjects by examining the differences in the characteristics of the recipients selected at each social distance by laboratory, as opposed to field subjects.

2. Experiment

Participants:

The subjects were recruited over a period from August 2016 to September 2017 and June 2018. One hundred and eighty five students (laboratory) and 67 staff (field) subjects were recruited separately using flyers distributed among students and staff from the Faculty of Economic and Management Sciences at the University of the Free State. Two (2) experiments consisting of 10 sessions (6 staff and 4 student sessions) were conducted throughout the duration of the study.

Ethics:

Ethical clearance for the study was obtained from the Faculty of Economic and Management Sciences' Research Ethics Committee at the University of the Free State (UFS-HSD2016/0124 and UFS-HSD2016/1084). Participation was voluntary and written informed consent was obtained from all subjects.

Procedure:

The recruitment flyers were physically distributed amongst undergraduate students during an Economics lecture at the University of the Free State and by hand to staff working in the Faculty of Economic and Management Sciences. A total number of 260 recruitment flyers were distributed amongst the students and 150 for staff. The staff and student experimental sessions were conducted separately on different dates and in different venues on the campus of the University of the Free State. Upon arrival at the venue, subjects were asked to present the recruitment flyer to the experimenter following which they were paid a show-up fee of R50. All subjects were required to read and sign a consent form before the actual experiment commenced. The experimenter provided each subject with a pencil, eraser and a hard-copy of the full experimental tool document. In all of the experimental sessions the subjects completed an incentivised pencil-and-paper version of Rachlin and Jones' (2008b) standard social

discounting task (SDT). The experimenter read a set of detailed instructions and asked subjects to complete a practice table (Annexure A). Upon completion of the practice table, the experimenter instructed subjects to complete a series of seven uniform tables, one for each social distance. In each table, subjects made a choice between an amount of money for themselves versus an amount of money for the person cited at that specific social distance (Annexure B). The following instruction was included before the first table in the SDT in order to guide subjects in defining their social ladder:

Imagine you made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at #1 to a mere acquaintance at #100. Now imagine the following choices between an amount of money for yourself and an amount for the #1 person on the list. Circle A or B on the right-hand side to indicate which you would choose in EACH line.

In each case, the #1 in the above instruction and in the table and other forms, including the recipient questionnaire, was replaced by #2, #5, #10, #20, #50, #100, respectively. The task was counter-balanced, with the tables in half of the experimental packages organised in the standard ascending order and in the other half in descending order. After completing the SDT each participant was also required to provide information on their social relation to the person, how often they communicated with the person, whether they lived with the person and, if not, how far they lived from the person, how often they visited the person, how long they had known the recipient, and how close they perceived themselves to be to this person on an emotional and psychological level, as well as the basic socio-demographics of this person (i.e. recipient characteristics, including gender, age, and household poverty rank of the person) (Annexure C). The questionnaire on the recipient characteristics immediately succeeded the respective social discounting table for that particular social distance. In other words, for each one of the seven SDT tables there was a corresponding recipient characteristics questionnaire. Subjects also completed a post-experimental questionnaire. The information on subjects collected by means of this questionnaire includes standard socio-demographic information: age; sex; race/ethnicity; education; household poverty rank; and individual financial status (Annexure D).

Payment:

Subjects received a show-up fee of R50. In addition, subjects earned some money from completing the experimental tasks. The payment protocol was as follows. Since the SDT was combined with other experimental tasks across differential experimental sessions, the specific task for actual payment had to be selected by rolling a ten-sided dice where 1-3 was for the Time Task, 4-6 was for Risk Task and 7-9 was for the SDT in the first experiment. An eight-sided dice was used for the second experiment, where 1-2 was for the Trust Game; 3-4 for the Ultimatum Game, and 5-6 for the SDT. Where the SDT was selected for payment, a seven-sided dice was used to select one of the social distances randomly. The subject would then proceed to roll a ten-sided dice to select one of the rows in the table and the experimenter would then record the decision taken by the subject (Option A or Option B) in that particular row, and proceed to implement the relevant decision for payment. If Option B, i.e. payment to the recipient at that particular social distance, was selected, the subject was required to provide the name, address and cell-phone number of the intended recipient. Payment of the monetary award to the recipient took place via a cashless money transfer payment to the cell-phone number of the recipient. The recipient would then be able to withdraw the money from an ATM of the relevant bank. Alternatively, if Option A, i.e. the subject choosing to keep the money for themselves, was selected, the monetary reward was transferred to the cell-phone number of the subject. The payment procedure was conducted individually and in private with the assistance of the experimenter (Annexure E). The mean earnings earned by subjects in these experiments amounted to R171.59.

3. Measures

This paper uses the Social Discounting Task (SDT) to measure altruism among student (laboratory) and staff (field) subjects. Three measures of altruism are estimated. A monetary value for the crossover value is estimated as the mean point at which a subject switched from choosing option A (selfish option) to option B (sharing option) for each social distance – and is captured as such in the task-level data set (i.e. for each social distance table). For instance, if in Row 1 of the table, a subject chose the selfish option at R180 instead of the sharing option of R160 for the recipient and then switched to the sharing option at R160 in Row 2, the crossover value was calculated to be R170. For subjects who exclusively chose the selfish option throughout, the crossover value is given as R0 and for subjects who exclusively chose the sharing option, the crossover value is assumed to be R190. For subjects who crossed over

multiple times, the crossover value was calculated at the first switch. The crossover value is employed as a measure of giving.

The crossover values are then used to determine social discounting functions which are fitted individually on each subject's crossover values with the aid of Reed, Kaplan and Brewer's (2012) Excel solver toolkit to derive a social discounting rate (k') for each subject. The social discounting function is assumed to be hyperbolic and following Jones and Rachlin (2006), it assumes the following form:

$$v_{i,j} = \frac{A_i}{1 + k'N_{i,j}},$$

where v_{ij} represents the value that person i attaches to the welfare of person j , A_i represents the value person i associates with her own welfare, and N_{ij} is the rank person i assigns to person j among i 's full list of associated people. The constant k' , one aggregate measure of altruism, measures the steepness of discounting and the greater k' is, the greater the degree of social discounting and the lower the degree of altruism (Sharp *et al.*, 2012).

Another aggregate measure of altruism, i.e. Area under the curve (AUC) is derived from each participant's series of crossover values. The AUC index is a normalised measure not dependent on functional form (Myerson *et al.*, 2001) and is constructed for each subject by making use of the Excel solver toolkit of Reed, Kaplan and Brewer (2012). The value of this index varies from 1.0 (no discounting) to 0.0 (complete discounting) (Locey *et al.*, 2011).

The use of these multiple measures of altruism, i.e. crossover value, k' , and AUC allows for robustness testing in the actual analysis. Two data sets were used, one using crossover values captured for each social distance (hence task-level data), and the other using aggregate measures of altruism, i.e. AUC and k' , for each subject (hence subject-level data). For crossover values, task-level analysis is carried out and subject-level analysis for AUC and social discounting rates. In both data sets subjects with inconsistent preferences on the SDT are identified in the study by distinguishing between subjects who switched multiple times and subjects who switched once or less per task. For the total number of 1 763 tasks completed by the 252 subjects, subjects switched multiple times in 200 or 11.34% of the total tasks while 43 subjects (17.06%) switched multiple times in at least one task. Multiple switching is very common in the SDT and Booysen *et al.* (2018) reported 41.1% and Sharp *et al.* (2012) reported 66.5% of such. For robustness checks, the analysis is split into a full sample analysis, which

includes all subjects, and a sub-sample analysis, where subjects who switched multiple times are excluded from the sample.

4. Analysis

A descriptive analysis of the socio-demographic information, i.e. age, race, gender, financial situation and language, of the subject pool was undertaken first separately for the laboratory and field subject groups and then for the combined sample. The study further employed descriptive statistical analysis to investigate whether laboratory subjects are more altruistic or less altruistic than field subjects by comparing the means and medians of the measures of altruism: crossover values, k -values and AUC. Chi-squared, t-tests and F-tests are used in the descriptive analysis. All three measures of altruism (i.e. crossover values, AUC and the social discounting rate [k']) are employed as dependent variables in the regression models estimating the relationship between these outcomes and subject-type (the independent variable of primary interest). These regressions are estimated for the full and sub-samples as well as at subject-level and task-level (i.e. for each social distance task). Given the panel nature of the task-level data (i.e. subjects are observed at multiple times in seven different choice sets, one for each social distance) a linear random effects (RE) regression model is employed to assess differences across subject-type. Subject-type is also interacted with social distances to determine if differences across subject-type are restricted to specific social distances.

The Shapiro-Wilk test was used to test for normality in all three outcomes, crossover; k' and AUC. In each instance, the statistical test and p-values confirmed the non-normality of the data: crossover (0.979, $p < 0.001$); AUC (0.957, $p < 0.001$); k' (0.247, $p < 0.001$). As a result, quantile regression models were employed, since this type of analysis makes no assumptions on the normal distribution of the dependent variables. Quantile regression models are estimated using the crossover value, AUC index and k' as dependent variables and subject-type as the independent variable which is of primary interest.

A summary of the different regression models employed in the analysis is given below:

Stage 1: Testing for differences in measures of altruism amongst laboratory and field subjects

Regression: *Random Effects Regression Model*

Dependent variable: Crossover value

Independent variables: social distance; subject-type; number of times switched; subject characteristics; family status; solidarity

Regression: *Ordinary Least Squares Regression Models*

Dependent variables: (1) AUC and (2) k-value

Independent variables: subject-type; number of times switched; subject characteristics

Regression: *Quantile Regression Model*

Dependent variable: Crossover value

Independent variables: social distance; subject-type; number of times switched; subject characteristics; family status; solidarity

Regression: *Quantile Regression Models*

Dependent variables: (1) AUC and (2) *k*-value

Independent variables: subject-type; subject characteristics; number of times switched

Subject characteristics include age; gender; household poverty rank; previous experimental experience.

Stage 2: Testing whether laboratory and field subjects select different recipients

Regression: *Ordered probit regression models*

Dependent variables: (1) frequency of communication; (2) physical distance; (3) years known

Independent variables: social distance; subject-type; subject characteristics; number of times switched

Regression: *Ordinary Least Squares Regression Models*

Dependent variables: (1) psychological distance; (2) solidarity; (3) recipient age

Independent variables: social distance; subject-type; subject characteristics; number of times switched

Regression: *Probit Regression Model*

Dependent variable: recipient gender

Independent variables: social distance; subject-type; subject characteristics; household characteristics; number of times switched

Regression: *Probit Regression Models*

Dependent variables: Relationship – (1) family versus friend; (2) family versus other; (3) friend versus other; (4) family versus non-family

Independent variables: social distance; subject-type; subject characteristics; number of switches

For the crossover value analysis, the seven social distances are collapsed into four categories since the results of the regressions are not estimable across all social distances due to small sub-samples. The social distances were grouped as follows: category 1 – social distance #1 and #2; category 2 – social distance #5 and #10; category 3 – social distance #20 and category 4 – social distance #50 and #100. The solidarity variable was generated by applying the same approach followed by Booysen *et al.* (2018). The solidarity variable makes use of the Multiple Correspondence Analysis (MCA) from Bengtson and Roberts (1991) and groups three recipient characteristics namely length of years known; physical proximity; and frequency of communication in order to provide an index against which relationship closeness can be measured.

The analysis therefore comprises two key stages. The first stage investigates differences in the levels of altruism amongst field and laboratory subjects, using each of the three measures of altruism. The second stage assesses whether field and laboratory subjects chose recipients with different characteristics, i.e. whether the underlying dynamics of altruism play out differently in the two groups of subjects. These analyses were completed for the full sample and the sub-sample, which excluded subjects who switched multiple times in the SDT, thus to determine the robustness of the results.

5. Results

The results of the study are presented in this section. First, the focus is on the comparison of subject characteristics between laboratory and field subjects. Then, the focus shifts to the comparison of giving and social discounting in laboratory and field subjects. Finally, the emphasis falls on the differences in the characteristics of recipients selected by laboratory and field subjects.

5.1 Subject characteristics

In Table 1, the characteristics of the subjects are reported separately for laboratory and field subjects and collectively for the total sample. The total sample consisted of 252 subjects, of which 185 were laboratory subjects and 67 field subjects. The median age is 23 years for laboratory subjects, 36 years for field subjects, and 25 years for the total sample, while the mean age is reported as 23.45 years for laboratory subjects, 36.60 years for field subjects, and 26.94 years for the total sample. The majority of the student subject group is Sesotho-speaking African females who are pursuing their studies within the Faculty of Economic and

Management Sciences, while the majority of the field subjects are Afrikaans-speaking white females who are employed within the Faculty of Economic and Management Sciences. Of the total sample, 93.42% of laboratory subjects are from the African race group, compared to only 37.88% of field subjects. Nearly 60% of the laboratory subjects speak Sesotho, compared to only 14.93% of staff. Both groups of subjects can be considered to be not poor with nearly 80% placing themselves on the 3rd and 4th rung of the Household poverty ladder. However, only around 30% of subjects indicated they were not broke. Furthermore, 55.73% of laboratory subjects were considered broke and very broke, compared to only 25.38% of field subjects. A total of 91 subjects (36.4%) of the full sample indicated that they had previously participated in a similar experiment. Most of the differences in the characteristics of the subject groups are highly significant, particularly with respect to age, race, language and financial situation. This degree of imbalance between the two subject groups is expected given the nature of the type of subjects. Only gender and previous experimental experience showed no statistically significant differences across the two subject groups. The subject pools, therefore, are relatively diverse. One would therefore expect that giving and social discounting may differ significantly between laboratory and field subjects. The analysis now turns to this question.

Table 1. Sample descriptive statistics

	Laboratory	Field	Total	p-value
Age:				
Mean	23.45	36.60	26.94	<0.001
Median (IQR)	23 (20-26)	36(28-43)	25(21-29)	<0.001
Female (%)	65.57	75.38	68.15	0.145
Race:				
African	93.41	37.88	78.6	<0.001
Coloured	1.65	7.58	3.2	
Asian/Indian	1.65	3.03	2.02	
White	3.30	51.52	16.13	
Total	100.00	100.00	100.00	
Language:				
Sesotho	59.89	14.93	47.79	<0.001
Afrikaans	3.30	5.97	15.26	
Setswana	9.89	47.76	8.84	
isiXhosa	7.69	5.97	7.63	
English	3.85	7.46	7.23	
isiZulu	6.04	16.42	5.62	
Other	8.80	2.98	7.22	
Total	100.00	100.00	100.00	
Faculty:				
Economics & Management	88.42	95.52	90.32	0.026
Natural & Agricultural	9.39	0.00	6.85	
Humanities	1.10	2.99	1.61	
Education	1.10	0.00	0.81	
Health	0.00	1.49	0.40	
Total	100.00	100.00	100.00	
Household poverty rank:				
1	6.04	0.00	4.42	0.003
2	10.99	7.46	10.04	
3	51.65	37.31	47.79	
4	27.47	41.79	31.33	
5	3.30	8.96	4.82	
6	0.55	4.48	1.61	
Total	100.00	100.00	100.00	
Financial situation:				
Very broke	16.39	8.96	14.40	<0.001
Broke	39.34	16.42	33.20	
Neither	26.78	31.34	28.00	
In good shape	15.30	38.81	21.60	
In very good shape	2.19	4.48	2.80	
Total	100.00	100.00	100.00	
Previous experimental experience (% yes)	38.25	31.34	36.40	0.315
Sample (n)	185	67	252	

Note: The differences in the characteristics of the subjects are mostly statistically significant.

5.2 Giving and social discounting by subject-type

Figures 1A and 1B illustrate the distribution of the crossover values for the two subject pools for both the full sample and sub-sample. A greater number of field subjects crossed over at the higher crossover values compared to the laboratory subjects. At the other end of the spectrum, the opposite is observed, where more laboratory subjects crossed over at lower crossover values, compared to field subjects. A similar result is reflected in the sub-sample analysis reported in Figure 1B.

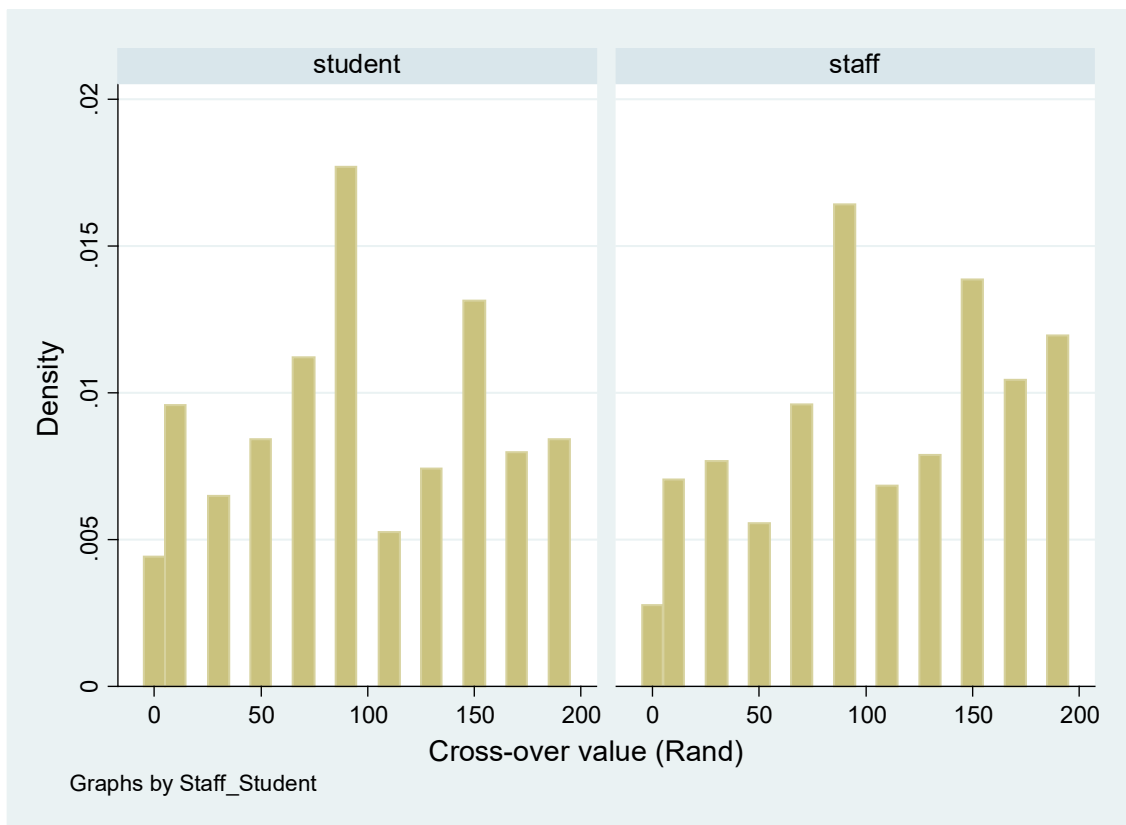


Figure 1A: Crossover values (Rand), by subject-type: Full sample

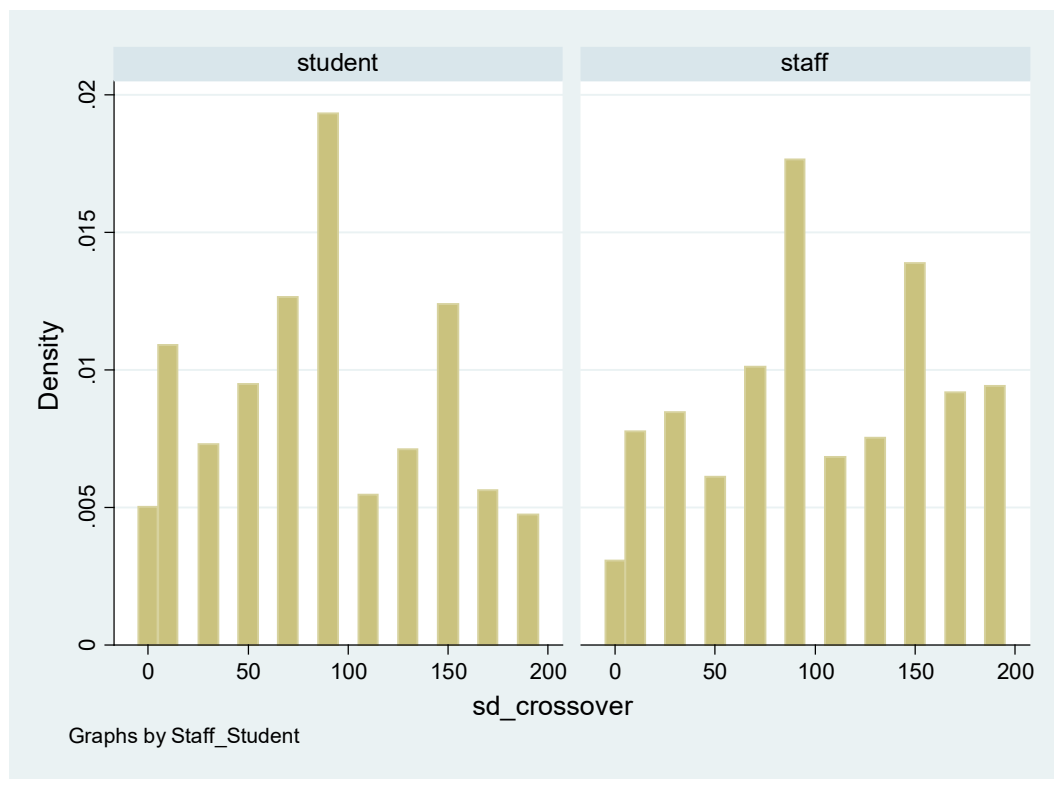


Figure 1B: Crossover values (Rand), by subject-type: Sub-sample

Table 2A: Mean crossover values (Rand), by social distance and subject-type

Social distance	Full Sample				Sub-Sample			
	Laboratory	Field	<i>p</i> -value	Total	Laboratory	Field	<i>p</i> -value	Total
1	128.43	147.01	0.005	133.37	120.66	145.08	0.008	127.68
2	121.08	141.49	0.004	126.50	114.11	138.16	0.001	120.73
5	107.89	123.43	0.032	112.02	98.79	116.10	0.020	103.50
10	94.00	101.49	0.323	95.99	86.72	97.50	0.163	89.60
20	80.27	91.34	0.142	83.21	71.67	87.30	0.028	75.95
50	73.04	75.07	0.795	73.58	64.97	68.36	0.650	65.87
100	64.05	64.02	0.997	64.04	56.16	55.57	0.937	56.00
Total	95.55	106.26	<0.001	98.40	86.68	100.94	<0.001	90.56
Sample (n)	1,294	469		1,763	1,138	425		1,563

Note: The full sample includes all observations, while the sub-sample excludes subjects who reported multiple switches.

Table 2A shows the mean crossover values for the laboratory and field subjects. The mean crossover value for the full sample is R98.40, compared to R106.26 for staff subjects and R95.55 for student subjects. This difference between laboratory and field subjects is statistically significant ($p < 0.001$). The mean crossover values for the sub-sample is lower than those of the full sample, with R90.56 reported for the total and R100.94 for staff subjects and

a mean crossover value of R86.68 reported for students. This difference is also statistically significant for the laboratory and field subjects ($p < 0.001$). At each social distance, excluding the last distance of #100, the mean crossover value for the staff subject group is higher than that of the student subject group. However, these differences are only statistically significant at the close social distances (#1, #2 and #5, all at $p < 0.05$) and are not statistically significant for the remainder of the social distances. In both groups, the majority of subjects crossed over at higher values for close social distances and at lower values for the more distant social distances. In the sub-sample, i.e. the group who did not switch multiple times in the experiment, the mean crossover values are lower than those of the full sample at each social distance. This could be attributed to the fact that subjects who did switch multiple times generally switched early on in the task, and therefore the mean crossover value for the sample inclusive of these subjects will be higher. For the sub-sample, the mean crossover value for staff is higher at all social distances, except for the last social distance, #100, where it is marginally lower. The differences in the means for laboratory and field subjects are statistically significant at social distances #1, #2, #5 and #20 ($p < 0.05$).

Table 2B: Median crossover values (Rand), by social distance and subject-type

Social distance	Full sample				Sub-sample			
	Laboratory	Field	<i>p</i> -value	Total	Laboratory	Field	<i>p</i> -value	Total
1	150	150	0.111	150	130	150	0.017	150
2	130	150	0.001	130	110	150	0.001	130
5	110	130	0.162	110	90	110	0.107	90
10	90	90	0.434	90	90	90	0.201	90
20	70	90	0.250	70	70	90	0.155	70
50	70	70	0.751	70	50	70	0.697	50
100	50	50	0.901	50	50	30	0.772	50
Total	90	110	0.001		90	90	<0.001	
Sample (n)	1,294	469		1,763	1,138	425		1,563

Note: The full sample includes all observations, while the sub-sample excludes subjects who reported multiple switches.

The difference between the full sample median crossover value for laboratory subjects (R90) and the field subjects (R110) is statistically significant ($p < 0.01$). Furthermore, the differences in the median crossovers for the two subject types are only statistically significant for both the full sample and sub-sample at social distance #2, and for only the sub-sample at distance #1. The median crossover value for field subjects is higher than those of laboratory subjects in the full sample for three of the seven social distances (#2; #5; #20) and for the total result, although these results are only statistically significant for distance #2 and the total result. For the sub-

sample, the median crossover value of field subjects is higher than that of laboratory subjects for six of the seven social distances (#1; #2; #5; #20 and #50), but this result is only significant at distances #1 and #2. Both the mean and median crossover values for the full sample and sub-sample and for the two subject types decline as social distance increases.

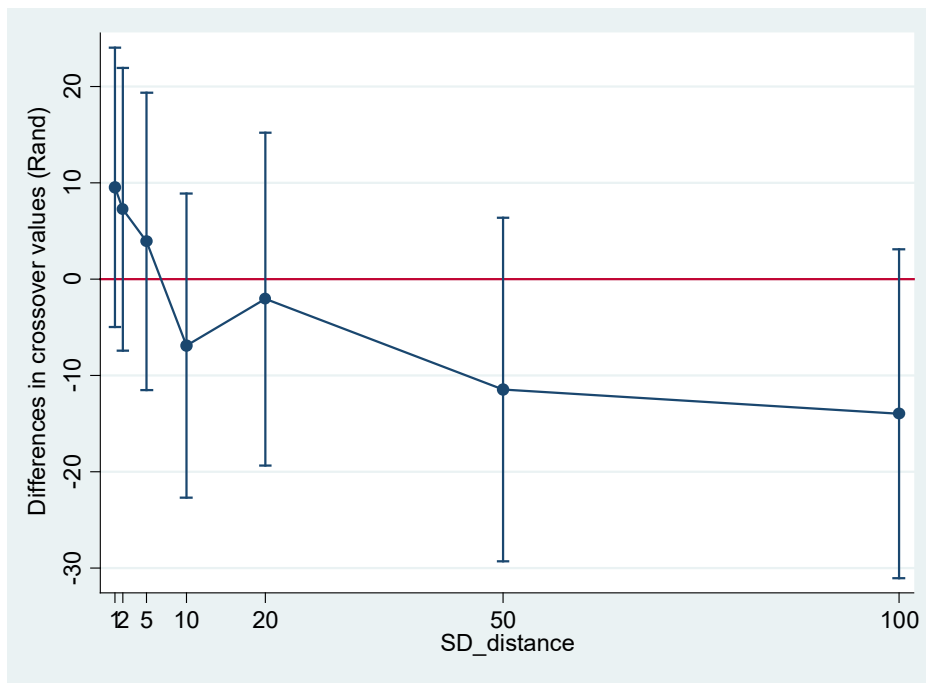
Table 3: Subject and crossover values (Rand), by social distance

	Full sample	Sub-sample
Model A:		
Laboratory versus Field	-1.932 (7.160)	-0.471 (7.766)
Wald chi2 (<i>p</i> -value)	595.33 (<0.001)	367.19 (<0.001)
R ²	0.329	0.244
Sample (n)	1,709	1,516
LR-test (<i>p</i> -value)	1375.96 (<0.001)	1333.26 (<0.001)
Model B:		
Laboratory versus Field	-1.890 (7.153)	-0.507 (7.804)
Social distance (interaction)		
1	9.533 (8.265)	13.526 (8.918)
2	7.282 (8.556)	8.737 (9.622)
5	3.931 (8.073)	3.966 (8.839)
10	-6.912 (9.064)	-2.995 (9.741)
20	-2.051 (8.037)	-1.079 (8.456)
50	-11.468 (8.695)	-10.953 (9.186)
100	-13.957 (8.702)	-13.289 (9.344)
Wald chi2 (<i>p</i> -value)	639.83 (<0.001)	411.73 (<0.001)
R ²	0.334	0.249
Sample (n)	1,709	1,516
LR-test (<i>p</i> -value)	1398.69 (<0.001)	1355.12 (<0.001)

Note: The full sample includes all observations, while the sub-sample excludes subjects who reported multiple switches. In model A, a Random Effects (RE) regression model was applied. In model B, a RE regression model is applied with interactions of social distance and subject-type. Controls for age, gender, poverty status and experimental experience of sender. Standard errors are reported in parentheses. Statistical significance: 1% ***, 5% **, 10% *

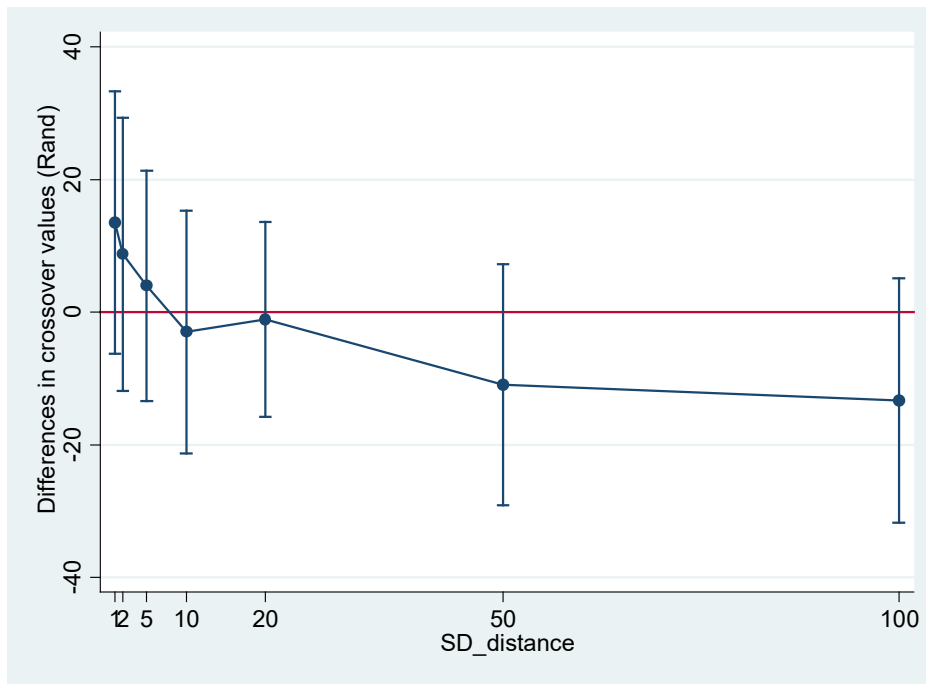
The Random Effects (RE) regression results are reported in Table 3. These regressions were estimated for both the full sample and the sub-sample. In model B, the effect of the subject-type, i.e. staff-student, on the crossover value at each social distance is estimated. When controlling for the differences in the characteristics of the subject pool, there is no difference in the level of altruism between laboratory and field subjects, not overall (model A) nor at each

of the different social distances (model B). At the closer social distances, 1, 2 and, 5 field subjects give more than laboratory subjects. At social distance 1, field subjects give R9.53 more than laboratory subjects, at social distance 2 field subjects give R7.28 more than laboratory subjects, and at distance 5 field subjects give R3.93 more than laboratory subjects. For the further social distances, i.e. distances 10-100, staff give less than students as indicated by the negative coefficients for distances 10, 20, 50 and 100. These results are mirrored for the sub-sample and are illustrated graphically in Figures 2A and 2B, with the most notable difference between the crossover values for the full sample of R6.91 compared to a R2.99 for the sub-samples at social distance 10. However, none of the differences reported here are statistically significant, suggesting some degree of balance in giving between the two subject pools.



Note: Comparison is for field versus laboratory subjects.

Figure 2A: Subject-type difference in crossover values, by social distance – Full sample



Note: Comparison is for field versus laboratory subjects.

Figure 2B: Subject-type difference in crossover values, by social distance – Sub-sample

In Table 4, the results of the quantile regression models are reported. Three quantile regression models were estimated, one at the median ($q = 0.50$) and one each at the two quartiles ($q = 0.25$ and $q = 0.75$). The coefficients for the crossover values at the three quartiles are reported in Table 4 for the full and sub-samples, respectively. For the full sample, there is a strong, positive and statistically significant effect of the subject-type on crossover values for $q = 0.25$, which means that amongst the less altruistic subjects ($q = 0.25$) field subjects are willing to forego larger amounts than laboratory subjects. This result is significant at 1%, as opposed to 5% for the sub-sample. For the more altruistic subjects ($q = 0.75$), field subjects are willing to give less than laboratory subjects. This result is statistically significant for the full sample only, although the sign of the coefficient is also negative for the sub-sample. For subjects at the median level of altruism, i.e. $q = 0.50$, field subjects are willing to give less than laboratory subjects for both the full and sub-samples, although these results are not significant.

