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## EMOTIONS AS POTENTIAL DRIVERS OF TRUST AND RECIPROCITY

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### ABSTRACT

This study proposes that the effect of positive or negative emotions signalled by the partner in subjects with different intrinsic characteristics, can affect decision-making in terms of the level of trust and reciprocity in a trust game context. The empirical evidence found by other authors shows that, depending on how emotions are affected, the level at which s/he will trust his/her partner will be determined, making decisions that may even be rationally detrimental to their utility. By conducting the trust game twice (with and without emotional signalling), it is shown that signalling negative emotions causes that the amount given by trustors and trustees decrease significantly between treatments. In addition, being female trustor significantly reduces the probability of increasing the amount given, after emotional signalling. No significant effects are found for other intrinsic characteristics of the trustors. Regarding trustees, signalling emotions such as compassion, culpability and rage versus happiness increase the probability of increasing the amount returned.

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# EMOTIONS AS POTENTIAL DRIVERS OF TRUST AND RECIPROCITY

## 1. INTRODUCTION

To deny that a number of external and internal factors influences human behavior is a big mistake. The main motivation of this study is to observe what makes subjects not to behave rationally and in particular, the main objective is to demonstrate how emotions are a great driver of trust and reciprocity. To apply concepts and theories learned during the degree of Economics is another motivation to carry out this dissertation. Using game theory and experimental methodology is a good opportunity to discover certain characteristics of the trust game.

Non-rational behavior exists as a basic driver of human behavior. Specifically, the aim is to find out what factors induce this non-rational behavior, with the intrinsic characteristics of each subject as the main causal factors, as well as how the emotional signalling expressed by the partner affects this non-rational behavior. The main reason to choose the trust game (TG, henceforth) is to study how positive and negative emotion signalling affects decision-making. Also demonstrate that in a context of uncertainty, emotions and individual characteristics such as gender, altruism and psychopathy can become very relevant in terms of the trust and reciprocity expressed by the subject, both being the consequence of non-rational behavior.

It is found that emotions perceived as an external factor, signalled by the partner, can act as a driver of more prosocial behavior. Furthermore, depending on the type of emotion perceived, subjects will be more or less likely to vary their decision in a repeated TG. In particular, it is shown that the differences, in terms of lower amount given by players 1 (trustors, henceforth) in baseline (T0, henceforth) and treatment 1 (T1, henceforth), are mainly explained by negative emotions such as culpability and rage. Results show gender differences in a TG context. In particular, the binary logit for trustors shows that females trustors are more likely to decrease the amount given once they observe their partner's emotional signalling.

Regarding players 2 (trustees, henceforth), only the negative emotion culpability act as predictors of lower amount given before and after observing the emotion. In addition, the binary logit for trustees shows that perceiving the emotion compassion or negative emotions, such as culpability and rage, compared to happiness, increases the probability of greater reciprocity, regardless of the intrinsic characteristics of each subject.

The dissertation is organized as follows: In the second section, literature review is presented and the hypotheses of the study is described in the third section. In the fourth and fifth sections, methods, procedures and the game itself are described. Sixth section includes the experimental and the questionnaires design are detailed. Seventh section includes the descriptive data analysis, results of the experiment and some non-parametric tests of the data. The eighth section includes the econometric analysis with two binary logit regression models. Finally, the discussion and main conclusions are in the ninth section.

## **2. LITERATURE REVIEW**

In this section, the literature about economic decision theory and some experiments done in the context of prisoner's dilemma (PD, henceforth) and TG are reviewed. In addition, some theories and experiments that try to explain why there is a deviation between the theoretical economic prediction (subgame perfect Nash equilibrium) and the empirical evidence found in the context of those games. Finally, the main purpose of this section is to find enough scientific evidence to serve as a basis for the study.

Economic theory bases its predictions on rational behavior. The great requirement of this assumption causes that on multiple occasions, when we observe the empirical evidence, we can see that such evidence not support economic predictions about the behavior of subjects. One example of this is the experiment by Berg et al. (1995) where they introduced the TG.

The empirical evidence shown is that the subjects who had 10\$ send 5.16\$ on average in spite of the subgame perfect Nash equilibrium, under perfect information, which is sending no money at all. In this study, authors demonstrate that reciprocity exists as a basic human behavioral driver.

One of the main objectives of this study is trying to explain which factors induce humans not to behave rationally. In order to understand the human behavior in certain situations, it has been tried to find scientific evidence about the phenomenon of the difference between theoretical prediction and empirical evidence. Specifically, the current state of the art places five characteristics as the most important elements to consider as a cause of this non-rational behavior.

- Emotions felt by your partner and by yourself.
- Aversion to risk intrinsically associated with each subject

- The characteristics of the game (how many times is the game repeated, whether the subjects play both roles, etc).
- The personality of each subject.
- The level of altruism.

Following this evidence, this study will focus on what mainly makes us different from machines or robots: the emotions. Throughout history, philosophers have affirmed that emotions serve as a clue in order to try to observe the true intentions of a person; Such is the evidence found in the study carried out by Darwin., (1872). Emotions are a consequence of several things. On the one hand, our mental schemes and on the other hand, emotions are based on our perceptions of what is happening around us. What makes this study made by Darwin., (1872) particularly interesting and complex is that every human can feel different emotions in similar situations, mainly because of the personality and education of each subject.

Some studies suggest that decisions to trust strangers may not depend so much on economic dynamics but on emotional ones, the latter being a much more consistent predictor when it comes to explaining the decisions made (Dunning et al., 2012).

In terms of emotions, the influence of emotions has been an essential element to be studied by behavioral science. In their study, Learner et al. (2015) emphasized how the emotional consideration can be a paradigm shift in decision theory by finding scientific evidence that emotions are powerful, predictable, detrimental and sometimes beneficial drivers of decision-making. Depending on how these emotions affect the subject, they will determine at what level the subject can make decisions that are rationally detrimental to him or herself. This evidence can help to understand the divergences between rational and observed behavior.

It is important to mention some evidence found by the paper of Levine et al. (2018), which has provided solid advances that show how subjects who base their decision-making on emotions are more likely to trust and cooperate than those subjects who base their actions on reason.

Authors put a lot of emphasis in how emotions indicate trust (and as consequence cooperation) better than reason. In the same way, the emotion is, and is perceived by the subjects involved in the game, as a signal of cooperation. It is evident that cooperation and trust have many aspects in common. In fact to cooperate, you must trust your partner. Therefore, this evidence is one of the main starting points in order to studying the emotional influence in the level of trust and reciprocate in a TG.

Levine et al., (2018) are not the only ones who have found evidence about the relevance of emotions in decision making. Specifically, additional evidence is found which tells us that emotions can be treated as cognitive and motivational foundations of human judgment and decision making (Muramatsu and Hanoch, 2005). Therefore, emotion in decision-making is a basic element in the field of behavior theory and not including the role played by emotions (felt and perceived) in decision-making the study could show erroneous results.

In terms of the factors that influence human behavior, as described above, emotions play a very important role. However, sometimes, emotions can be induced by emotional signals that are perceived from the other (your partner, for example). As Miller et al. (2002) found in their study, subjects often base their behavior on the signals they receive from others. At the same time, they also recognize the importance of the signals they send to the partner. The evidence found by Miller et al. (2002) is not the only one that supports this assertion, Stratou et al. (2015) affirm that emotional signalling plays an important role in negotiations and other social decision-making tasks as it can signal intention and shape joint decisions.

In addition, one of the main aspects suggesting that emotional signalling can induce a greater degree of trust and reciprocity is communication. In the present study, with the modification its made of the original TG introduced by Berg et al (1995) which corresponds to treatment 1, there is a higher level of information in the moment of deciding, making the players not to behave as total strangers. Based on this evidence, authors affirm that communication and information is one of the main causes of cooperation between subjects (Miller et al., 2002).

Another study that finds the same evidence as Miller et al. (2002) are Levine et al. (2018), they affirmed that introducing this type of modification in a PD game, it makes the subjects reach a greater level of cooperation (as a consequence of confidence) when this game is finitely.

As mentioned above, cooperation and trust are closely related, so it is not surprising to find evidence that the elements that favour cooperation also favour trust. Reed et al. (2012) said that emotional expressions, indicate trust and commitment in contexts such us the area of negotiation (Reed et al. 2012). This is the main evidence on which this study is supported to introduce emotional signalling in the context of TG, as it can induce a higher degree of trust and reciprocity.

