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Altruism and Gender in the Trust Game

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Abstract - This paper analyses gender differences in the trust game. Our experiment implements the triadic design proposed by Cox (2004) to discriminate between transfers resulting from trust or trustworthiness and transfers resulting from altruistic preferences. We observe that women exhibit a higher degree of altruism than men for both trust and trustworthiness but relatively more for trustworthiness. This result provides an explanation to the experimental finding that women reciprocate more than men.

JEL classification: C90; C91; D64; J16

Keywords: gender differences; trust; trustworthiness; altruism; gender pairing

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1. Introduction

Trust and trustworthiness are key concepts for the analysis of economic systems. At the same time their theoretical justification represents a challenge for the model of self-seeking economic agent. To deal with this issue, some economists describe trust and trustworthiness as a pair of strictly related concepts, the so-called *t-pair* (Bacharach, Guerra and Zizzo 2001). This interpretation postulates that a utility-maximizing individual is expected to be trustworthy if he does not have economic incentives to take advantage of the trust of others. The consequence is that he will trust another one if the incentives of the trustee to be trustworthy are self-evident or self-enforceable.

A different approach is to assume that trust and trustworthiness may depend on different factors. This hypothesis is particularly appropriate for one-shot interactions in which factors like reputation and experience are ineffective. In this case trust and trustworthiness may be the consequence of distinct motivations or also the product of different behavioural regularities. Trust could be perceived as an economic investment in the trustee's reliability and consequently as a decision dependent on risk attitude or on the perception of the vulnerability to the action of others. Trustworthiness would seem to be better explained by institutional, psychological or moral factors, as social distance or inequality aversion, and it could be justified by extra-economic values.

Nevertheless, both trust and trustworthiness may be the result of altruistic preferences. If utility increases in other individuals' utility or consumption the truster can find rational to trust even if he does not expect the trustee to be trustworthy. Similarly, the trustee may exhibit trustworthiness without any economic incentive to reciprocate.

To detect the effect of altruism, Cox (2002) and (2004) propose an across-subjects experiment that discriminates between transfers resulting from trust or trustworthiness and transfers resulting from altruistic preferences. Cox's findings confirm that subjects are also moved by altruistic preferences. His conclusion is that utility should not be assumed independent of other individuals' payoffs and altruistic preferences should be included in the rational model of economic behaviour.

This theoretical objective requires an investigation of the factors explaining altruism. Laboratory activity offers a possible clue to address this question. There is wide experimental evidence that men and women behave differently in relation to trust and trustworthiness. This result may be useful not only to analyse gender differences but also for discriminating among the causes of trust and trustworthiness.

To provide some insight into both these issues, we replicate Cox's (2002) experiment on gender differences by modifying the information given to the subjects. Our test specifically intends to find evidence on the difference between women and men in altruism when subjects playing the trust game are informed of partners' gender.

The next section surveys the past experimental work on gender differences in the trust game and then summarizes some theoretical interpretations of the collected evidence. The third section illustrates the design of our experiment whose results are presented in the fourth section. Finally, in the last section we draw some conclusions.

2. Background

To test trust and trustworthiness in the laboratory, Berg, Dickhaut and McCabe (1995) propose the trust (or investment) game that involves two players who are paired off anonymously and respectively named as the sender and the responder. The sender is given a

certain amount of money and told that he or she can keep the entire amount or send some or all of it to the responder. Any money passed from the sender to the responder is tripled by the experimenter and then given to the responder. The responder can keep the entire amount or give back some or all of it to the sender. The game ends when the sender receives the amount sent back by the responder.

This game-theoretical framework offers a simple measure of the propensities to trust, which is the proportion of the initial endowment sent by the sender, and to be trustworthy, which is the ratio between the amount returned and the amount received by the responder. In the seminal Berg, Dickhaut and McCabe's paper senders sent 51.6% of their initial endowment and responders returned to the senders about 18% of the received money. In the following years the trust game was the object of many experimental papers, some of which also investigated the differences between male and female behaviour. In this section we survey first the evidence on trust and then that on trustworthiness. In both cases we discuss separately the experiments in which participants did not know the gender of their partners and those in which participants received that information.