Table 4: Quantile regression analysis – subject-type and crossover values (Rand)

	Laboratory versus Field (Full sample)	Pseudo R ²	Laboratory versus Field (Sub-sample)	Pseudo R ²
q = 0.25	8.352** (4.087)	0.223	10.520*** (2.329)	0.163
q = 0.50	-4.174 (4.495)	0.206	-2.100 (4.599)	0.141
q = 0.75	-8.187** (3.568)	0,178	-4.387 (3.096)	0.170
Sample (n)	1,709		1,516	

Note: The full sample includes all observations, while the sub-sample excludes subjects who reported multiple switches. Controls for age, gender, poverty status and experimental experience of sender. Standard errors are reported in parentheses. Statistical significance is reported as follows: 1% ***, 5% **, 10% *.

Table 5: Mean and median *k*-values and Area Under the Curve (AUC), by subject-type

	Full Sample				Sub-sample			
	Laboratory	Field	<i>p</i> -value	Total	Laboratory	Field	<i>p</i> -value	Total
AUC:								
Mean	0.401	0.419	0.630	0.406	0.360	0.377	0.638	0.365
Median	0.377	0.362	0.887	0.367	0.344	0.326	0.565	0.337
Sample (n)	185	67		252	151	58		209
k-value:								
Mean	0.597	0.320	0.317	0.523	0.714	0.367	0.289	0.618
Median	0.101	0.071	0.318	0.095	0.142	0.096	0.133	0.120
Sample (n)	185	67		252	151	58		209

Note: The full sample includes all observations, while the sub-sample excludes subjects who reported multiple switches.

The differences in the mean and median crossover values reported in Tables 2A and 2B are also consistent with the mean and median results for the aggregate measures of altruism, *k*-value and AUC as reported in Table 5. The mean *k*-value is lower for field subjects (0.320) than laboratory subjects (0.597) and AUC higher for field subjects (0.419) than laboratory subjects (0.401), although none of these differences is statistically significant. This result is the same for both the full and sub-samples, i.e. social discounting does not differ statistically significantly between laboratory and field subjects. The question, however, is if these results prevail when using a regression framework.

Table 6A: OLS and Quantile regression analysis – subject-type and (AUC)

	Full Sample	Sub-sample
A. OLS Regression		
Laboratory versus Field	-0.049 (0.042)	-0.045 (0.045)
F-statistic (<i>p</i> -value)	<0.001	0.009
R ²	0.187	0.082
Sample (n)	246	204
B. Quantile regression		
q = 0.25	-0.028 (0.060)	-0.015 (0.061)
Pseudo R ²	0.083	0.038
q = 0.50	-0.096 (0.070)	-0.070 (0.074)
Pseudo R ²	0.115	0.049
q = 0.75	-0.055 (0.076)	-0.092 (0.080)
Pseudo R ²	0.138	0.068
Sample (n)	246	204

Note: The full sample includes all observations, while the sub-sample excludes subjects who reported multiple switches. Controls for age, gender, poverty status and experimental experience of sender. Standard errors are reported in parentheses. Statistical significance is reported as follows: 1% ***, 5% **, 10% *

Table 6B: OLS and Quantile regression analysis – subject type and the social discounting rate

	Full Sample	Sub-sample
A. OLS Regression		
Laboratory versus Field	-0.478** (0.233)	-0.574** (0.273)
F-statistic (<i>p</i> -value)	0.007	0.162
R ²	0.030	0.023
Sample (n)	246	204
B. Quantile regression		
q = 0.25	0.010 (0.017)	0.020 (0.028)
Pseudo R ²	0.009	0.005
q = 0.50	0.006 (0.037)	-0.015 (0.057)
Pseudo R ²	0.019	0.007
q = 0.75	-0.171 (0.116)	-0.239 (0.149)
Pseudo R ²	0.028	0.017
Sample (n)	246	204

Note: The full sample includes all observations, while the sub-sample excludes subjects who reported multiple switches. Controls for age, gender, poverty status and experimental experience of sender. Standard errors are reported in parentheses. Statistical significance is reported as follows: 1%***, 5%** , 10%*

In Tables 6A and 6B, the subject-type dummies, sender characteristics and previous experimental experience are regressed on AUC and individual discount rates (k), using OLS regression models and quantile regression models, respectively. It can be seen from Tables 6A and 6B that the subject-type difference in the two aggregate measures of altruism, k' and AUC, is only statistically significant for the social discounting rate, i.e. k' . In other words, for the social discounting rate, k' , field subjects proved to be more altruistic than laboratory subjects. This result is consistent across both the full sample and sub-sample. The quantile regression results show no significant differences across subject-type for both AUC and k' as measures of altruism, in both the full and sub-samples. Although statistically insignificant, the results of k' are in-line with the quantile regression results reported on the crossover values earlier in Table 4, which depict higher levels of giving amongst field subjects in the lower quantile and lower levels of giving for field subjects, compared to laboratory subjects in the median and upper quantile ranges.

5.3 Subject-type and recipient characteristics

Table 7 shows the descriptive characteristics of the recipients listed by the subjects for each social distance. There are a number of statistically significant differences in the characteristics of the recipients chosen by laboratory subjects, as opposed to field subjects. The most significant differences ($p < 0.001$) between field and laboratory subjects are for age; years known; physical proximity; and relation with frequency of communication slightly less significant at $p = 0.099$. Field subjects selected recipients who on average were older (40.42 years) than the recipients selected by laboratory subjects (30.69 years). In terms of relationship status, field subjects more often selected spouses, other family and strangers as recipients compared to the laboratory subjects, while laboratory subjects more selected parents, siblings, friends and acquaintances than field subjects. Field subjects mostly chose recipients whom they had known in excess of 10 years (51.56%) compared to 48.31% for laboratory subjects, while laboratory subjects chose a bigger percentage (15.48%) of recipients whom they had known for less than a year than field subjects (8.61%) Staff selected more recipients living in the same town (31.37%) than students (18.77%), and students chose more recipients within walking distance (17.17%) compared to staff (9.37%). The first difference could be attributed to the fact that field subjects are settled in the town/city where they work and have an established network of family and friends here, and the second difference could be attributed to the fact that laboratory subjects live away from home, without private transport and were likely to choose recipients living close by such as fellow students or friends or room-mates. Both field

and laboratory subjects selected more females (57.81%) than males as recipients, while the biggest proportion of the recipients chosen by both staff and students were friends (22.01%). Spouses and partners accounted for the smallest percentage (8.59%) of the recipients for both subject-types. Both groups had marginally more family (53.47%) than non-family (46.53%) as recipients. The differences in five of the eight choices made by the two groups are significant at the 1% and 5% significance level, which illustrates that the two subject groups selected very different recipients.

Table 7: Descriptive characteristics of recipients, by subject-type

	Laboratory	Field	Total	p-value
Age				
Mean	30.69	40.42	33.29	<0.001
Median	25(21-37)	40(28-51)	28(22-43)	
Female (%)	57.77	57.93	57.81	0.954
Relation:				
Spouse & partner	7.75	10.90	8.59	0.009
Parents	15.19	13.68	14.79	
Siblings	15.97	12.82	15.13	
Other family	13.49	19.02	14.96	
Friends	22.71	20.09	22.01	
Neighbour/Acquaintance	13.95	11.32	13.25	
Strangers	10.93	12.18	11.26	
Total	100.00	100.00	100.00	
Relation:				
Family	52.40	56.41	53.47	0.137
Non-family	47.60	43.59	46.53	
Total	100.00	100.00	100.00	
How long known:				
<1 year	15.48	8.61	13.67	<0.001
1-2 years	11.31	7.06	10.20	
3-5 years	13.59	10.15	12.69	
5-10 years	11.31	15.01	12.28	
>10 years	48.31	59.16	51.16	
Total	100.00	100.00	100.00	
Communication:				
Daily	28.59	32.04	29.51	0.099
A few times a week	21.33	17.42	20.29	
Once a week	7.58	9.68	8.14	
A few times a month	13.28	11.61	12.84	
Once a month	6.88	5.38	6.48	
A few times a year	9.69	8.82	9.46	
Less frequently	5.47	8.17	6.19	
No contact	7.19	6.88	7.11	
Total	100.00	100.00	100.00	
Distance				
Live together	15.50	15.69	15.55	<0.001
Within walking distance	17.17	9.37	15.08	
In same town/city/village	18.77	31.37	22.15	
Another town/city/village	26.92	32.03	28.29	
In another country	14.70	4.36	11.92	
Do not know	6.95	7.19	7.01	
Total	100.00	100.00	100.00	
Psychological & Emotional Distance				
Mean	6.42	6.49	6.44	0.664
Median	7 (4-9)	7 (4-9)	7 (4-9)	0.360
Sample (n)	1, 274	464	1, 738	

Table 8A: Subject-type and recipient characteristics, by social distance: Full Sample

	Communication (oprobit)	Physical distance (oprobit)	Psychological distance (OLS)	Solidarity (OLS)	Years known (oprobit)	Age (OLS)	Gender (probit)
Model A:							
Laboratory versus Field	-0.013 (0.029)	0.012 (0.029)	-0.508* (0.262)	0.042 (0.069)	0.001 (0.020)	3.285*** (1.197)	0.011 (0.036)
Wald chi2/ F-statistic	426.48 (<0.001)	22.69(0.006)	135.27(<0.001)	34.27(<0.001)	356.24(<0.001)	27.30(<0.001)	124.87
Pseudo R ²	0.104	0.005	0.499	0.239	0.093	0.176	0.052
Sample (n)	1,703	1,554	1,696	1,709	1,684	1,649	1,507
Model B:							
Laboratory versus Field	0.013 (0.029)	0.024 (0.030)	-0.508* (0.263)	0.042 (0.069)	0.004 (0.021)	3.253*** (1.197)	0.013 (0.036)
Social distance (interaction)							
1 &2	0.107* (0.059)	0.130** (0.055)	-0.160 (0.264)	0.035 (0.050)	0.003 (0.010)	-1.190 (2.093)	-0.067 (0.060)
5 &10	-0.027 (0.042)	-0.025 (0.027)	-0.455 (0.315)	0.063 (0.067)	-0.010 (0.018)	6.379*** (1.888)	0.010 (0.055)
20	-0.015 (0.039)	0.003 (0.347)	-0.416 (0.376)	0.111 (0.095)	-0.000 (0.034)	6.247*** (1.970)	0.091 (0.076)
50 &100	-0.024* (0.013)	0.027 (0.027)	-0.965*** (0.336)	-0.006 (0.168)	-0.023 (0.051)	3.132 (1.607)	-0.065 (0.058)
Wald chi2/ F-statistic	477.93 (<0.001)	41.14 (<0.001)	122.82 (<0.001)	29.20 (<0.001)	367.59 (<0.001)	27.70 (<0.001)	134.54
Pseudo R ²	0.106	0.009	0.501	0.239	0.093	0.185	0.054
Sample (n)	1,703	1,554	1,696	1,709	1,684	1,649	1,507

Note: The full sample includes all observations, while the sub-sample excludes subjects who reported multiple switches. Standard errors are reported in parentheses. Statistical significance is reported as follows: 1% ***, 5% **, 10% *

Tables 8A and 8B report the results of the regression analyses employed to test whether field and laboratory subjects select different recipients. In Table 8A for the full sample, field subjects are less likely to choose subjects with whom they communicate frequently, more likely to choose recipients within close physical proximity and less likely to choose recipients to whom they feel psychologically close, as well as more likely to choose recipients whom they have known for longer, who are older and female. The differences between field and laboratory subjects are highly significant (1%) for age only and less significant (10%) for psychological distance. When the subject-type is interacted with the social distance variable (model B), field subjects are more likely to choose recipients with whom they communicate with frequently and who are within close physical proximity at social distances #1 and #2; and they are more likely to choose older recipients at social distances #5; #10 and #20 and at the distant social distances, i.e. #50 and #100. Age, frequency of communication and psychological distance therefore were important considerations for field subjects.

For the sub-sample (Table 8B), field subjects are more likely to choose recipients with whom they communicate frequently, whom they have known for longer periods of time and who are older and male, while they are less likely to choose recipients with whom they are psychologically close. As with the full sample, the differences between field and laboratory subjects are highly significant (1%) for age only and less significant (10%) for psychological distance. When interacted with social distance (model B), at further social distances, i.e. #50 and #100, field subjects selected people who are less close to them in terms of psychological distance. This result was weakly significant (10%) for model A for both the full and sub-sample analysis and highly significant (1%) and evident for both the full and sub-sample results at the said distances #50 and #100 in model B. Furthermore, field subjects were more likely to choose males at the close social distances #1 and #2. This could be due to the fact that 75% of the field subjects were in fact females and more likely chose their male spouses/partners as recipients at these close distances. Subject-type was not associated with years known and solidarity for both the full and sub-samples. The association of subject-type with physical distance was more significant in the full sample for social distances #1 and #2 (model B), than in the sub-sample, where the effect had a weaker statistical significance. The result shows that field subjects chose recipients who lived physically further away from them at social distances #1 and #2. The opposite is seen for the association between subject-type and frequency of communication, where the sub-sample result has a stronger statistical significance at social distances #1 and #2 (model B), than for the full sample, where the effect is significant but weaker (model B). In

both cases, field subjects selected recipients in social distance category 1 with whom they communicated on a more frequent basis, compared to laboratory subjects.

Table 8B: Subject-type and recipient characteristics, by social distance: Sub-sample

	Communication (oprobit)	Physical distance (oprobit)	Psychological distance (OLS)	Solidarity (OLS)	Years known (oprobit)	Age (OLS)	Gender (probit)
Model A:							
Laboratory versus Field	0.003 (0.029)	0.000 (0.029)	-0.511* (0.276)	-0.050 (0.074)	0.005 (0.022)	3.235** (1.303)	-0.006 (0.042)
Wald chi2/ F- statistic	391.80 (<0.001)	24.00(0.002)	144.19 (<0.001)	35.67(<0.001)	344.73(<0.001)	27.33(<0.001)	101.47
Pseudo R ²	0.109	0.007	0.520	0.251		0.178	0.056
Sample (n)	1,511	1,372	1,504	1,516	1,496	1,476	1,341
Model B:							
Laboratory versus Field (interaction)	0.032 (0.029)	0.011 (0.030)	-0.513* (0.277)	-0.050 (0.074)	0.009 (0.023)	3.235** (1.301)	-0.003 (0.042)
Social distance:							
1 &2	0.144** (0.062)	0.107* (0.057)	-0.121 (0.287)	-0.027 (0.052)	0.008 (0.011)	-0.819 (2.322)	-0.112* (0.063)
5 &10	-0.007 (0.044)	-0.033 (0.027)	-0.466 (0.335)	-0.078 (0.071)	-0.016 (0.017)	6.026*** (2.065)	0.013 (0.062)
20	-0.000 (0.040)	-0.002 (0.363)	-0.343 (0.391)	-0.113 (0.100)	0.016 (0.038)	5.737*** (1.967)	0.090 (0.079)
50 &100	-0.017* (0.012)	-0.042 (0.027)	-1.018*** (0.332)	-0.013 (0.180)	0.032 (0.055)	3.160* (1.710)	0.043 (0.063)
Wald chi2/ F- statistic	424.35 (<0.001)	38.76(<0.001)	130.09(<0.001)	29.78(<0.001)	355.42(<0.001)	26.89(<0.001)	105.80
Pseudo R ²	0.111	0.010	0.523	0.252	0.099	0.185	0.059
Sample (n)	1,511	1,372	1,504	1,516	1,496	1,467	1,341

Note: The full sample includes all observations, while the sub sample excludes subjects who reported multiple switches. Robust standard errors in parentheses, statistical significance are reported as follows: 1% ***, 5% **, 10% *

In Tables 9A and 9B, further evidence is provided as to whether field subjects chose different recipients from laboratory subjects with regard to their relationships. None of the results is statistically significant in model A for all four relationship categories in both the full sample and sub-sample analysis. However, when the subject-type dummy is interacted with social distance (model B), it is evident from both the full and sub-sample analysis that field subjects did nominate recipients in different relationships to them, and particularly the first social distance category, or for the close social distances #1 and #2, specifically for the family versus other; friend versus other; and family versus non-family categories. In model B of the full and sub-sample analysis for all three the latter relationship categories, the results were strongly significant in statistical terms, indicating that field subjects were more likely to nominate family over others; friends over others; and family over non-family for the first two social distances. In model B of the sub-sample analysis, for social distances #5 and #10, the evidence is significantly strong that field subjects rather chose family over friends and friends over others in this category. Furthermore, field subjects were more likely to choose others over family (model B) and non-family over family for social distance category 4, i.e. social distances #50 and #100.

Table 9A: Subject-type and relationship choice, by social distance: Full sample

	Family vs Friend	Family vs Other	Friend vs Other	Family vs Non-Family
Model A				
Field versus Laboratory	0.015 (0.033)	0.028 (0.033)	0.007 (0.028)	0.020 (0.032)
Wald chi2(<i>p</i> -value)	15.87 (0.069)	435.73 (<0.001)	106.32(<0.001)	453.11(<0.001)
Pseudo R ²	0.031	0.221	0.195	0.220
Sample (n)	919	1,626	887	1,716
Model B				
Field versus Laboratory	0.015 (0.032)	0.027 (0.032)	0.007 (0.026)	0.016 (0.031)
Social distance				
1 & 2	-0.018 (0.044)	0.118*** (0.033)	0.301** (0.138)	0.110*** (0.030)
5 & 10	0.081** (0.039)	0.078 (0.059)	-0.083 (0.057)	0.051 (0.057)
20	-0.049 (0.096)	-0.061 (0.073)	0.001 (0.044)	-0.063 (0.073)
50 & 100	0.014 (0.069)	-0.064 (0.044)	-0.012 (0.014)	-0.073 (0.044)*
Wald chi2 (<i>p</i> -value)	24.95(0.015)	432.71(<0.001)	114.89(<0.001)	450.83(<0.001)
Pseudo R ²	0.038	0.228	0.207	0.227
Sample (n)	919	1,626	887	1,716

Note: The full sample includes all observations, while the sub-sample excludes subjects who reported multiple switches. Robust standard errors in parentheses, statistical significance are reported as follows: 1% ***, 5% **, 10% *

Table 9B: Subject-type and relationship choice, by social distance: Sub-sample

	Family vs Friend	Family vs Other	Friend vs Other	Family vs Non-Family
Model A				
Field versus Laboratory	0.007 (0.034)	0.004 (0.035)	-0.002 (0.026)	-0.003 (0.034)
Wald chi2 (<i>p</i> -value)	10.01 (0.2646)	389.83(<0.001)	85.68(<0.001)	404.17(<0.001)
Pseudo R ²	0.024	0.222	0.182	0.221
Sample (n)	788	1,452	806	1,523
Model B				
Field versus Laboratory	0.063 (0.033)	0.004 (0.034)	-0.003 (0.023)	-0.007 (0.033)
Wald chi2 (<i>p</i> -value)	18.58	387.27(<0.001)	96.28(<0.001)	401.57(<0.001)
Pseudo R ²	0.040	0.230	0.203	0.229
Social distance				
1 & 2	-0.037 (0.049)	0.112*** (0.037)	0.305** (0.142)	0.105*** (0.034)
5 & 10	0.099*** (0.033)	0.047 (0.064)	-0.130*** (0.046)	0.017 (0.062)
20	-0.055 (0.097)	-0.058 (0.075)	-0.001 (0.042)	-0.061 (0.075)
50 & 100	-0.037 (0.092)	-0.100** (0.042)	-0.009 (0.013)	-0.108** (0.042)
Sample (n)	788	1,452	806	1,523

Note: The full sample includes all observations, while the sub-sample excludes subjects who reported multiple switches. Robust standard errors in parentheses, statistical significance is reported as follows: 1%***, 5%***, 10%*

6. Discussion

Studies relying solely on students as participants have often failed to detect differences in human behaviour across socio-demographic characteristics (Carpenter, Verhoogen and Burks, 2005). Given the relative similarities in the socio-demographic characteristics of students (Harrison and List, 2004), this is to be expected. The current study employs a SDT amongst laboratory and field subjects at a South African university and adds to the limited literature on the comparison of social discounting in laboratory and field subjects (Tiokhin *et al.*, 2019). Tiokhin *et al.* (2019) compared discounting between semi-literate, rural subjects from Bangladesh and Indonesia and US college students in an effort to avoid the development of theories of human behaviour that are based on the generalisation of findings from one particular subject type/pool. The study found that US undergraduate students exhibited typical patterns of social discounting. However the semi-literate and rural subjects from Indonesia and Bangladesh did not exhibit social discounting. Boyer *et al.* (2012) compared delayed discounting, social discounting and social trust amongst three highly distinct subject groups,

namely Chinese urban dwellers – ranging from students to employees, US middle-class college students, and Kenyan herders. With respect to social discounting the study found that US and Chinese subjects exhibited more social discounting than the Kenyan subjects did. The delay discounting results also displayed different discount rates for each subject group, with the Kenyan subjects having the steepest discount function compared to a fairly steep function for China and US subjects with the least steep discounting function. In the current study specifically, the focus is on directly comparing the altruistic behaviour of field and laboratory subjects, which is the first such study done in a South African context. Other studies have not collected detailed information on recipient characteristics. As such, this component of this research represents a novel contribution.

The differences in altruism amongst staff and student subjects present mixed results. The mean values of the three measures of altruism, i.e. crossover, AUC and k' consistently indicate that the levels of altruism are higher amongst field subjects than laboratory subjects, with the former subject group having higher crossover values, higher AUC and lower k' -values. However, these differences in the mean values were only statistically significant for crossover values. When measuring the subject-type differences in the measures of altruism through the OLS regression and subsequent quantile regression models, the results are also mixed. There is no significant subject-type effect on AUC in both the OLS and quantile regression models. For crossover value, the subject-type difference is significant in the quantile regression analysis but not in the OLS analysis, and for the social discounting rate, k' , the difference is significant in the OLS analysis but not the quantile regression. The study therefore, unlike the research done by Tiokhin *et al.* (2019) and Boyer *et al.* (2012) presents no conclusive evidence of differences in these measures of altruism between this group of laboratory and field subjects.

However, the observed differences, although not conclusively, may be attributed to the differences in age between the two subject groups, whereby one can expect the staff group to behave more altruistically than students do. Engel (2011) and Matsumoto *et al.* (2016) found that in laboratory settings, older adults compared to young adults usually distribute more money to another stranger in an economic game. The World Giving Index (2016; <https://www.cafonline.org>) surveyed individuals of different ages from 153 countries and found the enhanced generosity amongst older adults to cut across cultures, with donations being the highest among those aged 50 years and above. These differences can also be attributed to the significant differences between the two groups relating to race, language, household poverty rank, and financial status, with the two latter differences endorsing a recent finding by

Belisle *et al.* (2019) that economic hardship may function as a motivating operation increasing social discounting. Indeed, prior research has shown that philanthropic behaviour is more likely to be demonstrated by individuals of greater socio-economic status (Schervish & Havens, 2003), in which behaviour described by socio-economic status analytically correlates with altruistic behaviour, rather than merely serving as a predictor variable.

In addition to measuring differences in altruistic behaviour amongst the two subject groups, the study also collected information on recipient characteristics and whether these differed for the two subject groups, an approach not followed elsewhere in the literature. In the regression results, the evidence suggests that the subject-type had a significant influence on five of the eight recipient characteristics as choices of field versus laboratory subjects, namely (1) age; (2) frequency of communication; (3) physical distance; (4) psychological distance; and (5) gender. Furthermore, in terms of relationship status, field subjects chose more family over friends, others and non-family at the close social distances, and more non-family and others over family at the distant social distances compared to their student counterparts.

Although the results on the differences in the levels of altruism between the laboratory and field subjects appear to be inconclusive, the dynamics underlying the subjects' choices and behaviour in regards to the choice of recipients are distinctly different. This could be attributed to differences in the socio-demographic characteristics of the two subject groups. The nature of the relationships between the subjects and the chosen participants is also valid, with students expected to have less close-knit relationships with friends, with less frequent interactions, knowing that their time on the campus and/or in the city is limited. Furthermore, the world in which laboratory subjects exist is much smaller than that of field subjects and as such the manner in which laboratory subjects structure a social distance hierarchy would differ from that of field subjects.

The study has various limitations. The sample sizes of the two subject groups are not relatively similar in size, with the laboratory (student) sample being almost thrice the size (185) of the field (staff) sample (67), which makes it difficult to generalise on the differences in altruistic behaviour between field and laboratory subjects and may have an impact on the statistical power of the field sample. The size of the field sample also implies that field subjects are not truly representative of the field. Thirdly, the sample is primarily from one Faculty at the same university in one country, which also makes generalisation difficult. Future research is needed to determine whether other factors such as different fields and levels (undergraduate versus

postgraduate) of study, physical location, and cultural differences of and amongst laboratory and field subjects have an impact on differences in levels of altruism. Furthermore, the culture of the workplace where the experiment is conducted may also influence these field subjects' behaviour; hence workers at other workplaces may behave differently. In addition, during the payment process subjects had to identify specific people as paid recipients and the subjects were not required to refrain from revealing their identity to paid recipients. This allows for lack of anonymity in the task and makes it difficult to attribute the subjects' behaviour or choices to pure altruism whereby the choice benefits the recipient, irrespective of their closeness to the subject, or mutualism, which means that the choice will have benefits for both subjects and recipients (West *et al.*, 2006). Finally, a common limitation of social discounting tasks is the "house money" effect (Carlson & Martinsson, 2013; Clark, 2002; Dankova & Servátka, 2015), which implies that since subjects are giving away the experimenter's money, and not their own, they could be more giving and as a result altruism could be over-estimated.

7. Conclusion

The study conducted an SDT experiment with laboratory (student) and field (staff) subjects at a South African university in order to determine if three measures of altruism differ between subject types and presents us with the following key results. The study finds that field and laboratory subjects differ on two of the three measures of altruism, namely the crossover value and the social discounting rate, k' . For both subject types, crossover values declined as social distance increased. When adjusting for differences in characteristics of the subjects, and allowing for the non-linearity of the distribution of these characteristics, the results of the study are mixed, and the subject-type differences on all three measures of altruism are evident only in some instances. In addition, the study finds that, when selecting recipients, laboratory and field subjects selected different recipients and the dynamics underlying the observed similarities in altruism are different for the two subject types. This implies that the causes and consequences of altruism may be different among the two groups of subjects. Future research is needed to investigate altruistic behaviour amongst field and laboratory subjects in other regions and countries.

CHAPTER 3: PAPER 2

Giving and social discounting and risk and time preferences: An experimental study

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Abstract

This study empirically explores the theoretical argument that altruism is related to risk and time preferences by separately eliciting risk and time preferences amongst subjects from the University of the Free State in South Africa. Subjects completed a standard social discounting task (SDT), together with a series of multiple price lists (MPLs) tasks. The study finds that risk and time preferences are correlated with giving and social discounting. More specifically, giving to those closest to you increases with risk appetite, whereas the rate of social discounting declines with risk appetite and patient subjects give more to those closest to them, compared to more impatient subjects. There is also some evidence that altruism is higher among the most future-oriented subjects. Some of the evidence, however, contradicts the theoretical priors which postulate that individuals with higher discount rates of future rewards are less altruistic than more patient individuals and more risk-averse individuals are less likely to engage in reciprocal altruism, with some evidence in the study indicating that risk-averse subjects and impatient subjects are more altruistic to those who are socially more distant. Based on the evidence from the study, the associations between altruism and risk attitudes and time preferences are complex and non-linear by nature.

1. Introduction

The concept of social discounting was first suggested by Jones and Rachlin (2006) and proposes that altruism decreases across social distance in a non-constant, hyperbolic way. Currently, there is a vast expanse of literature documenting the use of the social discounting task (SDT) by researchers as an experimental tool aimed to measure altruism. Examples of these studies include Belisle *et al.* (2019), Booysen *et al.* (2018), Boyer *et al.* (2012), Bradstreet *et al.* (2012), Ito *et al.* (2011), Jones and Rachlin (2006 & 2009) Leider *et al.* (2009), Locey *et al.* (2013), Locey and Rachlin (2013 & 2015), Olson *et al.* (2016), Osiński (2009 & 2010) Rachlin and Jones (2008), Sharp *et al.* (2012), Strombach *et al.* (2013, 2015 & 2016), Yi *et al.* (2011, 2012 & 2016), and Ziegler and Tunney (2012).

With respect to risk and time preferences, and their associations with altruism, which is the main focus of this paper, some empirical literature documents research in this regard that takes place outside, as well as within the social discounting framework. These empirical literatures are now briefly described in turn. In the only such study we could locate outside the social discounting literature, Angerer *et al.* (2015) undertook a study to determine how altruism amongst primary school children is related to risk attitudes and intertemporal choices. Subjects completed three experiments: (i) a donation task; (ii) a simple investment task to elicit risk attitudes; and (iii) an intertemporal choice experiment. The results showed that subjects with a higher risk tolerance and who were more patient also had higher levels of donations, and were thus more altruistic.

For empirical studies conducted within the framework of social discounting, the research evidence comprises two approaches: (1) studies where risk attitudes and time preferences are elicited separately from social discounting, with a focus on determining whether the latter is correlated with the former; and (2) studies where temporal delays or risky prospects are incorporated into the social discounting task itself to determine how these preferences may affected decisions on social discounting.

The studies following the first approach include Jones and Rachlin (2009), Bickel *et al.* (2014), and Bialaszek *et al.* (2019). Jones and Rachlin (2009) conducted social, delay and probability discounting experiments with Stony Brook University business school undergraduates. The study found that “despite the differing properties of social discounting together with probability discounting on the one hand and delay discounting on the other, all three discount functions correlated significantly with each other” (Jones & Rachlin, 2009). Social and delay discounting

were positively correlated in both of the experiments conducted in the study, and statistically significantly so, implying that subjects in the study who sacrificed present good for the benefit of others also tended to sacrifice present good for the benefit of their future selves. Social and probability discounting were also positively and significantly correlated, meaning that subjects who sacrificed more for the benefit of others were also bigger risk-takers. Bialaszek *et al.* (2019) also found probability, delay and social discounting to be significantly correlated. Delay and probability discounting were both positively correlated with the mean AUC, in line with the findings of Jones and Rachlin (2009) that risk-loving and patient subjects are more altruistic. Bickel *et al.* (2014) report positive and statistically significant correlations between all three measures of discounting, namely social, probability and delay, when investigating these amongst obese and non-obese subjects. Social discounting reported positive and significant correlations with both delay and probability discounting, further echoing the findings of the other studies mentioned above.

Examples of studies that follow the second approach include the work of Osiński and Karbowski (2017), who investigated whether altruism due to delayed rewards is enhanced when the social distance between the subject and the recipient gets bigger. In the study, students from two Polish universities completed a SDT with three delay outcomes, such as one day, one month, and five years, added for each decision at each social distance. The results of the study show that at close social distances, the level of altruism was high regardless of the delay, and when the recipient is a distant person, altruism declines, but increases with the delay, suggesting some form of non-linearity across social distance. A similar approach was followed by Yi *et al.* (2011), who examined the effect of adding a common delay to outcomes in a social discounting procedure. In Yi *et al.*'s (2011) study, college students completed three social discounting tasks, which varied the delay to both the A and B outcomes as no delay, six months, and twelve months. The results of the experiment suggest that when the outcomes of the interpersonal choice procedure are delayed, participants are more likely to relinquish an outcome for the self *in lieu* of a better outcome for someone else. This implies that with delay, subjects are more altruistic.

Jin *et al.* (2017) conducted an empirical test on the influence of risk on social discounting. In the experiment, participants from Zhejiang University completed a SDT with and without a risk option. With the risk option, the choices between choosing for oneself and for a recipient at a particular social distance also involves a probability that both will receive the reward and a probability that both will not. The study showed that individuals' generosity declined as social

distance increased for both the risky and non-risky options, and furthermore found that the mean measure of giving (V) was higher under the risk condition, i.e. when the probability of neither receiving the reward is higher, compared to the no-risk condition.

In this paper, the research on social discounting is extended by following the former approach i.e. where risk and time preferences are elicited separately and in conjunction with social discounting and associations between the three are investigated. This paper empirically explores the theoretical argument put forward by Angerer *et al.* (2015) that altruism is related to risk and time preferences by hypothesising that (i) “individuals with higher discount rates of future rewards can therefore be expected to engage less in altruistic behaviour than more patient individuals (Axelrod, 1984 as cited in Angerer *et al.* 2015: 68); and (ii) more risk-averse individuals could be less likely to engage in reciprocal altruism” (Angerer *et al.*, 2015:68). The study separately elicits risk and time preferences amongst a group of laboratory and field subjects from the University of the Free State in South Africa who completed a standard social discounting task (SDT) together with a series of multiple price list tasks. The resultant data are used to investigate the association between giving and social discounting and risk and time preferences.

2. Experiment

Participants:

In total, 168 subjects, of which 133 are students and 35 staff, were recruited into the study. The majority of subjects are students from the Faculty of Economic and Management Sciences (EMS) at the University of the Free State in South Africa, although a small percentage are students from the Faculty of Agricultural Sciences (6.02%) and other faculties (1.80%) from the same university, who were registered for modules within the EMS faculty. Three separate sessions were held, of which two were for student subjects and one exclusively for staff subjects.

Ethics:

Ethical clearance for the study was obtained from the Faculty of Economics and Management Sciences at the University of the Free State (UFS-HSD2016/0124). Participation was voluntary and written informed consent was obtained from all subjects.