It is obvious that there are different types of emotions and that not all of them will have the same effect in a TG context. Therefore, it is worth wondering what signalled

emotions are the ones that can significantly influence decision-making. For this, we rely on the studies of Coombs (1973); Dawes et al. (1986); Pillutla and Murnighan. (1996) where they affirm that negative emotions like fear, rage or anger, can incite people to behave selfishly and to reduce the level of cooperation, trust and reciprocate less in the TG.

There is more evidence that supports the influence in decision making when the subject can observe the negative emotion felt by the other player. Stratou et al (2015) in a context of PD used an experimental design in which they allowed to observe through a computer camera the facial expression of the other player in decision-making. They found evidence about negative emotions associated with non-cooperative gaming behavior, so it is quite possible to think that in this study, signalling negative emotions lead to a lower level of trust and reciprocity.

Following the intention of finding what types of emotions are those that can significantly influence decision-making, Pfister and Böhm (1992) found scientific evidence about positive emotions. They affirmed that this type of emotions are significantly correlated with preferences, being those one associated with higher payments. Supporting this evidence, the cooperative subjects are more likely to express positive emotion than non-cooperative ones and expressions of positive emotion may elicit cooperation in others (Mehu et al., 2007). Therefore, the study made by Mehu et al. (2007) aims to demonstrate that the signalling of positive emotions can induce a higher level of trust and reciprocity given the relation between cooperation and trust. In addition, they concluded that concrete emotions are a necessary part of the decision process. Another consequence of positive emotions such as sympathy and empathy on decision-making is that they influence the subject in a way that may come to allocate his/her resources in a non-optimal way (Small, 2010). This evidence may be an additional reason in explaining why the subgame perfect Nash equilibrium of the TG is not systematically fulfilled in the experiments made for other authors.

Stratou et al. (2015), found evidence about positive and negative displays of emotion associated with more prosocial and proself game acts, respectively. For all the evidence found, in order to observe the effect on decision-making in the area of TG, the current study introduces signals of positive and negative emotions felt for the partner in a similar situation in the past.

Within emotion-based behavior, the influence of emotions is not the same for all humans. Recent studies affirm that among the possible causes that may favour cooperation, cooperative behavior is significantly related to the personality of each



subject participating in the experiment, being the main result that a marginal increase in agreeableness generates a positive effect of 13.9% on the probability of cooperating. Moreover, on average, a marginal increase in agreeableness increases the predicted probability of cooperating from 70% to 82.1% (Kagel and McGee, 2014). This study will focus on only one aspect of the personality, the level of non-clinical psychopathy, thanks to the evidence found by Ibáñez et al. (2016), is also possible to assume that the lack of reciprocity is significantly related to a psychopathic personality. In addition, the evidence found by Osumi and Ohira (2010) supports the evidence found by Ibáñez et al. (2016) who showed that subjects with a higher level of non-clinical psychopathy base their behavior on rationality, and rationality is not related with trust and reciprocity. Their study was based on playing an ultimatum game and found that subjects with a higher psychopathic level choose economic utility by accepting low offers, rather than sacrificing it in order to get higher payoffs in the following rounds of the game.

Another important factor when studying the factors that induce cooperation, trust and reciprocity is the level of altruism of the subjects. Experimental evidence indicates that human altruism is a powerful force, being the interaction between altruists and selfish individuals a vital factor to human cooperation (Fehr & Fischbacher., 2003). In their study they found the importance of the environment the subjects are facing, also that a minority of altruistic individuals can force a majority of selfish individuals to cooperate or trust.

The most frequently mentioned possible source of altruistic motivation is an emotional response to a person who is in a bad situation. We will call this emotion, caused by the partner, "empathy", it should be noted that philosophers ranging from Aquinas, Rousseau to Adam Smith have named empathy as the source of altruism (Batson et al., 2002).

This dissertation will try to analyse the effect of emotional signalling on subjects with different levels of altruism, in order to observe whether it induces a higher or lower level of trust and reciprocity. Being also possible to observe whether the fact of perceiving your partner's emotions in the TG in that subjects who are more sensible to the emotions, acts as a source of altruism.

Trying to look for more characteristics of the subjects which might allow us to observe differences in decision-making becomes a very relevant task. Therefore, one interesting characteristic that this dissertation will analyse is gender. Studies such as Embrey et al. (1997) find evidence that women are more risk averse than men and therefore send a smaller amount of money to their partner in a TG context. Trying to study the differences between genders, it may be that the higher level of communication between subjects, caused by signalling emotions, tends to reduce risk aversion,

therefore making not significant the gender differences in terms of the amount of money they send to the partner.

### **3. HYPOTHESES**

Thanks to the current state of the art on these aspects, its consider that results from our experiment, using procedures described in the methodology, will fit the next hypotheses:

**H1:** Trust and reciprocity exist as a basic driver of human behavior.

It is assumed that acting non-rationally is the main characteristic of human behavior. In line with Berg et al. (1995), it is considered that individuals will tend to trust and reciprocate, being this a clearly non-rational behavior.

**H2:** The average amount trusted and reciprocated will differ significantly with signalling positive and negative emotions.

It is considered that perceiving positive and negative emotions on the part of the partner will make the subject change his or her decision in the next treatment. In line with the result obtained by Stratou et al. (2015), positive and negative emotions are associated with more acts of prosocial and proself behavior, respectively.

**H3:** Subjects classified as highly manipulators and insensitive towards others (psychopathy scale 1) and those classified as higher level of impulsivity and low behavioral control (psychopathy scale 2), will not be affected by the partner's emotions.

The main characteristic of a psychopathic behavior is the lack of affection and rage. A psychopathic individual should be less influenced by external factors, in this case the emotions signalled by the partner. Consequently, his/her behavior should be more rational in both treatments than subjects with lower levels of non-clinical psychopathy.

**H4:** There are not gender differences in terms of the amount they give in the dictator game and in the TG. In addition, there is not difference between male and female in the probability of increase the amount they give after signalling emotion elicited by the partner.

Altruism is not considered gender dependent. In line with the result obtained by Goeree et al. (2002), no differences are expected to be observed between male and female subjects.

Next section will proceed to analyse the experimental data. Also in this section described the method used in this dissertation for classify each subject in terms of their altruistic behavior and non-clinical psychopathic personality, in order to obtain robust evidence about human behavior in a TG context.

## **4. METHODS AND PROCEDURES**

Experimental methodology has been used to create a controlled, saliently motivated and replicable environment. In this dissertation the experimental methodology has been selected because is a very useful tool for testing whether certain theories are fellfield in reality and also because is a very useful tool to create the necessary data. In addition, it also allows us to obtain certain evidence on issues related to human behavior in areas such as individual decision-making (on which the study is based).

The questionnaire was carried out with the Google Forms application from Google, the participating subjects were obtained from the database of the Experimental Economics Laboratory (LEE). It was used because the limited experimental budget and the pandemic made it impossible, in order to minimise the risks, to carry out on-site laboratory experiments. However, by applying it, it could be possible to reach a large number of data in a simple way. Another of the advantages of the questionnaire is that in the circumstances of the pandemic was the most convenient and quickest method.

In the literature review, it has been found considerable evidence about the role of altruism and the level of non-clinical psychopathy in decision making, so it has been explained how the data will be measured and obtained for further analysis.

Altruism has been measured through the decisions dictator's genuine game. This game involves two players, one of the players (known as the dictator) decides the amount he wants to give to the partner. The main characteristic of this game is that the other player (known as the receiver) has a passive role in the game, so she/he accepts always.

The data obtained from the dictator game is analysed varying the methodology followed in the study made by Barreda-Tarrazona et al. (2017). In their study, they consider that a subject acts altruistically if she/he gives part of his/her initial endowment, being more altruistic the more she/he gives to his/her partner. In the present study, it is considered that a subject acts altruistically if she/he gives more of 2€ to his/her partner.

Regarding the aspect of the personality focused on non-clinical psychopathy, following Lynam et al. (1999), the validation of the Levenson Self-Report Psychopathy Scale (LSRP) consists on 26 items that evaluate psychopathy on a Likert-type scale ranging from 1 "strongly disagree" to 4 "strongly agree". It can be obtained a score in two scales: the first one related to manipulation and insensitivity towards others and the second one related to impulsivity and low behavioral control. A general score can also be obtained by adding all items together. Given the characteristics of Likert scale, the score that the subject obtains in each scale can be calculated as the total of the sum of each item that compose them.