Trust with unknown gender

In the standard trust game, Buchan, Croson and Solnick (2004) find that men trust more (74%) than women (61%) These figures are significantly higher than those of Berg, Dickhaut and Mc Cabe (1995) and of other replications. Cox's (2002) proportions of amount sent are 64% for men and 53% for women, Ashraf, Bohnet and Piankov's (2003) figures are 47% and 41% and Chaudhuri and Gangadharan's (2002) 53% and 34%. It is noteworthy that Chaudhuri and Gangadharan adopt a design in which all subjects play the double role of sender and receiver.

Women are also less likely to send than men in Snijders and Keren (1999) and in Eckel and Wilson (2004), in which subjects select their partners by means of icons chosen to represent them but that do not reveal their gender. Finally, in an experiment collecting data from different countries (China, Japan, Korea and the United States) Croson and Buchan (1999) find a slight but non significant difference between men and women in sending behaviour (respectively, 69% and 63%).

While in all the previous cases men send more than women, Cox and Deck (2002) in a reduced version of the trust game with discrete choices find contradictory patterns of behaviour between men and women. Their paper also provides evidence of a different sensitivity to the experimental environment between men and women. Men's choices do not depend on reciprocal considerations, the level of payoffs, or the social distance, as measured by the degree of anonymity between subjects. Women's decisions are significantly inversely related to the social distance and to the relative cost of trusting behaviour.

Trust with known gender

Buchan, Croson and Solnick (2004) inform subjects of the partners' gender by communicating their names. In the full information condition - both senders and responders know the opponent's gender - women (63%) are less likely to send than men (79%) but they send more to male (67%) than to female responder (58%). In general, women appear more responsive than men to the change of information conditions as measured by the range of sent amounts, which is $1.22 for men and $1.47 for women.

Schwieren and Sutter (2003) also communicate gender by announcing subjects' first name. They don't find any significant difference either between men (65%) and women (65%) or between mixed and same gender pairings.

Feshtman and Gneezy (2001) signal participants' gender by using first and last names. Their work analyses the joint effect of gender and ethnicity. Their findings are that men discriminate differently between men and women in function of the ethnic background for both trust and trustworthiness while women discriminate only for trustworthiness. Apart from that, there are no significant differences for sending behaviour between men and women.

In a discrete version of the trust game - the sender decides only if to send all or none of the endowment - Eckel and Wilson (2002) test subjects' behaviour when differently informed of the gender of the counterpart. Their outcome is that women send less than men with written information and send more than men when they observe a photo of their partner. Women are less likely to be trusted than men in the written information treatment, but equally likely to be trusted in the photo treatment.

Scharlemann et al. (2001) communicate gender by showing to subjects a smiling or a non-smiling photo of the partner. Men trust more and discriminate more between the two information conditions than women. This experiment also finds support to the gender pairing effect, according to which participants trust more other gender's partners.

Finally, Slonim (2004) gives subjects the possibility of selecting the partner on the basis of his or her gender. Results show that men send significantly more than women in almost all the information conditions.

Trustworthiness with unknown gender

Croson and Buchan (1999) find that trustworthiness, as measured by the ratio between the amount returned and the amount received by responders, is significantly greater for women (37.4%) than for men (28.6%). The proportion of money returned is positively related to the amount sent: it increases by one third per each additional dollar and this ratio is increased by 12% for women. This finding is explained by Croson and Buchan in terms of reciprocity rather than of altruism by taking into account the post-experimental questionnaires. When asked how obligated they feel to return to the sender the money received, women felt significantly more compelled than men to do so.

Buchan, Croson and Solnick's (2004) results with unknown gender are that men (24%) return less than women (32%). The same result is found by Chaudhuri and Gangadharan (2002). However in this case the difference between women's and men's amount returned (respectively, 19.8 and 14.7) is not significant by using either parametric or non-parametric tests. Chaudhuri and Gangadharan also find that for women the amount returned is significantly more correlated with the amount sent than for men.