Procedure:

The recruitment flyers were physically distributed amongst undergraduate students during an Economics lecture at the University of the Free State and by hand to staff working in the Faculty of Economic and Management Sciences. A total number of 200 recruitment flyers were distributed amongst the students and 100 for staff. Recruited subjects, i.e. subjects in possession of recruitment flyers, received a once-off show-up fee of R50 when arriving at the experiment venue. Each participant received a pencil, eraser and a hard-copy of the experimental package. The experimental packages consisted of a paper and pencil version of Rachlin and Jones' (2008b) social discounting task (SDT). Subjects completed a short questionnaire for each person they envisioned at each of the following social distances, i.e. 1, 2, 5, 10, 20, 50 and 100. In the questionnaire they were requested to provide information on their social relation to the person, how often they communicated with the person, whether they lived with the person and, if not, how far they lived from the person, how often they visited the person, how long they had known the person, how close they perceived themselves to be to this person – both emotionally and psychologically, as well as the basic socio-demographics of the person (Annexure C). Subjects were also presented with two sets of MPLs: one set was used to elicit risk preferences and the other set was used to elicit time preferences (RUBEN, UCT). Details about these MPLs are provided later in this section. For each one of the three sets of experimental tasks, the experimenter read a set of detailed instructions and subjects completed practice tables. Upon completion of the practice tables, subjects were instructed to complete four tables for risk preferences, four tables for time preferences, and seven uniform tables for the social discounting task. Subjects also completed a post-experimental questionnaire. The information collected by means of the latter questionnaire includes the standard socio-demographic information of the participant: age; sex; race/ethnicity; education; household size; and individual/household income (Annexure D).

For the social discounting task, subjects were asked to make choices between a declining amount of money for themselves versus a fixed amount of money for each of the people on their social distance ladder. (Annexure B). The following instruction was included before the first table in the SDT in order to guide subjects in defining their social ladder:

Imagine you made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at #1 to a mere acquaintance at #100. Now imagine the following choices between an amount of money for you and an amount for the #1

person on the list. Circle A or B on the right-hand side to indicate which you would choose in EACH line.

In each table, the amount of money remained the same while the #1 in the above instruction and in the table and other forms, including the recipient questionnaire, was replaced by #2, #5, #10, #20, #50 and #100, respectively, representing the seven social distances.

For the four risk preference tables, subjects were asked to choose between different amounts of money at low and high probabilities (see Annexure G). The stakes across the four risk tables ranged from low stakes (Table E: Option A: R60 versus R50, or Option B: R100 versus R25) to high stakes (Table H: Option A: R250 versus R150, and Option B: R400 versus R40). Figure 1 provides an example of one of the four risk tables (Table E) included in the risk experimental task. In row 1 of Table E, subjects choose between Option A which entails winning a pay-out of either R60 at low probability or R50 at a higher probability; or Option B which allows the subject to win a pay-out of either R100 at a low probability or R25 at a higher probability. The pay-out amount remains the same for Option A and B as subjects move down the decision rows, with only the probability of winning the smaller pay-out in both Options A and B decreasing and the probability increasing for the bigger pay-out. In other words, as participants move down the rows, the probability of the high pay-out increases.

RISK ATTITUDES (continued)

Now play the table below:

TABLE E

Decision	Option A	Option B	Your Choice (Circle A or B)
1	R60 if dice is 1 R50 if dice is 2 3 4 5 6 7 8 9 0	R100 if dice is 1 R25 if dice is 2 3 4 5 6 7 8 9 0	A B
2	R60 if dice is 1 2 R50 if dice is 3 4 5 6 7 8 9 0	R100 if dice is 1 2 R25 if dice is 3 4 5 6 7 8 9 0	A B
3	R60 if dice is 1 2 3 R50 if dice is 4 5 6 7 8 9 0	R100 if dice is 1 2 3 R25 if dice is 4 5 6 7 8 9 0	A B
4	R60 if dice is 1 2 3 4 R50 if dice is 5 6 7 8 9 0	R100 if dice is 1 2 3 4 R25 if dice is 5 6 7 8 9 0	A B
5	R60 if dice is 1 2 3 4 5 R50 if dice is 6 7 8 9 0	R100 if dice is 1 2 3 4 5 R25 if dice is 6 7 8 9 0	A B
6	R60 if dice is 1 2 3 4 5 6 R50 if dice is 7 8 9 0	R100 if dice is 1 2 3 4 5 6 R25 if dice is 7 8 9 0	A B
7	R60 if dice is 1 2 3 4 5 6 7 R50 if dice is 8 9 0	R100 if dice is 1 2 3 4 5 6 7 R25 if dice is 8 9 0	A B
8	R60 if dice is 1 2 3 4 5 6 7 8 R50 if dice is 9 0	R100 if dice is 1 2 3 4 5 6 7 8 R25 if dice is 9 0	A B
9	R60 if dice is 1 2 3 4 5 6 7 8 9 R50 if dice is 0	R100 if dice is 1 2 3 4 5 6 7 8 9 R25 if dice is 0	A B
10	R60 if dice is 1 2 3 4 5 6 7 8 9 0	R100 if dice is 1 2 3 4 5 6 7 8 9 0	A B

Decision row selected:		
Roll 10-sided dice		
Number on dice (1-0)		
Choice (A/B)		
Payment (R):		

Figure 1: Risk table (E) from risk preference task

For the four ‘time preference tables’, participants were instructed to choose between a smaller reward, which was available “within one week” (Option A) and a larger reward, which was only available after some delay (Option B) of say one month; three months; six months or one year. In each of the four time preference tables, the pay-out amount for Option A remained constant at R250, with the delayed amount (Option B) varying with each decision, depending

on the pay-out timeframe, as listed above. Figure 2 below, provides an example of one of the four ‘time preference tables’ included in the experimental package. In Row 1 of Table A, subjects can choose between Option A, i.e. payment of a reward almost immediately, or Option B, which entails payment of a larger reward but a later time, e.g. 1 month and 1 week later. As the subject moves down the table from row 1 to 10, the amount for immediate payment stays the same, while the delayed payment increases. These tables, together with their instructions, are included as Annexure H.

TIME PREFERENCES (continued)

Please play the table below:

TABLE A

Decision	Option A (Pays amount below in 1 week)	Option B (Pays amount below in 1 month and 1 week)	Your Choice (Circle A or B)
1	R250.00 + 10% interest = Timeline: Today 1 week	R252.09 Timeline: 1 month and 1 week	A B
2	R250.00 + 20% interest = Timeline: Today 1 week	R254.20 Timeline: 1 month and 1 week	A B
3	R250.00 + 30% interest = Timeline: Today 1 week	R256.33 Timeline: 1 month and 1 week	A B
4	R250.00 + 40% interest = Timeline: Today 1 week	R258.47 Timeline: 1 month and 1 week	A B
5	R250.00 + 50% interest = Timeline: Today 1 week	R260.63 Timeline: 1 month and 1 week	A B
6	R250.00 + 60% interest = Timeline: Today 1 week	R262.81 Timeline: 1 month and 1 week	A B
7	R250.00 + 70% interest = Timeline: Today 1 week	R265.00 Timeline: 1 month and 1 week	A B
8	R250.00 + 80% interest = Timeline: Today 1 week	R267.22 Timeline: 1 month and 1 week	A B
9	R250.00 + 90% interest = Timeline: Today 1 week	R269.45 Timeline: 1 month and 1 week	A B
10	R250.00 + 100% interest = Timeline: Today 1 week	R271.70 Timeline: 1 month and 1 week	A B

Figure 2: Time table (A) from time preference task

All three experimental tasks were counter-balanced, with the tables in half of the experimental packages organised in the standard ascending order and in the other half in descending order. For the time preferences tables the ascending order for the time tasks were as follows: Table A

– one month delay; Table B - three month's delay; Table C – 6 months' delay; and Table D – one year delay; and in descending order, the time preference tables were ordered from Table D to Table A. In the risk preferences tables the ascending order was ranked according to the stakes of the pay-out amounts, i.e. Table E (R60 or R50 versus R100 or R25); Table F (R70 or R45 versus R110 or R10); Table G (R200 or R120 versus R300 or R50); and Table H (R250 or R150 versus R400 or R40). For descending order the risk tables were ordered from Table H to Table E. In the SDT, the seven tables were ordered from social distance #1 to #100 for ascending order and from distance #100 to #1 for descending order.

The tasks were incentivised where subjects first needed to select one of the games/tasks on which the payment would be based randomly by rolling a ten-sided dice before implementing a series of randomised choices to select one decision from the selected set of tasks for actual payment. This was in addition to receiving a show-up fee of R50 for participating in the experiments. The show-up fee was paid immediately in cash at each session and the payoffs procedure was conducted individually with each subject. The mean earnings of subjects in these experiments amounted to R195.38, exclusive of the show-up fee.

3. Measures

In this paper, three measures of social discounting are estimated. A monetary value for the crossover value is estimated as the mid-point at which a subject switched from choosing option A to option B (giving option) for each social distance – and is captured as such in the task-level dataset. For instance, if a subject chooses the selfish option at R180 against R160 for the recipient, and switches to the giving option at R160 for him/her against the same R160 for the recipient, the crossover value is the midpoint value between R180 and R160, i.e. R170. For subjects who exclusively choose option A throughout, the crossover value is given as R0, and for subjects who exclusively chose the giving option (Option B), the crossover value is assumed to be R190. The crossover values are then used to determine social discounting functions which are fitted individually on each subjects' crossover values with the aid of Reed, Kaplan and Brewer's (2012) Excel solver toolkit, using a hyperbolic function. Excel solver toolkit proceeds to compute two aggregate measures of each subject's altruism from this hyperbolic function. First is the social discounting rate, k' , which measures the steepness of social discounting: the greater k' , the greater the degree of social discounting and the lower the degree of altruism (Sharp *et al.*, 2012). Second is the Area Under the Curve (AUC), which is a normalised measure

not dependent on functional form (Myerson *et al.*, 2001) and it is an index varying from 1.0 (highly altruistic) to 0.0 (non-altruistic) (Locey *et al.*, 2011).

For the risk preferences, the difference in the pay-out amount for Option A, R60 or R50, in Table E is smaller than the difference in the potential pay-out amount of R100 or R25 in the "risky" Option B (see Figure 1 above). In the first decision row, the probability of the high pay-out for both options is 1/10, so only an extreme risk seeker would choose Option B. Based on this approach, a risk-averse variable is coded in the dataset. Subjects are classified as risk loving if they choose or switched to Option B within the first four decision rows, and as risk averse if they switched to risky Option B from decision row 5 downwards. Furthermore, the number of risky choices made by the subjects in each table served as a measure of their risk appetite.

In the time preference tasks, instructions indicated that on each row participants had to indicate if they would prefer to receive an amount of money "within one week" versus an amount delayed after time (e.g. one week and one year). Option A, the impatient option, allowed subjects to receive the money almost immediately, with a front-end delay of one week, while with Option B, subjects would receive a larger amount of money, but at a later time. The amount of money in Option B increases as subjects move along down the table from row 1 to 10. At task-level, a variable named "*time present*" indicates whether subjects are present oriented, based on the decisions made by subjects in each table. At the subject-level, subjects who chose the impatient option (Option A) throughout and per timetable were classified as present-oriented (impatient) and if they chose Option B at least once in a table they were classified as not completely present-oriented. However, cognisance is taken of the fact that subjects can behave inconsistently regarding their choices made by switching multiple times across options in one table. This is accounted for and addressed in more detail in section 4 of the paper. In addition, the number of delayed choices made by the subjects in each table and on aggregate served as a measure of their level of patience.

4. Analysis

The aim of this study is to investigate the relationship between giving and social discounting and time and risk preferences by answering three questions:

1. Is risk aversion associated with giving, and at the different social distances?
2. Is patience associated with giving, and at different social distances?
3. Is risk aversion and patience associated with social discounting?

Six datasets were used in the analysis, of which three included the aggregate measures of social discounting (AUC and k') with the time and risk preference data at task and subject level. The other three datasets included the crossover value with the time and risk preferences data at task level (i.e. for each social distance), per risk and time preference table and aggregated across the four tables each. The latter datasets, i.e. those aggregated across the risk and timetables, allow the inclusion of risk and time preferences into the same regression models.

Since the tables in the three experimental tasks were ordered in ascending and descending order, there are order variables for every set of tasks, namely *sd_order*, *risk_order* and *time_order* in order to control for the order effects of the variations in the order of the tables. For the SDT, tables varied according to social distance, with some experimental packages containing tables in ascending order, i.e. social distances 1 to 100, and others in descending order, i.e. for social distances 100 to 1. The order of the risk tables varied with some packages starting from low stakes (Tables E and F) to high stakes (Tables G and H) and others from high to low. Finally, with the timetables the order of the tables varied according to the timeframe for the delayed payment, with some packages starting with the table for which the delayed payment was due in one month (Table A) and ending with the Table D, where payment was due one year later, and vice versa in other packages.

There are also binary switching variables for multiple switching at both task and subject level. These variables include a variable “*sd_switch*” for subjects who switched multiple times in the social discounting task; one for subjects who switched multiple times in the risk tables “*risk_switch_yes* and *total_risk_switch_yes*” and one for subjects who switched multiple times in the time preference tables “*time_switch_yes* and *total_time_switch_yes*”. The “*risk_switch_yes*” and “*time_switch_yes*” variables are for subjects who switched multiple times per task table, while the “*total_risk_switch_yes*” and “*total_time_switch_yes*” are for subjects who switched multiple times in any one task table. At task level subjects switched multiple times in 8.77% of the SDT tasks; in 10.86% of the time tasks; and in 17.22% of the risk tasks. At subject level, in the SDT 13.69% of subjects switched multiple times; 32.34% switched multiple times in the risk experiment, and 19.05% switched multiple times in the time experiment. These order and switching variables are used as controls in the various regression models employed in the statistical analysis.

A binary family relationship variable was generated and recipients were categorised according to family (spouses; parents; siblings; other family) and non-family (friends; neighbours;

acquaintances; other). A solidarity variable was generated by applying the same approach followed by Booyesen *et al.* (2018). The solidarity variable makes use of Bengston and Roberts' (1991) Multiple Correspondence Analysis (MCA) and groups the following recipient characteristics – length of years known; physical proximity; frequency of communication – in order to provide an index against which relationship closeness can be measured.

The statistical and regression analyses consisted of three parts. In part one, a descriptive analysis of the socio-demographic information, i.e. age, race, gender, financial situation, and language – of the subject pool is undertaken. This section also includes a univariate description analysis of the main variables for (i) social discounting, i.e. crossover value, AUC and k' ; and for (ii) the risk preferences, i.e. *risk_averse* and *number of risky choices*; and (iii) time preferences, namely *time_present* and *number of delay choices*. This analysis is done at both task and subject level. The mean and median crossover values are estimated at the seven social distances to determine if giving declines with social distance or, in other words, if the data exhibit social discounting.

Part two entails the bivariate analysis. To identify the association between giving and altruism, and risk and time preferences, a number of bivariate analyses and statistical tests such as chi-square tests; one-way analysis of variance; t-tests, and Pearson correlation tests are run using the social discounting variables (crossover values, AUC and k') as variables of interest in comparison to the risk preference and time preference variables. A collapsed social distance variable, namely "*sd_distance 3*" was generated consisting of three categories, namely "*close*" – social distances #1,2 and 5; "*intermediate*" – social distances #10 and 20; and "*distant*" – social distances #50 and 100. The aim here is to use this variable to determine if giving is associated with risk and time preferences, respectively, and if this differs at different social distances. Here the analysis includes a "t-test" analysis of the crossover values with the risk preference variables and time preference variables separately, and also for each risk and time preference table (e.g. "*risk_table*" = 1/2/3/4) individually.

In Part three, the regression models are estimated. All three social discounting measures are employed as dependent variables in the regression models estimating the relationship between these measures (crossover value, AUC and k') and time and risk preferences. The relevant statistical tests were estimated to test for normality in the distribution of all three social discounting outcomes, crossover; k' and AUC. All three measures of altruism, crossover value, AUC and k' failed the test for normality, AUC (0.960, $p < 0.001$); k' (0.222, $p < 0.001$); crossover

value (0.984, $p < 0.001$), confirming the non-normality of the data. As a result, quantile regression models were also employed, since this type of analysis makes no assumptions on the distribution of dependent variables. Both ordinary least squares (OLS) regression models and quantile regressions were estimated to determine the relationship between these outcomes and the two independent variables of primary interest, namely risk and time preferences. In order to control for any non-linearity in the associations of risk attitudes and time preferences with the dependent variables, the square of risky and delayed choices are also entered into the regression model. The OLS regression models for crossover value were run with social distance as control and then separately for the three social distance categories, namely (i) *close* – distances #1; #2; and #5; (ii) *intermediate* – distances #10 and #20; and (iii) *distant* – distances #50 and #100.

A summary of the different regression models is given below:

- (i) Testing the impact of risk preferences on giving and social discounting:

Regression: *Random Effects and Quantile Regression Models*

Dependent variable: Crossover value

Independent variables: risk aversion/risky choices; square of risky choices; social distance; subject-type; switching; task order; risk stakes; risk task; subject characteristics; recipient characteristics

Dependant variable: AUC/ k -value

Independent variables: risk aversion/risky choices; square of risky choices social distance; subject type; switching; task order; risk stakes; risk task

- (ii) Testing the impact of time preferences on giving and social discounting:

Regression: *Random Effects and Quantile Regression Models*

Dependent variable: Crossover value

Independent variables: present-oriented/delayed choices; square of delayed choices; social distance; subject-type; switching; task order; time task; subject characteristics; recipient characteristics

Regression: *Random Effects Regression Model*

Dependent variable: AUC/ k -value

Independent variables: present-oriented/delayed choices; square of delayed choices; social distance; subject-type; switching; task order; time task

- (iii) Testing the impact of risk and time preferences combined on giving and social discounting:

Regression: *Random Effects and Quantile Regression Models*

Dependent variable: Crossover value

Independent variables: risk aversion and present-oriented/ risky choices and delayed choices; square of risky choices; square of delayed choices; social distance; subject type; switching; task order; subject characteristics; recipient characteristics

Regression: *Random Effects and Quantile Regression Model*

Dependent variable: AUC/ *k*-value

Independent variables: risk aversion and present-oriented/risky choices and delayed choices; square of risky choices; square of delayed choices; social distance; subject type; switching; task order

Subject characteristics include age, gender, household poverty rank and previous experimental experience; and recipient characteristics include relationship status, solidarity, and financial status.

5. Results

The results of the study are presented in this section.

5.1 Descriptive analysis

Table 1: Subjects' characteristics

Age (years):	
Mean	25.93
Median (IQR)	24 (21-27)
Female (%)	63.64
Race (%):	
African	82.53
Coloured	3.01
Asian/Indian	1.20
White	13.25
Total	100.00
Language (%):	
Sesotho	52.73
Afrikaans	12.73
Setswana	9.09
isiXhosa	6.06
English	6.67
isiZulu	5.45
Other	7.27
Total	100.00
Faculty (%):	
Economics & Management	92.17
Natural & Agricultural	6.02
Other	1.80
Total	100.00
Household poverty rank (%):	
1	5.45
2	7.88
3	52.12
4	28.48
5	4.24
6	1.82
Total	100.00
Financial situation:	
Very broke	15.66
Broke	33.73
Neither	29.52
In good shape	18.67
In very good shape	2.41
Total	100.00
Previous experimental experience (%)	29.52
Group (%)	
Student	79.17
Staff	20.83
Total	100.00
Sample (n)	168

In Table 1, the characteristics of the subjects are reported for the entire sample. The average age of the subject group is 25.93 years of age, with the majority of the subjects being African (82.53%), Sesotho speaking (52.73%), females (63.64%) who are studying within the Faculty of Economic and Management Sciences (92.17%). Only around 30% of subjects indicated that they were not broke, and approximately 6% placed themselves on the top two ranks of the household poverty scale. A total of 49 subjects (29.52%) of the sample group indicated that they had previously participated in a similar experiment.

Table 2: Crossover value (Rand), by social distance

Social distance	Mean	Median
1	133.63	150
2	126.01	130
5	115.05	110
10	97.85	90
20	86.19	90
50	77.48	70
100	63.86	50
Total	100.03	90
F-statistic (<i>p</i> -value)	43.65 (<0.001)***	
Sample (n)	1,175	1,175

Note: Statistical significance: 1% ***, 5% **, 10% *

Table 3: Giving and social discounting

	Crossover value (Rand)	AUC	<i>k'</i>
Mean	100.03	0.417	0.489
Median (IQR)	90 (50-150)	0.365 (0.233-0.618)	0.087 (0.015-0.263)
Sample (n)	1,175	168	168

Note: At task-level the analysis is done for crossover value and at subject-level for the aggregate measures of social discounting (AUC and *k'*).

Tables 2 and 3 report the social discounting measures for the sample. The mean crossover value is R100.03 and the aggregate measures of altruism are given as AUC= 0.417 and *k'* = 0.489. Both the mean and median crossover values per social distance, as reported in Table 3, decline as social distance increases, with the most substantial decline in average giving occurring at social distance #10.

Figure 2 illustrates the level of risk aversion in each risk task table and is constructed using the same approach followed by Holt and Laury (2002). The level of risk aversion is determined by taking into account the number of safe choices (Option A) per decision/row in each of the risk tables. The level of risk aversion (number of safe choices) is the highest amongst rows 1-4 and, as expected, declines substantially after row 5 for all four of the risk tables.

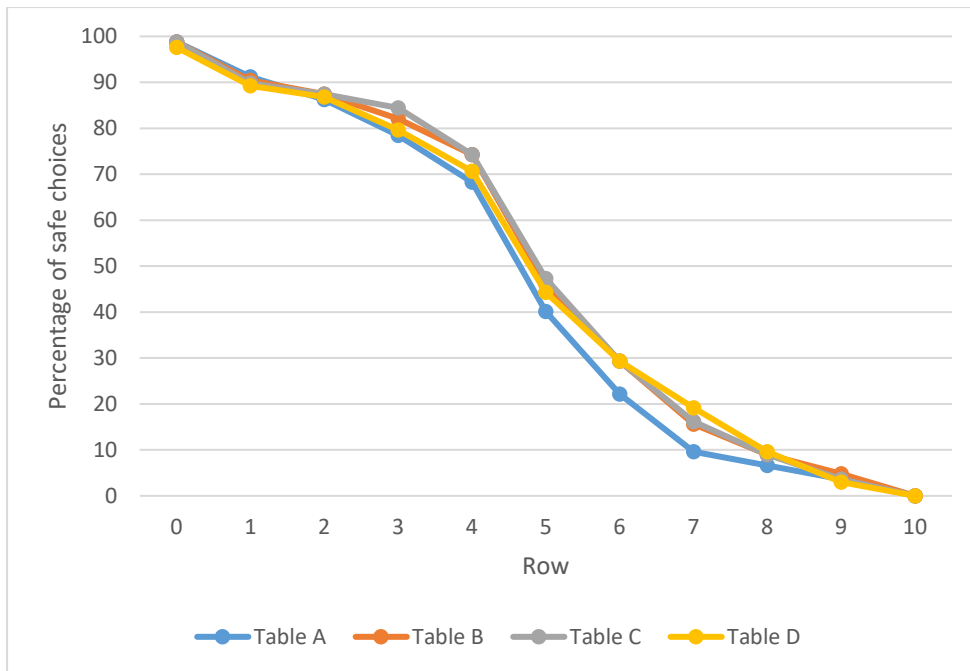


Figure 3: Safe choices per row and per risk table (%)

Table 4: Risk and time preferences at task and subject level

Risk preferences	Task level	Subject level
Risk averse – yes (%)	75.90	56.89
Risky choices – mean	4.90	18.09
Risky choices – median (IQR)	5 (4-6)	21 (16-24)
Sample (n)	1,169	167
Time preferences	Task level	Subject level
Present-oriented – yes (%)	36.31	20.24
Delay choices – mean	3.26	13.05
Delay choices – median (IQR)	3 (0-6)	14 (3-21)
Sample (n)	1,176	168

Note: At subject-level the outcome represents the total calculated across each of the four risk and time preference tasks.

In terms of the risk and time preference profiles of the subjects, 56.89% are risk averse and 20.24% are present-oriented (impatient) – Table 4. At task level, subjects made an average of 4.90 risky choices and 3.26 delayed choices.

5.2 Bivariate analysis

Table 5: Giving and social discounting, by risk aversion

	Crossover value	AUC	k'
Table E			
Risk averse (yes)	99.45	0.407	0.471
Risk averse (no)	100.50	0.443	0.574
Total	99.66	0.414	0.492
<i>p</i> -value	0.795	0.447	0.791
Sample(n)	1,168	167	167
Table F			
Risk averse (yes)	100.01	0.411	0.562
Risk averse (no)	98.60	0.423	0.278
Total	99.66	0.414	0.492
<i>p</i> -value	0.711	0.800	0.431
Sample (n)	1,168	167	167
Table G			
Risk averse (yes)	101.38**	0.421	0.574
Risk averse (no)	94.39	0.393	0.240
Total	99.66	0.414	0.492
<i>p</i> -value	0.065	0.526	0.353
Sample (n)	1,168	167	167
Table H			
Risk averse (yes)	98.68	0.402	0.590
Risk averse (no)	102.31	0.447	0.226
Total	99.66	0.414	0.492
<i>p</i> -value	0.325	0.306	0.296
Sample (n)	1,168	167	167
Total			
Risk averse (yes)	99.88	0.410	0.548
Risk averse (no)	98.97	0.426	0.316
Risk averse (total)	99.66	0.414	0.492
<i>p</i> -value	0.631	0.484	0.198
Sample (n)	4,672	668	668
Aggregate			
Risk averse (yes)	98.97	0.399	0.576
Risk averse (no)	100.57	0.434	0.382
Risk averse (total)	99.66	0.414	0.492
<i>p</i> -value	0.314	0.181	0.268
Sample(n)	1,168	167	167

Note: At task-level the analysis is done for crossover value and at subject-level for the aggregate measures of social discounting (AUC and k'). The “aggregate” analysis is done for risk and time preferences data aggregated across the tables and the “total” analysis is done for data pooled across the individual tables. Statistical significance: 1%***, 5%** , 10%*

The level of giving and social discounting of the risk averse versus the not risk averse as reported in Table 5 shows no statistically significant results for all three measures of altruism. In Table 6, risky choices, as a measure of risk appetite is correlated with the crossover value and the two measures of social discounting. There is a negative correlation between the risk

appetite of subjects for all three of the afore-mentioned measures in all four of the individual tasks (tables) and at the total and aggregate outcomes. This result is significant for two of the three measures namely crossover value and AUC for risk Table G and for the overall, total and aggregate outcomes. This implies that giving and social discounting decline with the number of risky choices taken (risk appetite) of the subjects.

Table 6: Correlation between giving, social discounting and risky choices

	Crossover value	AUC	k'
Table E			
Pearson's r	-0.044	-0.104	-0.085
<i>p</i> -value	0.125	0.178	0.275
Sample (n)	1,168	167	167
Table F			
Pearson's r	0.042	-0.104	-0.039
<i>p</i> -value	0.147	0.180	0.616
Sample (n)	1,168	167	167
Table G			
Pearson's r	-0.142***	-0.199***	-0.047
<i>p</i> -value	<0.001	0.009	0.542
Sample (n)	1,168	167	167
Table H			
Pearson's r	-0.025	-0.068	-0.081
<i>p</i> -value	0.392	0.376	0.293
Sample (n)	1,168	167	167
Total			
Pearson's r	-0.064***	-0.119***	-0.063
<i>p</i> -value	<0.001	0.001	0.102
Sample (n)	4,672	668	668
Aggregate			
Pearson's r	-0.07***	-0.142*	-0.075
<i>p</i> -value	0.008	0.065	0.332
Sample (n)	1,168	167	167

Note: At task-level the analysis is done for crossover value and at subject-level for the aggregate measures of social discounting (AUC and k'). The "aggregate" analysis is done for risk and time preferences data aggregated across the tables and the "total" analysis is done for data pooled across the individual tables. Statistical significance: 1%***, 5%** , 10%*

In Table 7, the levels of giving and the social discounting measures of the present-oriented (impatient) subjects are compared to those who are not (i.e. the patient). The results for the three measures are mixed. For crossover value, the only statistically significant result appears in time preference table D, indicating that present-oriented subjects are less giving than their counterparts in this task. With respect to AUC, present-oriented (impatient) subjects are less altruistic at the 10% significance level, but in time preference table A only. However, present-oriented (impatient) subjects displayed higher AUCs in time preference table B and for the

total and aggregate result, with the two latter results statistically significant at 5%, implying that the impatient subjects were more altruistic at these outcomes. For the social discounting rate k' , the result is weakly significant for the total outcome, with impatient subjects proving to be more altruistic ($k' = 0.321$) than their counterparts ($k' = 0.585$).

Table 7: Giving and social discounting, by impatience

	Crossover value	AUC	k'
Table A			
Present-oriented (yes)	102.41	0.382*	0.262
Present-oriented (no)	98.67	0.463	0.619
Total	100.03	0.417	0.489
<i>p</i> -value	0.273	0.078	0.265
Sample(n)	1,175	168	168
Table B			
Present-oriented (yes)	103.30	0.468*	0.282
Present-oriented (no)	98.60	0.395	0.580
Total	100.03	0.417	0.489
<i>p</i> -value	0.187	0.084	0.375
Sample(n)	1,175	168	168
Table C			
Present-oriented (yes)	101.18	0.444	0.279
Present-oriented (no)	99.41	0.403	0.603
Total	100.03	0.417	0.489
<i>p</i> -value	0.604	0.937	0.315
Sample(n)	1,175	168	168
Table D			
Present-oriented (yes)	95.96**	0.416	0.430
Present-oriented (no)	103.15	0.419	0.535
Total	100.03	0.417	0.489
<i>p</i> -value	0.029	0.937	0.736
Sample(n)	1,175	168	168
Total			
Present-oriented (yes)	100.37	0.445**	0.321*
Present-oriented (no)	99.83	0.402	0.585
Total	100.03	0.417	0.489
<i>p</i> -value	0.753	0.029	0.096
Sample (n)	4700	672	672
Aggregate			
Present-oriented (yes)	102.10	0.497**	0.333
Present-oriented (no)	99.50	0.397	0.529
Total	100.03	0.417	0.489
<i>p</i> -value	0.262	0.019	0.304
Sample(n)	1,175	168	168

Note: The analysis was done for the full sample at task-level (crossover value) and at subject-level for the aggregate measures of social discounting (AUC and k'). The “aggregate” analysis is done for risk and time preferences data aggregated across the tables and the “total” analysis is done for data pooled across the individual tables. Statistical significance: 1%***, 5%***, 10%*

Table 8: Correlation between giving and social discounting and number of delay choices

	Crossover value	AUC	k'
Table A			
Pearson's r	-0.044	-0.138*	0.099
<i>p</i> -value	0.125	0.074	0.201
Sample (n)	1,168	168	168
Table B			
Pearson's r	0.042	-0.082	0.092
<i>p</i> -value	0.147	0.287	0.234
Sample (n)	1,168	168	168
Table C			
Pearson's r	-0.142***	-0.088	0.049
<i>p</i> -value	<0.001	0.254	0.525
Sample (n)	1,168	168	168
Table D			
Pearson's r	-0.025	-0.003	0.021
<i>p</i> -value	0.392	0.959	0.784
Sample (n)	1,168	168	168
Total			
Pearson's r	-0.06***	-0.077**	0.064*
<i>p</i> -value	<0.001	0.045	0.095
Sample (n)	4,672	672	672
Aggregate			
Pearson's r	0.019	-0.095*	0.079
<i>p</i> -value	0.503	0.218	0.304
Sample (n)	1,175	168	168

Note: The analysis was done for the full sample at task-level (crossover value) and at subject-level for the aggregate measures of social discounting (AUC and k'). The “aggregate” analysis is done for risk and time preferences data aggregated across the tables and the “total” analysis is done for data pooled across the individual tables. Statistical significance: 1%***, 5%***, 10%*

In Table 8, the number of delayed choices is correlated with the crossover value and the two aggregate measures of social discounting. For the total outcome, the results are consistent for all three measures of social discounting. For crossover there is a significant negative correlation between the number of delayed choices and crossover value in time preference table C and for the total outcome. The result for the total sample is also the only robust result in Table 8, with all three measures reflecting significant associations with the degree of patience. For AUC the negative correlation is weakly significant for time preference table A and for the aggregate results, and slightly more significant at the total outcome. This implies that crossover value (giving) and altruism (AUC) decline as the number of delayed choices increases. For the social discounting rate k' , there is a weakly significant positive correlation between the number of

delayed choices and k' , which means that altruism declines as the number of delayed choices increases.

Table 9 reports the crossover value across the seven social distances for the patient and risk-averse subjects, compared to those who are not. In all of these categories – risk averse: yes or no; and impatient: yes or no; the crossover value declines as social distance increases. For social distances #1 and #2, impatient subjects appeared less giving than their patient counterparts, while at social distances #50 and #100, the impatient subjects were more giving than the patient subjects. This implies that patient subjects were more altruistic at closer social distances than the impatient subjects who were more altruistic at greater social distances. Risk-averse subjects are more giving at social distances #5 and #10 than their risk-loving subjects.

Table 10 reports that there is a negative and statistically significant correlation between crossover values and the number of risky choices for all individual social distances from #5 up to and including #100, while the correlation for distance #2 is positive and statistically significant at 10%. The negative coefficient for five of the seven social distances and the total result implies that giving declines as the number of risky choices and social distance increase. Furthermore the positive coefficients for the number of delayed choices at four of the seven social distances (of which three are statistically significant) imply that there is a positive relationship between giving and the number of delayed choices at the early social distances (#1; #2 and #5). This means that patient subjects are more giving, but only at the closer social distances.