The main objective of the study is to observe how signalling positive and negative emotions, given certain intrinsic characteristics (altruism, gender and non-clinical psychopathy) of each subject, affect the decision-making environment in a TG.

## **5. THE GAME**

Experimental subjects play the TG (figure 1), firstly introduced by Berg et al. (1995). The trustor has to choose between a sure alternative, which guarantees his/her payments, (not trust) and a risky alternative (trust). The sure strategy results in the end of the game and outcome with fixed payoff for himself. In the risky one, will have to decide the amount of money that trust to his partner ( $\beta$ ) with the characteristic that the partner will receive that amount multiplied by three ( $3\beta$ ), hence will also decide the amount it chooses not to give ( $z$ ).

Regarding the trustee, if the partner decides to trust, s/he will has two alternatives, to reciprocate or not to reciprocate. Not to reciprocate is the decision that is characterised as selfish and utility-maximising behavior of the subject. In addition, if the trustee decides to reciprocate, will decide how much money to reciprocate to the partner ( $\alpha$ ). In this game, choosing the risky alternative means that the principal trusts and allows trustee to determine both players payoffs. Figure 1 represents the choices in this TG.

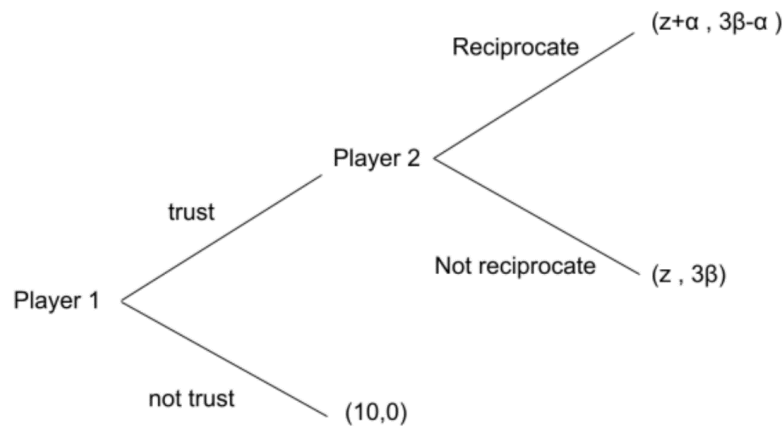


Figure 1: The Trust Game in extensive form

The TG is a sequential game. To obtain the solution of this game, given its nature, it must be done by backward induction. Therefore, we find a subgame perfect Nash equilibrium, which is not to trust, and not to reciprocate [not trust, not reciprocate].

In this experiment presented in the next section, the subjects will play two TGs, the only difference between them will be that they will be able to observe how their partner felt after the first time they played the game. This modification is done in order to observe the effect of emotions (positive and negative) in a TG repeated a finite number of times, in concrete terms, two times.

Finally, in order to facilitate the understanding of the data, the subjects decisions in the TG will be transformed into a dummy and used in two different logit models as a dependent variable.

## 6. EXPERIMENTAL DESIGN

This experiment consists in two treatments, T0 in which subjects do not perceive any emotional signalling from the partner, and T1, in which subjects observe emotional signalling from the partner.

As mentioned above, the experiment was carried out by means of questionnaires dividing the sample according to each treatment. In this way, each subject had to answer two questionnaires corresponding to T0 and T1.

A database of 184 subjects were recruited. A number of 94 subjects were classified into trustors and 90 subjects into trustees and were randomly paired.<sup>1</sup>

In T0 there was sent two questionnaires, one of them for trustors and to other for trustees.

In both treatments, all subjects had to answer 30 questions, first they were asked to state their gender and age in order to control these aspects in the data analysis. They were also asked to play the dictator game (explained in the methodology section), in which all players were dictators and had to decide the amount to give to their partner out of 10 euros, knowing that the partner would accept in any case. This will allow classifying subjects as altruists or not altruists following the procedures explained in the methodology section, and after analysing the data, it will be able to observe if certain hypotheses are fulfilled.

Another section that was included in both questionnaires was the Levenson Self-Report Psychopathy Scale (LSRP). It will try to classify each subject in order to assess whether it induces in a reduction of the probability of increasing the level of trust and reciprocity and even to observe whether it is negatively correlated with the amount that they give in the dictator game.

The last section is the one that makes two types of questionnaires exist for each player, when they play the TG discussed in the methodology section. In this study, the questionnaire that trustor receives, must decide the amount that gives to the partner of 10 euros, knowing that will receive it triplicated. While in the questionnaire that trustee receives will decide how much of the amount received by the partner (multiplied by three) decides to reciprocate. The objective of making subjects to play TG is to generate data that will allow us to analyse changes in the decision making process by controlling individual subjects characteristics.

In the second questionnaire received by each subject, T1, sample of trustors will be divided into two groups of 24 subjects and two groups of 23 subjects. They answered the same TG played in the first questionnaire but in these treatment one of the emotions: positive (happiness and compassion) and negative (culpability and rage), are introduced to each group, making the subject believe that these is the emotion elicited by their

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<sup>1</sup> Note that there is not the same number of subjects for each type of player because in the recruitment phase for trustees, only 90 subjects signed up.

partner when they gave them the amount in T0. Finally, only 90 subjects out of 94 trustors answered the second questionnaire.

Regarding to the second questionnaire sent to the sample of trustees, they had been divided into two groups of 23 subjects and two groups of 22 subjects and answered the same TG played in the first questionnaire. In these treatment as has been done with the trustors one of the emotions: positive (happiness and compassion) and negative (culpability and guilt), are introduced to each group, making the subject believe that it is the emotion elicited by their partner when they reciprocate the amount in T0.

The purpose of the emotional signalling in this experiment is to try to observe if knowing how their partner felt in the previous round, makes the subjects increase, decrease or not to change the amount they trust and reciprocate.

Table 1: Treatments characteristics

	<u>T0</u>	<u>T1</u>
Trustor observe his/her partner decision	No	No
Trustee observe his/her partner decision	Yes	Yes
Number of subjects	185 (56,75% females)	180 (55% females)
Emotional Signalling	No	Yes
		25% of the subjects observe happiness.
		25% of the subjects observe compassion.
		25% of the subjects observe culpability.
		25% of the subjects observe rage.
Note: In both treatments, the same subjects played with the same partner		

It should be noted that there is some evidence stating that past behavior is undoubtedly a strong signal of future behavior, being evident how people cooperate and trust more with others who have behaved cooperatively before. On average, in repeated play among same subjects, player A sends more and player B returns a higher percentage than in one-shot play (Cochard et al., 2004).

In all questionnaires, all the subjects must enter a Hash code. This code is generated automatically by the Laboratory of Experimental Economics (LEE) system, is shown in the mail to access the questionnaire and is related to the e-mail address of each subject. This question is the most important of the experiment because in this way, the subjects can be randomly matched, also personalized e-mails can be sent to each of them with their partner's answers.

Of course, in order for the subjects to have the incentive to answer and for the data to be as realistic as possible, a prize draw was promised in which there would be twenty winners, who would receive the payment they counted on in one of the two treatments they will play.

Thanks to the hash code, we will contact with the winners to determine how they will receive their payments.

## **7. DESCRIPTIVE DATA ANALYSIS**

This section focuses on describing the main results of the analysis of the survey data using R-STUDIO and STATA. First, the main details of some descriptive statistics of the sample are presented, followed by measure altruistic behavior and the level of non-clinical psychopathy following the procedures presented in the Methodology section, finally an analysis of the TG results of each type of player will be carried out.

The survey was answered online and made accessible through Google Forms sharing options, using the Laboratory of Experimental Economics (LEE) database. The study consisted of two treatments, T0 and T1 and two groups of players (trustors and trustees). As T1 includes four types of emotions for each group of players, so in total, ten questionnaires were sent out, all of them with 48 hours to answer.

The questionnaire corresponding to T0 for trustors was sent out on 26th February, the second questionnaire for trustors corresponded to T1 and was sent out on 2nd March.



While trustees' T0 questionnaire was sent out on 2nd March (incorporating trustors' responses from 26 February), trustees' T1 questionnaire was sent out on 5th March.