On the contrary, Cox's (2002) experiment on gender differences finds than men return slightly more (40%) than women (39,5%) and show a significantly positive correlation with the amount received while female subjects do not. Other evidence of men's higher trustworthiness is provided by Ashraf, Bohnet and Piankov (2003) in an experiment run in Russia, South Africa and United States (27.3% for men and 25.7% for women).

Trustworthiness with known gender

In the full information condition with participants knowing partner's gender, Buchan, Croson and Solnick (2004) find no difference between women's (33%) and men's (33%) proportions of amount returned. However, their data exhibit the gender pairing effect: while

men's trustworthiness is not affected by sender's gender, women are more trustworthy to male senders (36%) than to female senders (29%).

Schwieren and Sutter (2003) find that women (37%) are significantly more reciprocal than men (31%) and return more to male senders (45% vs. 30-33% of the other pairings)

Lastly, in Eckel and Wilson (2002)'s experiment with the written information and the photo treatment there is no significant gender difference neither among treatments nor among pairings.

As for gender differences as a whole (Camerer 2004, Eckel and Grossman forthcoming), the laboratory evidence on the trust game is hardly conclusive but it points out some recurrent patterns providing the background for further experimental work. These regularities can be summarized as follows:

a) the rational backward-induction prediction (no amount sent) is rejected in the lab for both genders and all information conditions;
b) men send more than women, especially with unknown gender;
c) women return more than men and appear more reactive to the change of experimental conditions;
d) mixed gender pairings increase both trust and trustworthiness.

This evidence can be interpreted according to various theoretical approaches. A first explanation is given by the rational approach (Rabin 1993, Fehr and Schmidt 1999) that introduces additional arguments to the standard utility function. The standard hypothesis is to assume that economic agents' preferences are defined on their own and other agents' payoffs. For our purposes, this view would imply that male and female different behaviour can be rationalized by appropriate adjustments to the respective utility functions.

Another rational-like interpretation of this experimental evidence is given by the transformed-payoffs theory (Geanakoplos et al 1989, Guerra and Zizzo 2001) according to which rational players play psychological games. In these games the primary payoff is replaced with transformed payoffs. These payoffs are expressed in terms of player's secondary utility, which is a function of his or her belief about other players' beliefs on players' choices. Responders would fulfil trust not for perceived kindness or inequality aversion but because they believe senders trusts them. For the gender issue, this approach would mean that women are more trust responsiveness because they believe more than men that senders intended to trust them. Gender differences in trusting behaviour would be explained by symmetrical reasons. As for the rational approach, this interpretation postulates that trust and trustworthiness are strictly related.

A third explanation relies upon the dynamics of cognitive processes (McCabe et al. 2001, Rustichini 2005). Rather than viewing trust as something to be built into formal models, the cognitive approach argues that a different understanding of trust and trustworthiness could be provided by an analysis of the relations between behavioural regularities and structures and functions of the brain. The study of the different levels of brain activation would reveal the anatomical underpinnings of individuals' behaviour. For the gender issue, it would imply that men have acquired a functional ability different from women that justifies gender differences in trust and trustworthiness.

Finally, the psychological approach (Riley and Babcock 2002, Ostrom 2003) connects behavioural regularities to the context in which decision are taken. This view tends to differentiate between factors explaining trust and trustworthiness. For example, trust could be explained in terms of the psychological mechanisms activated in conditions of uncertainty, as

negativity bias or cognitive consistency (Eiser and White 2005). On the other hand, trustworthiness would be explained in terms of norms, which are defined as valuations - internal to the strategic situation - of a certain choice. Women would tend to interpret the economic exchange more communally and empathically and thus to repay trust with trustworthiness in return more than men. Female behaviour would exhibit more trustworthiness because women's preferences are more other-regarding than men's.