Table 9: Giving and risk aversion and impatience, by social distance

Social distance	A. Risk aversion					B. Impatience				
	Yes	No	Total	<i>p</i> -value	Sample (n)	Yes	No	Total	<i>p</i> -value	Sample (n)
1	133.35	133.10	133.29	0.953	668	126.06***	137.94	133.63	0.001	672
2	124.73	128.44	125.62	0.411	668	119.67**	129.62	126.01	0.013	672
5	116.60*	108.32	114.61	0.051	668	113.27	116.07	115.05	0.461	672
10	99.27*	91.11	97.30	0.072	668	101.84	95.58	97.85	0.122	672
20	85.99	88.69	86.64	0.555	668	89.46	84.32	86.19	0.207	672
50	75.52	81.30	76.92	0.230	668	83.47**	74.08	77.48	0.029	668
100	63.53	61.80	63.11	0.729	668	68.68*	61.12	63.86	0.091	672
Total	99.88	98.97	99.66	0.631	4,672	100.37	99.83	100.03	0.753	4,700

Note: Statistical significance ***1%; **5%; *10%

Table 10: Correlation between giving and number of risky and delay choices, by social distance

Social distance	A. Number of risky choices			B. Number of delay choices		
	Pearson's r	<i>p</i> -value	Sample (n)	Pearson's r	<i>p</i> -value	Sample (n)
1	0.018	0.635	668	0.142***	<0.001	672
2	0.068*	0.070	668	0.077**	0.046	672
5	-0.067*	0.080	668	0.079**	0.039	672
10	-0.1385***	<0.001	668	0.010	0.788	672
20	-0.123***	0.001	668	-0.030	0.432	672
50	-0.107***	0.005	668	-0.062	0.108	668
100	-0.128***	<0.001	668	-0.067	0.082	672
Total	-0.064***	<0.001	4,672	0.015	0.279	4,700

Note: Statistical significance ***1%; **5%; *10%

5.3 Regression analysis

In Table 11, the dependent variable, crossover value was regressed separately against four independent variables, namely (1) *risk aversion*; (2) *number of risky choices*; (3) *present-oriented*; and (4) *number of delay choices*. In terms of risk preferences (model A), there is a positive and highly significant association between the level of risk aversion and crossover values for the overall result and for the “*intermediate*” social distance category. This result is the same for the “*distant*” social distance category, although weak in terms of statistical significance. This implies that risk-averse subjects are more giving overall and at the “*intermediate*” and “*distant*” social distance categories, i.e. to recipients to whom they do not feel very close. Risk appetite, i.e. number of risky choices in Model B, also has a slightly significant and positive association with giving for overall and for close social distances, implying that subjects with a greater risk appetite are more giving overall and specifically to recipients to whom they are socially close. For time preferences in model A, present-oriented (impatient) subjects displayed the same results as risk-averse subjects overall and for the same social distance categories as above with a stronger statistical significance in the “*distant*” social distance category. In other words impatient subjects were more giving overall and to recipients to whom they did not feel close, i.e. in the “*intermediate*” and “*distant*” social distance categories. The number of delayed choices in Model B of the time preferences panel is highly significant for the overall result and for two of the three social distance categories (intermediate and distant), while the close social distance category shows a weak statistical significance. The negative association with giving implies that giving declines as the number of delayed choices increases, overall and for recipients in the intermediate and distant categories. Both the square of risky choices and the square of delayed choices have opposite signs to those of risky choices and delayed choices, respectively, which implies non-linearity in the associations of altruism with degrees of patience and degrees of risk tolerance. For the square of risky choices the results show a negative, statistically more significant result for the total sample and for the close social distance category, implying that when the risk appetite of subjects gets very high then giving in fact declines. The level of significance for square of delay choices is relatively the same for all the categories as compared to delayed choices, and the nature of the association is in the opposite direction, implying that subjects with very high levels of patience are more generous.

For risk preferences in Table 12, risk aversion matters for those who are less altruistic, i.e. quantile 0.25 and most altruistic, i.e. at quantile 0.75, whereas the number of risky choices only

matter for those who are less altruistic, i.e. at quantile 0.25. There is a positive and statistically significant association between risk aversion and crossover values for $q = 0.25$, which means that amongst the less altruistic subjects ($q = 0.25$) those who were risk averse were willing to forego larger amounts than non-risk-averse subjects, and also for $q=0.75$, implying that for the more altruistic subjects the risk-averse individuals were also more giving than the non-risk averse. Furthermore, for subjects who were less altruistic, the number of risky choices positively affected their level of giving. With respect to time preferences, the quantile regression results in Table 13 further show that impatience matters slightly for subjects who are moderately and most altruistic, and the number of delayed choices are also highly significant for these two quantiles. There is a positive, albeit weakly significant association with impatience and crossover values for the moderate and highly altruistic subjects, which shows that moderate and mostly altruistic impatient subjects are willing to forego more than their patient counterparts. With respect to the number of delayed choices, there is a negative and strong, statistically significant association with the number of delayed choices on the levels of giving for the moderate and most altruistic subjects. This implies that giving declines with the number of delayed choices for the moderate and most altruistic subjects. Once again, the square of risky choices and delayed choices display opposite, yet, also significant, associations with giving in the quantile regression analysis, implying that giving declines when risk appetite is very high and increases when level of patience is very high.

Table 11: Risk and time preferences and giving by social distance - OLS regression analysis

	Total	Close	Intermediate	Distant
Panel 1: Risk Preferences				
Model A: Risk aversion				
Risk averse (yes)	5.483 (1.724)***	0.001 (2.582)	10.226 (2.960)***	6.420 (3.353)*
R ²	0.365	0.204	0.326	0.411
F-statistic (<i>p</i> -value)	94.54 (<0.001)	24.97 (<0.001)	37.49 (<0.001)	47.25 (<0.001)
Sample (n)	4,224	1,880	1,212	1,132
Model B: Risky choices				
Risky choices	2.833 (1.193)*	4.057 (1.707)*	0.074 (2.107)	-0.849 (2.132)
Risky choices ²	-0.299 (0.112)***	-0.343 (0.159)**	-0.151 (0.196)	0.059 (0.203)
R ²	0.365	0.207	0.324	0.409
F-statistic (<i>p</i> -value)	92.24 (<0.001)	24.01 (<0.001)	36.22 (<0.001)	44.98 (<0.001)
Sample (n)	4,224	1,880	1,212	1,132
Panel 2: Time Preferences				
Model A: Impatience				
Present-oriented (yes)	3.319 (1.559)**	-1.891 (2.274)	11.656 (2.873)***	7.380 (2.813)***
R ²	0.366	0.209	0.326	0.423
F-statistic (<i>p</i> -value)	99.03 (<0.001)	26.61 (<0.001)	41.01 (<0.001)	41.28 (<0.001)
Sample (n)	4,252	1,892	1,220	1,140
Model A: Delay choices				
Delayed choices	-4.219 (0.737)***	-1.832 (1.077)*	-8.184 (1.372)***	-4.659 (1.312)***
Delayed choices ²	0.485 (0.089)***	0.216 (0.128)*	0.898 (0.171)***	0.497 (0.157)
R ²	0.371	0.210	0.339	0.425
F-statistic (<i>p</i> -value)	97.95 (<0.001)	25.95 (<0.001)	39.55 (<0.001)	51.86 (<0.001)
Sample (n)	4,252	1,892	1,220	1,140

Note: ‘Close’: social distances 1,2& 5; ‘Intermediate’: social distances 10&20; Distant: social distances 50&100. Adjusted for social distance, age, gender, race; household poverty, previous participation; switching; task order and solidarity. Robust standard errors in parentheses. Statistical significance ***1%; **5%; *10%

Table 12: Risk and time preferences and giving – Quantile regression analysis

	q =0.25	q =0.50	q =0.75
Panel 1: Risk Preferences			
Model A: Risk aversion			
Risk averse	5.782 (2.420)**	14.207 (2.477)	12.094 (2.460)***
Pseudo R ²	0.223	0.213	0.194
Sample (n)	4,224	4,224	4,224
Model B: Risky choices			
Risky choices	5.827 (1.791)***	1.317 (1.515)	2.610 (1.790)
Risky choices ²	-0.531 (0.140)***	-0.327 (0.144)**	-0.425 (0.173)**
Pseudo R ²	0.224	0.212	0.191
Sample (n)	4,224	4,224	4,224
Panel 2: Time Preferences			
Model A: Impatience			
Present-oriented	-4.60 (2.063)	4.226 (2.425)*	3.740 (2.233)*
Pseudo R ²	0.221	0.211	0.189
Sample (n)	4,252	4,252	4,252
Model B: Delay choices			
Delayed choices	-1.476 (0.989)	-6.313 (1.075)***	-6.154 (0.980)***
Delayed choices ²	0.145 (0.121)	0.782 (0.131)***	0.821 (0.107)***
Pseudo R ²	0.222	0.217	0.199
Sample (n)	4,252	4,252	4,252

Note: Robust standard errors in parentheses. Statistical significance ***1%; **5%; *10%

In Table 13, the aggregated measures of risk and time preferences are regressed on the crossover values at all social distances, and for the three social distance categories – close, intermediate and distant. There is no statistically significant association between risk aversion and crossover values, not in total, nor for any specific social distance category. The number of delayed and risky choices, and the square of these choices are all significant overall and for delayed choices this result is also statistically significant at all three the individual social distance categories. The number of delayed choices is negatively correlated for the overall result and at each social distance category, while the square of delayed choices is positively correlated and statistically significant for the total outcome and at the intermediate and distant social distance categories. The number of risky choices is positively correlated with giving, and statistically significant for the total result and at the close social distance category, while the square of risky choices shows a negative correlation with giving which is statistically significant for the total result and the close and intermediate social distance categories. In other words, giving increases with risk tolerance and patience at close social distances, while it declines with patience at the intermediate and distant social distances. Furthermore, giving declines as the number of delayed choices increases in total and for all three social distances.

Table 13: Aggregated risk and time preferences and giving, by social distance – OLS regression analysis

	Total	Close	Intermediate	Distant
Panel 1: Risk aversion and present orientation				
Risk averse (yes)	2.217 (3.101)	-1.555 (4.763)	6.341 (5.346)	1.024 (5.908)
Present-oriented (yes)	2.048 (3.753)	-11.689 (5.627)**	15.090 (6.825)**	13.742 (7.281)*
R ²	0.368	0.219	0.334	0.419
F-statistic (<i>p</i> -value)	24.41 (<0.001)	6.75 (<0.001)	9.96 (<0.001)	12.30 (<0.001)
Sample (n)	1,056	470	303	283
Panel 2: Number of risky and delayed choices				
Delayed choices	-1.015 (0.416)**	-0.043 (0.634)**	-2.414 (0.754)***	-1.780 (0.801)**
Delayed choices ²	0.029 (0.013)**	0.000 (0.020)	0.067 (0.025)**	0.054 (0.024)**
Risky choices	2.852 (0.893)***	3.461 (1.361)**	2.291 (1.609)	0.561 (1.511)
Risky choices ²	-0.074 (0.021)***	-0.083 (0.034)**	-0.069 (0.038)*	-0.014 (0.037)
R ²	0.377	0.224	0.352	0.422
F-statistic (<i>p</i> -value)	24.15 (<0.001)	6.16 (<0.001)	9.51 (<0.001)	13.11 (<0.001)
Sample (n)	1,056	470	303	283

Note: ‘Total’ result includes the full sample. ‘Close’: social distances 1, 2 & 5; ‘Intermediate’: social distances 10 & 20; Distant: social distances 50 & 100. Adjusted for social distance, age, gender, race; household poverty, previous participation; switching; task order and solidarity. Robust standard errors in parentheses. Statistical significance ***1%; **5%; *10

Table 14: Aggregated risk and time preferences and giving – Quantile regression analysis

	q=0.25	q=0.50	q=0.75
Panel 1: Risk aversion and present orientation			
Risk averse (yes)	2.331 (4.374)	10.846 (4.937)**	11.742 (4.498)***
Present-oriented (yes)	-0.232 (5.959)	5.139 (6.042)	6.657 (5.608)
Pseudo R ²	0.233	0.218	0.199
Sample (n)	1,056	1,056	1,056
Panel 2: Number of risky and delayed choices			
Risky choices	3.068 (1.271)**	2.546 (1.237)**	3.370 (1.447)***
Risky choices ²	-0.078 (0.031)**	-0.083 (0.028)***	-0.105 (0.035)***
Delayed choices	-0.532 (1.271)	-1.719 (0.547)***	-1.429 (0.565)**
Delayed choices ²	0.011 (0.026)	0.054 (0.017)***	0.043 (0.016)***
Pseudo R ²	0.236	0.226	0.205
Sample	1,056	1,056	1,056

Note: Robust standard errors in parentheses. Statistical significance ***1%; **5%; *10%

Table 15: Risk and time preferences and social discounting – OLS regression analysis

	AUC	k'
Panel 1: Risk Preferences		
Model A: Risk aversion		
Risk averse (yes)	0.059 (0.077)	-0.335 (0.166)**
R ²	0.248	0.246
F-statistic (p-value)	12.39 (<0.001)	21.77 (<0.001)
Sample (n)	644	640
Model B: Risky choices		
Risky choices	0.095 (0.057)*	-0.251 (0.138)*
Risky choices ²	-0.010 (0.005)*	0.026 (0.012)**
R ²	0.253	0.248
F-statistic (p-value)	12.33 (<0.001)	22.46 (<0.001)
Sample (n)	644	640
Panel 2: Time Preferences		
Model A: Impatience		
Present-oriented (yes)	0.123 (0.061)**	-0.325 (0.162)
R ²	0.248	0.252
F-statistic (p-value)	12.83 (<0.001)	24.33 (<0.001)
Sample (n)	648	644
Model B: Delayed choices		
Delayed choices	-0.054 (0.029)*	0.180 (0.075)**
Delayed choices ²	0.003 (0.003)	-0.023 (0.009)**
R ²	0.251	0.260
F-statistic (p-value)	12.20 (<0.001)	27.39 (<0.001)
Sample (n)	648	644

Note: Statistical significance ***1%; **5%; *10%

In Table 14, the quantile regression results show that there is a positive and significant association between risk aversion and giving for subjects who are moderately and highly altruistic (q=0.50 and q=0.75). Furthermore, giving is positively associated with risky choices

for all three quantiles and significantly so, while giving is negatively associated with delayed choices for subjects who are moderately and most altruistic ($q = 0.25$ and $q = 0.75$). The square of risky choices is significant for three quantiles of altruism, while delayed choices are significant for the subjects who are moderately and highly altruistic. The nature of the association for both these variables is opposite to those of risky choices and delayed choices, implying that giving declines when risk appetite is very high and increases when level of patience is very high.

The OLS and quantile regression results for the aggregate measures of social discounting (AUC and k') are reported in Tables 15 and 16. In terms of risk preferences, risk aversion in Model A has a negative and significant association with the social discounting rate k' , meaning that k' declines with risk aversion. As for risk appetite (Model B), the number of risky choices has a significant (albeit weak) positive association with AUC and a negative association with k' . Both these results indicate that subjects with a higher risk appetite are also more altruistic. The square of risky choices has a negative and significant association with AUC, and a positive and significant association with k' , showing that altruism declines with very high levels of risk tolerance. Both measures of time preferences, i.e. present-oriented and number of delayed choices show significant associations with AUC, with impatience (Model A) having a positive association with AUC, and number of delayed choices (Model B) having a negative association with AUC and a positive and strongly significant association with k' , while the square of delayed choices has a negative and significant association with k' . This implies that altruism declines as the number of delayed choices increases, and increases when the level of patience is very high. In Table 16 the results tell a slightly different story for the quantile regression analysis with only risk aversion and number of delayed choices being relevant and significant at the median and higher levels of altruism for social discounting measure, AUC, and the two afore-mentioned variables, together with square of risky choices being significantly associated with social discount rate k' , but only at the moderate and high levels of altruism. There is a positive and significant association with risk aversion and altruism for subjects who are moderately ($q = 0.50$) and most altruistic ($q = 0.75$), and a negative and significant association between risk aversion and k' for the moderately altruistic subjects ($q = 0.50$). In terms of risk appetite, the number of risky choices in Model B, had a negative association with the social discounting rate, k' but only for the most altruistic subjects ($q = 0.75$), and a positive and significant association with square of risky choices, implying that altruism increased with risk appetite, but when the levels of risk appetite became very high, altruism in fact declined. Both

AUC and k' are significantly associated with the number of delayed choices at the median and higher levels of altruism, with the association being negative for AUC and delayed choices and positive for k' and delayed choices. Furthermore, the square of delayed choices reports a positive and significant association with AUC at the median and upper levels of altruism and a negative association with k' in the middle quartile of altruism. In other words, altruism declines with the level of patience, but increases at very high levels of patience. Overall, in terms of the two preference sets, risk aversion and the number of delayed choices have the most significant associations with the two measures of social discounting, with the former having a positive association and the latter a negative association with altruism.

In Table 17, risk appetite, i.e. the number of risky choices, has a positive and statistically significant association with AUC, while for the square of risky choices the coefficient is negative for AUC and statistically significant at the 5% significance level. For the social discounting rate, k' , there is a negative association with number of risky choices and a positive association with square of risky choices, both statistically significant at the 5% significance level. These associations imply that altruism increases with risk appetite, but declines when the level of risk appetite is very high. Furthermore, impatience is positively associated with AUC only, implying that altruism is higher for impatient subjects. There is therefore a non-linear relationship between both risky choices and delay choices and the squares of these variables, with the measures of altruism.

Table 16: Risk and time preferences and social discounting - Quantile regression analysis

	AUC			k'		
	q = 0.25	q=0.50	q=0.75	q = 0.25	q=0.50	q=0.75
Panel 1: Risk Preferences						
Model A: Risk aversion						
Risk averse (yes)	0.010 (0.023)	0.074 (0.037)**	0.097 (0.043)**	-0.010 (0.011)	-0.052 (0.017)***	-0.084 (0.059)
Pseudo R ²	0.149	0.154	0.223	0.015	0.023	0.034
Sample (n)	648	648	648	648	648	648
Model B: Risky choices						
Risky choices	2.95 (0.022)	-0.026 (0.075)	0.009 (0.017)	-0.005 (0.004)	-0.005 (0.019)	-0.083 (0.035)**
Risky choices ²	9.76 (0.001)	0.001 (0.002)	-0.001 (0.001)	0.000 (0.000)	0.001 (0.002)	0.010 (0.003)***
Pseudo R ²	0.148	0.157	0.219	0.015	0.023	0.039
Sample (n)	648	648	648	648	648	648
Panel 2: Time Preferences						
Model A: Patience						
Present-oriented (yes)	0.016 (0.021)	0.018 (0.335)	0.017 (0.032)	-0.003 (0.006)	-0.003 (0.015)	0.038 (0.051)
Pseudo R ²	0.142	0.157	0.227	0.015	0.021	0.033
Sample (n)	652	652	652	652	652	652
Model B: Delayed choices						
Delayed choices	-0.000 (0.011)	-0.034 (0.013)**	-0.045 (0.016)***	0.007 (0.004)	0.015 (0.007)**	-0.003 (0.018)
Delay choices ²	-0.000 (0.001)	0.004 (0.001)***	0.004 (0.001)**	-0.000 (0.000)	-0.002 (0.000)***	0.000 (0.002)
Pseudo R ²	0.143	0.165	0.234	0.016	0.022	0.032
Sample (n)	652	652	652	652	652	652

Note: Statistical significance ***1%; **5%; *10%. Standard errors are reported in parentheses.

Table 17: Aggregated risk and time preferences and social discounting

	AUC	k'
Panel 1: Risk aversion and future orientation		
Risk averse (yes)	-0.008 (0.130)	-0.225 (0.324)
Present-oriented (yes)	0.234 (0.140)*	-0.095 (0.476)
R ²	0.256	0.251
F-statistic (p -value)	3.19 (<0.001)	6.06 (<0.001)
Sample (n)	161	160
Panel 2: Number of risky and delayed choices		
Risky choices	0.093 (0.049)*	-0.204 (0.095)**
Risky choices ²	-0.002 (0.001)**	0.005 (0.002)**
Delayed choices	-0.018 (0.017)	0.031 (0.050)
Delayed choices ²	0.000 (0.000)	-0.001 (0.001)
R ²	0.290	0.279
F-statistic (p -value)	3.33 (<0.001)	7.64 (<0.001)
Sample (n)	161	160

Note: Statistical significance ***1%; **5%; *10%

6. Discussion

In the current paper, the relationship between altruism, as measured by giving and social discounting, and risk and time preferences amongst subjects from a South African university is investigated, the first of its kind in a South African context. Previous research by, amongst others, Jones and Rachlin (2009), Bialaszeck *et al.* (2019), Bickel *et al.* (2014) looked at eliciting risk and time preferences separately within a social discounting framework and further investigating correlations between risk and time preferences and social discounting. A different approach followed by researchers such as Osiński and Karbowski (2017), Yi *et al.* (2011) and Jin *et al.* (2017) involved the incorporation of temporal delays and/or risky prospects into the social discounting task to determine the associations between these preferences with the choices made in the SDT. One research study outside the social discounting literature is that of Angerer *et al.* (2015) who investigated altruism amongst school children and its relation to risk attitudes and intertemporal choices. All of the afore-mentioned studies found significant correlations between social discounting and delay and probability discounting, with evidence showing that subjects with a higher risk appetite and who were more patient were also more altruistic.

This paper follows the approach of Jones and Rachlin (2009), Bialaszeck *et al.* (2019), and Bickel *et al.* (2014) by eliciting time and risk preferences separately and in conjunction with social discounting in order to investigate the association between the three forms of discounting. The study finds that risk and time preferences are correlated with giving and social discounting, with some evidence supporting the previous theoretical arguments and existing

empirical research evidence. *Firstly*, giving to those closest to you increases with risk appetite, whereas the rate of social discounting declines with risk appetite. Risk has some effect on distance-dependent levels of giving, with risk-loving subjects giving less at intermediate and distant social distances, but more at the close social distances. As for risk appetite, the number of risky choices has a significant (albeit weak) positive association with AUC and a negative association with k' , indicating that subjects with a higher risk appetite are also more altruistic. All three measures of altruism show significant associations with risk appetite, i.e. number of risky choices. *Secondly*, patient subjects give more to those closest to them compared to impatient subjects. There is also some evidence that altruism is higher among the most future-oriented subjects. In terms of distance-dependent giving, for social distances #1 and #2, impatient subjects appeared less giving than their patient counterparts, while at social distances #50 and #100, the impatient subjects were more giving than the patient subjects. Furthermore, there is a positive relationship between giving and the number of delayed choices at the early social distances (#1; #2 and #5). These two key findings support the theoretical priors and previous empirical evidence on the correlation between social discounting and time and risk preferences.

Some of the evidence, however, contradicts the theoretical priors. Risk-averse subjects and impatient subjects give more to those who are socially more distant. Furthermore, altruism declines with risk appetite at very high levels of risk appetite, while altruism declines with patience at lower levels of patience.

In all of the relevant models, both the square of risky choices and the square of delayed choices have opposite signs to those of risky choices and delayed choices, respectively, which implies non-linearity in the associations of altruism with degrees of patience and degrees of risk tolerance. This is similar to the findings of Angerer *et al.* (2015) of a non-linear relationship between risk attitudes and time preferences and altruism. Angerer *et al.* (2015) state that “Up to an intermediate level of risk tolerance and patience, donations increase, as expected. Yet, at the upper tail of risk tolerance and patience, donations decrease again.” The study found higher levels of altruism for subjects with a high levels of risk appetite and patience, but found that altruism declined when levels of risk appetite and patience became very high. Hence, based on the evidence from the study, the associations between altruism and risk attitudes and time preferences are complex and non-linear by nature.

The study has a number of limitations. The number of multiple switches in the study is quite high, which brings into question the validity of the measures used in the study. Future research across countries and cultural spectrums, such as the study by Tiokhin *et al.* (2019), may assist in validating the measures used in the discounting tasks. Given the cross-sectional nature of the data, the study cannot make claims about causality between social discounting, risk and time preferences, and therefore the inclusion of a post-experimental qualitative questionnaire to elicit motives for social and other discounting in future may assist in explaining the findings of the study. *Secondly*, choices are not consistent across the individual MPLs used in the risk and time preference tasks, which may reflect some learning between tasks or a lack of understanding on the part of subjects. *Thirdly*, the separate elicitation of preferences and the correlational design of the study precludes a detailed exposition of the mechanisms behind the associations between the different preference sets. Future research should consider further replication and expansion of the methodological approaches followed by Osiński and Karbowski (2017), Yi *et al.* (2011) and Jin *et al.* (2017), or possibly the introduction of both delay and risky prospects for each SDT, or alternatively the joint elicitation of risk and time preferences alongside the SDT, with an additional delay on lotteries in the probability task. *Fourthly*, the relatively simplistic measures of risk appetite and time preferences used in the study may not be theoretically sound and as such future research employing an alternative approach for the measurement of risk attitudes such as using rates of relative risk aversion (CRRA) may be considered. The current study did not make use of the CRRA measure, due to (i) the high rate of multiple switches and inconsistent preferences reported in the study, which makes it difficult to calculate the CRRA, since it is measured at the point of switching; and (ii) the fact that the CRRA cannot be aggregated across the four risk tasks to assess the robustness of the results. In addition, the relatively small sample sizes for social discounting measures (AUC and k') make it difficult to detect robust results. Finally, although participants are all from the same university in one country, it is a purposive sample, but it makes it difficult to generalise on the altruistic behaviour and the impact of time and risk preferences on altruism. The field subjects in this study, for example, represent a select group of employed people, which may be very distinct from unemployed community members in respect of their preferences. Further research of this nature therefore needs to include diverse samples of field subjects to assess the extent to which results in the lab may travel to the field.

7. Conclusion

This research paper examines the associations between risk and time preferences and giving and social discounting amongst subjects at a South African university. The analysis reveals that all three measures of altruism, i.e. crossover value, AUC and k' are consistently associated with number of risky choices, illustrating that subjects with a greater risk appetite give more, particularly at close social distances, and their social discounting is also lower. Risk-loving subjects give less at intermediate and distant social distances, because the prospect of reciprocity is lower for individuals at these distances. Secondly, patience is only positively correlated with crossover at close social distances, implying that patient subjects are more generous to people to whom they feel close. The evidence further shows a non-linear relationship between risk appetite and time preferences, with altruism initially increasing with risk appetite and patience and then declining at very high levels of risk tolerance and patience.

CHAPTER 4: PAPER 3

Playing the ultimatum game and trust game alongside the social discounting task: Evidence on social preferences

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Abstract

The study conducts an economics experiment by employing a social discounting task (SDT) together with an Ultimatum Game (UG) and Trust Game (TG) amongst staff and student subjects at the University of the Free State in South Africa. The purpose of the study is to investigate associations between altruism as measured by giving and social discounting in the SDT, with social subject-types uniquely identified here based on the strategy method responses of subjects in the UG and TG. The study finds altruism to be associated with egalitarianism, reciprocity and to a lesser extent with trust. In turn, altruism is also associated with trustworthiness. Furthermore, evidence is also found that social distance matters for subjects with these preferences, since they behave more altruistically towards recipients at close social distances.

1. Introduction

The use of the Social Discounting Task (SDT) to measure altruism has been well documented and the existing empirical literature on the SDT and social discounting is extensive (Booyesen *et al.*, 2018; Boyer *et al.*, 2012; Jones & Rachlin, 2006 & 2009; Ma *et al.*, 2015; Margittai *et al.*, 2015; Osiński, 2009; Rachlin & Jones, 2008; Sharp *et al.*, 2012; Strombach *et al.*, 2014 & 2015; Romanowich & Igaki, 2017; Yi *et al.*, 2016; Ziegler & Tunney, 2012). In order to explore the association between altruism and other social preferences, the SDT has been employed in tandem with other experimental tasks, notably the Public Goods Game (PGG) (Jones & Rachlin, 2009) and the Prisoner's Dilemma (PD) (Locey *et al.*, 2013; Green *et al.*, 2011). Jones and Rachlin (2009) investigated the association between social discounting and cooperation in a PGG with 103 business school students from Stony Brook University and found strong positive correlations between cooperation and social discounting. The study found that participants with shallower social discount functions (higher AUC) tended to contribute more to the PGG than participants with steeper social discount functions did.

Green *et al.*, (2011) employed an SDT, together with a one-shot Prisoner's Dilemma Game with 519 US students and 530 Japanese students to determine if the discount rates correlate with cooperation in a social dilemma situation for both cultural groups. The results of the study showed that the higher the discount rate, i.e. the less altruistic the subjects were, the lower the tendency to choose the sharing option in the dilemma questionnaires. Hence, altruism and cooperation were positively correlated. Locey *et al.* (2013) investigated the association between social discounting and cooperation by employing a SDT and a Prisoner's Dilemma Game with 60 undergraduate students from Stony Brook University to explain altruistic behaviour in various versions of a Prisoner's Dilemma Game. The study also found strong positive correlations between altruism and cooperation, with altruism amongst subjects being higher when the number of people who would benefit from cooperation was greater.

Theoretical advances on social preferences have identified and formally defined a larger array of such preferences and these are widespread across individuals (Fehr & Schmidt, 2006; Van Lange *et al.*, 2013). According to Fehr *et al.* (2008) social types in a dictator game is a broad categorization of the subjects given their allocation behavior. The different social types include, inter alia, altruism, egalitarianism, (un)kindness, selfishness and spitefulness, and trust and trustworthiness, to name but a few (Espin *et al.*, 2016), Frohlich and Oppenheimer (1984) employed a number of experiments to check for three social types, namely (1) altruistic; (2)

egalitarian and (3) difference maximizing. An altruistic choice was found to be one where a participant chooses a payoff of \$7 for themselves and \$14 for someone else instead of \$8 for themselves and \$7 for someone else. Egalitarian preferences were identified where subjects strictly chose equal payoffs as opposed to higher payoffs for one self. Finally, difference maximizing was identified as subjects who chose a \$5 payoff for themselves and \$0 for someone else instead of \$8 for themselves and \$7 for someone else. Declerck *et al.* (2009) identified four social types based on the behavior of the respondent in their mini UG experiment. These types included (1) the “Rational” type of participants who accepted all non-zero offers as predicted by standard economic theory; (2) the “Threshold” type of participants who accepted all offers up to a point and rejected any offer less than the threshold; (3) the “Altruistic” type of participants who accepted all offers including zero and; (4) the “Other” type of participants who shows mainly “one acceptance area,” accepting all offers between some lower and some upper bound and rejecting all offers outside this “area” (Declerck *et al.*, 2009; Huck, 1999). Chaudhuri and Gangadharan (2007) made use of a Trust Game to identify, inter alia, self-interested individuals and those with motivations for behaving reciprocally. In their experiments self-interested social types were classified as subjects who played as receivers in the TG and who would return \$0 from what they received and those motivated by reciprocity were receivers who sent more when they received more. In the afore-mentioned studies, subjects’ behaviours are used to measure the existence and intensity of various preferences as well as the interactions between these preferences.

However, as far as it could be ascertained, to date no studies have employed the ultimatum game (UG) and trust game (TG) alongside the SDT with a view to investigating the extent to which giving and social discounting as measured with the SDT are associated with other types of social preferences. This study attempts to do that. The experiment setting allowed the same subjects to play the roles of both senders and recipients in each of the UG and TG. By combining the strategy method responses of subjects in the UG and TG, the paper defines a distinct framework of indicative social subject-types. The paper proceeds to investigate the association between these social subject-types and giving (measured by crossover values) and social discounting (measured by AUC and the social discounting rate, k').

2. Experiment

Participants:

The subjects were recruited over two periods: September 2017 and June 2018. A sample of 52 student and 32 staff subjects were recruited separately using flyers distributed among students and staff from the Faculty of Economic and Management Sciences at the University of the Free State in South Africa. The experiment consisting of the three experimental tasks was conducted during three sessions in the aforementioned periods.

Ethics:

Ethical clearance for the study was obtained from the Faculty of Economics and Management Sciences at the University of the Free State (UFS-HSD2016/1084). Participation was voluntary and written informed consent was obtained from all subjects.