## 7.1 THE SAMPLE

The aim of this section is to describe the characteristics of the sample. Sample is classified into two criteria: age and gender. In total, the sample of the study in T0 was 185 subjects and in Treatment 1 was 180 subjects. Although the subjects involved in treatment 0 and treatment 1 are the same, there are fewer subjects in treatment 1 because some subjects were not able to answer the second questionnaire.

First, the sample of trustors will be described. Figure 2 is a pie chart that shows the percentages of the distribution of the sample by gender in the questionnaire that corresponds to T0 of the trustors. This sample consists in 94 subjects.

While on the right hand of figure 2 corresponds to treatment 1 of trustors, in this sample there were 90 subjects.

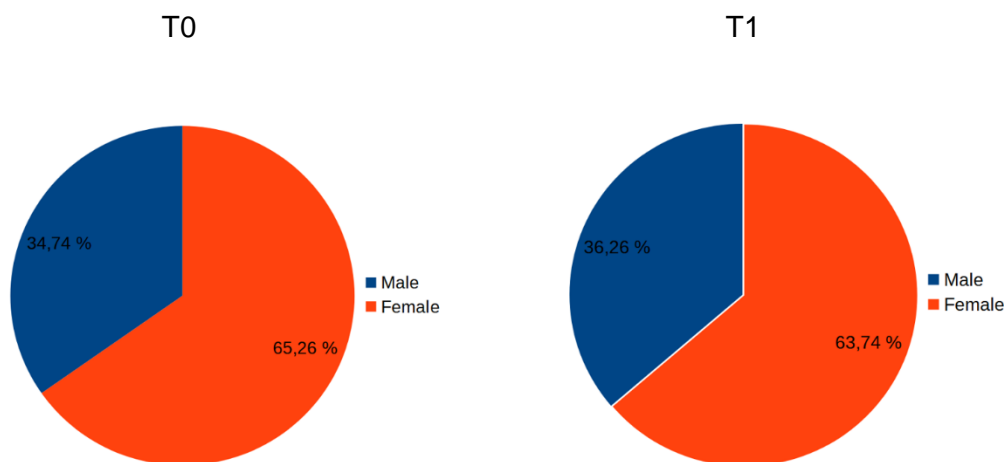


Figure 2: Proportion of males and females in the trustors' sample

As can be seen, in both trustors' treatments, the sample was skewed in favour of female subjects.

Regarding the sample of trustees, figure 3 is another pie chart that shows the percentages of the distribution of the sample by gender in the questionnaire that corresponds to T0 of the trustees. This sample consists in 90 subjects.

While on the right hand of figure 3 corresponds to treatment 1 of the trustees, in this sample there were the same 90 subjects.

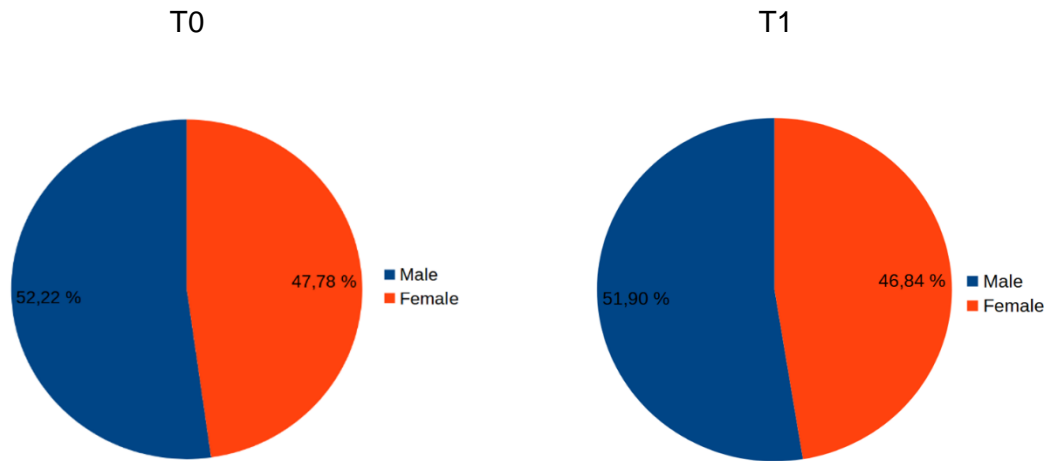


Figure 3: Proportion of males and females in the trustees' sample

As can be seen in contrast to the sample of trustors, in both treatments of trustees, the subjects were gender balanced.

Regarding age distribution, this study was made including only Jaume I University students; therefore, as we can see in figure 4 almost the great majority of sample are between 18 - 30 years old.

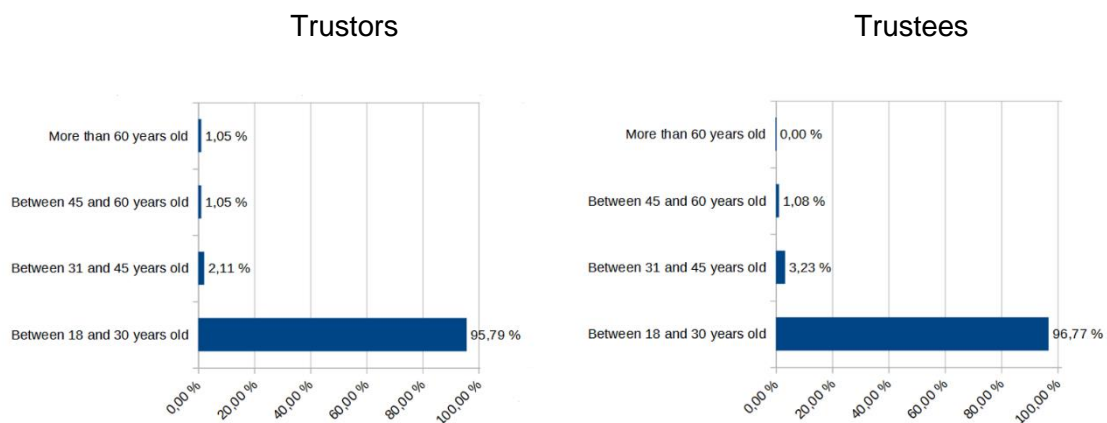


Figure 4: Distribution of the trustors and trustees' sample by age

## 7.2 PERSONALITY: ALTRUISM AND LEVENSON SELF-REPORT PSYCOPATHY SCALE

In this section, it will be commented the results the dictator game and the Levenson Self-Report Psychopathy Scale, played in T0. The data will be analysed varying the methodology followed in the study made by Barreda-Tarrazona et al. (2017). In this dissertation it is going to consider that a person acts altruistically if unilaterally pays a cost ( $c$ ) greater or equal to two to increase the benefit of the partner (where  $c$  is the amount that the subject gives to the partner). Subjects are altruistic if they prefer the allocation  $(10-c, c)$  to the allocation  $(x, 0)$ , where  $c \geq 2$ . In this way of identifying the altruistic subjects, this variable will be transformed into a dummy.

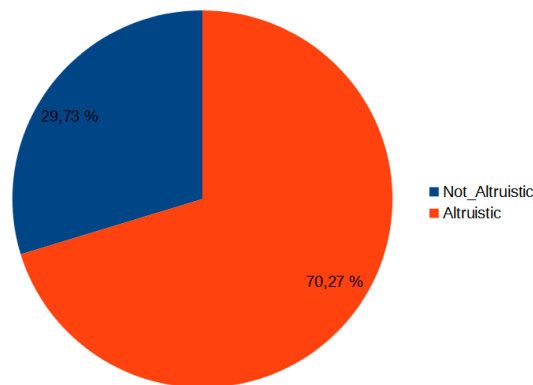


Figure 5: Proportion of the sample into altruistic and not altruistic

As can be seen in figure 5, the methodology chosen to classify subjects as altruistic and non-altruistic shows that out of 185 subjects who answered the first questionnaire (where they were asked to answer the genuine dictator game), 55 subjects (29,73%) were classified as non-altruistic and 130 subjects (70,27%) as altruistic.

In order to observe differences between genders in terms of altruistic behavior, a proportion test was carried out using STATA software.

The test concentrates on the relative difference between the two sample proportions (altruism ( $p_1$ ) and gender ( $p_2$ ) dummy's). Small differences denote only chance variation due to sampling ( $H_0$  cannot be rejected); while large differences mean the opposite ( $H_0$  is rejected), the hypotheses test is presented below.

$$H_0: p_1 = p_2$$

$$H_1: p_1 \neq p_2$$

When testing hypotheses, the STATA software shows a P-value of 0.056. Therefore, the null hypotheses that there is no difference between genders in terms of altruism can be rejected at a 10% of significance level.