Our experiment intends to provide some evidence on whether trust and trustworthiness depend on different factors. Specifically, we initially assume that while senders interpret the decision to trust mainly as an economic investment, responders are trustworthy mainly because they have altruistic preferences. The corroboration of this hypothesis would be helpful in explaining gender differences in the trust game. Women would be more trustworthy because they are more altruistic than men. In contrast, the role of risk aversion in trust would make the decision of trusting strictly dependent on subjects' competitive attitude. If men perform better than women in competitive environments (Gneezy, Niederle and Rustichini 2005) this interpretation could explain the fact that men trust more than women.

Another experimental finding we emphasize is women's higher sensitivity to the changes in the laboratory environment. In a survey on gender differences in the lab, Croson and Gneezy argue that "this variance (gender difference) can be explained by a differential sensitivity of men and women to the social conditions in the experiment. Research from psychology suggests that women are more sensitive to social cues in determining appropriate behavior than are men. (…) Participants of both genders are likely maximizing an underlying utility function, but the function that men use is less sensitive to the conditions of the experiment, information about the other party, and (even) the other party's actions, than the function that women use." (Croson and Gneezy 2004, p. 19)

According to this view, women would be more sensitive than men to the experimental context, i.e. face-to-face interaction, design variations or information about the partner. When Cox (2002) applies its design to detect gender differences in the trust game, he chooses not to inform participants of partner's gender. Our experiment modifies Cox's design exactly in this point by testing trust and trustworthiness with known gender. We expect that this feature of the design will increase the differences of reactivity between men and women and consequently highlight the gender effect.

Finally, the surveyed evidence shows that men and women may behave differently depending on partner's gender. According to the theory of parental investment (Trivers 1972), individuals would be more cooperative against the opposite sex than within the same sex for evolutionary reasons. The relevance of gender pairing in bilateral relationships is supported by an experiment made by Sutter, Bosman, Kocher and van Winden (2003), who find that cooperation is lower with bargaining partners of the same gender. We decided to inform subjects of partner's gender also to collect evidence on this hypothesis.

3. Experimental design

The main purpose of our experiment, which is to detect differences in altruism between genders in the trust game, was not extensively analyzed in the laboratory, as pointed out in the previous section. The only exception is the design proposed by Cox (2002) and (2004) that decomposes transfers resulting from trust or trustworthiness and transfers resulting from altruistic preferences that are not conditional on the behaviour of others. This design includes three treatments, A, B and C, with a between-subjects design in which each subject takes part to only one treatment.

Treatment A is the standard trust game. Each responder is given 5 euros as participation fee. Each sender receives 5 euros in half units and is given the task of deciding how many to transfer to the paired responder. The amounts transferred are tripled by the experimenter and given to the paired responder. Each responder decides whether she or he wants to return some, all, or none of the amount received to the paired sender and the game ends. In this treatment the decisions of both sending and giving back money are also attributable to altruistic preferences but this determinant is not distinguishable from the subjects' attitudes to trust or to be trustworthy.

Treatment B is a dictator game which differs from treatment A only because responders do not have any decision to make, while senders decide as in treatment A. In treatment B senders do not have any motivation to send related to trust because they do not expect any money back. In our interpretation, any amount of money sent by senders to the paired man or woman can be ascribed to altruistic preferences.

Treatment C is another dictator game in which senders do not move while responders decide how much money to send to senders. Subjects' initial endowments are calculated as follows. Senders receive an amount of money equal to that hold by the senders in the experiments of treatment A after having taken their sending decisions. Responders are given as initial endowment the (tripled) amounts of money received by responders in the experiments of treatment A. Both senders and responders are informed with a table of the exact inverse relation between the endowments received by responder and by the anonymously paired sender. Thus each responder will transfer part or all the initial endowment only if his or her preferences are altruistic because the sender cannot send back anything.

The comparison between these treatments gives an across-subjects measure of altruism. In particular, the degree of altruism in trusting decisions is measured by the ratio between the proportions of the initial endowment sent by the senders to the responders in treatment A and in treatment B. The degree of altruism in trustworthiness is measured by the ratio between the proportions of amounts of money transferred to senders by responders in treatment A and in treatment C.