Procedure:

The recruitment flyers were physically distributed amongst undergraduate students during an Economics lecture at the University of the Free State and by hand to staff working in the Faculty of Economic and Management Sciences. A total number of 100 recruitment flyers were distributed amongst the students and 60 for staff. Upon arrival at the experimental sessions, subjects were split into two separate groups. In each experimental session, the recruited subjects completed an Ultimatum Game (UG) and a Trust Game (TG) in addition to Rachlin and Jones' (2008b) standard Social Discounting Task (SDT). The subjects played two different roles in each of the two groups. In Group 1, subjects were assigned the role of recipient in the UG and sender in the TG, and in Group 2, subjects played the roles of UG sender and TG recipient. Subjects are thus given the opportunity to play the roles of both senders and receivers in the different experiments. This strengthens the one-shot nature of the experiment since each subject plays each role only once and there is thus no room for reputation building. The rationale for this type of design was also applied by Chaudhuri and Ganghadharan (2007) when they applied a Trust Game to measure trust and trustworthiness amongst subjects. Furthermore, by allowing subjects to play different roles, the responses from these roles are used to classify each subject into different social types. Hence the social types in this study refers to a broad categorization of subjects according to their responses in the UG and TG. The stakes in the UG and TG varied between R0, R50 and R100. The strategy method is applied where subjects are allowed to indicate whether they will accept or reject each possible allocation, which in turn

makes it possible for the experimenter to evaluate the subjects' choices at different allocations. Subjects were given two experimental packages, one for the TG combined with the SDT and a separate package for the UG. Each of the three (SDT, UG and TG) tasks were explained by having the experimenter reading a set of detailed instructions for each task (Annexures A & I). For participants in Group 1, i.e. UG recipients and TG senders, the following instructions were provided:

Trust Game: *This game is played by pairs of individuals. Each pair is made up of Player A and Player B. You have been assigned the role of **sender, player A**. You will be playing against a **recipient (player B)**. The researcher will give R100 to you and another R100 to the recipient, Player B. You then have the opportunity to give a portion of your R100 to Player B. Whatever amount you decide to give to Player B will be multiplied by three by the researcher before it is passed on to Player B. Player B then has the option of returning a portion of this multiplied amount to you. Then, the game is over.*

Ultimatum Game: *You have been assigned the role of “**recipient**”, **Player B**. You will be playing against a “**sender**” (**Player A**). The “**sender**” (**Player A**) has received an endowment of R100 and has to divide this money between him/her and yourself. Each of the potential choices open to **you** is presented in the table below. You, as the recipient, has to decide to “**accept**” or “**reject**” each of these potential allocations by circling “**accept**” or “**reject**” for each division. If you “**accept the sender’s decision**”, you will then receive the money according to his/her decision. If you “**reject the sender’s decision**”, both of you will receive no money.*

The following set of instructions was provided for subjects in Group 2, i.e. the UG senders and TG recipients:

Trust Game: *This game is played by pairs of individuals. Each pair is made up of Player A and Player B. You have been assigned the role of **recipient, player B**. You will be playing against a **sender (player A)**. The researcher will give R100 to you and another R100 to the sender, Player A. Player A has the opportunity to give a portion of their R100 to you, Player B. Whatever amount Player A decides to give to you will be multiplied by three by the researcher before it is passed on to you. You, Player B, then have the option of returning any portion of this multiplied amount to Player A. Then, the game is over.*

Ultimatum Game: You have been assigned the role of **sender, player A**. You will be playing against a **recipient (player B)**. You, as the sender, will receive a R100 endowment. You will decide how to divide this money between yourself and player B. If B “**accepts your decision**”, you will receive the money according to your decision. If B “**rejects your decision**”, both of you will receive no money.

Upon completion of the UG and TG tasks, subjects in both groups completed the standard SDT. Subjects were instructed to complete a series of seven uniform tables, one for each social distance. In each table, subjects were asked to make choices between an amount of money for themselves versus an amount of money for each of the people on their social distance ladder (Annexure B). The following instruction was included before the first table in the SDT in order to guide subjects in defining their social ladder:

Imagine you made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at #1 to a mere acquaintance at #100. Now imagine the following choices between an amount of money for you and an amount for the #1 person on the list. Circle A or B on the right-hand side to indicate which you would choose in EACH line.

In each case, the #1 in the above instruction and in the table and other forms, including the recipient questionnaire, was replaced by #2, #5, #10, #20, #50 and #100, respectively. Each participant was also required to provide information on their social relation to the person, how often they communicate with the person, whether they live with the person and, if not, how far they live from the person, how often they visit the person, how long they have known the person, how close they perceive themselves to be to this person – both emotionally and psychologically, as well as the basic socio-demographics of the person (recipient characteristics) (Annexure C). Subjects also completed a post-experimental questionnaire. The information collected by means of the questionnaire includes the standard socio-demographic information: age, sex, race/ethnicity, education, household size, individual/household income (Annexure D).

Payment:

Subjects, in addition to receiving a show-up fee of South African Rand R50 for participating in the experiments, also earned an amount of money for the incentivized tasks. This was done by implementing a specified payment protocol for each experiment (Annexure F). Subjects

first needed to randomly select one of the games/tasks on which the payment would be based by rolling a ten-sided dice before implementing a series of randomised choices to select one decision from the selected set of tasks for actual payment. The payment procedure was conducted individually and in private with the assistance of the experimenter. The average earnings earned by subjects in these experiments amounted to R125.

3. Measures and social subject-types identification

In this paper, the Social Discounting Task (SDT) is used to measure altruism amongst the subject pool. Three measures of altruism are estimated – one measure is at task level (giving) and two measures are at aggregate level. “Giving” is the monetary crossover value estimated as the mean point at which a subject switched from choosing option A (selfish option) to option B (sharing option) for each social distance – and is captured as such in the task-level data set. For instance, if a subject chose the selfish option at R180 and switched to the sharing option at R160, the crossover value was calculated to be R170. For subjects who exclusively chose the selfish option throughout, the crossover value is given as R0, and for subjects who exclusively chose the sharing option, the crossover value is assumed to be R90. The social discounting functions are then fitted individually on each subject’s crossover values with the aid of Reed, Kaplan and Brewer’s (2012) Excel solver toolkit. The social discounting function is assumed to be hyperbolic and following Jones and Rachlin (2006), it assumes the following form:

$$v_{i,j} = \frac{A_i}{1 + k'N_{i,j}},$$

where v_{ij} represents the value that person i attaches to the welfare of person j , A_i represents the value person i associates with her own welfare, and N_{ij} is the rank person i assigns to person j among i ’s full list of associated people. The constant k' , one aggregate measure of altruism, measures the steepness of discounting and the greater k' is, the greater the degree of social discounting and the lower the degree of altruism (Sharp *et al.*, 2012). Area under the curve (AUC) is a normalised measure not dependent on functional form (Myerson *et al.*, 2001). An AUC index and k -value are constructed for each subject by making use of the Excel software of Reed, Kaplan and Brewer (2012). AUC varies from 1.0 (no discounting) to 0.0 (complete discounting) (Locey *et al.*, 2011). The two measures of social discounting, i.e. Area under the curve (AUC) and k' are captured in the subject-level data set.

Subjects with inconsistent altruistic preferences are identified in the study by distinguishing between subjects who switched multiple times and subjects who switched once or less per social distance table. At task-level, the number of inconsistent responses amounts to 15.69% for Group 1 and 15.18% for Group 2. For the subject-level analysis, 19.61% of subjects reported inconsistent responses in Group 1, compared to 28.13% for subjects in Group 2. The number of multiple switches for this study is much lower than the 41.1% reported by Booyesen *et al.* (2018) and the 66.5% reported by Sharp *et al.* (2012).

The responses of subjects in the UG and TG are used to identify a number of social subject-types in each of the two groups. A comparative analysis of the outcomes for giving and social discounting across these different social subject-types, namely (1) fair; (2) greedy; (3) trustful; (4) egalitarian; (5) reciprocal; and (6) trustworthy is conducted. The description and coding of these social subject-types are detailed in Tables 1A and 1B below:

Table 1A: Social subject-types: descriptions and coding- Group 1

Social subject-type	Description	Group 1: UGR & TGS	
		Yes (=1)	No (=0)
Fair (Type 1)	Subjects who are concerned about fairness	Rejected 0% offer received in UGR [n = 14]	Accepted 0% offer received in UGR [n = 17]
Fair (Type 2)	Subjects who are concerned about fairness	Rejected both 0% and 100% offers received in UGR [n = 15]	Accepted both 0% and 100% offers received in UGR [n = 16]
Greedy	Subjects with preferences for selfishness	Sent 0% in TGS and rejected 0% offer received in UGR OR sent 0% in TGS and accepted 50% and/or 100% offer received in UGR OR sent 50% in TGS and accepted 100% offer received in UGR [n = 19].	Sent non-zero amounts in TGS and accepted 0% offer received in UGR OR sent non-zero amounts in TGS and rejected 50% or 100% offer received in UGR OR sent nothing in TGS and rejected 100% offer received in UGR [n = 11].
Trustful	Subjects with preferences for being trustful or not.	Sent R50 or R100 in TGS [n = 27].	Sent nothing (R0) in TGS [n = 4].
Egalitarian (Type 1)	Subjects with preferences for equal sharing of resources.	Sent R50 in TGS AND accepted R50 offer received in UGR [n = 20].	Sent nothing or R100 in TGS AND rejected R0; R50 and R100 offers received in UGR [n = 11]
Egalitarian (Type 2)	Subjects with strong preferences for equal sharing of resources	Sent R50 in TGS AND accepted R50 offer received in UGR AND also rejected R0 and R100 offers received in UGR [n = 5]	Sent nothing or R100 in TGS AND rejected R50 offers and accepted R0 and R100 offers received in UGR [n = 26]
Reciprocal	Subjects with preferences for being reciprocal	Sent R50 or R100 in TGS AND only accepted R50 and R100 offers received and rejected 0% offers in UGR [n = 12].	Sent nothing (R0) in TGS AND rejected R50 and R100 offers received and accepted 0% offers received in UGR [n = 19]

Table 1B: Social subject-types: description and coding – Group 2

	Description	Group 2: UGS & TGR	
		Yes (=1)	No (=0)
Trustful	Subjects with preferences for being trustful.	Sent half (R50) or 100% (R100) of endowment received in UGS [n = 41].	Sent nothing (R0) of endowment received in UGS [n = 9]
Egalitarian (Type 1)	Subjects with preferences for equal sharing of resources at lower offers.	Sent half (R50) in UGS AND returned half (R75) of R150 endowment received in TGR [n = 25].	Sent nothing (R0) or 100% (R100) in UGS AND returned nothing or 100% (R150) in TGR [n = 25].
Egalitarian (Type 2)	Subjects with preferences for equal sharing of resources at higher offers.	Sent half (R50) in UGS AND returned half (R150) of R300 endowment received in TGR [n = 31].	Sent nothing (R0) or 100% (R100) in UGS AND returned nothing or 100% (R300) in TGR [n = 19].
Egalitarian (Type 3)	Subjects with preferences for equal sharing of resources at both offers	Sent half (R50) in UGS AND returned half of both R150 and R300 endowments received in TGR [n = 24].	Sent nothing (R0) or 100% (R100) in UGS AND returned nothing or 100% of both endowments (R150 and R300) in TGR [n = 16].
Reciprocal (Type 1)	Subjects who are reciprocal at lower offers.	Sent half (R50) or 100% (R100) in UGS AND returned half (R75) or 100% (R150) of R150 endowment received in TGR [n = 30].	Sent nothing (R0) in UGS AND returned nothing of R150 endowment received in TGR [n = 20].
Reciprocal (Type 2)	Subjects who are reciprocal at higher offers.	Sent half (R50) or 100% (R100) in UGS AND returned half (R150) or 100% (R300) of R300 endowment received in TGR [n = 33].	Sent nothing (R0) in UGS AND returned nothing of R300 endowment received in TGR [n = 17].
Reciprocal (Type 3)	Subjects who are reciprocal at both offers.	Sent half (R50) or 100% (R100) in UGS AND returned half or 100% of both endowments received in TGR [n = 32].	Sent nothing (R0) in UGS AND returned nothing of both endowments received (R150 & R300) in TGR [n = 18]
Trustworthy (Type 1)	Subjects who are trustworthy at lower offers	Returned 50% (R75) or 100% (R150) of R50 endowment received in TGR [n = 35].	Returned nothing of R150 endowment received in TGR [n = 15].
Trustworthy (Type 2)	Subjects who are trustworthy at higher offers	Returned 50% (R150) or 100% (R300) of R100 endowment received in TGR [n = 38].	Returned nothing of R300 endowment received in TGR [n = 12].
Trustworthy (Type 3)	Subjects who are trustworthy at both offers	Returned 50% or 100% of both offers received in TGR [n = 38].	Returned nothing of both endowments (R150 & R300) received in TGR [n = 12].

The description and coding provided above extend on the number of social preferences already identified in previous research and develops a distinct framework of social subject-types based on the combined responses of subjects in both the UG and TG and uses this framework to find associations with altruism as measured in the SDT. The first social subject-type identified is that of fairness. Some researchers argue that the underlying mechanism of non-self-regarding behaviours in the UG (i.e. high offers by the proposers and frequent rejections by the responders) is not only to get as much money as possible, but also to maintain fairness norms among players (Fehr & Gächter, 2000; Gintis *et al.*, 2003). In this study subjects were typed as fair based on their responses as recipients in the UG. A recipient in the UG with preferences for fairness chose to reject offers of zero and 100 per cent. It has been argued therefore that fairness considerations must be the underlying motive behind altruistic cooperation (Fehr & Gächter, 2000; Gintis *et al.*, 2003). Individuals with preferences for being fair are thus expected to be more altruistic.

The “greedy” social subject-type refers to individuals with a preference for selfishness and is categorized based on a combination of a subject’s responses as a sender in the TG and a recipient in the UG. Subjects are typed as “greedy” if they choose to send nothing in the TG and yet reject offers of zero or accept offers of half or the full endowment. In other words, subjects who are willing to receive more than they are prepared to send. Green *et al.* (2011) investigated associations between sharing, selfishness and discounting amongst Japanese and American subjects and used the discount rates as a measure of selfishness, with a higher discount rate reflected as a higher level of selfishness. The study found that the higher the degree of selfishness, the less likely subjects were to choose the sharing option in a social-dilemma situation. As such, the study hypothesizes that greedy/selfish individuals are expected to be interested primarily in their own material payoffs and will thus be less altruistic.

According to Zhao *et al.* (2016), another way in which social preferences deviate from narrow self-interest is the desire for equality or inequity aversion and egalitarianism. Egalitarian or inequity averse individuals are expected to reject unfair offers of the initial endowment. Egalitarian social types are classified in each of the two groups of subjects in the study. In Group 1, the “egalitarian” social type is classified based on a combination of a subject’s responses who played the roles of sender in the TG and recipient in the UG. In this group subjects are deemed to have preferences for equal sharing of resources when they choose to send half of their endowment

received in the TG and accept half of the offers received in the UG, while rejecting offers of nothing or the full endowment. In Group 2 subjects are classified as “egalitarian” when they choose to send half of their endowment as senders in the UG and also return half of the offers received as recipients in the TG. Models used by Fehr and Schmidt (1999) assume that players are “inequity averse” in the sense that they experience “guilt” if they receive a payoff that is higher than others (advantageous inequity), while they experience “envy” if they receive a payoff that is smaller (disadvantageous inequity). In one-shot interactions of the UG, rejections of unfair offers are often described as altruistic, because others may benefit from greater equity in future interactions with the punished defector, although the player (the rejecting recipient) is left objectively worse off (Fehr & Gächter, 2000). Egalitarian individuals are therefore expected to behave more altruistically.

Another social subject-type, trust, has been defined as the “voluntary transfer of a good or favour to someone else, with future reciprocation expected but not guaranteed” (Gunnthorsdottir, McCabe & Smith, 2002:50). In Group 1, subjects who sent positive amounts in the TG are deemed to be trustful while in Group 2, the “trustful” social type is allocated to subjects who send positive amounts of their endowments received in the UG. In Group 2, a “trustworthy” social type is also classified based on the subjects’ responses as recipients in the TG. Trustworthy subjects are those who chose to return half or full amounts of the offers they received in the TG. The understanding of trust and trustworthiness go hand-in-hand (Ben-Ner & Putterman, 2001; Hardin, 2004). Since the publication of Berg, Dickhaut, and McCabe (1995), economists have used the amount sent in the trust game as a behavioural measure of trusting, and the amount or proportion returned as a measure of trustworthiness. According to Cox and Deck (2005), proposers may make generous proposals in the trust game because they have altruistic other-regarding preferences over outcomes. Alternatively, proposers may make generous decisions because they trust that responders will return enough money to make the proposer’s payoff exceed the endowment. Responders may return positive amounts because of altruistic other-regarding or inequality-averse preferences over outcomes (Cox and Deck, 2005). Trusting and trustworthy individuals are expected to be altruistic and, conversely, altruistic individuals are also expected to be more trustworthy.

Finally, reciprocal altruists are considered to be individuals who send non-zero amounts as proposers and also return non-zero amounts as responders. Reciprocity can be modelled as the

desire to be kind to those who are kind to you and unkind to those who are unkind to you (Dufwenberg & Kirchsteiger, 2004; Falk & Fischbacher, 2006; Fehr & Fischbacher, 2002; Rabin, 1993). Empirical support for such behaviour has been provided (Fischbacher & Gächter, 2010; Fischbacher, Gächter & Fehr, 2001; Keser & Van Winden, 2000) via experimental public good games. It can be expected that reciprocal altruistic individuals will also be more generous than other individuals.

In short, the paper hypothesizes that individuals who are fair, trusting, egalitarian and reciprocal altruists will behave more altruistically than selfish/greedy individuals, and that levels of altruism will decline as social distance increases.

4. Analysis

The paper first describes the demographic characteristics i.e. age, race; gender; financial situation; and language – of the subject pool for the two experimental groups, i.e. Group 1 – UG recipients and TG senders; and Group 2 – UG senders and TG recipients. A number of histograms are constructed in the paper based on the results of univariate and bivariate analyses, which aims to graphically illustrate the subjects' responses as individual participants in each of the UG or TG tasks and their collective responses as participants in their different roles in both the UG and TG. Univariate analyses are conducted to determine the prevalence of each social subject-type amongst the subject pool. Further, a number of bivariate descriptive statistical analyses are employed to investigate differences in the three measures of altruism across the identified social subject types. Chi-square tests, t-tests and F-tests are used in the bivariate descriptive analyses. All three measures of altruism are employed as dependent variables in the regression models estimating the relationship between the three measures of altruism and each social subject-type. For this purpose, Ordinary Least Squares (OLS) regression models are estimated for the full sample, i.e. sample including subjects who switched multiple times in the SDT in order to maximize the statistical power of the results due to the small sample size. The log of k' is used since the outcome is not normally distributed. With respect to the models that employ crossover value as a dependent variable, the regression models are also estimated for the three social distance categories, namely close, intermediate and distant; this to determine if the relevant social subject-type is only

significant at a particular social distance or across the social distance hierarchy. Here the seven social distances are collapsed into three categories, namely “close” – social distances #1; #2 and #5; “intermediate” – social distances #10 and #20; and “distant” – social distances #50 and #100. Finally, a probit regression analysis is employed for subjects in Group 2, with categorical variable “trustworthiness” as the dependent variable where the relationship between a subject’s level of altruism and trustworthiness is investigated.

A summary of the regression models in this study is presented here:

To test for a relationship between measures of altruism and social subject-type, the following regression models were estimated:

Regression: *OLS Regression Model*

Dependent variable: Crossover value

Independent variables: social subject-type (e.g. fair; trustful; greedy; egalitarian; reciprocal altruistic and trustworthy); social distance category; subject-type (staff or student); number of times switched; subject gender; subject age; subject household poverty rank; previous experimental experience

Regression: *OLS Regression Model*

Dependent variable: $AUC/k' \log$

Independent variables: social subject-type (e.g. fair; trustful; greedy; egalitarian; reciprocal altruistic and trustworthy); subject-type (staff or student); number of times switched; subject gender; subject age; subject household poverty rank; previous experimental experience

In each instance, a separate regression model was estimated for each social type.

To investigate the association between altruism and a subject’s trustworthiness, the following regression models were used:

Regression: *Probit regression model*

Dependent variable: trustworthy

Independent variables: k' log; subject-type (staff or student); subject age; subject gender; subject household poverty rank; previous experimental experience; number of times switched.

Regression: *Probit regression model*

Dependent variable: trustworthy

Independent variables: AUC; subject-type (staff or student); subject age; subject gender; subject household poverty rank; previous experimental experience; number of times switched.

Regression: *Probit regression model*

Dependent variable: trustworthy

Independent variables: crossover value; subject-type (staff or student); subject age; subject gender; subject household poverty rank; previous experimental experience, number of times switched, social distance category.

Although the study collected data on recipient characteristics, due to the small sample size many observations were dropped from the regression analysis when controlling for recipient characteristics, and as such these variables were excluded from the regression models.

5. Results

5.1 Descriptive characteristics

In Table 2, the socio-demographic characteristics of the subjects are presented according to the experimental group in which they participated, namely Group 1: UGR and TGS, and Group 2: UGS and TGR. The average age of the subjects in Group 1 is 26.9 years, with approximately 70.9% being African females and 37.5% are Sesotho speaking. More than 80% of the subjects in this group placed themselves on the 3rd and 4th rungs of the poverty scale and nearly 46.88% indicated that they were not broke and in good shape. The subjects in Group 2 are somewhat older with an average age of 30.17 years, because they consisted of more staff subjects than in Group 1, with 80.77% being females who are mainly African (70.00%) and Sesotho speaking (39.22%). Approximately 74.51% of subjects in this group placed themselves on the 3rd and 4th rung of the poverty scale and 56.56% indicated that they are not broke and in good financial shape. Both groups consisted of more student subjects than staff subjects.

Table 2: Subject characteristics, by experimental group

	<u>Group 1 (n=32)</u>	<u>Group 2 (n=52)</u>
Age (years):		
Mean	26.90	30.17
Median (IQR)	24 (21-28)	28 (23-34)
Female (%)	70.97	80.77
Race (%):		
African	70.97	70.00
Coloured	6.45	2.00
Indian	3.23	4.00
White	19.35	24.00
Total	100.00	100.00
Language (%):		
Sesotho	37.5	39.22
Afrikaans	21.88	19.61
Setswana	12.50	5.88
English	9.38	7.84
isiXhosa	9.38	11.76
isiZulu	6.25	3.92
Other	3.13	11.76
Total	100.00	100.00
Faculty (%):		
Economics & Management	87.50	85.71
Other	12.50	14.28
Total	100.00	100.00
Household poverty rank (%):		
1	3.13	1.96
2	18.75	11.76
3	53.13	31.37
4	25.00	43.14
5	0.00	9.80
6	0.00	1.96
Total	100.0	100.0
Financial situation (%):		
Very broke	12.50	9.80
Broke	37.50	29.41
Neither	21.88	27.45
In good shape	25.00	29.41
In very good shape	3.13	3.92
Total	100.00	100.00
Previous experimental experience (%)	43.75	54.90
Group (%)		
Student	65.63	59.62
Staff	34.38	40.38
Total	100.00	100.00

Note: 'Group 1' completed the recipient UG and sender TG tasks, while 'Group 2' completed the sender UG and recipient TG tasks.

5.2 Giving and social discounting

In Table 3, the mean and median values for the three measures of altruism are reported for each of the two experimental groups, with a higher mean for crossover value in Group 1, indicating that subjects are more altruistic than those in Group 2. This result is supported by the much higher k' reported for Group 2 which is also indicative of a lower degree of altruism amongst subjects in this group.

Table 3: Giving and social discounting measures, by experimental group

	Group 1	Group 2
Crossover value (Rand)		
Mean	98.97	90.95
Median (IQR)	90 (50-150)	90 (30-150)
Sample (n)	224	357
AUC		
Mean	0.380	0.374
Median (IQR)	0.378 (0.168- 0.516)	0.360 (0.145-0.587)
Sample (n)	32	51
k		
Mean	0.211	0.842
Median (IQR)	0.098 (0.027- 0.325)	0.184 (0.018- 0.509)
Sample (n)	32	51

Note: 'Group 1' completed the recipient UG and sender TG tasks, while 'Group 2' completed the sender UG and recipient TG tasks.

Table 4 reports the mean crossover values for each of the seven social distances and per experimental group. For both experimental groups the mean crossover values decline significantly as social distances increase, with substantial declines reported from social distance #10 (R95,00) to #20 (R75,62) for group 1, and from distance #5 (R103,52) to #10 (R88,62) for group 2.

Table 4: Crossover value (Rand), by social distance and experimental group

Social distance	Group 1		Group 2	
	Mean	Median	Mean	Median
1	146.25	150	123.33	150
2	141.87	150	117.25	110
5	107.18	90	103.52	90
10	95.00	90	88.62	90
20	75.62	70	76.47	70
50	64.37	50	64.31	50
100	62.50	50	63.13	50
Total	98.97	90	90.95	90
F-statistic (p-value)	14.83 (<0.001)		9.47 (<0.001)	
Sample (n)	224	224	357	357

Note: ‘Group 1’ completed the recipient UG and sender TG tasks, while ‘Group 2’ completed the sender UG and recipient TG tasks.

5.3 Social subject-types and UG and TG responses

Figures 1–7 present a graphical illustration of the subjects’ responses in their respective roles as senders or recipients in the UG and TG. When playing as senders in the TG game, the responses of the subjects – as recorded in Figure 1 – show that 20 subjects (64.5%) decided to send half of the endowment received (i.e. R50), 7 subjects (22,5%) sent nothing (R0), and only 4 (12.9%) sent the full endowment of R100. These results show that most subjects in Group 1 (77.42%) preferred choosing to trust. In Figure 2, the responses of subjects who played as recipients in the UG are displayed. Of the 31 subjects, all (100%) accepted the offer of half of the endowment (R50); while 17 (54.8%) accepted a zero offer (R0). The choice between accepting or rejecting a zero offer (R0) would in both instances leave subjects with a zero payoff and as such subjects may have behaved indifferently between accepting and rejecting the zero offer, which could explain why the majority (17 versus 14) accepted this offer. Finally, 24 out of the 31 subjects (77.4%) accepted the offer of R100. Figure 3 shows the combined responses of the subjects as recipients in the UG and senders in the TG. Of the 17 subjects who accepted the zero offer in the UG, two (11.8%) sent R0, ten (58.8%) sent R50, and 5 (29.4%) sent R100 in the TG. The 31 subjects who accepted the R50 offer in the UG behaved as follows in the TG: four (12.9%) sent nothing, 20 (64.5%) sent R50, and 7 (22.6%) sent R100. Finally, of the 24 subjects who accepted the R100 offer in the UG, two (8.33%) sent R0, 15 (62.5%) sent R50, and 7 (29.2%) sent R100. Fourteen of the 31 subjects (45%) rejected

the zero percent offer in the TG, and of these 14, two sent R0, 10 sent R50, and two sent R100 in the TG. Of the 7 subjects who rejected the R100 offer in the TG, two sent R0 and five sent R50.

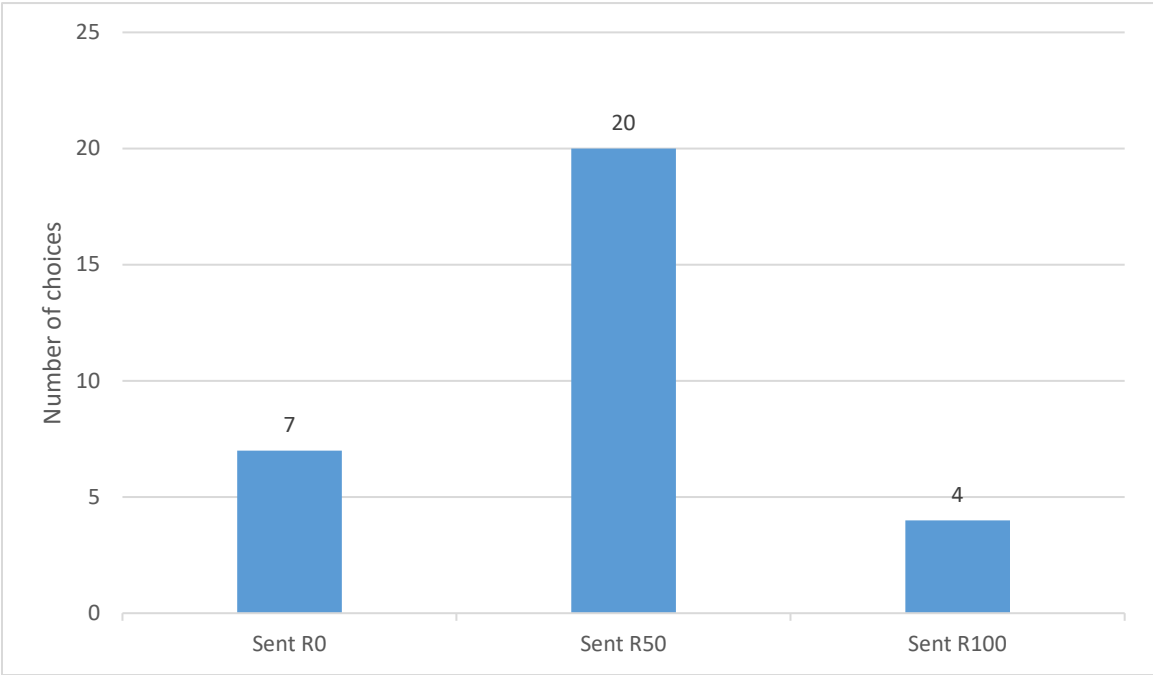


Figure 1: TG Sender choices

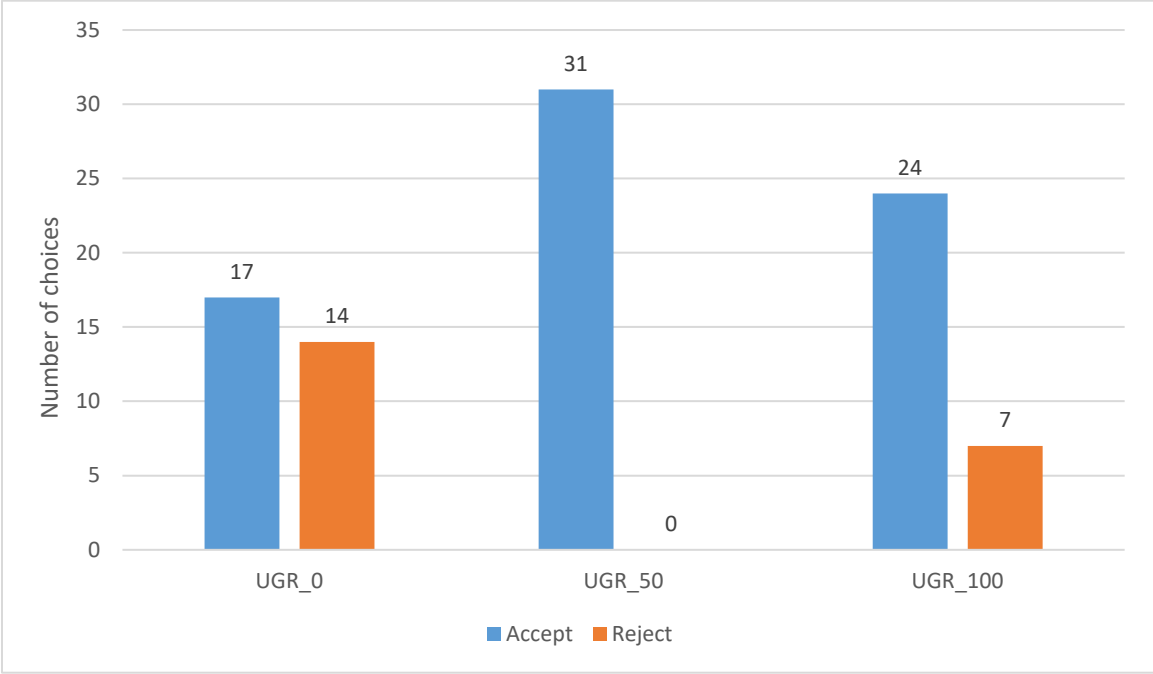


Figure 2: UG Recipient choices

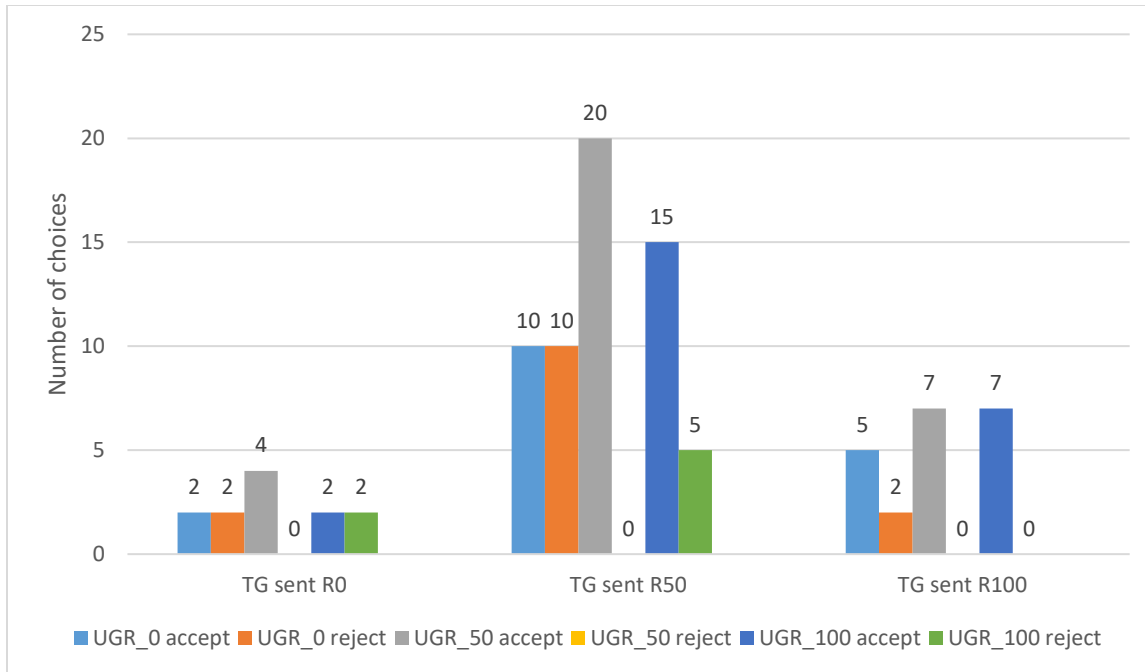


Figure 3: Combined UG recipient and TG sender choices

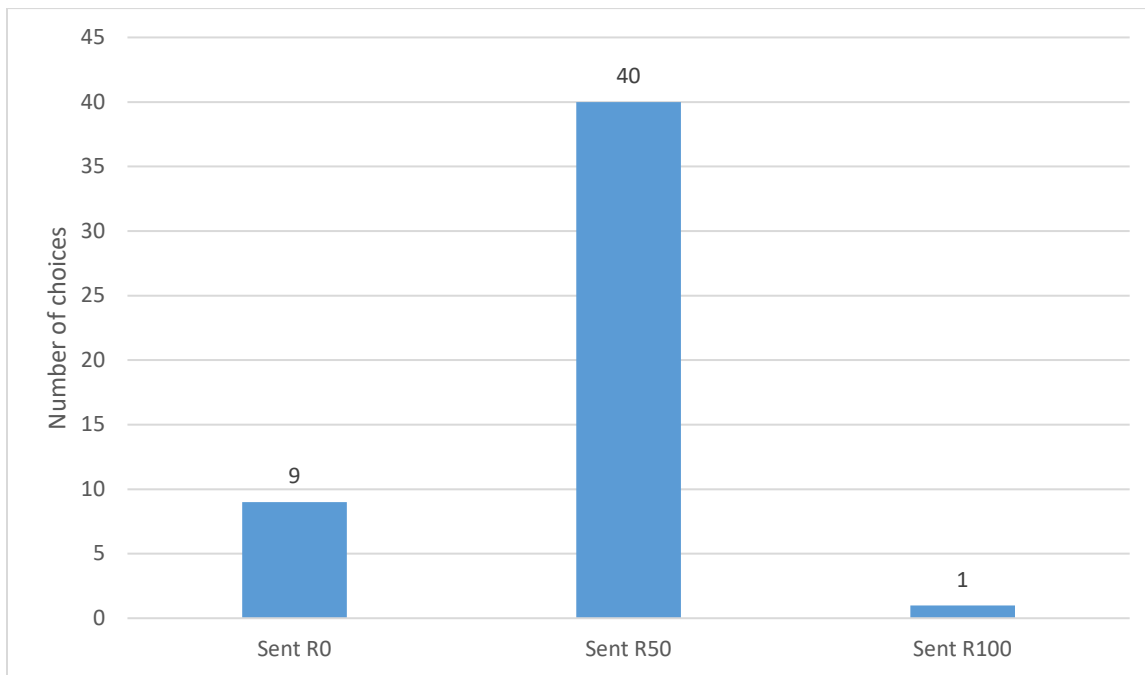


Figure 4: UG Sender choices

Figure 4 illustrates the responses of the UG senders in Group 2. Subjects in this group had to choose between sending nothing (R0), half (R50) or everything (R100) of their endowment

received from the experimenter. The majority of the subjects (80%) sent half of the endowment, with only one subject (2%) choosing to send the full R100 endowment. In Figure 5, the responses of the TG recipients in Group 2 are illustrated. Subjects in this task received an offer of either R0, R150 or R300 from the sender and had to choose between returning 0, half, or the full offer received. When confronted with an offer of R150, 15 subjects (30%) chose to return nothing, 31 subjects (62%) chose to return half, 4 four subjects (8%) decided to return the full R150. When subjects received an offer of R300, 12 (24%) chose to return nothing, 36 (72%) chose to return half and only 2 (4%) chose to return the full R300. At the higher offer (R300) more subjects (36 or 72%) chose to return half of the offer received than at the low offer (R150). When having to decide on whether to return the full amount offered, four (8%) subjects returned the full low offer of R150 compared to only two (4%) who chose to return the full high stake offer of R300.