Thanks to this result, we can affirm that one of the parts of the H4, based on the current state of the literature, is not fulfilled. Therefore, the evidence found by Goeree et al. (2002) does not hold in this study.

Regarding psychopathic personality, the vast majority of individuals have certain behaviors that can be associated with some level of it. The main characteristic of that people is that they do not feel affection and rage. Psychopathic personality can be categorised in subjects on different criteria. Some of them are: impulsivity, irresponsibility, arrogance, total lack of culpability, etc. This study uses the Levenson Self-Report Psychopathy Scale (LSRP), this one is used to classify subjects on two scales. Scale 1 is related to manipulation and insensitivity towards others, scale 2 is related to impulsivity and low behavioral control and the general scale can also be obtained by adding all items together. The score for each scale will be calculated as the total of the sum of each item. A higher score on each scale will indicate a higher level of non-clinical psychopathy.

Table 2: Descriptive statistics of the Levenson Self-Report Psychopathy Scale

<u>Variables</u>	<u>Obs</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Max</u>
scale1	184	35.271	3.462	27	46
scale2	184	21.429	4.025	14	29
general	184	60.592	6.162	45	78

The following will show whether the mean obtained in Table 2 is representative of the sample, with the coefficient of variation ( $C_V = \frac{\sigma}{\mu}$ ). Being the mean of each scale representative of the data, it can be used correctly in logit models to know the probability of increasing the amount given at T1 of a subject with average levels of psychopathy.

Table 3: Coefficient of Variation of the Levenson Self-Report Psychopathy Scale

<u>Variables</u>	<u>Mean (<math>\mu</math>)</u>	<u>Standard deviation (<math>\sigma</math>)</u>	<u>C<sub>v</sub></u>
Psychopathy_scale1	35.271	3.462	0.098
Psychopathy_scale2	21.429	4.025	0.187
Psychopathy_general	60.592	6.162	0.101

As we can see in table 3, all the C<sub>v</sub> are smaller than 0.8 so we can affirm that arithmetic means of those variables are representative of the data set.

Attempting to obtain correlations between the amount of dictator gambling (level of altruism) and the degree of non-clinical psychopathy may be interesting. It is expected that the low affection for others that characterises psychopaths is correlated with a non-altruistic personality. These data raise the question whether the amount given in the dictator game and the level of non-clinical psychopathy are correlated. It can be observed that altruism is significantly and negatively correlate at 10% of significance with scale1 (Spearman, rho = -0.143, p = 0.062) and general (Spearman, rho = -0.145, p = 0.058) LSRP scores.

## 7.4 TRUST AND RECIPROCITY

Data, which corresponds to TG, is analysed<sup>2</sup> in order to find empirical evidence of whether the differences between treatments are significant and, more importantly, to what these differences between treatments are due.

### 7.4.1 Trustors

Regarding trustors' behavior, as can be seen in figure 6, the average amount they gived at T0 was 5.67€, while the average amount they trusted at T1 after knowing the emotions felt by their partner in T0 was 5.15€. It is important to remember that trustee

<sup>2</sup> To analyse all the data, it has been used STATA and R-Studio programme.

receive that amount multiplied by 3, so de mean that partner receives on average 15.65€ in T0 and 15.45€ in T1.

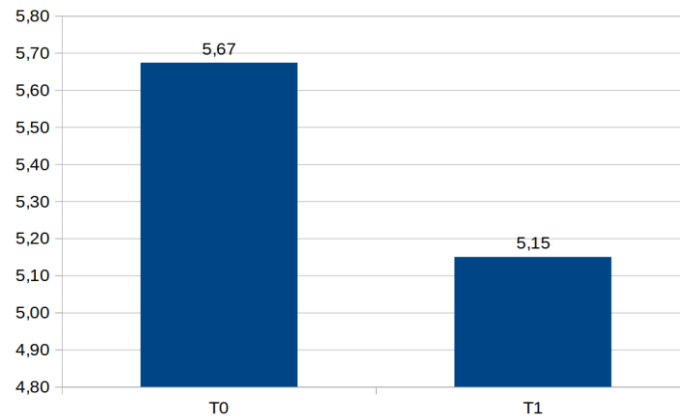


Figure 6: Amount given by trustors, per treatment

However, it is necessary to know what variables cause these differences between treatments. As explained above, the only difference between the two treatments is that the subject observes their partner's emotional signalling after receiving the amount given by trustors in T0.

One of the characteristics of the sample to be known in this study is whether it approximates a normal distribution.

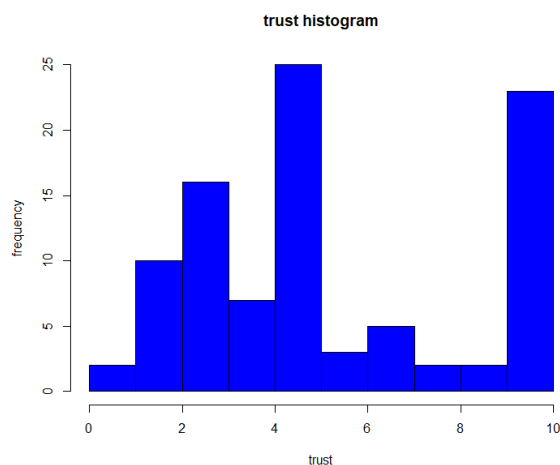


Figure 7: Histogram of the trustors' decisions

For this purpose, as an illustration, a histogram has been made with the aggregated trustor's data. It can be seen that a priori, our data are not normally distributed, but to verify this, the Shapiro-Wilk test has been carried out. The null hypothesis is that the population is normally distributed, while the alternative hypothesis is that it is not normally distributed. The R-statistic programme yields:  $W = 0.87651$ ,  $P\text{-value} = 2.303e-07$ ; therefore, the null hypothesis that the sample is normally distributed can be rejected at 1% significance. This evidence is very important, as non-parametric tests must be applied to test for differences between samples.

To study gender differences in terms of the amount trusted to the partner. The starting hypotheses of this test are as follows:

**H<sub>0</sub>** = the starting distribution of the males' sample and females' sample are the same.

**H<sub>1</sub>** = the values of the males' sample tend to exceed those of the females' sample, or vice versa.

Using the Mann-Whitney U test<sup>3</sup> the R statistical program yields:  $W = 969$ ,  $p\text{-value} = 0.669$ ; therefore, we cannot reject the hypothesis that there are no differences between males and females in terms of the amount they trust. Verifying the second part of the H<sub>4</sub>.

In order to observe whether the differences between the amount trusted in T<sub>0</sub> and the amount trusted in T<sub>1</sub> are different from each other has been carried out the Wilcoxon Signed Rank test<sup>4</sup>. The starting hypotheses of this test are as follows:

**H<sub>0</sub>**: difference between samples follow a symmetric distribution around zero.

**H<sub>1</sub>**: difference between samples does not follow a symmetric distribution around zero.

This test yields:  $V = 711.5$ ,  $p\text{-value} = 0.060$ : therefore, it can be rejected the null hypothesis that both samples are not different from each other at 10% significance. Therefore, thanks to this evidence we cannot reject a part of the H<sub>2</sub>.

The question it must be asked now is what kind of emotions elicited by the partner are causing these significant differences. The sample was disaggregated into two groups: those subjects who perceived positive emotions (happiness and compassion) and those who perceived negative emotions (culpability and rage), in order to observe

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<sup>3</sup> The Mann-Whitney U test is a non-parametric test applied to observe differences between two independent samples.

<sup>4</sup> The Wilcoxon Signed Rank test is used to observe differences between non-parametric and dependent samples.

the same subjects before and after emotional signalling and therefore find out what differences between samples are significant.

Again using the Wilcoxon Signed Rank test, we find evidence that the difference between samples of those who perceived positive emotions is not significant ( $V=106$ ,  $p$ -value = 0.652) while the difference between samples of those who perceived negative emotions is significant at 10% ( $V=1.7322$ ,  $p$ -value = 0.083). Therefore, it can be concluded that the differences between T0 samples and T1 samples are mainly explained by the signalling of negative emotions (culpability and rage).