To exemplify, the lowest degree of altruism in trust occurs if senders do not send any money in treatment B and any amount of money sent in treatment A is attributable to trust. Higher is the ratio between the average amount sent in treatment B and the average amount sent in treatment A greater is the degree of altruism. The same calculation on the proportions between the amount sent and the amount received by responders in Treatment A and C gives an estimation of the degree of altruism in trustworthiness.

We modify Cox's design by imposing that partner's gender is known both by senders and responders. Consequently we had to decide how to inform subjects of partner's gender and we chose to communicate the gender by naming each subject "man" or "woman".[1] The same information can be conveyed by making known participants' proper names but this option can be criticised for two reasons. The first is that proper names have an evocative meaning and hence may unconsciously influence subjects' behaviour in a way that is hardly predictable. The second is that anonymity may be not guaranteed if the experiment involves no cheating and names are real names.[2] Although we acknowledge that to communicate the partner's gender by means of the labels "woman" or "man" may intensify the focus on gender, we assess it as a minor drawback.

[1] Innocenti and Pazienza (2004) focused on how experimenter's gender influences players' behaviour. Also in that case we test the trust game with known gender by naming each subject man or woman.

[2] On this point see Dufwenberg and Muren (2003) and Slonim (2004). A different view is expressed by Holm (2000).

The experiments were carried out between March and October of 2005 and concerned 216 subjects, 108 women and 108 men. All the subjects were first and second year undergraduate students from the University of Siena and from the University of Firenze, recruited from economics courses through billboards posted on the web and around the university campus. The experiments were run manually and the participants were paid according to the euros earned. Table 1 summarizes the experimental design.

Table 1 Summary of the experimental design

Session	Treatment	Participants (women + men)
1	A	12 + 12
2	A	12 + 12
3	A	12 + 12
4	B	12 + 12
5	B	12 + 12
6	B	12 + 12
7	C	12 + 12
8	C	12 + 12
9	C	12 + 12
Total		108+108

We ran all treatments with the double blind procedure. It was made clear to subjects that in all the sessions neither the experimenters nor other subjects were able to attribute individual choices to individual people. To guarantee this anonymity, all subjects were initially directed to an isolated desk to make their decisions privately. Then, subjects received the written instructions that were read aloud by the monitor.

In treatment A when the experiment began, senders were given a large unmarked envelope which contained the money to be invested (5 euros which could be transferred in steps of half units), the "identification card" marked with the identification number and the partner's gender ("woman" or "man"), a small envelope and two "gender cards" marked respectively with the word "man" or "woman". Senders were asked to remember their identification numbers. Also receivers were given a large unmarked envelope which contained the fee (5 euros) and a card marked with the identification number. The correspondence between each number and each participant remained unknown to the other participants and to the experimenter and this was made clear to the participants.

Once senders had decided how much money to send to their partners in the small envelopes, they had to insert the identification cards in the smaller envelopes. Moreover, each subject had to insert the appropriate gender card corresponding to his or her gender. The sealed envelopes were collected in a closed urn by the monitor and were taken to the experimenters in a separate room. After having recorded the amount sent and tripled it, the experimenters marked each envelope with the number identifying a receiver of the appropriate gender. The envelopes in the closed urn were delivered again by the monitor to the subjects' room. At this time, responders were called one at a time by the monitor. Once called, each responder had to privately choose the envelope with her or his identification number from the urn placed on an isolated desk. Then he or she came back to his or her place. Having decided how much of the received money to return to the sender, responders sealed their envelopes. The monitors collected again the envelopes in the closed urn and took them to the experimenters' room, where the experimenters recorded the amounts returned and gave

the envelopes back for distribution to senders by the same procedure used before. When the experiment was over, all subjects left the room without revealing their identities to anyone.

The other two treatments followed the same double blind procedure. In treatment B the procedure stopped after the sending decision. In treatment C all the subjects also received the table reporting the pairs of the amounts of money received by responders and senders and the procedure ended after the transfer of money from the responders to the senders.