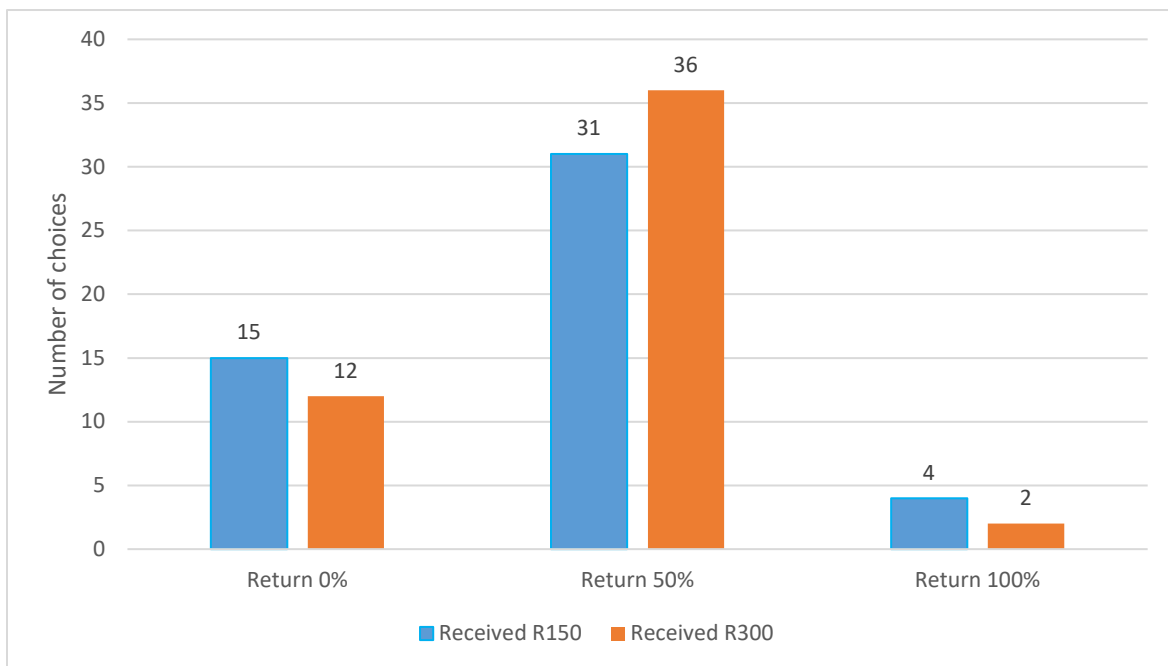


Figure 5: TG Recipient choices

In Figures 6 and 7, the joint responses of the subjects as UG senders and TG recipients are illustrated. Figure 6 portrays the results for the low (R150) offer received in the TG and Figure 7 portrays the results for the high (R300) offer received. In Figure 6, of the nine (18%) UG sender subjects who sent nothing in the UG, four (8%) chose to also return nothing of the R150 offer received in the TG, and five (10%) chose to return half of the R150 offer received. Forty subjects

(80%) sent half of their endowment in the UG, and as TG recipients, 11 (22%) of these 40 chose to return nothing of the R150 offer received, 25 (50%) chose to return half, and 4 (8%) chose to return the full R150 offer received in the TG. Only one subject (2%) sent his/her full endowment in the UG and this subject chose to return half of the R150 offer received in the TG.

In Figure 7, one subject (2%) sent nothing in the UG and also chose to return the full R300 offer received in the TG. Of the 40 subjects who sent half of their endowment in the UG, in the TG, 8 (16%) of these 40 chose to return nothing of the R300 offer received, 31 (62%) chose to return half of the offer, and only 1 (2%) chose to return the full R300 offer received. Nine subjects (18%) sent their full endowment in the UG, and four (8%) of these subjects chose to return nothing of the R300 offer received in the TG, while five (10%) chose to return half of the offer. Subjects who sent half of the endowment were also more likely to choose to return half of the offers received in the TG. This result is found at both the low (R150) and high (R300) offer in the TG.

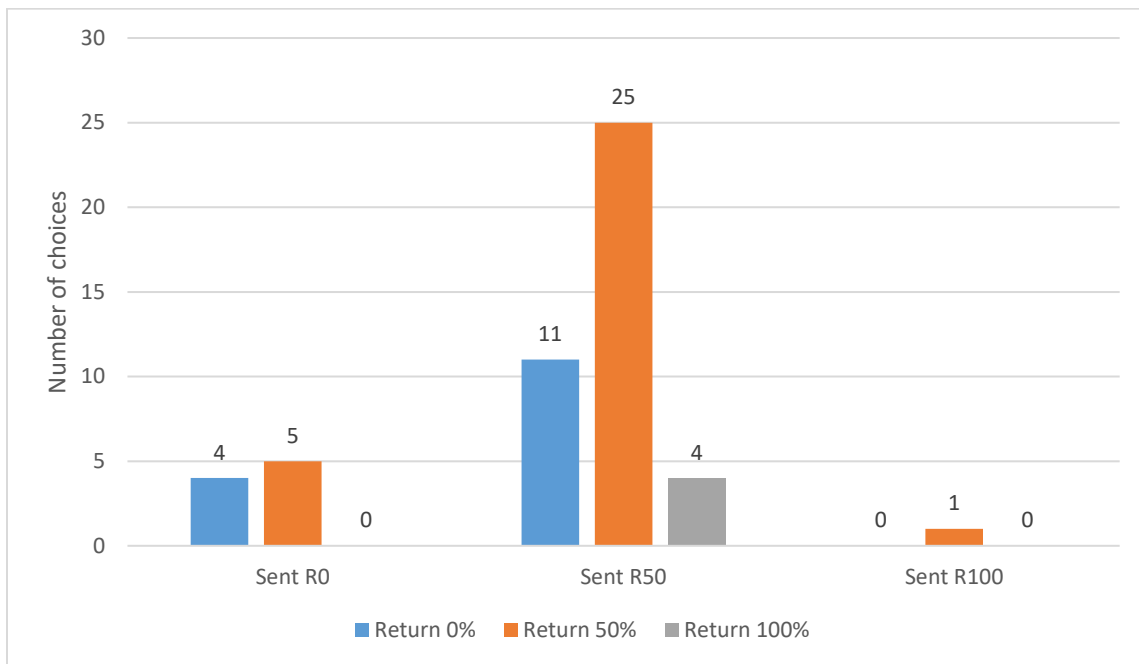


Figure 6: Combined UG sender and TG recipient choices (TGR_50)



Figure 7: Combined UG sender and TG recipient choices (TGR_100)

Table 5: Social subject-types, by group

Social subject-type	Group 1:	
	Yes (%)	No (%)
Fair (Type 1)	45.16	54.84
Fair (Type 2)	48.39	51.61
Greedy	61.29	38.71
Trustful	87.10	12.90
Egalitarian (Type 1)	64.52	35.48
Egalitarian (Type 2)	16.13	83.87
Reciprocal	38.71	61.29
Sample (n)	31	
Social subject-type	Group 2:	
	Yes (%)	No (%)
Trustful	82.69	17.31
Egalitarian (Type 1)	50.00	50.00
Egalitarian (Type 2)	62.00	38.00
Egalitarian (Type 3)	48.00	52.00
Reciprocal (Type 1)	60.00	40.00
Reciprocal (Type 2)	66.00	34.00
Reciprocal (Type 3)	64.44	35.56
Trustworthy (Type 1)	70.00	30.00
Trustworthy (Type 2)	76.00	24.00
Trustworthy (Type 3)	76.74	23.26
Sample (n)	50	

Note: ‘Group 1’ completed the recipient UG and sender TG tasks, while ‘Group 2’ completed the sender UG and recipient TG tasks.

Based on the responses of the subjects in their respective roles as senders or recipients in the two tasks, a few social subject-types are identified highlighting the social preferences of the subjects. A total of six social subject-type categories are identified for both experimental groups; namely fair; greedy; trustful; egalitarian; reciprocal and trustworthy. The percentages of preferences inclination of the subjects according to the identified social subject-types are reported in Table 5. The most noteworthy social subject-type is trustful/trusting – with 87.10% of the subjects reported as such in group 1 and 82.69% in group 2. Many subjects in Group 1 are egalitarian (64.52%), and 61.29% have preferences for selfishness (greedy), while only 16.13% are reciprocal. In Group 2, more than 70% of the subjects are trustworthy, i.e. those who returned non-zero amounts in the TG, with 82.69% reported to be trusting. Approximately 50% are egalitarian, while on average 63% are reported as reciprocal.

5.4 Social subject-types and giving and social discounting

The results of the bivariate and the OLS regressions are reported in Tables 6, 7 and 8 for Group 1 and Tables 9, 10 and 11 for Group 2. In Tables 6 and 9, the seven social distances are collapsed into three categories, since the results of the regressions are not estimable across all individual social distances, due to the small sample sizes in the sub-groups. In the aforementioned tables, the bivariate results show the mean values of the three measures of altruism (crossover value; AUC and k') for each of the social subject types identified in Table 5. The regression results show the association between the identified social subject-types and the three measures of altruism.

In Table 6, the regression results show that the only and most significant result is for the trustful social subject-type. Subjects with preferences for being trustful are more altruistic. This result is significant for the mean crossover value and for the full sample, and weakly significant for the “close” social distance category, but not significant for the intermediate and distant social distances. For the aggregate measures of social discounting, AUC and k' , none of the results for Group 1 as reported in Tables 7 and 8 is statistically significant. In other words, giving and social discounting for the most part did not differ by social subject-type for the sample of subjects in Group 1.

Table 6: Crossover value (Rand), per social subject-type and per social distance category – Group 1: UGR & TGS

	Bivariate analysis			OLS Regression			
	Mean (Yes)	Mean (No)	T statistic (p-value)	Full sample	Close	Intermediate	Distant
Fair Type 1	96.93	100.92	0.495 (0.620)	-0.891 (6.741)	-1.415 (9.975)	3.440 (13.209)	-8.580 (13.523)
p-value				0.895	0.888	0.796	0.529
R ²				0.406	0.201	0.312	0.269
F statistic (p-value)				19.38 (<0.001)	7.67 (<0.001)	6.05 (<0.001)	8.75 (<0.001)
Fair Type 2	93.71	104.19	1.312 (0.190)	-5.728 (6.842)	-5.945 (10.017)	-3.420 (13.740)	-11.218 (13.654)
p-value				0.403	0.554	0.804	0.415
R ²				0.408	0.204	0.312	0.273
F statistic (p-value)				20.18 (<0.001)	7.96 (<0.001)	5.79 (<0.001)	9.06 (<0.001)
Greedy	100.00	97.73	-0.275 (0.783)	5.614 (7.224)	4.642 (11.608)	-6.318 (12.661)	18.579 (12.487)
p-value				0.438	0.690	0.620	0.143
R ²				0.408	0.202	0.313	0.286
F statistic (p-value)				20.09 (<0.001)	8.24 (<0.001)	5.86 (<0.001)	11.51 (<0.001)
Trustful	102.69**	75.00	-2.347 (0.019)	21.665*** (7.536)	21.302* (11.490)	25.189 (15.497)	16.993 (11.685)
p-value				0.004	0.067	0.110	0.152
R ²				0.421	0.221	0.335	0.274
F statistic (p-value)				20.12 (<0.001)	7.71 (<0.001)	6.27 (<0.001)	16.22 (<0.001)
Reciprocal	99.88	99.88	-0.150 (0.880)	3.972 (6.537)	-0.063 (10.150)	10.203 (12.059)	-0.148 (12.879)
p-value				0.544	0.995	0.401	0.991
R ²				0.407	0.200	0.319	0.263
F-statistic (p-value)				18.96 (<0.001)	7.73 (<0.001)	6.18 (<0.001)	8.76 (<0.001)
Sample (n)	217			210	90	60	60

Note: Statistical significance: 1% ***, 5% **, 10% *. 'Group 1' completed the recipient UG and sender TG tasks

Table 7: AUC per social subject-type – Group 1: UGR & TGS

Bivariate analysis			OLS Regression			
Mean (no)	Mean (yes)	T statistic (p-value)	Coefficient	p value	R square	F statistic (p-value)
Fair Type 1:						
0.405	0.367	0.440 (0.662)	0.010 (0.085)	0.905	0.152	0.62 (0.731)
Fair Type 2:						
0.426	0.347	0.916 (0.367)	-0.016 (0.086)	0.850	0.152	0.68 (0.688)
Greedy						
0.366	0.401	-0.389 (0.700)	0.092 (0.094)	0.339	0.181	1.37 (0.267)
Trustful:						
0.255	0.407	-1.196 (0.241)	0.096 (0.114)	0.407	0.170	0.72 (0.653)
Egalitarian Type 1:						
0.387	0.388	-0.005 (0.995)	0.076 (0.083)	0.371	0.171	1.00 (0.458)
Egalitarian Type 2:						
0.418	0.231	1.642 (0.111)	-0.116 (0.104)	0.278	0.181	1.06 (0.421)
Reciprocal:						
0.387	0.388	-0.005 (0.995)	0.037 (0.088)	0.674	0.158	0.59 (0.758)

Note: Statistical significance: 1% ***, 5% **, 10% *. 'Group 1' completed the recipient UG and sender TG tasks.

Table 8: *k*-value per social subject-type – Group 1: UGR & TGS

Bivariate analysis			OLS Regression			
Mean (no)	Mean (yes)	T statistic (p-value)	Coefficient	p value	R square	F statistic (p-value)
Fair Type 1:						
0.251	0.170	0.697 (0.491)	-0.499 (0.661)	0.458	0.217	0.91 (0.517)
Fair Type 2:						
0.237	0.190	0.407 (0.687)	-0.410 (0.711)	0.570	0.211	0.90 (0.522)
Greedy:						
0.179	0.237	-0.494 (0.624)	-0.177 (0.765)	0.819	0.199	1.31 (0.292)
Trustful:						
0.260	0.208	0.301 (0.765)	-0.821 (0.616)	0.197	0.222	1.00 (0.460)
Egalitarian Type 1:						
0.176	0.236	-0.494 (0.624)	-0.289 (0.590)	0.629	0.202	1.64 (0.177)
Egalitarian Type 2:						
0.208	0.249	-0.263 (0.794)	0.588 (0.803)	0.471	0.211	1.04 (0.434)
Reciprocal:						
0.248	0.162	0.726 (0.473)	-0.627 (0.679)	0.365	0.232	0.89 (0.529)

Note: Statistical significance: 1% ***, 5% **, 10% *. 'Group 1' completed the recipient UG and sender TG tasks.

Table 9: Crossover value (Rand), per social subject-type and per social distance category – Group 2: UGS &TGR

	Bivariate analysis				OLS Regression			
	Mean (Yes)	Mean (No)	Mean (Total)	T statistic (p value)	Full sample	Close	Intermediate	Distant
Trustful	90.40	93.49	90.95	0.365 (0.715)	-9.482 (6.849)	0.142 (9.707)	-20.169 (12.484)	-11.918 (14.193)
p-value					0.167	0.988	0.110	0.403
R ²					0.476	0.471	0.375	0.386
F statistic (p-value)					56.62 (<0.001)	28.23 (<0.001)	14.45 (<0.001)	10.60 (<0.001)
Sample (n)	357				357	153	102	102
Egalitarian Type 1	90.77	87.2	88.95	-0.544 (0.586)	8.262 (5.420)	18.033** (7.526)	1.404 (10.153)	-0.334 (11.696)
p-value					0.128	0.018	0.890	0.977
R ²					0.490	0.498	0.374	0.392
F-statistic (p-value)					60.55 (<0.001)	39.04 (<0.001)	13.47 (<0.001)	12.25 (<0.001)
Egalitarian Type 2	91.76	84.51	88.95	-1.077 (0.282)	15.855*** (5.903)	20.682*** (7.726)	13.374 (12.448)	12.681 (12.152)
p-value					0.008	0.008	0.286	0.299
R ²					0.497	0.498	0.383	0.400
F-statistic (p-value)					61.19 (<0.001)	36.18 (<0.001)	15.33 (<0.001)	14.49 (<0.001)
Egalitarian Type 3	93.60	84.83	88.95	-1.335 (0.182)	13.919*** (5.294)	21.528*** (7.217)	10.803 (10.636)	5.124 (11.208)
p-value					0.009	0.003	0.312	0.649
R ²					0.498	0.507	0.382	0.394
F-statistic (p-value)					63.34 (<0.001)	39.58 (<0.001)	14.75 (<0.001)	13.46 (<0.001)
Reciprocal Type 1	99.95***	73.00	88.95	-4.132 (<0.001)	20.563*** (6.037)	32.811*** (8.606)	7.312 (11.743)	14.767 (11.352)
p-value					0.001	<0.001	0.535	0.197
R ²					0.505	0.531	0.377	0.403
F-statistic (p-value)					61.57 (<0.001)	34.26 (<0.001)	13.70 (<0.001)	14.82 (<0.001)
Reciprocal Type 2	94.91**	77.73	88.95	-2.512 (0.012)	15.206*** (5.662)	21.406*** (7.217)	9.588 (11.926)	11.840 (11.846)
p-value					0.008	0.004	0.423	0.320
R ²					0.497	0.500	0.379	0.399
F-statistic (p-value)					57.00 (<0.001)	31.28 (<0.001)	13.71 (<0.001)	13.88 (<0.001)
Sample (n)	343				343	147	98	98
Reciprocal Type 3	102.60***	80.98	94.74	-3.057 (0.002)	13.597** (6.276)	25.693*** (7.565)	-0.246 (11.796)	8.824 (13.413)
p-value					0.031	0.001	0.983	0.513
R ²					0.532	0.572	0.440	0.407
F-statistic (p-value)					57.30 (<0.001)	28.07 (<0.001)	13.01 (<0.001)	12.27 (<0.001)
Sample (n)	308				308	132	88	88

Note: Statistical significance: 1% ***, 5% **, 10% *. 'Group 2' completed the sender UG and recipient TG tasks.

Table 10: AUC per social subject-type – Group 2: UGS & TGR

Bivariate analysis				OLS Regression			
Mean (no)	Mean (yes)	Mean (Total)	T statistic (<i>p</i> -value)	Coefficient	<i>p</i> value	R square	F statistic (<i>p</i> -value)
Egalitarian Type 1:							
0.370	0.351	0.361	0.259 (0.796)	0.020 (0.065)	0.751	0.489	7.95 (<0.001)
Egalitarian Type 2:							
0.359	0.362	0.361	-0.030 (0.975)	0.067 (0.072)	0.352	0.499	8.67 (<0.001)
Egalitarian Type 3:							
0.357	0.365	0.361	-0.113 (0.910)	0.043 (0.066)	0.518	0.494	8.45 (<0.001)
Reciprocal Type 1:							
0.303	0.400	0.361	-1.343 (0.185)	0.075 (0.070)	0.287	0.503	8.32 (<0.001)
Reciprocal Type 2:							
0.322	0.381	0.361	-0.783 (0.437)	0.062 (0.067)	0.362	0.498	7.81 (<0.001)
Reciprocal Type 3:							
0.340	0.414	0.387	-0.0933(0.356)	0.053 (0.076)	0.485	0.507	6.93 (<0.001)
Sample (n)	49			49			

Note: Statistical significance: 1% ***, 5% **, 10% *. ‘Group 2’ completed the sender UG and recipient TG tasks.

Table 11: *k*-value per social subject-type – Group 2: UGS & TGR

Bivariate analysis				OLS Regression			
Mean (no)	Mean (yes)	Mean (Total)	T statistic (<i>p</i> -value)	Coefficient	<i>p</i> value	R square	F statistic (<i>p</i> -value)
Egalitarian Type 1:							
1.342	0.390	0.876	1.414 (0.163)	-0.868 (0.529)	0.108	0.565	11.43 (<0.001)
Egalitarian Type 2:							
0.999	0.797	0.876	0.286 (0.775)	-0.977* (0.542)	0.079	0.565	10.41(<0.001)
Egalitarian Type 3:							
1.339	0.352	0.876	1.466 (0.149)	-0.974* (0.524)	0.070	0.576	12.21 (<0.001)
Reciprocal Type 1:							
1.675	0.325**	0.876	2.012 (0.049)	-1.422** (0.592)	0.021	0.603	10.75(<0.001)
Reciprocal Type 2:							
1.116	0.748	0.876	0.510 (0.612)	-0.919* (0.517)	0.083	0.562	8.71 (<0.001)
Reciprocal Type 3:							
1.106	0.291	0.588	1.458 (0.152)	-1.189** (0.499)	0.023	0.639	10.51 (<0.001)
Sample (n)	49			49			

Note: Statistical significance: 1% ***, 5% **, 10% *. ‘Group 2’ completed the sender UG and recipient TG tasks.

Table 12: Trustworthiness per measure of giving, crossover value – Group 2: UGS & TGR

	Bivariate analysis				OLS Regression			
	Mean (Yes)	Mean (no)	Mean (Total)	T statistic (p-value)	Full sample	Close	Intermediate	Distant
Trustworthy Type 1	100.33***	63.14	88.95	-5.440 (<0.001)	0.011*** (0.002)	0.018*** (0.002)	0.008** (0.003)	0.009** (0.004)
p- value					<0.001	<0.001	<0.017	0.024
R ²					0.240	0.333	0.195	0.205
Wald chi ² (p-value)					80.13 (<0.001)	73.80 (<0.001)	21.66 (0.002)	24.86 (<0.001)
Sample (n)	343				343	147	98	98
Trustworthy Type 2	96.33***	66.19	88.95	-4.039 (<0.001)	0.008*** (0.002)	0.012*** (0.003)	0.005* (0.003)	0.005 (0.004)
p-value					<0.001	<0.001	0.094	0.220
R ²					0.229	0.283	0.213	0.216
Wald chi ² (p-value)					72.99 (<0.001)	35.28 (<0.001)	23.48 (0.001)	24.40 (0.001)
Sample (n)	343				343	147	98	98
Trustworthy Type 3	102.09***	65.00	93.26	-4.593 (<0.001)	0.009*** (0.002)	0.020*** (0.004)	0.007* (0.004)	0.004 (0.004)
p-value					<0.001	<0.001	0.069	0.352
R ²					0.271	0.390	0.248	0.254
Wald chi ² (p-value)					72.61 (<0.001)	47.41 (<0.001)	22.81 (<0.001)	22.15 (0.002)
Sample (n)	294				294	126	84	84

Note: Statistical significance: 1% ***, 5% **, 10% *. ‘Group 2’ completed the sender UG and recipient TG tasks.

Table 13: Trustworthiness per social discounting measure, AUC – Group 2: UGS & TGR

Bivariate analysis				OLS Regression				Sample (n)
Mean (no)	Mean (yes)	Mean (Total)	T statistic (p-value)	Coefficient	p value	R square	Wald chi square (p-value)	
Trustworthy Type 1								
0.249**	0.410	0.361	-2.142 (0.037)	3.178** (1.263)	0.012	0.255	15.47 (0.030)	
								49
Trustworthy Type 2								
0.261	0.393	0.361	-1.608 (0.114)	2.365* (1.290)	0.067	0.247	10.49 (0.162)	
								49
Trustworthy Type 3								
0.259*	0.419	0.381	-1.768 (0.084)	2.688* (1.419)	0.058	0.290	11.70 (0.110)	
								42

Note: Statistical significance: 1% ***, 5% **, 10% *. ‘Group 2’ completed the sender UG and recipient TG tasks.

Table 14: Trustworthiness per social discounting measure, *k*-value – Group 2: UGS & TGR

Bivariate analysis				OLS Regression				Sample (n)
Mean (no)	Mean (yes)	Mean (Total)	T statistic (p-value)	Coefficient	p value	R square	Wald chi square (p-value)	
Trustworthy Type 1								
2.175***	0.303	0.876	2.696 (0.009)	-0.601*** (0.163)	<0.001	0.341	23.19 (0.001)	
								49
Trustworthy Type 2								
1.508	0.671	0.876	1.059 (0.294)	-0.264** (0.131)	0.044	0.238	12.85 (0.076)	
								49
Trustworthy Type 3								
1.680**	0.281	0.614	2.185 (0.034)	-0.631** (0.242)	0.009	0.357	16.80 (0.018)	
								42

Note: Statistical significance: 1% ***, 5% **, 10% *. ‘Group 2’ completed the sender UG and recipient TG tasks

A number of significant results are reported in Table 9. Subjects from Group 2 with preferences for being reciprocal and egalitarian are giving significantly more. This result is highly significant

for these subjects for the full sample analysis and at the close social distances, but not at further distances. For the two measures of social discounting, AUC and k' , none of the results for AUC as reported in Table 10 are statistically significant. However, for the social discounting rate, k' , in Table 11, subjects in Group 2 who are reciprocally inclined were also more altruistic, with this result being most significant at the mean value at the lower offers and for both offers in the TG. Subjects with preferences for egalitarianism at high offers and at both offers in the TG are also more altruistic, albeit only weakly significantly so in statistical terms.

In Tables 12, 13 and 14, the association of altruism with trustworthiness of subjects in Group 2 is reported for each of the altruism measures. According to the results reported in these three tables, all three measures of altruism are significantly associated with trustworthiness. This is the case for all three outcomes. For crossover, this result is statistically significant at the “close” and “intermediate” social distance categories, but not for distant relations. This association implies that altruism is associated with trustworthiness in the TG, as subjects may realise that altruistic choices may increase payoffs for their counterparts.

6. Discussion

Social preferences are one major type of preferences investigated in behavioural economics and relate to the concepts of reciprocity, altruism, inequity aversion, and fairness (Fehr & Fischbacher, 2002). Furthermore, a large array of social preferences that are widespread across individuals has subsequently been investigated and defined through the theoretical development of social preferences (Fehr & Schmidt, 2006; Van Lange *et al.*, 2013). The paper builds on this work and defines a set of social subject-types based on responses in a UG and TG. The paper extends the SDT literature by investigating the association of giving and social discounting, as measures of altruism, with these identified social subject-types, a study which is believed to be the first of its kind.

There are three key findings in this study. *Firstly*, the results show that subjects in the study with preferences for egalitarianism are more altruistic, with statistically significant associations reported for two of three measures of altruism, namely crossover value (higher) and k' (lower). With respect to crossover values, these subjects were significantly more generous to recipients at close social distances. According to Frohlich *et al.* (1984), egalitarian preferences involve a

concern for the degree of equality of income, wealth, or payoff associated with the outcomes. In terms of the responses in the UG and TG, this would refer to choices strictly for equal payoffs (which implies offers of 50% of the endowment) rather than a higher payoff for one-self. Fehr and Schmidt (1999) assume, for example, that egalitarian persons want to achieve an equitable distribution of material resources. This means that they are altruistic towards other persons, i.e. they want to increase the other persons' material payoffs, if the other persons' material payoffs are below an equitable benchmark. The findings of this study to some extent confirm these assumptions.

Secondly, subjects with preferences for being reciprocal are more altruistic, with significant results for crossover values and k' and specifically significant for individuals in the close social distance category. Leider *et al.* (2009) investigated whether giving is motivated by the prospect of future interaction, and found that greater social proximity to the partner in the anonymous dictator games increased the levels of generosity of the sender and the effect of reciprocity increased these levels of generosity by almost 50%. Furthermore Zhao *et al.* (2016) found positive evidence of associations between generosity and positive reciprocity, even more so when the relationship between the sender and recipient had previously been established. Therefore, reciprocity matters when giving to those to whom we feel close, as confirmed in the results of this study. Fehr and Fischbacher (2002) suggest that reciprocal and egalitarian individuals would have relatively similar altruistic behaviour, and this is confirmed in the study.

Thirdly, when testing for an association between social preferences and altruism levels in Group 1, the results report a statistically significant result for the relationship between trust and crossover values, with trustful subjects being more generous to individuals at close social distances. According to Cox and Deck (2005), play in the trust game can be motivated by responders' positive reciprocity and proposers' trust that responders will not defect because of their positive reciprocity and/or altruism. Proposers may make generous proposals in the trust game because they have altruistic other-regarding preferences over outcomes. In other words, proposers who are trusting are expected to be more generous, which is confirmed by the findings of this study. Ben-Ner and Putterman (2001) and Hardin (2004) suggest that the understanding of trust and trustworthiness should go hand in hand. The study also tested for any associations between the altruistic behaviour of subjects and their level of trustworthiness and found that altruistic subjects exhibit preferences

for trustworthiness and more so at close social distances. The results of the study show that altruism is associated with the trustworthiness of subjects. This confirms previous evidence that suggests a positive association between altruism and trustworthiness (Ashraf *et al.*, 2006; Chaudhuri & Gangadharan, 2007; Kovacs & Willinger, 2013). While previous research results regarding the association of altruism with trust are less consistent, although not non-existent (Brülhart & Usunier, 2012; Cox, 2004; Dufwenberg & Gneezy, 2000), this study does find evidence of an association between giving and trust. This study finds that trusting individuals in the study behave more altruistically, and there is also a significant association between altruism and the trustworthiness of the subjects, which confirms these previous findings.

In summary, four of the six social subject-types identified in the study, namely egalitarianism, reciprocity, and trust and trustworthiness, were found to be related to at least two of the three measures of altruism, i.e. crossover value and k' , with crossover being consistently significant for all of three mentioned preferences and specifically at close rather than distant relations.

The study has various limitations. The sample size is very small, and this influences the statistical power of the results, as is evident by the mostly insignificant results for Group 1 of the subject pool. Furthermore, the sample is primarily from one faculty at the same university in one country, which also makes generalisation difficult. Future research is needed to determine whether other factors such as different fields and levels (undergraduate versus postgraduate) of study, physical location, cultural differences and employment status may impact on differences in levels of altruism and types of social preferences and the subsequent associations between these two preference sets. The next limitation is that the study cannot make claims about causality between social subject-types and altruism as the data are primarily cross-sectional. Future research should explore the inclusion of post experimental questionnaires, which can provide further information on subjects' motivations for giving and altruism expressed in the SDT. Alternatively, social preference choice tasks may be incorporated into the SDT to elucidate the motives for altruism. Lastly, the classification of the social subject-types as done in the paper represents indicative measures only of social preferences based on the responses to a simple UG and TG rather than fully fledged characterizations of such social types. For example, preferences for egalitarianism is probably overstated here, because the task only allows subjects to give or return nothing, half or

all the endowment. Further research based on this work should look into using expanded versions of the UG and TG to assess the role of social preferences in explaining choices observed in SDTs.