### 7.4.2 Trustees

Regarding trustee's behavior, as can be seen in Figure 8, the average amount they reciprocate at T0 was 5.66€, while the average amount they trusted at T1 after knowing the emotions felt by their partner in T0 was 5.19€.

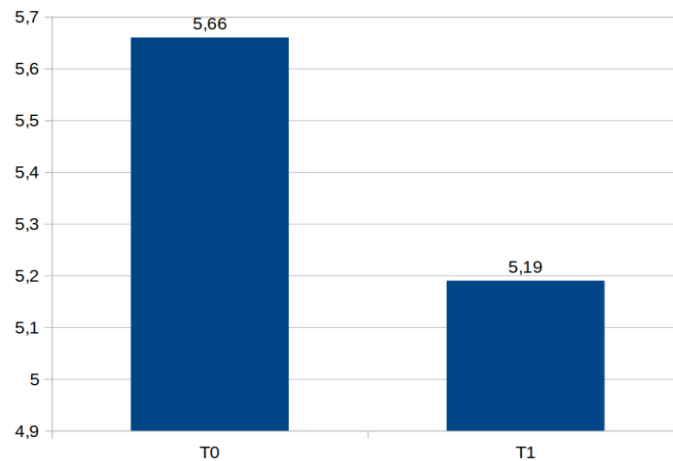


Figure 8: Amount given by trustees, per treatment

In order to observe whether the differences in the proportion that trustors and trustees choose to give to their partner are statistically significant, it has been obtained how much of their endowment the subject sacrificed in order to increase their partner's utility. In the case of trustors ( $\frac{trust}{10}$ ) and in the case of trustees ( $\frac{reciprocate}{3*trust}$ ).

Given that the samples do not follow a normal distribution, which will be verified later for trustee, the Mann-Whitney U test has been performed to test for differences between the two samples. R statistical programme yields:  $W = 23064$ ,  $p$ -value =  $6.496e^{-11}$ ;



therefore, we can reject the null hypotheses that the differences between the amount that trustor sacrifices and trustee sacrifices to give to their partner are not different from each other at a 1% of significance level, being trustees sacrificing a smaller proportion of their endowment.

Note that these differences between trustors and trustees in the proportion of their endowment that they choose to return to the partner may be due to the difference in terms of information. As the experiment was set up, trustor cannot know the amount that is returned by the partner, he only observes his partner's emotion, while trustee has all possible information. Also, these differences may come from the fact that trustees do not perceive risk as trustors do, as the latter have the possibility of not getting anything back, which may make them behave more strategically and cause the differences previously discussed.

In addition, it is necessary to know what variables cause these differences between trustees' treatments. As explained above, the only difference between the two treatments is that the subject observes their partner's emotional signalling after receiving the amount reciprocated in T0.

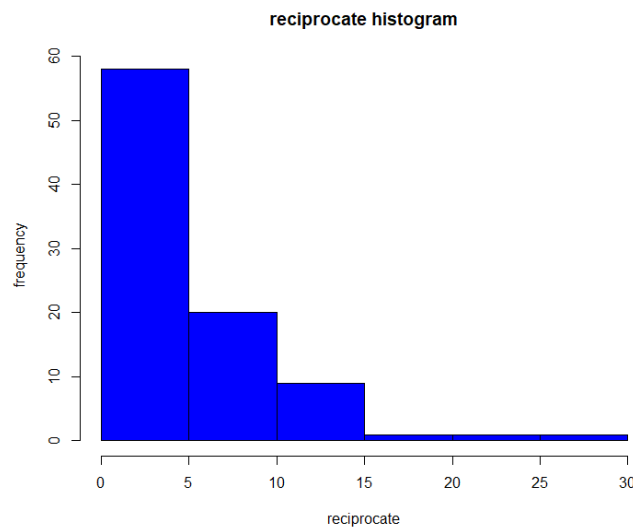


Figure 9: Histogram of the trustees' decisions

A histogram has been made with trustee's data, trying to observe whether or not the sample approximates to a normal distribution, as can be seen in figure 9. A priori, our data are not normally distributed, however, we need to verify it, the Shapiro-Wilk test has been carried out, where the null hypotheses is that the population is normally distributed,

while the alternative hypotheses is that it is not normally distributed. The R-statistic programme yields:  $W = 0.861$ ,  $P\text{-value} = 1.148e^{-07}$ ; therefore, the null hypotheses that the sample is normally distributed can be rejected at 1% level of significance. This evidence is very important, as it tells us that we should apply non-parametric tests, as has been done with the sample of trustors.

To study gender differences in terms of the amount gives to the partner. Using the Mann-Whitney U test, R statistical program yields:  $W = 2365.5$ ,  $p\text{-value} = 0.028$ ; therefore, we can reject the hypotheses that there are no differences between males and females in terms of the amount they reciprocate.

This and previous evidence found impedes the verification of the first part of the H4: while there are no gender differences in the amount trusted, there are differences in the amount reciprocated.

Following the previous procedures, it is important to know whether the differences between the amount reciprocated at T0 and T1 are significantly different from each other. It has been used again the Wilcoxon Signed Rank test: This tests yields:  $V = 409.5$ ,  $p\text{-value} = 0.79$ ; therefore, we cannot reject the null hypotheses that both samples are not different from each other. Hence, we cannot verify H2 even if the first part concerning the trustors is fulfilled.

But given that there are different types of emotions positive and negative, also each category is divided into two positive emotions (happiness and compassion) and two negative emotions (culpability and anger), a much more disaggregated analysis has been carried out to see if there are differences between samples for each emotions.

Doing the Wilcoxon Signed Rank test, we observe that the only emotion that causes significant differences between samples is "culpability". The test yields:  $V = 4$ ,  $p\text{-value} = 0.087$ ; therefore we can reject the null hypotheses that both samples are not different from each other at 10% level of significance.

Finally, it can be concluded that the differences between reciprocators samples from T0 and T1 are only statistically and significantly different in those subjects who perceived the partner's emotion of culpability.

To conclude the section called Descriptive Data Analysis, it should be noted that thanks to the empirical evidence obtained with the experiment, it is possible to verify H1 proposed in this study. Trust and reciprocity exist as a basic driver of human behavior, obtaining the same evidence found by Berg et al. (1995).

## 8. ECONOMETRIC ANALYSIS

Following the procedures discussed in the methodology, two regression models have been estimated, one for each type of player. In both models, a binary logit has been adjusted, one for trustors and one for trustees.

In the trustors' binary logit model, those trustors who have increased the amount they trust will take the value 1 while the value 0, will be taken by those subjects who have decreased the amount sent or have not changed their decision.

The trustees' binary logit model will follow a similar structure to the first, but will focus on trustees. Those subjects who have increased the amount they reciprocate will take the value 1, while the value 0 will be taken by those subjects who have decreased the amount sent or have not changed their decision.

These models will allow us to calculate the probability of whether the direction of change is to increase the given trust and reciprocated, or on the contrary to decrease it or not to change it. Both models are made in order to differentiate between trustors and trustees. It is worth noting that both in this experiment, trustors have a great lack of information, as they do not know at any time the amount that their partner sends back to them. While trustees have all the information available, as they know the amount that is sent to them.

The equation 1 presents the probability of outcome one;

$$\Pr(y = 1|x_i) = \Lambda(z) = \frac{\exp(z)}{1 + \exp(z)} \quad (1)$$

Where:

$$z = \beta_0 + \beta_1 \text{altruism} + \beta_2 \text{female} + \beta_3 \text{psychopathy scale 1} + \beta_4 \text{psychopathy scale 2} \\ + \beta_5 \text{compassion} + \beta_6 \text{culpability} + \beta_7 \text{rage}$$

The equation (1) represents in both models, therefore, the probability of increase the amount given to the partner given subject characteristics (altruism, gender and level of non-clinical psychopathy) and perceived emotional signalling (happiness, compassion, culpability and rage) which are included in the equation as  $x_i$ . Also,  $z$  included  $x_i$  and their corresponding parameters to be estimated  $\beta$ . The reference level is outcome zero, that is, not to change or decrease the amount given to the partner.

Before presenting the results of the binary logit model, some proportions tests have been performed for each of the dummies (altruism and female) in the model. This has been done in order to give serious indications of the behavior of these variables on the dependent variable.