4. Results

Our experiment intended to test the following two hypotheses that concern the effect of altruism on subject's behaviour in the trust game:

H.1 Women are more altruistic than men as both sender and responder.

H.2 Mixed gender pairings exhibit a higher level of altruism in the decisions both of trusting and of being trustworthy.

We first analyze sender's decisions to measure the degree of altruism in trust and then responder's decisions that determine the degree of altruism in trustworthiness.

The results of treatment A (Table 2) confirm the very common finding that men trust more and are less trustworthy than women. On average, men send more than women (55.6% and 28.9%, respectively) and women return more than men (20.2% and 12.5%). However, the t-test and the non parametric Wilcoxon test show that the difference between genders is statistically significant only for trust.

Table 2 Trust and trustworthiness in treatment A (average values)

TRUST				TRUSTWORTHINESS			
Sender's gender	Amount sent	Amount sent/ Endowment	N.	Responder's gender	Amount returned	Amount returned/Amount received	N.
Female	1.4	28.9	18	Female	1.9	20.2	16
Male	2.7	55.6	18	Male	0.9	12.5	17
Total	2.1	42.2	36	Total	1.3	16.2	33
T-test for equality of means				T-test for equality of means			
T		3.93		T		-1.07	
Sign. Value		*0.02*		*Sign. value*		*0.29*	
N-PAR Wilcoxon				N-PAR Wilcoxon			
Wilcoxon		234		Wilcoxon		260	
Sign. Value		*0.02*		*Sign. value*		*0.32*	

Figure 1 records the amount sent and returned by each pair. Three subjects send nothing and three subjects send all their endowment. Among the thirty-three responders who receive a positive amount of money, twelve subjects do not return anything. Three responders give back more than the amount sent by the senders.

Figure 1 Subjects' decisions in treatment A sorted by amounts sent

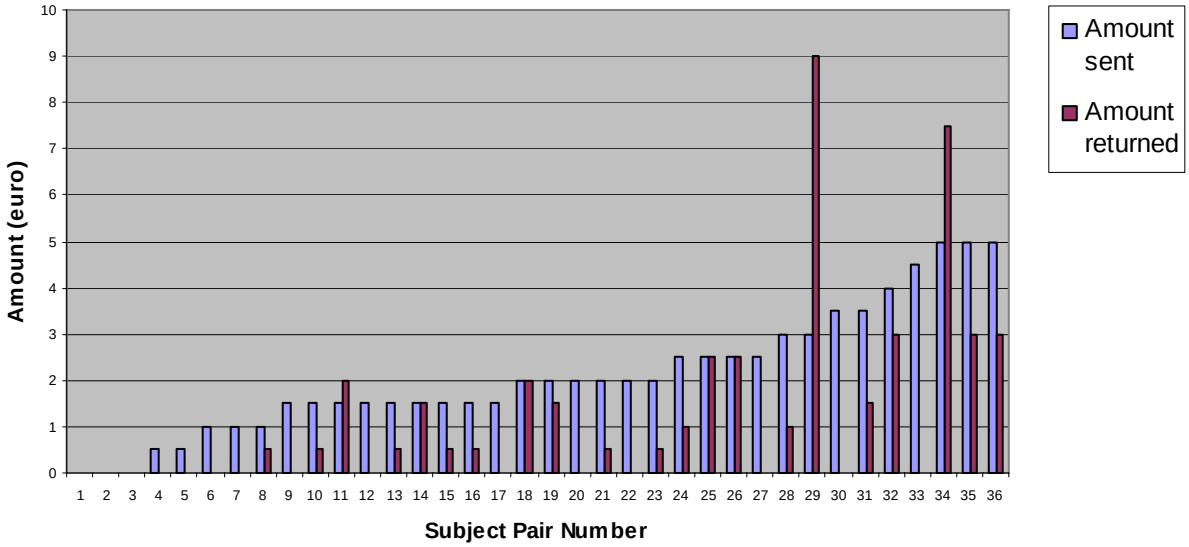


Table 3 reports the average amounts sent by 18 males and 18 females in the treatment B. Male subjects send again more than female subjects (25.6% for men and 18.3% for women).[3]

The comparison between treatments A and B gives a measure of altruism in trust, that is determined by the ratio between the amount sent in treatment B and the amount sent in treatment A. Women exhibit a degree of altruism in trust higher than men. The ratio between the female and male altruism (respectively, 63.9% and 46.0%) is equal to 1.39.