7. Conclusion

The paper reports on the results of an economic experiment employing the UG, TG and SDT tasks with a group of staff and student subjects at a South African university. The study identifies a number of social subject-types from the subjects' responses in the UG and TG and then investigates the association of these preferences with the altruistic behaviour of subjects based on responses in the SDT. The study finds that altruism, as measured by giving and social discounting, is associated with four of the six social subject-types identified in the study. Particularly subjects with preferences for being egalitarian and reciprocal were more altruistic. Furthermore, trusting subjects were also reported to be more generous, while a positive and significant associations was found between altruism and trustworthiness. Finally, where social subject-types matter for altruism, i.e. reciprocal, egalitarian, trust and trustworthy, all four of these types mattered only at close social distances and not for distant relations. In summary, altruism is associated with egalitarianism, reciprocity and to a lesser extent with trust, and in turn, altruism is also associated with trustworthiness of subjects in the study.

CHAPTER 5: GENERAL CONCLUSION

This thesis presents the findings of a study investigating altruism, as measured by giving and social discounting, elicited with the aid of the social discounting task (SDT) and its relation to economic and social preferences. This in particular entails comparing the altruistic behaviour of laboratory to field subjects and the dynamics that form the basis for differences in group subjects' altruistic behaviour; testing for any associations between altruism and risk and time preferences; and testing for any associations between altruism and other social preferences. The study collects data from a purposive sample of experimental subjects at a South African university. The social discounting task (SDT), in its standard form, is used to measure altruism, but inclusive of the collection of detailed recipient characteristics, a feature not normally included in this experimental task. Multiple price lists (MPLs) are employed in the first of the experiments to elicit time and risk preferences, and an ultimatum game (UG) and a trust game (TG) are employed in the second experiment to derive a set of social types based on the responses of the subjects in these two games. Statistical analyses are employed to measure and compare altruistic behaviour between the two subject types and to test for the association between altruism and the various economic and social preferences mentioned above.

The findings of the thesis highlights important information on altruism and its relations to economic and other social preferences.

There is evidence of the extensively researched hypothesis, namely that altruism declines as social distance increases. There is no consistent evidence of significant differences in preferences for giving and social discounting between laboratory and field subjects. (For this reason, the data for laboratory and field subjects were pooled in papers 2 and 3.) However, the dynamics underlying the relative similarity in subjects' choices and altruistic behaviour differ distinctly with regard to the choice of recipients and the nature of the relationships with the recipients. In other words, the precursors and consequences of altruism are likely to play out differently among laboratory and field subjects. In the regression results, the evidence suggests that the subject-type had a significant influence on five of the eight recipient characteristics as choices of field versus laboratory subjects, namely (1) age; (2) frequency of communication; (3) physical distance; (4) psychological distance;

and (5) gender. Furthermore, in terms of relationship status, field subjects chose more family over friends, others and non-family at the close social distances, and more non-family and others over family at the distant social distances compared to their student counterparts.

Although the results on the differences in the levels of altruism between the laboratory and field subjects appear to be inconclusive, the dynamics underlying the subjects' choices and behaviour in regards to the choice of recipients are distinctly different. This could be attributed to differences in the socio-demographic characteristics of the two subject groups. The nature of the relationships between the subjects and the chosen participants is also relevant, with students expected to have less close-knit relationships with friends, with less frequent interactions, knowing that their time on the campus and/or in the city is limited.

Such findings add to the limited literature on the comparison of social discounting in laboratory and field subjects and in a way dampens Tiokhin *et al.*'s (2019) concern that studies that solely focused on students as subjects cannot be relied upon to generalise on aspects of human behaviour such as the concept of social discounting. What the thesis does confirm is that the findings on altruism for laboratory subjects are externally valid, since they correlate with findings for field subjects in this particular sample of subjects.

Risk and time preferences are correlated with altruism, as measured by giving and social discounting, but this association is complex and non-linear by nature in this particular sample of laboratory and field subjects. More specifically, giving to those closest to you increases with risk appetite, whereas the rate of social discounting declines with risk appetite. Patient subjects give more to those closest to them, compared to impatient subjects. These two key findings support some of the theoretical priors and previous empirical evidence on the correlation between social discounting and time and risk preferences. However, the study also provides some evidence that contradicts the theoretical priors with risk-averse subjects and impatient subjects found to give more to those who are socially more distant. Furthermore, when the levels of risk appetite and patience became very high, altruism in fact declined, indicating a complex and non-linear association between altruism, risk attitudes and time preferences in this particular subject pool. Jones and Rachlin (2009), Bialaszeck *et al.* (2019), and Bickel *et al.* (2014) followed the same approach as adopted in this thesis, but these authors did not find a nonlinear relationship between

altruism, risk attitudes and time discounting. The reasons for the non-linearity and complexity in the association reported are unclear and require further investigation.

Finally, the thesis provides evidence that altruism is associated with egalitarianism, reciprocity and, to a lesser extent, with trust, as well as with the trustworthiness of subjects participating in the study. This evidence is the first of its kind reporting on the existence of a number of social types and any associations between these preferences and altruism as studied by means of social discounting studies. The measures used for identifying the social types, albeit theoretically simple, presents a novel and distinct framework of social types, as well as a unique approach to the research focus area of the thesis.

There are some common limitations across the three papers worth mentioning. *First*, the participants (i.e. both laboratory and field subjects) are all from the same university in one country and this makes it difficult to generalise on the altruistic behaviour and its association with time and risk and other social preferences. Furthermore, the field subjects in this study represent a select group of employed people, which may be very distinct from unemployed community members in respect of their economic and social preferences. Future research is needed to determine whether other factors such as different study fields (e.g. social science, health sciences) and levels (undergraduate versus postgraduate) of study, physical location, cultural differences and employment status may have an impact on the altruism levels and economic and social preferences of participants and the subsequent associations between these. Nevertheless, the thesis provides evidence that the social distance task can be used successfully for both laboratory and field subjects. *Secondly*, the sample sizes of the study are relatively small and the subject groups' sizes are not relatively similar, which in some instances make it difficult to detect robust results and influences the statistical power of the study. Since the experiments involved monetary payoffs to subjects, financial constraints precluded a larger sample. Further research of this nature therefore needs to include more representative, diverse, larger and comparatively similarly sized samples of both laboratory and field subjects to assess the extent to which these results are robust and to untangle the explanations for these findings further. *Third*, all three measures of altruism used in the study are estimates, and not data. Using estimates, which are measured by error, and not data can lead to inferential issues and this may account for some of the inconsistent results reported in

the study. Future research employing Nonlinear least squares (NLLS) estimation, or maximum likelihood, will allow for the prevention of uncertainty in the estimates of, for example, k -values to be passed on into inferences drawn from the data. Furthermore, the use of AUC and k -values, although both these variables measure the same phenomenon, is justified due to the fact that AUC has less discriminant ability than k -values and may not present a holistic representation of altruism. *Finally*, since all the experiments within the study were incentivised, the results from the study may be subject to “house money” effects (Carlson & Martinsson, 2013; Clark, 2002; Danková & Servátka, 2015). This implies that since subjects did not ‘play’ with their own money, the monetary incentives may have acted as cues for subjects to behave altruistically, and as such, altruism may be over-stated. In this regard, a methodological avenue for further research includes the use of activities in social discounting tasks for earning the endowment prior to making decisions on the distribution of this money between the self and others. It also needs to be noted that the number of statistical tests conducted in this study raises the spectre of Type I and Type II errors, and hence the possibility of a number of false positive and false negatives.

In summary, the findings in the thesis confirm the existence of altruism, but further shows that this type of behaviour involves a diverse set of distinctive interactions with other economic and social preferences, a topic that requires further study to elucidate the behavioural mechanisms underlying these patterns and associations.

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Annexure A:

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SOCIAL DISCOUNTING TASK

First, let us look at an example of how the task works and how we will calculate your earnings from the particular task.

The following experiment asks you to imagine that you have made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at position #1 to a mere acquaintance at #100. The person at number one would be someone you know well and is your closest friend or relative. The person at #100 might be someone you recognize and encounter but perhaps you may not even know their name.

You do not have to physically create the list- just imagine that you have done so.

For example, imagine the following choices between an amount of money for you and an amount for person **#75** on the list. Circle A or B on the right hand side to indicate which option you would choose in EACH line. Please note that there is no wrong or right answer, simply indicate whether you would choose A or B in each row.

	OPTION A:	OPTION B:	CHOICE	
1.	R90 for you alone	R80 for person #75 on the list	A	B
2.	R80 for you alone	R80 for person #75 on the list	A	B
3.	R70 for you alone	R80 for person #75 on the list	A	B
4.	R60 for you alone	R80 for person #75 on the list	A	B
5.	R50 for you alone	R80 for person #75 on the list	A	B
6.	R40 for you alone	R80 for person #75 on the list	A	B
7.	R30 for you alone	R80 for person #75 on the list	A	B
8.	R20 for you alone	R80 for person #75 on the list	A	B
9.	R10 for you alone	R80 for person #75 on the list	A	B
10.	R0 for you alone	R80 for person #75 on the list	A	B

Annexure B:

NUMBER:	S	D			
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SOCIAL DISCOUNTING TASK (continued)

Imagine you made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at #1 to a mere acquaintance at #100.

Now imagine the following choices between an amount of money for you and an amount for person #1 on the list. Circle A or B on the right hand side to indicate which option you would choose in EACH line.

	OPTION A:	OPTION B:	CHOICE	
1.	R180 for you alone	R160 for person #1 on the list	A	B
2.	R160 for you alone	R160 for person #1 on the list	A	B
3.	R140 for you alone	R160 for person #1 on the list	A	B
4.	R120 for you alone	R160 for person #1 on the list	A	B
5.	R100 for you alone	R160 for person #1 on the list	A	B
6.	R80 for you alone	R160 for person #1 on the list	A	B
7.	R60 for you alone	R160 for person #1 on the list	A	B
8.	R40 for you alone	R160 for person #1 on the list	A	B
9.	R20 for you alone	R160 for person #1 on the list	A	B
10.	R0 for you alone	R160 for person #1 on the list	A	B

NUMBER:	S	D			
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SOCIAL DISCOUNTING TASK (continued)

Imagine you made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at #1 to a mere acquaintance at #100.

Now imagine the following choices between an amount of money for you and an amount for person **#2** on the list. Circle A or B on the right hand side to indicate which option you would choose in EACH line.

	OPTION A:	OPTION B:	CHOICE	
1.	R180 for you alone	R160 for person #2 on the list	A	B
2.	R160 for you alone	R160 for person #2 on the list	A	B
3.	R140 for you alone	R160 for person #2 on the list	A	B
4.	R120 for you alone	R160 for person #2 on the list	A	B
5.	R100 for you alone	R160 for person #2 on the list	A	B
6.	R80 for you alone	R160 for person #2 on the list	A	B
7.	R60 for you alone	R160 for person #2 on the list	A	B
8.	R40 for you alone	R160 for person #2 on the list	A	B
9.	R20 for you alone	R160 for person #2 on the list	A	B
10.	R0 for you alone	R160 for person #2 on the list	A	B

NUMBER:	S	D			
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SOCIAL DISCOUNTING TASK (continued)

Imagine you made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at #1 to a mere acquaintance at #100.

Now imagine the following choices between an amount of money for you and an amount for person **#5** on the list. Circle A or B on the right hand side to indicate which option you would choose in EACH line.

	OPTION A:	OPTION B:	CHOICE	
1.	R180 for you alone	R160 for person #5 on the list	A	B
2.	R160 for you alone	R160 for person #5 on the list	A	B
3.	R140 for you alone	R160 for person #5 on the list	A	B
4.	R120 for you alone	R160 for person #5 on the list	A	B
5.	R100 for you alone	R160 for person #5 on the list	A	B
6.	R80 for you alone	R160 for person #5 on the list	A	B
7.	R60 for you alone	R160 for person #5 on the list	A	B
8.	R40 for you alone	R160 for person #5 on the list	A	B
9.	R20 for you alone	R160 for person #5 on the list	A	B
10.	R0 for you alone	R160 for person #5 on the list	A	B

NUMBER:	S	D			
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SOCIAL DISCOUNTING TASK (continued)

Imagine you made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at #1 to a mere acquaintance at #100.

Now imagine the following choices between an amount of money for you and an amount for person **#10** on the list. Circle A or B on the right hand side to indicate which option you would choose in EACH line.

	OPTION A:	OPTION B:	CHOICE	
1.	R180 for you alone	R160 for person #10 on the list	A	B
2.	R160 for you alone	R160 for person #10 on the list	A	B
3.	R140 for you alone	R160 for person #10 on the list	A	B
4.	R120 for you alone	R160 for person #10 on the list	A	B
5.	R100 for you alone	R160 for person #10 on the list	A	B
6.	R80 for you alone	R160 for person #10 on the list	A	B
7.	R60 for you alone	R160 for person #10 on the list	A	B
8.	R40 for you alone	R160 for person #10 on the list	A	B
9.	R20 for you alone	R160 for person #10 on the list	A	B
10.	R0 for you alone	R160 for person #10 on the list	A	B

NUMBER:	S	D			
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SOCIAL DISCOUNTING TASK (continued)

Imagine you made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at #1 to a mere acquaintance at #100.

Now imagine the following choices between an amount of money for you and an amount for person **#20** on the list. Circle A or B on the right hand side to indicate which option you would choose in EACH line.

	OPTION A:	OPTION B:	CHOICE	
1.	R180 for you alone	R160 for person #20 on the list	A	B
2.	R160 for you alone	R160 for person #20 on the list	A	B
3.	R140 for you alone	R160 for person #20 on the list	A	B
4.	R120 for you alone	R160 for person #20 on the list	A	B
5.	R100 for you alone	R160 for person #20 on the list	A	B
6.	R80 for you alone	R160 for person #20 on the list	A	B
7.	R60 for you alone	R160 for person #20 on the list	A	B
8.	R40 for you alone	R160 for person #20 on the list	A	B
9.	R20 for you alone	R160 for person #20 on the list	A	B
10.	R0 for you alone	R160 for person #20 on the list	A	B

NUMBER:	S	D			
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SOCIAL DISCOUNTING TASK (continued)

Imagine you made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at #1 to a mere acquaintance at #100.

Now imagine the following choices between an amount of money for you and an amount for person **#50** on the list. Circle A or B on the right hand side to indicate which option you would choose in EACH line.

	OPTION A:	OPTION B:	CHOICE	
1.	R180 for you alone	R160 for person #50 on the list	A	B
2.	R160 for you alone	R160 for person #50 on the list	A	B
3.	R140 for you alone	R160 for person #50 on the list	A	B
4.	R120 for you alone	R160 for person #50 on the list	A	B
5.	R100 for you alone	R160 for person #50 on the list	A	B
6.	R80 for you alone	R160 for person #50 on the list	A	B
7.	R60 for you alone	R160 for person #50 on the list	A	B
8.	R40 for you alone	R160 for person #50 on the list	A	B
9.	R20 for you alone	R160 for person #50 on the list	A	B
10.	R0 for you alone	R160 for person #50 on the list	A	B

NUMBER:	S	D			
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SOCIAL DISCOUNTING TASK (continued)

Imagine you made a list of the 100 people closest to you in the world ranging from your dearest friend or relative at #1 to a mere acquaintance at #100.

Now imagine the following choices between an amount of money for you and an amount for person **#100** on the list. Circle A or B on the right hand side to indicate which option you would choose in EACH line.

	OPTION A:	OPTION B:	CHOICE	
1.	R180 for you alone	R160 for person #100 on the list	A	B
2.	R160 for you alone	R160 for person #100 on the list	A	B
3.	R140 for you alone	R160 for person #100 on the list	A	B
4.	R120 for you alone	R160 for person #100 on the list	A	B
5.	R100 for you alone	R160 for person #100 on the list	A	B
6.	R80 for you alone	R160 for person #100 on the list	A	B
7.	R60 for you alone	R160 for person #100 on the list	A	B
8.	R40 for you alone	R160 for person #100 on the list	A	B
9.	R20 for you alone	R160 for person #100 on the list	A	B
10.	R0 for you alone	R160 for person #100 on the list	A	B

Annexure C:

SOCIAL DISCOUNTING TASK (continued)

Now we would appreciate it if you can provide us with more information on person **#1**. For Person **#1** on your list, please indicate which category best fits your relationship with that person by checking ONE box ONLY.

Wife/Husband	<input type="checkbox"/>	Girlfriend/Boyfriend	<input type="checkbox"/>
Mother/Father	<input type="checkbox"/>	Friend	<input type="checkbox"/>
Sister/Brother (sibling)	<input type="checkbox"/>	Neighbour/Acquaintance	<input type="checkbox"/>
Other family	<input type="checkbox"/>	Stranger	<input type="checkbox"/>

Other:
(please specify)

--

Imagine a six-step ladder where the poorest in South Africa stand at the bottom (the first step) and the richest people in South Africa stand on the highest step (the sixth step). On which step is this person's household today?

Poorest						Richest
1	2	3	4	5	6	

Don't know

Note: Circle ONE option ONLY.

In addition, please provide the following information for person **#1**:

Age (approximately): years

Gender (circle ONE option ONLY):

Male	Female
< one year	1
1-2 years	2
3-5 years	3
5-10 years	5
> 10 years	6

How long have you known this person?

Note: Mark ONE option ONLY.

How often do you communicate with this person?

Daily	1
A few times a week	2
Once a week	3
A few times a month	4
Once a month	5
A few times a year	6
Less frequently	7
I have no contact with this person	8

Note: Mark ONE option ONLY.

How far does this person live from you currently?

We live together	1
Within walking distance	2
In the same town/city/village	3
In another town/city/village	4
In another country	5
I do not know where this person lives	6

Note: Mark ONE option ONLY.

On a ten-point scale, at an emotional and psychological level, how close do you perceive yourself to be to this particular person?

Not close at all					Extremely close				
1	2	3	4	5	6	7	8	9	10

SOCIAL DISCOUNTING TASK (continued)

Now we would appreciate it if you can provide us with more information on person **#2**. For Person **#2** on your list, please indicate which category best fits your relationship with that person by checking ONE box ONLY.

Wife/Husband	<input type="checkbox"/>	Girlfriend/Boyfriend	<input type="checkbox"/>
Mother/Father	<input type="checkbox"/>	Friend	<input type="checkbox"/>
Sister/Brother (sibling)	<input type="checkbox"/>	Neighbour/Acquaintance	<input type="checkbox"/>
Other family	<input type="checkbox"/>	Stranger	<input type="checkbox"/>

Other:
(please specify)

Imagine a six-step ladder where the poorest in South Africa stand at the bottom (the first step) and the richest people in South Africa stand on the highest step (the sixth step). On which step is this person's household today?

Poorest						Richest
1	2	3	4	5	6	

Note: Circle ONE option ONLY.

Don't know

In addition, please provide the following information for person **#2**:

Age (approximately):

years

Gender (circle ONE option ONLY):

Male	Female
------	--------

How long have you known this person?

< one year	1
1-2 years	2
3-5 years	3
5-10 years	5
> 10 years	6

Note: Mark ONE option ONLY.

How often do you communicate with this person?

Daily	1
A few times a week	2
Once a week	3
A few times a month	4
Once a month	5
A few times a year	6
Less frequently	7
I have no contact with this person	8

Note: Mark ONE option ONLY.

How far does this person live from you currently?

We live together	1
Within walking distance	2
In the same town/city/village	3
In another town/city/village	4
In another country	5
I do not know where this person lives	6

Note: Mark ONE option ONLY.

On a ten-point scale, at an emotional and psychological level, how close do you perceive yourself to be to this particular person?

Not close at all					Extremely close				
1	2	3	4	5	6	7	8	9	10

SOCIAL DISCOUNTING TASK (continued)

Now we would appreciate it if you can provide us with more information on person **#5**. For Person **#5** on your list, please indicate which category best fits your relationship with that person by checking ONE box ONLY.

Wife/Husband	<input type="checkbox"/>	Girlfriend/Boyfriend	<input type="checkbox"/>
Mother/Father	<input type="checkbox"/>	Friend	<input type="checkbox"/>
Sister/Brother (sibling)	<input type="checkbox"/>	Neighbour/Acquaintance	<input type="checkbox"/>
Other family	<input type="checkbox"/>	Stranger	<input type="checkbox"/>

Other:
(please specify)

Imagine a six-step ladder where the poorest in South Africa stand at the bottom (the first step) and the richest people in South Africa stand on the highest step (the sixth step). On which step is this person's household today?

Poorest						Richest
1	2	3	4	5	6	

Note: Circle ONE option ONLY.

Don't know

In addition, please provide the following information for person **#5**:

Age (approximately):

years

Gender (circle ONE option ONLY):

Male	Female
------	--------

How long have you known this person?

< one year	1
1-2 years	2
3-5 years	3
5-10 years	5
> 10 years	6

Note: Mark ONE option ONLY.

How often do you communicate with this person?

Daily	1
A few times a week	2
Once a week	3
A few times a month	4
Once a month	5
A few times a year	6
Less frequently	7
I have no contact with this person	8

Note: Mark ONE option ONLY.

How far does this person live from you currently?

We live together	1
Within walking distance	2
In the same town/city/village	3
In another town/city/village	4
In another country	5
I do not know where this person lives	6

Note: Mark ONE option ONLY.

On a ten-point scale, at an emotional and psychological level, how close do you perceive yourself to be to this particular person?

Not close at all					Extremely close				
1	2	3	4	5	6	7	8	9	10

SOCIAL DISCOUNTING TASK (continued)

Now we would appreciate it if you can provide us with more information on person **#10**. For Person **#10** on your list, please indicate which category best fits your relationship with that person by checking ONE box ONLY.

Wife/Husband	<input type="checkbox"/>	Girlfriend/Boyfriend	<input type="checkbox"/>
Mother/Father	<input type="checkbox"/>	Friend	<input type="checkbox"/>
Sister/Brother (sibling)	<input type="checkbox"/>	Neighbour/Acquaintance	<input type="checkbox"/>
Other family	<input type="checkbox"/>	Stranger	<input type="checkbox"/>

Other:
(please specify)

Imagine a six-step ladder where the poorest in South Africa stand at the bottom (the first step) and the richest people in South Africa stand on the highest step (the sixth step). On which step is this person's household today?

Poorest						Richest
1	2	3	4	5	6	

Note: Circle ONE option ONLY.

Don't know

In addition, please provide the following information for person **#10**:

Age (approximately):

years

Gender (circle ONE option ONLY):

Male	Female
------	--------

How long have you known this person?

< one year	1
1-2 years	2
3-5 years	3
5-10 years	5
> 10 years	6

Note: Mark ONE option ONLY.

How often do you communicate with this person?

Daily	1
A few times a week	2
Once a week	3
A few times a month	4
Once a month	5
A few times a year	6
Less frequently	7
I have no contact with this person	8

Note: Mark ONE option ONLY.

How far does this person live from you currently?

We live together	1
Within walking distance	2
In the same town/city/village	3
In another town/city/village	4
In another country	5
I do not know where this person lives	6

Note: Mark ONE option ONLY.

On a ten-point scale, at an emotional and psychological level, how close do you perceive yourself to be to this particular person?

Not close at all					Extremely close				
1	2	3	4	5	6	7	8	9	10

SOCIAL DISCOUNTING TASK (continued)

Now we would appreciate it if you can provide us with more information on person **#20**. For Person **#20** on your list, please indicate which category best fits your relationship with that person by checking ONE box ONLY.

Wife/Husband	<input type="checkbox"/>	Girlfriend/Boyfriend	<input type="checkbox"/>
Mother/Father	<input type="checkbox"/>	Friend	<input type="checkbox"/>
Sister/Brother (sibling)	<input type="checkbox"/>	Neighbour/Acquaintance	<input type="checkbox"/>
Other family	<input type="checkbox"/>	Stranger	<input type="checkbox"/>

Other:
(please specify)

Imagine a six-step ladder where the poorest in South Africa stand at the bottom (the first step) and the richest people in South Africa stand on the highest step (the sixth step). On which step is this person's household today?

Poorest						Richest
1	2	3	4	5	6	

Note: Circle ONE option ONLY.

Don't know

In addition, please provide the following information for person **#20**:

Age (approximately):

years

Gender (circle ONE option ONLY):

Male	Female
------	--------

How long have you known this person?

< one year	1
1-2 years	2
3-5 years	3
5-10 years	5
> 10 years	6

Note: Mark ONE option ONLY.

How often do you communicate with this person?

Daily	1
A few times a week	2
Once a week	3
A few times a month	4
Once a month	5
A few times a year	6
Less frequently	7
I have no contact with this person	8

Note: Mark ONE option ONLY.

How far does this person live from you currently?

We live together	1
Within walking distance	2
In the same town/city/village	3
In another town/city/village	4
In another country	5
I do not know where this person lives	6

Note: Mark ONE option ONLY.

On a ten-point scale, at an emotional and psychological level, how close do you perceive yourself to be to this particular person?

Not close at all					Extremely close				
1	2	3	4	5	6	7	8	9	10

SOCIAL DISCOUNTING TASK (continued)

Now we would appreciate it if you can provide us with more information on person **#50**. For Person **#50** on your list, please indicate which category best fits your relationship with that person by checking ONE box ONLY.

Wife/Husband	<input type="checkbox"/>	Girlfriend/Boyfriend	<input type="checkbox"/>
Mother/Father	<input type="checkbox"/>	Friend	<input type="checkbox"/>
Sister/Brother (sibling)	<input type="checkbox"/>	Neighbour/Acquaintance	<input type="checkbox"/>
Other family	<input type="checkbox"/>	Stranger	<input type="checkbox"/>

Other:
(please specify)

Imagine a six-step ladder where the poorest in South Africa stand at the bottom (the first step) and the richest people in South Africa stand on the highest step (the sixth step). On which step is this person's household today?

Poorest						Richest
1	2	3	4	5	6	

Note: Circle ONE option ONLY.

Don't know

In addition, please provide the following information for person **#50**:

Age (approximately):

years

Gender (circle ONE option ONLY):

Male	Female
------	--------

How long have you known this person?

< one year	1
1-2 years	2
3-5 years	3
5-10 years	5
> 10 years	6

Note: Mark ONE option ONLY.

How often do you communicate with this person?

Daily	1
A few times a week	2
Once a week	3
A few times a month	4
Once a month	5
A few times a year	6
Less frequently	7
I have no contact with this person	8

Note: Mark ONE option ONLY.

How far does this person live from you currently?

We live together	1
Within walking distance	2
In the same town/city/village	3
In another town/city/village	4
In another country	5
I do not know where this person lives	6

Note: Mark ONE option ONLY.

On a ten-point scale, at an emotional and psychological level, how close do you perceive yourself to be to this particular person?

Not close at all					Extremely close				
1	2	3	4	5	6	7	8	9	10

SOCIAL DISCOUNTING TASK (continued)

Now we would appreciate it if you can provide us with more information on person **#100**. For Person **#100** on your list, please indicate which category best fits your relationship with that person by checking ONE box ONLY.

Wife/Husband	<input type="checkbox"/>	Girlfriend/Boyfriend	<input type="checkbox"/>
Mother/Father	<input type="checkbox"/>	Friend	<input type="checkbox"/>
Sister/Brother (sibling)	<input type="checkbox"/>	Neighbour/Acquaintance	<input type="checkbox"/>
Other family	<input type="checkbox"/>	Stranger	<input type="checkbox"/>

Other:
(please specify)

Imagine a six-step ladder where the poorest in South Africa stand at the bottom (the first step) and the richest people in South Africa stand on the highest step (the sixth step). On which step is this person's household today?

Poorest						Richest
1	2	3	4	5	6	

Note: Circle ONE option ONLY.

Don't know

In addition, please provide the following information for person **#100**:

Age (approximately):

years

Gender (circle ONE option ONLY):

Male	Female
------	--------

How long have you known this person?

< one year	1
1-2 years	2
3-5 years	3
5-10 years	5
> 10 years	6

Note: Mark ONE option ONLY.

How often do you communicate with this person?

Daily	1
A few times a week	2
Once a week	3
A few times a month	4
Once a month	5
A few times a year	6
Less frequently	7
I have no contact with this person	8

Note: Mark ONE option ONLY.

How far does this person live from you currently?

We live together	1
Within walking distance	2
In the same town/city/village	3
In another town/city/village	4
In another country	5
I do not know where this person lives	6

Note: Mark ONE option ONLY.

On a ten-point scale, at an emotional and psychological level, how close do you perceive yourself to be to this particular person?

Not close at all					Extremely close				
1	2	3	4	5	6	7	8	9	10

Annexure D:

SOCIO-DEMOGRAPHIC QUESTIONNAIRE

Please provide us with the following information – please note that all information will be kept confidential and nobody else will know what you have written:

1. Age:

--	--

 years

2. Gender:

Male = 1	Female = 2
----------	------------

Note: Circle ONE option ONLY.

3. Race:

African/Black = 1	Coloured = 2	Asian/Indian = 3	White = 4
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Note: Circle ONE option ONLY.

4. Home language:

Afrikaans = 1	English = 2	IsiNdebele = 3	IsiXhosa = 4	IsiZulu = 5	Sepedi = 6
Sesotho = 7	Setswana = 8	Siswati = 9	Tshivenda = 10	Xitsonga = 11	Other = 12

Note: Circle ONE option ONLY.

5. Faculty:

Economic and Management Sciences = 1	Education = 2	Health Sciences = 3	Humanities = 4	Law = 5	Natural and Agricultural Sciences = 6	Theology = 7
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Note: Circle ONE option ONLY.

6. Imagine a six-step ladder where the poorest in South Africa stand at the bottom (the first step) and the richest people in South Africa stand on the highest step (the sixth step). On which step are your household today?

Poorest						Richest
1	2	3	4	5	6	

Note: Circle ONE option ONLY.

7. How will you describe your financial situation today? (i.e. the status of your personal finances)

Very broke	1
Broke	2
Neither	3
In good shape	4
In very good shape	5

Note: Mark ONE option ONLY.

8. Have you applied to UFS for financial aid?

Yes = 1	No = 0
---------	--------

Note: Circle ONE option ONLY.

9. Were you awarded financial aid from UFS?

Yes = 1	No = 0
---------	--------

Note: Circle ONE option ONLY.

10. Have you previously participated in any experiment of this nature?

Yes = 1	No = 0
---------	--------

Note: Circle ONE option ONLY.

Annexure E:

NUMBER:	S	D			
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ADMINISTRATIVE FORM - PAYMENT – ADMINISTRATIVE FORM

STEP 1: Record the following information for the subject

Name:

Surname:

Cell phone number:

Student/staff number:

STEP 2: Play out the random selection of the task/game to be paid

Instruction: Ask subject to roll the 10-sided dice once. Then record the number rolled below.

Dice number (1-4):	1-3	4-6	7-9	10
	=	=	=	=
<i>Note:</i> Circle number.	Time Preferences	Risk Attitudes	Social Discounting	Roll the dice again

Instruction:

Now implement the payment procedure for the above task/game using the form below.

NUMBER:	S	D			
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Instruction:

Implement the payment procedure for the ONE relevant task/game as below:

TIME PREFERENCES: (page 7-10)											RISK ATTITUDES: (page 15-18)																		
(i) Subject rolls 4-sided dice to select table:											(i) Subject rolls 4-sided dice to select table:																		
A				B				C				D			E				F				G				H		
(ii) Subject rolls 10-sided dice – record result:											(ii) Subject rolls 10-sided dice – record result:																		
1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10										
(iii) Record the relevant chosen option (A/B):											(iii) Record the relevant chosen option (A/B):																		
A						B					A						B												
											(iv) Subject rolls 10-sided dice – record result:																		
											1	2	3	4	5	6	7	8	9	10									
Payment for relevant option:											Payment for relevant option:																		
R											R																		
In ___ week and ___ months.																													

Instruction:

Implement the payment procedure for the ONE relevant task/game as below:

SOCIAL DISCOUNTING TASK: (page 21-33)									
(i) Subject rolls 8 sided-dice – if rolls 8, roll again until roll a number between 1 and 7 – record result:									
1	2	3	4	5	6	7			
(ii) Record the relevant social distance:									
1	2	5	10	20	50	100			
(iii) Subject rolls 10-sided dice – record row:									
1	2	3	4	5	6	7	8	9	10
(iv) Record the relevant chosen option (A/B):									
A		B							
Payment for relevant option:									
R									
(v) If OPTION B is chosen, complete the nomination/payment form for the person at the relevant social distance (see below).									

NUMBER:	S	D			
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ACKNOWLEDGEMENT OF PAYMENT

I, [_____ FULL NAMES _____] [_ STUDENT / STAFF NUMBER _],
 hereby declare that I have received the following amount of money as payment for my
 participation in this experiment.

Payment:		R					
Subject:	SIGNATURE	D	D	M	M	Y	Y
Witness 1:	SIGNATURE	D	D	M	M	Y	Y
Witness 2:	SIGNATURE	D	D	M	M	Y	Y

Payment processed:	SIGNATURE	D	D	M	M	Y	Y
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NUMBER:	S	D			
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ADMINISTRATIVE - PAYMENT - ADMINISTRATIVE

Instruction: In the case of the social discounting task being the task selected for payment AND OPTION B is selected for payment, please ask the subject for the following information for the person at the relevant social distance.

SOCIAL DISCOUNTING TASK – NOMINEE

Name:

Surname:

Address:

Cell phone number:

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Annexure F:

NUMBER:		G			
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ADMINISTRATIVE FORM - PAYMENT – ADMINISTRATIVE FORM

STEP 1: Record the following information for the subject

Name:

Surname:

Cell phone number:

Student/staff number:

STEP 2: Play out the random selection of the task/game to be paid

Instruction: Ask subject to roll the 8-sided dice once. Then record the number rolled below.

Dice number (1-8):

1-2	3-4	5-6
=	=	=
Trust Game	Ultimatum Game	Social Discounting Task

Instruction:

Now implement the payment procedure for the above task/game using the form below.