This test concentrates on the relative difference between the two sample proportions, proportion 1 ( $p_1$ ) and proportion 2 ( $p_2$ ). Small differences denote only chance variation due to sampling ( $H_0$  cannot be rejected); while large differences mean the opposite ( $H_0$  is rejected), the hypotheses test is presented below.

$$H_0: p_1 = p_2$$

$$H_1: p_1 \neq p_2$$

When testing whether there is a difference between altruists and non-altruists in terms of increasing the amount given to the partner, the STATA software yields a P-value = 0.399. Therefore, the null hypotheses that there is no difference between altruists and non-altruists in terms of increase the amount given to the partner cannot be rejected.

When testing whether there are differences between genders in terms of increasing the amount given to the partner, the STATA software yields a P-value = 0.001. Therefore, the null hypotheses that there is no genders differences in terms of increase the amount given to the partner can be rejected at a significance level of 1%.

Therefore, in binary logit models, thanks to the evidence found, it would expected that whether the subject is altruistic or not, does not significantly affect the probability of increasing the amount trusted or reciprocated to the partner. In addition, it would be expected that gender acts as a significant variable in terms of affecting the probability of increasing the amount trusted or reciprocated.

The next section focuses on the analysis of the data using the binary logit explained above.

## 8.1 Adjusting trustors behavior

We can then look at the result of our correlation matrix to see whether there is an affinity between our variables and in what proportion.

In order to avoid perfect collinearity problems in the emotions dummy variables, it has been chosen to omit the "happiness" dummy. We also obtained a correlation between

the linear variables (psycopathy\_scale1 and psycopathy\_scale2) of 0.427, although this correlation it is not high enough to be worrying in relation to the estimation.

As can be seen, table 4 shows the direction of the changes in probability to increase the amount trusted to the partner in T1, once the emotional signalling has been perceived. Remember that coefficients we can observe, given the nature of the binary logit model, are not directly interpretable, which is why equation (1) has to be used. Also to correctly interpreting the single effect of the dummies of the model, the *odds ratios* will be used.

Table 4: Binary logit for trustors' behavior: Probability of increasing the amount trusted

Dependent variable: Increase_P1			
	<u>Coefficient</u>	<u>Std. Error</u>	<u>z</u>
const	6.269 **	3.125	2
altruism	-0.071	0.583	-0.122
female	-1.256 **	0.527	-2.381
psycopathy_scale1	-0.102	0.085	-1.198
psycopathy_scale2	-0.165	0.106	-1.156
compassion	0.564	0.811	0.695
culpability	0.854	0.759	1.125
rage	1.032	0.803	1.284

Note: \*, \*\*, \*\*\* denote significance at the 10, 5, and 1% levels, respectively.

Starting with the continuous variables: level of manipulation and insensitivity towards others (psycopathy scale1) and level of impulsivity and low behavioral control (psycopathy scale 2), it can be appreciated that both are not statistically significant. This may be due to the fact that, as previously mentioned, trustor, in this experiment, has very limited information, since he does not observe at any time the amount reciprocated by his partner, he only observes the emotional signalling. This can make the psychopathic personality less differentiable and therefore the behavior to emotional

signalling between those subjects with lower and higher levels of non-clinical psychopathy is very similar.

Having analysed the dummy variables we can distinguish two subgroups: First group of dummy's are related to intrinsic characteristics of the subject: whether the subject is altruistic (according to the criteria described in the methodology) or not and whether the subject is a female or not.

Second group of dummies are related to the type of emotion that is perceived, highlighting that the omitted emotion is "happiness" (in order to avoid perfect multicollinearity) so that the parameters obtained in terms of changes in the probability of increasing the amount trusted are in comparison to the omitted dummy. This last group has been carried out in order to observe which emotion causes a greater and significant effect, comparing it with "happiness" on the probability of increasing.

As can be seen, only the dummy variable "female" is significant in terms of the change in the probability of increasing the amount of trust, in line with the indications of the test of proportions carried out previously. Specifically, being female versus being male reduces the probability of increasing the amount trusted.

This evidence may suggest that females in terms of increasing the amount they trust in T1 are less sensitive to signalling emotions than males.

In order to favour the analysis and interpretation of the dummy variables in the binary logit model, it will be used the *odds ratio (OR)*, which can be seen in the table 5. *Odds ratio*, will allow to observe number of times where increasing the amount given to the partner is more likely to happen versus not varying or decreasing the amount given.

Table 5: Odds ratio of increasing the amount trusted

Dependent variable: Increase_P1			
	<u>Odds Ratio</u>	<u>Std. Error</u>	<u>z</u>
const	527.741 **	3.125	2
altruism	0.931	0.583	-0.122
female	0.284 **	0.527	-2.381
psycopathy_scale1	0.903	0.085	-1.198
psycopathy_scale2	0.847	0.106	-1.156
compassion	1.758	0.811	0.695
culpability	2.349	0.759	1.125
rage	2.805	0.803	1.284

Note: \*, \*\*, \*\*\* denote significance at the 10, 5, and 1% levels, respectively.

Focusing on the significant variable "female", the odds ratio is  $< 1$ , meaning that the relationship between female and the probability of the event occurring is negative (as shown in table 2). Specifically, if the subject is female, the probability of increasing the amount trusted is a 72% less than if the subject is male, being this difference significant at 1%. Therefore, it can be concluded that part of H4 is not fulfilled, there are gender differences between trustors. This evidence may be due to the lower risk aversion of females, as the evidence found in the study of Borghans et al. (2009).

In addition, given that only the female variable is significant, we can conclude that the first parts of the H3, which refer to the sample of trustors, are not verified.

It should be considered that the lack of information perceived by the trustors in this experiment might be the reason why the difference between emotions (compassion, culpability, rage) and "happiness" is not significant in terms of the change in the probability of increasing the amount trusted.

Thanks to the odds ratio, the probability of the event occurring given certain characteristics of the subject can be obtained.

As an example, it will be assumed that the subject is characterised as an altruistic woman with a level of manipulation and insensitivity towards others and impulsivity and

behavioral control that is equal to the average, she perceives from her partner the emotion anger.

$$z = 6.269 - 0.071(1) - 1.256(1) - 0.102(35.271) - 0.165(21.43) + 0.564(0) + 0.854(0)$$

$$(3.125) (0.583) (0.527) (0.085) (0.106) (0.811) (0.759)$$

$$1.032(1) = -1.16$$

$$(0.803)$$

$$N = 90$$

Continuing with equation (1) shown at the beginning of this section, it is observed the probability that a subject with certain characteristics will increase the reciprocal quantity versus not varying or decreasing it.

$$\Pr(y = 1|x_i) = \Lambda(-1.16) = \frac{\exp(-1.16)}{1 + \exp(-1.16)} = 0.238$$

Therefore, it can be concluded that a subject with these characteristics has a 23.8% probability of increasing the amount trusted to his partner in T1.

## 8.2 Adjusting trustees behavior

Following the procedures carried out in the first model, in order to avoid perfect collinearity problems in the emotions dummy variables, it has been chosen to omit the "happiness" dummy. We also obtained a correlation between the linear variables (psycopathy\_scale1 and psycopathy\_scale2) of 0.65, although this correlation is not high enough to be of concern in relation to the estimate, because is less than 0.8.

Once the binary logit regression has been carried out table 6 shows the direction of the changes in probability to increase the amount reciprocated to the partner in T1, once the emotional signalling has been perceived.



Table 6: Binary logit for Trustees' behavior: Probability of increasing the amount reciprocated

Dependent variable: Increase_P2			
	<u>Coefficient</u>	<u>Std. Error</u>	<u>z</u>
const	0.550	2.533	0.217
altruism	-0.190	0.615	-0.309
female	-0.383	0.607	-0.630
psychopathy_scale1	0.093	0.102	0.912
psychopathy_scale2	-0.179	0.132	-1.355
compassion	2.435 ***	0.893	2.727
culpability	2.537 ***	0.878	2.888
rage	2.344 ***	0.771	3.040

Note: \*, \*\*, \*\*\* denote significance at the 10, 5, and 1% levels, respectively.

Regarding the data obtained, it is found that psychopathic personality: level of manipulation and insensitivity towards others (psychopathy scale1) and level of impulsivity and low behavioral control (psychopathy scale 2), is still not significant in the reciprocators. The main difference, which is found with respect to the model of trustors, is that the gender dummy is no longer significant, while the dummies of perceived emotion in front the omitted dummy “happiness” become significant at 1% of significance and with positive relationship on the dependent.