Table 3 Amounts sent in treatments A and B by gender (average values)

	Treatment A				Treatment B			
	Amount sent	Dev. St.	Amount sent / Endowment	N.	Amount sent	Dev. St.	Amount sent / Endowment	N.
Female	1.44	*(1.19)*	28.9%	18	0.92	*(0.79)*	18.3%	18
Male	2.78	*(1.24)*	55.6%	18	1.28	*(1.18)*	25.6%	18
All	2.11	*(1.37)*	42.2%	36	1.10	*(1.00)*	21.9%	36

	Amount sent Tr. B / Amount sent Tr. A (Altruism)
Female	63.9%
Male	46.0%
All	52.1%

These results can be summarized by means of a tobit estimation of the model (Table 4):

$$S_i = c + \alpha DT_i + \beta DS_i + \varepsilon_i$$

[3] The difference in the amount sent between genders is significant in treatment A at 99% while it is not statistically different from zero in treatment B.

In the equation above S_i is the amount sent in treatments A and B (censored for 0 and 5), DT_i is a treatment dummy (DT=0 for treatment A and DT=1 for treatment B) and DS_i is a gender dummy (DS=0 for men and DS=1 for women).

Table 4 Tobit regressions of gender differences in treatments A and B

Number of obs. = 72 LR chi2(2) = 19.85 Prob > chi2 = 0.0000 Log likelihood = -114.67847 Pseudo R2 = 0.0796

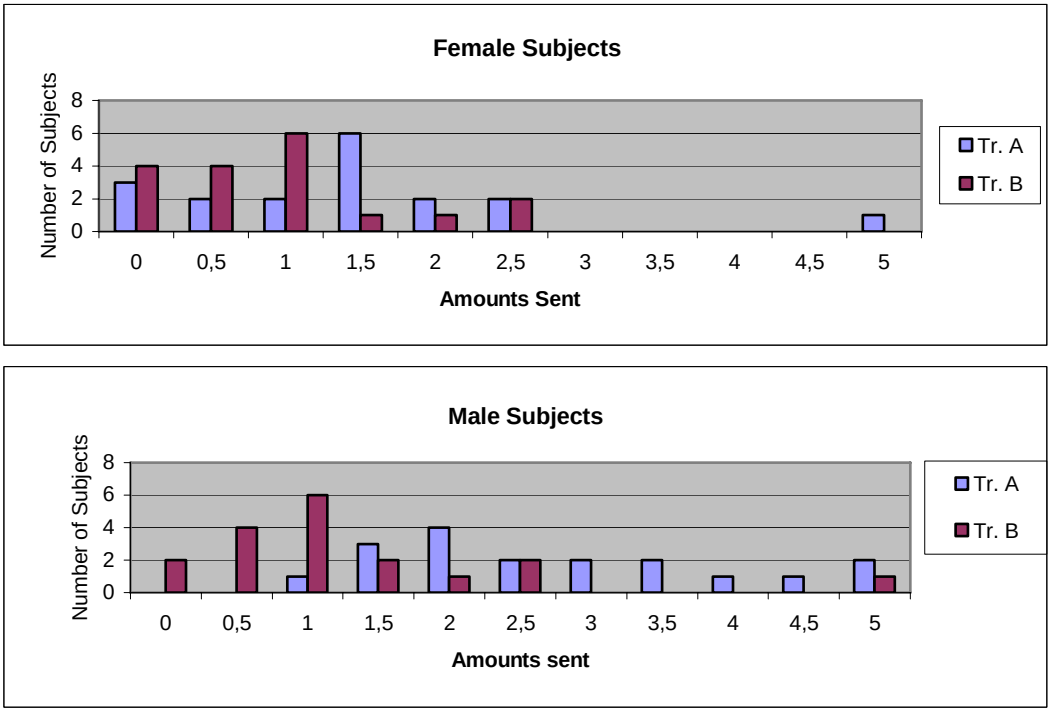
	Coeff.	Std. Err.	t	P>t	[95% Conf. Interval]	
α	-1.125	0.314	-3.57	0.001	-1.75353	-0.4974943
β	-0.990	0.315	-3.14	0.002	-1.619317	-0.3621984
C	2.593	0.270	9.58	0.000	-2.053975	-3.133496