NUMBER:		G			
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Instruction:

Implement the payment procedure for the ONE relevant task/game as below:

**TRUST GAME:
(page 5)**

FOR RECIPIENT

- (i) Subject rolls 4- sided dice – if rolls 1-2, – record result:

1	2	Choose Table 2
---	---	----------------

- (ii) Subject rolls 4- sided dice – if rolls 3-4, – record result:

3	4	Choose Table 3
---	---	----------------

- (iii) Record the relevant chosen option (Yes/No):

Table 2

R150 kept	Yes	No
R75 kept	Yes	No
R0 kept	Yes	No

Table 3

R300 kept	Yes	No
R150 kept	Yes	No
R0 kept	Yes	No

Payment for relevant option:

--	--	--

NUMBER:		G			
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**TRUST GAME:
(page 5)**

FOR SENDER

Table 1: Record Result

R0 to you/ R100 to player B	YES
R50 to you/ R50 to Player B	YES
R100 to you/ R0 to Player B	YES

Payment for relevant option:

--	--	--

NUMBER:		G			
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Instruction:

Implement the payment procedure for the ONE relevant task/game as below:

**ULTIMATUM GAME:
(page 5)**

FOR SENDER, ONLY

Table 1: Record Result

R0 to you/ R100 to player B	YES
R50 to you/ R50 to Player B	YES
R100 to you/ R0 to Player B	YES

Payment for relevant option:

--	--	--

FOR RECIPIENT, ONLY

Record Result

R0 to you/ R100 to player A	Accept	Reject
R50 to you/ R50 to Player A	Accept	Reject
R100 to you/ R0 to Player A	Accept	Reject

Payment for relevant option:

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NUMBER:		G			
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Instruction:

Implement the payment procedure for the ONE relevant task/game as below:

SOCIAL DISCOUNTING TASK:

(page 8-21)

<p>(i) Subject rolls 8 sided-dice – if rolls 8, roll again until roll a number between 1 and 7 – record result:</p>									
1	2	3	4	5	6	7			
<p>(ii) Record the relevant social distance:</p>									
1	2	5	10	20	50	100			
<p>(iii) Subject rolls 10-sided dice – record row:</p>									
1	2	3	4	5	6	7	8	9	10
<p>(iv) Record the relevant chosen option (A/B):</p>									
A		B							
<p>Payment for relevant option:</p>				<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> </table>					
<p>R</p>									
<p>(v) If OPTION B is chosen, complete the nomination/payment form for the person at the relevant social distance (see below).</p>									

NUMBER:		G			
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ACKNOWLEDGEMENT OF PAYMENT

I, [_____ FULL NAMES _____] [_STUDENT / STAFF NUMBER_],
 hereby declare that I have received the following amount of money as payment for my
 participation in this experiment.

Payment:		R	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>					
Subject:	SIGNATURE	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 16.6%;">D</td> <td style="width: 16.6%;">D</td> <td style="width: 16.6%;">M</td> <td style="width: 16.6%;">M</td> <td style="width: 16.6%;">Y</td> <td style="width: 16.6%;">Y</td> </tr> </table>	D	D	M	M	Y	Y
D	D	M	M	Y	Y			
Witness 1:	SIGNATURE	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 16.6%;">D</td> <td style="width: 16.6%;">D</td> <td style="width: 16.6%;">M</td> <td style="width: 16.6%;">M</td> <td style="width: 16.6%;">Y</td> <td style="width: 16.6%;">Y</td> </tr> </table>	D	D	M	M	Y	Y
D	D	M	M	Y	Y			
Witness 2:	SIGNATURE	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 16.6%;">D</td> <td style="width: 16.6%;">D</td> <td style="width: 16.6%;">M</td> <td style="width: 16.6%;">M</td> <td style="width: 16.6%;">Y</td> <td style="width: 16.6%;">Y</td> </tr> </table>	D	D	M	M	Y	Y
D	D	M	M	Y	Y			

Payment processed:	SIGNATURE	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 16.6%;">D</td> <td style="width: 16.6%;">D</td> <td style="width: 16.6%;">M</td> <td style="width: 16.6%;">M</td> <td style="width: 16.6%;">Y</td> <td style="width: 16.6%;">Y</td> </tr> </table>	D	D	M	M	Y	Y
D	D	M	M	Y	Y			

NUMBER:		G			
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ADMINISTRATIVE - PAYMENT - ADMINISTRATIVE

Instruction: Please ask the subject for the following information for the person at the relevant social distance.

NOMINEE

Name:

Surname:

Address:

Cell phone number:

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Annexure G:

NUMBER:	S	D			
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How do I play the table?

1. Please look at the above 'Practice Table'.
2. On the left of the table there are 10 rows.
3. You will need to play A or B on every row.
4. You will play by marking A or B on the right of the table under 'Your Choice'

How do A and B change on the table?

1. Please look at row 1 at the top of the 'Practice Table'.
2. With A you win R90 if you roll 1 on the 10-sided dice and you win R60 if you roll the number 2, 3, 4, 5, 6, 7, 8, 9 or 0.
3. With B you win R160 if you roll 1 on the 10-sided dice and you win R20 if you roll the number 2, 3, 4, 5, 6, 7, 8, 9, or 0.
4. On every row in this table the money under A is R90 or R60 and the money under B is R160 or R20.
5. Please look at the table at the top of the page. As you move down the table from row 1 to row 10, you will see that there are more numbers next to R90 under A. What this means is that the chance of winning R90 under A gets bigger as you move down the table.
6. As you move down the table, there are less numbers next to R60 under A. What this means is that the chance of winning R60 under A is smaller as you move down the table.
7. As you move down the table from row 1 to row 10, you will see that there are more numbers next to R160 under B. What this means is that the chance of winning R160 under B gets bigger as you move down the table.
8. As you move down the table, there are less numbers next to R20 under B. What this means is that the chance of winning R20 under B is smaller as you move down the table.
9. Please look at row 2 on the 'Practice Table'. With A you win R90 if you roll 1 or 2 and you win R60 if you roll 3, 4, 5, 6, 7, 8, 9 or 0. So now you can roll 1 or 2 to win R90 under A on row 2. On row 1 you could only roll 1 to win R90 under A.
10. On row 2, with B you win R160 if you roll 1 or 2 and you win R20 if you roll 3, 4, 5, 6, 7, 8, 9 or 0. So now you can roll 1 or 2 to win R160 under B on row 2. On row 1 you could only roll 1 to win R160 under B.
11. Please look at row 5. With A you win R90 if you roll 1, 2, 3, 4 or 5 and you win R60 if you roll 6, 7, 8, 9 or 0. So now you can roll 1, 2, 3, 4 or 5 to win R90 under A on row 5. On row 1 you could only roll 1 to win R90 under A.

12. On row 5, with B you win R160 if you roll 1, 2, 3, 4 or 5 and you win R20 if you roll 6, 7, 8, 9 or 0. So now you can roll 1, 2, 3, 4 or 5 to win R160 under B on row 5. On row 1 you could only roll 1 to win R160 under B.

13. Finally, look at row 10. With A you win R90 if you roll 1, 2, 3, 4, 5, 6, 7, 8, 9 or 0. With B you win R160 if you roll 1, 2, 3, 4, 5, 6, 7, 8, 9 or 0. So, on row 10, you can roll any number on the 10-sided dice and you will win R90 if you played A. If you played B on row 10, you can roll any number on the 10-sided dice and you will win R160. So, on row 10, you need to choose between R90 (A) and R160 (B).

How do I know whether to play A or B?

1. Now, you need to play A or B on every row of the table.
2. For row 1 you need to decide if you want to play A or B. In A, the big money is R90 and the small money is R60. In B, the big money is R160 and the small money is R20.
3. So as you can see the big money in B (R160) is always more than the big money in A (R90).
4. But the small money in A (R60) is always more than the small money in B (R20).
5. So if you play A on row 1, there is a low chance of winning R90 and a high chance of winning R60.
6. If you play B on row 1, there is a low chance of winning R160 and a high chance of winning R20.
7. On row 5, if you play A then there is a 50:50 chance of winning R90 or R60.
8. On row 5, if you play B then there is a 50:50 chance of winning R160 or R20.
9. **So all that you need to do is mark A if you want to play A and mark B if you want to play B.**
10. **There is no right or wrong answer in this game.** Please just play A if you want A and play B if you want B on every row of the table.
11. Do you have any questions?

It's now time for you to play the practice table

1. Now it's time for you to play the 'Practice Table'.
2. **Please note that you will not win money for playing this table.**
3. Its important that you play 'R Practice Table' so that you know how to play the other tables and so that you can ask any questions if you have them.

How does payment work again?

1. Roll the 10-sided dice to see your winning row in the table.
2. Look at if you played A or B on that row.
3. Now roll the 10-sided dice once more to see which amount of money you win.

Do you have any other questions?

It's now time for you to start the game

1. Please play Tables E-H in the game pack.
2. The money under A and B is different on every table.
3. So please look at the tables carefully so that you can decide whether to play A or B.
4. Please take your time to play the tables and remember that there is no right or wrong answer in this game. Please just play A if you want A and play B if you want B on each row of every table.

NUMBER:	S	D			
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RISK ATTITUDES (continued)

Now play the table below:

TABLE E

Decision	Option A	Option B	Your Choice (Circle A or B)
1	R60 if dice is 1 R50 if dice is 2 3 4 5 6 7 8 9 0	R100 if dice is 1 R25 if dice is 2 3 4 5 6 7 8 9 0	A B
2	R60 if dice is 1 2 R50 if dice is 3 4 5 6 7 8 9 0	R100 if dice is 1 2 R25 if dice is 3 4 5 6 7 8 9 0	A B
3	R60 if dice is 1 2 3 R50 if dice is 4 5 6 7 8 9 0	R100 if dice is 1 2 3 R25 if dice is 4 5 6 7 8 9 0	A B
4	R60 if dice is 1 2 3 4 R50 if dice is 5 6 7 8 9 0	R100 if dice is 1 2 3 4 R25 if dice is 5 6 7 8 9 0	A B
5	R60 if dice is 1 2 3 4 5 R50 if dice is 6 7 8 9 0	R100 if dice is 1 2 3 4 5 R25 if dice is 6 7 8 9 0	A B
6	R60 if dice is 1 2 3 4 5 6 R50 if dice is 7 8 9 0	R100 if dice is 1 2 3 4 5 6 R25 if dice is 7 8 9 0	A B
7	R60 if dice is 1 2 3 4 5 6 7 R50 if dice is 8 9 0	R100 if dice is 1 2 3 4 5 6 7 R25 if dice is 8 9 0	A B
8	R60 if dice is 1 2 3 4 5 6 7 8 R50 if dice is 9 0	R100 if dice is 1 2 3 4 5 6 7 8 R25 if dice is 9 0	A B
9	R60 if dice is 1 2 3 4 5 6 7 8 9 R50 if dice is 0	R100 if dice is 1 2 3 4 5 6 7 8 9 R25 if dice is 0	A B
10	R60 if dice is 1 2 3 4 5 6 7 8 9 0	R100 if dice is 1 2 3 4 5 6 7 8 9 0	A B

NUMBER:	S	D			
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RISK ATTITUDES (continued)

Now play the table below:

TABLE F

Decision	Option A	Option B	Your Choice (Circle A or B)
1	R70 if dice is 1 R45 if dice is 2 3 4 5 6 7 8 9 0	R110 if dice is 1 R10 if dice is 2 3 4 5 6 7 8 9 0	A B
2	R70 if dice is 1 2 R45 if dice is 3 4 5 6 7 8 9 0	R110 if dice is 1 2 R10 if dice is 3 4 5 6 7 8 9 0	A B
3	R70 if dice is 1 2 3 R45 if dice is 4 5 6 7 8 9 0	R110 if dice is 1 2 3 R10 if dice is 4 5 6 7 8 9 0	A B
4	R70 if dice is 1 2 3 4 R45 if dice is 5 6 7 8 9 0	R110 if dice is 1 2 3 4 R10 if dice is 5 6 7 8 9 0	A B
5	R70 if dice is 1 2 3 4 5 R45 if dice is 6 7 8 9 0	R110 if dice is 1 2 3 4 5 R10 if dice is 6 7 8 9 0	A B
6	R70 if dice is 1 2 3 4 5 6 R45 if dice is 7 8 9 0	R110 if dice is 1 2 3 4 5 6 R10 if dice is 7 8 9 0	A B
7	R70 if dice is 1 2 3 4 5 6 7 R45 if dice is 8 9 0	R110 if dice is 1 2 3 4 5 6 7 R10 if dice is 8 9 0	A B
8	R70 if dice is 1 2 3 4 5 6 7 8 R45 if dice is 9 0	R110 if dice is 1 2 3 4 5 6 7 8 R10 if dice is 9 0	A B
9	R70 if dice is 1 2 3 4 5 6 7 8 9 R45 if dice is 0	R110 if dice is 1 2 3 4 5 6 7 8 9 R10 if dice is 0	A B
10	R70 if dice is 1 2 3 4 5 6 7 8 9 0	R110 if dice is 1 2 3 4 5 6 7 8 9 0	A B

NUMBER:	S	D			
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RISK ATTITUDES (continued)

Now play the table below:

TABLE G

Decision	Option A	Option B	Your Choice (Circle A or B)
1	R200 if dice is 1 R120 if dice is 2 3 4 5 6 7 8 9 0	R300 if dice is 1 R50 if dice is 2 3 4 5 6 7 8 9 0	A B
2	R200 if dice is 1 2 R120 if dice is 3 4 5 6 7 8 9 0	R300 if dice is 1 2 R50 if dice is 3 4 5 6 7 8 9 0	A B
3	R200 if dice is 1 2 3 R120 if dice is 4 5 6 7 8 9 0	R300 if dice is 1 2 3 R50 if dice is 4 5 6 7 8 9 0	A B
4	R200 if dice is 1 2 3 4 R120 if dice is 5 6 7 8 9 0	R300 if dice is 1 2 3 4 R50 if dice is 5 6 7 8 9 0	A B
5	R200 if dice is 1 2 3 4 5 R120 if dice is 6 7 8 9 0	R300 if dice is 1 2 3 4 5 R50 if dice is 6 7 8 9 0	A B
6	R200 if dice is 1 2 3 4 5 6 R120 if dice is 7 8 9 0	R300 if dice is 1 2 3 4 5 6 R50 if dice is 7 8 9 0	A B
7	R200 if dice is 1 2 3 4 5 6 7 R120 if dice is 8 9 0	R300 if dice is 1 2 3 4 5 6 7 R50 if dice is 8 9 0	A B
8	R200 if dice is 1 2 3 4 5 6 7 8 R120 if dice is 9 0	R300 if dice is 1 2 3 4 5 6 7 8 R50 if dice is 9 0	A B
9	R200 if dice is 1 2 3 4 5 6 7 8 9 R120 if dice is 0	R300 if dice is 1 2 3 4 5 6 7 8 9 R50 if dice is 0	A B
10	R200 if dice is 1 2 3 4 5 6 7 8 9 0	R300 if dice is 1 2 3 4 5 6 7 8 9 0	A B

NUMBER:	S	D			
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RISK ATTITUDES (continued)

Now play the tables below:

TABLE H

Decision	Option A	Option B	Your Choice (Circle A or B)
1	R250 if dice is 1 R150 if dice is 2 3 4 5 6 7 8 9 0	R400 if dice is 1 R40 if dice is 2 3 4 5 6 7 8 9 0	A B
2	R250 if dice is 1 2 R150 if dice is 3 4 5 6 7 8 9 0	R400 if dice is 1 2 R40 if dice is 3 4 5 6 7 8 9 0	A B
3	R250 if dice is 1 2 3 R150 if dice is 4 5 6 7 8 9 0	R400 if dice is 1 2 3 R40 if dice is 4 5 6 7 8 9 0	A B
4	R250 if dice is 1 2 3 4 R150 if dice is 5 6 7 8 9 0	R400 if dice is 1 2 3 4 R40 if dice is 5 6 7 8 9 0	A B
5	R250 if dice is 1 2 3 4 5 R150 if dice is 6 7 8 9 0	R400 if dice is 1 2 3 4 5 R40 if dice is 6 7 8 9 0	A B
6	R250 if dice is 1 2 3 4 5 6 R150 if dice is 7 8 9 0	R400 if dice is 1 2 3 4 5 6 R40 if dice is 7 8 9 0	A B
7	R250 if dice is 1 2 3 4 5 6 7 R150 if dice is 8 9 0	R400 if dice is 1 2 3 4 5 6 7 R40 if dice is 8 9 0	A B
8	R250 if dice is 1 2 3 4 5 6 7 8 R150 if dice is 9 0	R400 if dice is 1 2 3 4 5 6 7 8 R40 if dice is 9 0	A B
9	R250 if dice is 1 2 3 4 5 6 7 8 9 R150 if dice is 0	R400 if dice is 1 2 3 4 5 6 7 8 9 R40 if dice is 0	A B
10	R250 if dice is 1 2 3 4 5 6 7 8 9 0	R400 if dice is 1 2 3 4 5 6 7 8 9 0	A B

Annexure H:

NUMBER:	S	D			
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How do I play the table?

1. Please look at the above 'Practice Table'.
2. On the left of the table there are 10 rows.
3. You will need to play A or B on EVERY ROW.
4. You will play by marking A or B on the right of the table for each row under 'Your Choice'.

How does the timeline work?

1. On every row there is a timeline that starts with 'Today'.
2. You will be playing today so you are at the start of the timeline.
3. As you can see, with A you win **R250** in 1 month from today. That is why R250 is 1 month from today on the timeline.
4. Look at the calendar to see the date 1 month from today.
5. With B you win money that is paid 3 months from today. That is why B is 3 months from today on the timeline.
6. Look at the calendar to see the date 3 months from today.

How is the amount in option B calculated?

1. As you can see, the B money increases as you move down the table from row 1 to row 10.
2. On row 1, with B you win R254.20 in 3 months from today. On row 10, with B you win R295.27 in 3 months from today.
3. B money increases as you move down the table because we are adding more interest to A money on every row.
4. On row 1 we add 10% interest to R250 in 1 month from today (A) and this gives us R254.20 in 3 months from today (B). On row 10 we add 100% interest to R250 in 1 month from today (A) and this gives us R295.27 in 3 months from today (B).
5. Note that interest represents the price of money. If you leave money in a bank account the bank pays you interest. The bank basically pays you for borrowing your money until you need it.
6. These tables use the same idea. If you play B then you have to wait 3 months to win B. If you play A you have to wait only 1 month to win A. So B money is bigger than A money because of interest that is added to A money over 2 months (the difference between 1 month and 3 months).
7. Please note that interest is usually calculated over 12 months. On this table, you win A after 1 month and you win B after 3 months. So with B money you only get interest for 2 months, i.e. the difference between 1 month (when you win A) and 3 months (when you win B).

How do I know whether to play A or B?

1. Now, you need to play A or B on every row of the table.
2. For row 1, you need to decide if you want R250 in 1 month from today (A) or R254.20 in 3 months from today (B).
3. If you play A then you want R250 in 1 month from today.
4. If you play B then you want R254.20 in 3 months from today.
5. On row 2 you need to decide if you want R250 in 1 month from today (A) or R258.47 in 3 months from today (B).
6. If you play A then you want R250 in 1 month from today.
7. If you play B then you want R258.47 in 3 months from today.
8. **So all that you need to do is mark A if you want to play A and mark B if you want to play B.**
9. **There is no right or wrong answer in this game.** Please just play A if you want A and play B if you want B on every row of the table.
10. Do you have any questions?

It's now time for you to play the practice table (see table above)

1. Now it's time for you to play 'D Practice Table'.
2. **Please note that you will not win money for playing this table.**
3. It's important that you play the 'Practice Table' so that you know how to play the other tables and so that you can ask any questions if you have them.

How does payment work again?

1. We will roll the 10-sided dice to see your winning row in the table.
2. Look at if you played A or B on that row.
3. You will win what you played (A or B) when it's time to win what you played (in this case, in 1 month from today or 3 months from today, depending on whether you played option A or option B).

Do you have any other questions?

It's now time for you to start the game

1. Please play the next tables in the game pack (Table A-D).
2. You win A and B at different times.
3. So please look at the table carefully so that you can decide whether to play A or B.
4. **Please take your time to play the tables and remember that there is no right or wrong answer in this game. Please just play A if you want A and play B if you want B on each row of every table.**

NUMBER:	S	D			
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TIME PREFERENCES (continued)

Please play the table below:


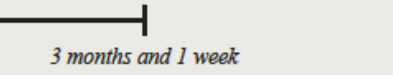

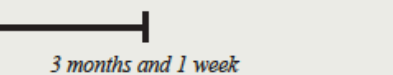

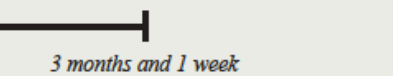

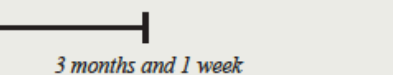

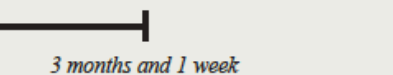

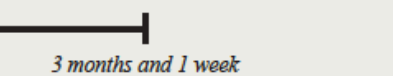

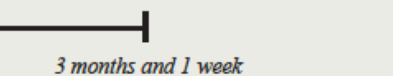

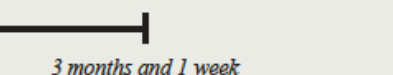
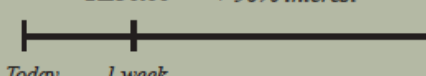
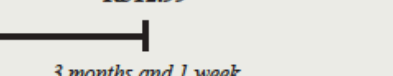
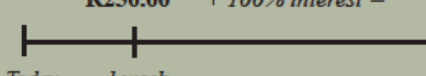
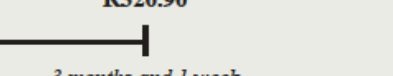
TABLE A

Decision	Option A (Pays amount below in 1 week)	Option B (Pays amount below in 1 month and 1 week)	Your Choice (Circle A or B)
1	R250.00 + 10% interest = Today 1 week	R252.09 1 month and 1 week	A B
2	R250.00 + 20% interest = Today 1 week	R254.20 1 month and 1 week	A B
3	R250.00 + 30% interest = Today 1 week	R256.33 1 month and 1 week	A B
4	R250.00 + 40% interest = Today 1 week	R258.47 1 month and 1 week	A B
5	R250.00 + 50% interest = Today 1 week	R260.63 1 month and 1 week	A B
6	R250.00 + 60% interest = Today 1 week	R262.81 1 month and 1 week	A B
7	R250.00 + 70% interest = Today 1 week	R265.00 1 month and 1 week	A B
8	R250.00 + 80% interest = Today 1 week	R267.22 1 month and 1 week	A B
9	R250.00 + 90% interest = Today 1 week	R269.45 1 month and 1 week	A B
10	R250.00 + 100% interest = Today 1 week	R271.70 1 month and 1 week	A B

TIME PREFERENCES (continued)

Please play the table below:

TABLE B

Decision	Option A (Pays amount below in 1 week)	Option B (Pays amount below in 3 months and 1 week)	Your Choice (Circle A or B)
1	R250.00 + 10% interest = 	R256.33 	A B
2	R250.00 + 20% interest = 	R262.81 	A B
3	R250.00 + 30% interest = 	R269.46 	A B
4	R250.00 + 40% interest = 	R276.28 	A B
5	R250.00 + 50% interest = 	R283.26 	A B
6	R250.00 + 60% interest = 	R290.42 	A B
7	R250.00 + 70% interest = 	R297.76 	A B
8	R250.00 + 80% interest = 	R305.28 	A B
9	R250.00 + 90% interest = 	R312.99 	A B
10	R250.00 + 100% interest = 	R320.90 	A B

NUMBER:	S	D			
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TIME PREFERENCES (continued)

Please play the table below:

TABLE C

Decision	Option A (Pays amount below in 1 week)	Option B (Pays amount below in 6 months and 1 week)	Your Choice (Circle A or B)
1	R250.00 + 10% interest = Today 1 week	R262.82 6 months and 1 week	A B
2	R250.00 + 20% interest = Today 1 week	R276.29 6 months and 1 week	A B
3	R250.00 + 30% interest = Today 1 week	R290.44 6 months and 1 week	A B
4	R250.00 + 40% interest = Today 1 week	R305.32 6 months and 1 week	A B
5	R250.00 + 50% interest = Today 1 week	R320.95 6 months and 1 week	A B
6	R250.00 + 60% interest = Today 1 week	R337.38 6 months and 1 week	A B
7	R250.00 + 70% interest = Today 1 week	R354.65 6 months and 1 week	A B
8	R250.00 + 80% interest = Today 1 week	R372.79 6 months and 1 week	A B
9	R250.00 + 90% interest = Today 1 week	R391.86 6 months and 1 week	A B
10	R250.00 + 100% interest = Today 1 week	R411.90 6 months and 1 week	A B

NUMBER:	S	D			
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TIME PREFERENCES (continued)

Please play the table below:

TABLE D

Decision	Option A (Pays amount below in 1 week)	Option B (Pays amount below in 1 year and 1 week)	Your Choice (Circle A or B)
1	R250.00 + 10% interest = Today 1 week	R276.29 1 year and 1 week	A B
2	R250.00 + 20% interest = Today 1 week	R305.33 1 year and 1 week	A B
3	R250.00 + 30% interest = Today 1 week	R337.42 1 year and 1 week	A B
4	R250.00 + 40% interest = Today 1 week	R372.87 1 year and 1 week	A B
5	R250.00 + 50% interest = Today 1 week	R412.04 1 year and 1 week	A B
6	R250.00 + 60% interest = Today 1 week	R455.31 1 year and 1 week	A B
7	R250.00 + 70% interest = Today 1 week	R503.10 1 year and 1 week	A B
8	R250.00 + 80% interest = Today 1 week	R555.90 1 year and 1 week	A B
9	R250.00 + 90% interest = Today 1 week	R614.22 1 year and 1 week	A B
10	R250.00 + 100% interest = Today 1 week	R678.64 1 year and 1 week	A B

Annexure I:

NUMBER:	T	G	S		
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1. This game is played by pairs of individuals. Each pair is made up of Player A and Player B.
2. You have been assigned the role of **sender, player A**.
3. You will be playing against a **recipient (player B)**.
4. The researcher will give R100 to you and another R100 to the recipient, Player B. You then have the opportunity to give a portion of your R100 to Player B. Whatever amount you decide to give to Player B will be multiplied by three by the researcher before it is passed on to Player B. Player B then has the option of returning a portion of this multiplied amount to you.

Then, the game is over.

You go home with whatever you kept from your original R100, plus anything returned to you by Player B. Player B goes home with their original R100, plus whatever was given to them by you and then multiplied by three by the researcher, minus whatever they returned to you.

Now let's try an example. The researcher gives R100 to you and another R100 to Player B. Imagine that you give R50 to Player B. The researcher multiplies this amount by three, so Player B gets R150 (3 times R50 equals R150) over and above their initial R100. At this point, you have R50 and Player B has R250. Then Player B has to decide whether they wish to give anything back to you, and if so, how much. Suppose Player B decides to return R100 to you. At the end of the game you will go home with R150 and Player B will go home with R150.

Note that the larger the amount that you give to Player B, the greater the amount that can be taken away by the two players together. However, it is entirely up to Player B to decide what he should give back to you. The first player could end up with more than R100 or less than R100 as a result.

NUMBER:	T	G	S		
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Let's play the game!!!

You are Player A. You must choose the amount of money you want to pass on to Player B. Player B will receive this amount multiplied by 3 plus their own initial R100. Remember the more you give to Player B the greater the amount of money at his or her disposal. While Player B is under no obligation to give anything back, we will pass onto you whatever he or she decides to return. **Circle "yes" only once in one row** on the right hand side to indicate which option you would choose.

Please complete the table below:

TRUST GAME

TABLE 1:

PLAYER A (Sender)

Allocation		Choice
R0 to you	R100 to Player B	yes
R50 to you	R50 to Player B	yes
R100 to you	R0 to Player B	yes

NUMBER:	T	G	R		
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1. This game is played by pairs of individuals. Each pair is made up of Player A and Player B.
2. You have been assigned the role of **recipient, player B**.
3. You will be playing against a **sender (player A)**.
4. The researcher will give R100 to you and another R100 to the sender, Player A. Player A has the opportunity to give a portion of their R100 to you, Player B. Whatever amount Player A decides to give to you will be multiplied by three by the researcher before it is passed on to you. You, Player B, then have the option of returning any portion of this multiplied amount to Player A.

Then, the game is over.

You go home with your original R100, plus anything you kept that was sent to you from Player A, and then multiplied by three by the researcher minus whatever you returned to Player A. Player A goes home with whatever they kept from their original R100 plus whatever amount you returned to him/her.

Now let's try an example. The researcher gives R100 to you and another R100 to Player A. Imagine that Player A gives you R50. The researcher multiplies this amount by three, so you get R150 (3 times R50 equals R150) over and above your initial R100. At this point, you have R250 and Player A has R50. You then have to decide whether you wish to give anything back to Player A, and if so, how much. Suppose you decide to return R100 to Player A. At the end of the game Player A will go home with R150 and you will go home with R150.

It is entirely up to you to decide what should be given back to Player A.

NUMBER:	T	G	R		
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Let's play the game!!!

You are Player B. Player A, has sent you an amount of money from their initial endowment of R100. This amount has been multiplied by 3 by the researcher and is now available to you. You must choose the amount of this money you want to keep for yourself and the amount- if any- you want to return to Player A. Player A will receive the amount you decide upon and will leave with that plus whatever remains from their initial R100.

Circle "yes" only once in one row per table below to indicate which option you would choose.

Please complete the table below:

TRUST GAME

**TABLE 1
PLAYER B (Recipient)**

If Player A sends R0

Allocation		Choice
Keep R0 for yourself	Return R0 to Player A	Yes

If Player A sends R50

Allocation		Choice
Keep R150 for yourself	Return R0 to Player A	Yes
Keep R75 for yourself	Return R75 to Player A	Yes
Keep R0 for yourself	Return R150 to Player A	Yes

If Player A sends R100

Allocation		Choice
Keep R300 for yourself	Return R0 to Player A	Yes
Keep R150 for yourself	Return R150 to Player A	Yes
Keep R0 for yourself	Return R300 to Player A	Yes

NUMBER:	U	G	S		
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ULTIMATUM GAME

About the experiment:

1. You have been assigned the role of **sender, player A**.
2. You will be playing against a **recipient (player B)**.
3. You, as the sender, will receive a R100 endowment.
4. You will decide how to divide this money between yourself and player B.
5. How to divide the R100 will be explained below.

- | |
|---|
| ➤ You, the Sender, player A , decides how to divide the R100 that has been given to you. |
| ➤ The Recipient, player B , chooses to “ accept ” or “ reject ” each possible decision. <ul style="list-style-type: none">○ If B accepts your decision”, you will receive the money according to your decision.○ If B “rejects your decision”, both of you will receive no money. |

Now let’s look at an example. The researcher gives R100 to you, Player A. Imagine that you give R50 to Player B. Player B has to decide whether they wish to “accept” or “reject” this decision. If Player B “accepts” this decision you both leave with R50. If Player B “rejects” this decision you both leave with nothing.

NUMBER:	U	G	S		
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Let's play the game!!!

You are Player A. You must choose the amount of money from your R100 endowment you want to pass on to Player B. Player B has to decide whether they wish to “accept” or “reject” this decision.

1. Please complete 'Table 1' below.
2. You will need to **circle “yes” only once in one row.**

ULTIMATUM GAME

TABLE 1:

PLAYER A (Sender)

Allocation		Choice
R0 to you	R100 to Player B	Yes
R50 to you	R50 to Player B	Yes
R100 to you	R0 to Player B	Yes

NUMBER:	U	G	R		
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ULTIMATUM GAME

About the experiment:

1. You have been assigned the role of “**recipient**”, **Player B**.
2. You will be playing against a “**sender**” (**Player A**).
3. The “**sender**” (**Player A**) has received an endowment of R100 and has to divide this money between him/her and yourself.
4. Each of the potential choices open to **you** is presented in the table below.
5. You, as the recipient, has to decide to “**accept**” or “**reject**” each of these potential allocations by circling “**accept**” or “**reject**” for each division.
6. How to play will be explained below.

<p>➤ The Sender, Player A, decides how to divide the R100 that has been given to him/her.</p>
<p>➤ You, the Recipient, B, chooses to “accept” or “reject” the sender’s decision.</p> <ul style="list-style-type: none"> ○ If you accept the sender’s decision, you will then receive the money according to his/her decision. ○ If you “reject the sender’s decision”, both of you will receive no money.

Now let’s look at an example. The researcher gives R100 to Player A. Suppose that Player A decides to give R50 to you, Player B. You have to decide whether you wish to “accept” or “reject” this decision. If you “accept” this decision you both leave with R50. If you “reject” this decision you both leave with nothing.

NUMBER:	U	G	R		
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Let's play the game!!!

You are Player B. Player A, has sent you an amount of money from their initial endowment of R100. You have to decide whether you wish to “accept” or “reject” this decision.

1. Please complete 'Table 1' below.
2. On the left of the table there are two choices.
3. You will play by **marking “accept” or “reject” in each row** on the right of each of the three tables below.

ULTIMATUM GAME

TABLE 1
PLAYER B (Recipient)

If Player A sends R0

Allocation		Choice	
R0 for yourself	R100 to Player A	Accept	Reject

If Player A sends R50

Allocation		Choice	
R50 for yourself	R50 to Player A	Accept	Reject

If Player A sends R100

Allocation		Choice	
R100 for yourself	R0 to Player A	Accept	Reject