Therefore, its found that eliciting positive emotions, in this case “compassion”, will increase the probability that the subject will increase the amount reciprocated to the emotion happiness. It is also surprising that negative emotions (guilt and anger) also increase the probability of reciprocation for “happiness”.

Given that female is not significant, it can be concluded that part of H4 is fulfilled. There are not gender differences between trustees.

As for H3, thanks to this evidence and that of the previous section, it can be concluded that they are not fulfilled for the experiment carried out.

Note that this large difference may be due to the higher information available to this group subjects (they observe the amount that is trusted to them), thus enhancing the effect of emotions. In addition, the high significance of perceived emotions makes gender differences dissipate, as there is no evidence found that emotions affect more to a certain type of gender.

Focusing on the significant variables in the model, it is observed that in the block of subjects who had perceived positive emotions (happiness and compassion), the latter has a greater positive effect than happiness in terms of the probability of increasing the amount reciprocated, versus not varying or decreasing it. Concluding that eliciting the emotion "culpability" provokes greater reciprocity or cooperation than "happiness".

In terms of the block of negative emotions, it is observed that those subjects who perceive both (guilt and anger) are more likely to increase the amount reciprocated than those who perceive the emotion "happiness".

In order to observe the estimated probability of increasing the reciprocal amount of perceived emotions versus "happiness", has been used again the *odds ratios*, which can be seen in table 7.

Table 7: Odds ratio of increasing the amount reciprocated

Dependent variable: Increase_P2			
	<u>Odds Ratio</u>	<u>Std. Error</u>	<u>z</u>
const	1.733	2.533	0.217
altruism	0.826	0.615	-0.309
female	0.682	0.607	-0.630
psycopathy_scale1	1.097	0.102	0.912
psycopathy_scale2	0.835	0.132	-1.355
compassion	11.412 ***	0.893	2.727
culpability	12.639 ***	0.878	2.888
rage	10.427 ***	0.771	3.040

Note: \*, \*\*, \*\*\* denote significance at the 10, 5, and 1% levels, respectively.

Analysing differences among positive emotions, it is observed that those subjects who perceive the emotion "compassion" from their partner are 11 times more probable to increase the amount reciprocated than those who perceive the emotion "happiness".

Trying to analyse the differences between those subjects who perceived negative emotions versus those who perceived "happiness", it is observed that subjects who were elicited "culpability" are 12 times more likely to increase the amount reciprocated, while those who were elicited "anger" are 10 times more likely to increase the amount reciprocated in T1.

In the same way as in the previous section, the data obtained in table 5 will be used to obtain the probability that a subject with certain characteristics will increase the amount reciprocated to his partner. The assumptions for this subject will be the same as those stated for the trustor, by way of reminder, these were: the subject is characterised as an altruistic woman with a level of manipulation and insensitivity towards others and impulsivity and behavioral control that is equal to the average, she perceives from her partner the emotion anger.

$$z = 0.550 - 0.190(1) - 0.383(1) - 0.093(35.271) - 0.179(21.43) + 2.435(0)$$

$$(2.533) \quad (0.615) \quad (0.607) \quad (0.102) \quad (0.132) \quad (0.893)$$

$$2.537(0) + 1.032(1) = 1.585$$

$$(0.878) \quad (0.803)$$

$$N = 90$$

Continuing with equation (1), we want to observe the probability that a subject with certain characteristics will increase the reciprocal quantity versus not varying or decreasing it.

$$\Pr(y = 1|x_i) = \Lambda(1.585) = \frac{\exp(1.585)}{1 + \exp(1.585)} = 0.83$$

Therefore, we can conclude that a subject with these characteristics has an 83% probability of increasing the amount reciprocated to his partner in T1.

As can be seen, the difference in the probability of increasing the amount given to their partner between trustors and trustees with the same characteristics is very high, with trustees having a 59,2% higher probability. It is important to note that the main reason why this difference is so high is due to the lack of information from trustors, as not perceiving the amount that their partner reciprocates can dilute the effect of emotions. Data and questionnaires used in this experiment are available at the following link:

[Data and Questionnaires - Google Drive](#)

## 9. DISCUSSION AND MAIN CONCLUSIONS

Non-rational behavior is one of the most important characteristics of human behavior and is one of the reasons for the deviation from theoretical prediction in experiments. Given the literature review, this study presents that trust and reciprocity in TG contexts can be explained by many intrinsic characteristics of the subject, such as altruism, gender and the level of non-clinical psychopathy. The main object of the study is to obtain the extent to which the subject's characteristics cause the amount given to the partner, once the partner's emotional signalling is observed. These effects can be: increasing it, decreasing it or remaining it constant compared with T0.

As Berg et al. (1995) found, evidence show that non-rational behavior in a TG context exists as a basic driver of human behavior, verifying our first hypotheses. Also, it is found a significant gender differences in the amount they give to the partner.

With respect to the second hypotheses, it is observed in the present study that the level of non-clinical psychopathy of the subjects does not act as a driver of lower trust and reciprocity.

Regarding trustors it is found evidence that shows differences between samples before and after emotional signalling. This differences are mainly explained by the signalling of negative emotions (culpability and rage). There is also empirical evidence about how emotional signalling for female trustors acts as a predictor of lower trust.

Regarding trustees, differences in terms of the amount returned to the partner are only significant in those subjects who perceived the emotion culpability. It is found that there are significant gender differences in terms of the amount reciprocated, also the fact of perceiving the emotion compassion or negative emotions compared to happiness acts as a predictor of greater reciprocity, as well as a more pro-social behavior in T1, independently of the intrinsic characteristics of each subject. Therefore, the third hypothesis can be rejected. The higher level on scale 1 and scale 2 of non-clinical psychopathy is not associated with a lower probability of increasing the amount given by trustors or trustees.

Concerning to the fourth hypothesis, the results show a significance difference between male and female in terms of the amount they give in the dictator game and in the probability of increase the amount given by trustors after emotional signalling, so we can reject the hypothesis. No gender differences are found in the probability of increasing

the amount given by trustees. In addition, the evidence found by Goeree et al. (2002) is not fulfilled.

The results exhibit a well explanation of how emotions can influence human behavior in a repeated TG, acting as a driver of non-rational behavior and even making subjects give more to the partner, once the emotion has been observed. This study finds large differences between trustors and reciprocators in terms of how much of their endowment the subject sacrifice to increase their partner's utility, being the trustees the ones that sacrifice the least. The experimental design can explain the big differences between trustors and trustees, as a consequence of the strategic interaction in one direction but not in the other, because trustors do not observe the amount reciprocated at all.

Emotions can be predictors of more pro-social behavior in a TG context as long as they are followed by enough information. They can also make subjects act more strategically.

The limitations of the study and possible lines for future research are outlined below. To follow a rigorous methodology in the laboratory or in the experimental process is fundamental. This is the main obstacle that the experiment has faced, because of the limitations. The most important ones are:

- It has not been possible to pay all the subjects who have participated in the experiment. Only the winners of the draw were awarded prizes. This makes the data obtained unrealistic, as the incentive was not strong enough.
- It is very difficult to carry out the experimental methodology and to guarantee the robustness of the data obtained through questionnaires, which are answered within 4 days of each other.
- Another limitation of conducting an online experiment is that it is not possible to control whether the subjects answer individually, or whether the researcher can answer questions they have. Therefore, conducting this study in an on-site laboratory becomes especially important.
- As the experiment was based on questionnaires, it was necessary to avoid including in the analysis other tests that would have helped to obtain more data of each subject personality, e.g. the Big Five Questionnaire (BFQ) introduced by Caprara et al. (1993).

Finally, some new research alternatives may be to implement the methodologies used for these questionnaires in a controlled laboratory experiment and also try to measure other aspects of the personality of the subjects that can explain human behavior under

emotional signalling. A physical laboratory would allow us to control the experiment and subjects to respond instantly and sequentially to the partner's choice.

Therefore, following this methodology rather than the one used, because of the TFG limitations, may make subjects more aware of the decisions they are making. In conclusion, it would be expected that certain variables to exhibit the same behavior as the evidence found in the literature review.

Conducting this research, in my opinion, is extremely important and useful in an economic context and as a starting point for future studies. Knowing the intrinsic characteristics determine non-rational human behavior and how emotions affect that characteristics can serve as an explanation of certain theories and strategies.

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