Observations summary: 9 left-censored obs. at amount returned ≤ 0; 59 uncensored obs.; 4 right-censored obs. at amount sent ≥ 5

The estimation gives evidence of trust because the negative α coefficient is significant. Senders' behaviour is significantly differentiated between genders as showed by the negative value of the β coefficient.

Visual inspection of Figure 2, which reports the amounts sent by female and male subjects grouped by the transfers of half units, confirms the conclusion of the tobit regression.

Figure 2 Senders' decisions in treatments A and B sorted by gender and amount sent



Finally, we analyse the effect of gender pairing on subjects' behaviour in treatments A and B. Gender pairing has a significant effect only in treatment B (Table 5), in which senders paired with responders of the other gender send more than senders matched with same gender responders (25.0% and 18.9%, respectively). More significantly, mixed pairings exhibit a higher degree of altruism (60.1%) than same gender pairings (44.1%).

Table 5 Amounts sent in treatments A and B by gender pairings (average values)

	Treatment A				Treatment B			
	Amount sent	Dev. St.	Amount sent / Endowment	N.	Amount sent	Dev. St.	Amount sent / Endowment	N.
Mixed	2.08	*(1.32)*	41.7%	18	1.25	*(0.73)*	25.0%	18
Same	2.13	*(1.46)*	42.8%	18	0.94	*(1.22)*	18.9%	18
All	2.11	*(1.37)*	42.2%	36	1.10	*(1.00)*	21.9%	36

	Amount sent Tr. B / Amount sent Tr. A (Altruism)
Mixed	60.1%
Same	44.1%
All	52.1%

Turning to the analysis of treatment C (Table 6), we find that women return more than men (21.3% vs. 7.6%) and this difference is statistically significant.

Being responders endowed with the same amount of money in treatments A and C, the comparison between the two treatments gives a measure of the degree of altruism for trustworthiness, that is the ratio between the amount returned in treatment C and the amount returned in treatment A. Women exhibit more altruism (90.0%) than men (55.2%) and the ratio between the two values is 1.64. The t-test shows that the difference between genders in treatment C is statistically significant (t=3.35, p=0.002).

Table 6 Amounts returned in treatments A and C by gender (average values)

	Treatment A				Treatment C			
	Amount returned	Dev. St.	Amount returned/ Amount received	N.	Amount returned	Dev. St.	Amount returned / Amount received	N.
Female	1.88	*(2.68)*	20.2%	16	1.68	*(1.34)*	21.3%	16
Male	0.85	*(1.08)*	12.5%	17	0.47	*(0.65)*	7.6%	17
All	1.35	*(2.05)*	16.2%	33	1.06	*(1.20)*	14.2%	33

	Amount returned Tr. C / Amount returned Tr. A (Altruism)
Female	90.0%
Male	55.2%
All	78.5%

Following Cox (2002), we run two tobit estimations of the model

$$R_i = c + \alpha Var_i + \beta S_i + \varepsilon_{i,}$$

in order to discriminate between amount returned due to other-regarding preferences and amount returned due to positive reciprocity. In the equation above R_i is the amount returned, which is censored between 0 and 15, S_i is the amount received, Var_i is computed given by multiplying a treatment dummy DT by the amount sent ($Var_i = S_i \cdot DT$, where DT=1 for treatment A and DT=0 for treatment C).

Table 7 Tobit regressions of amount returned in treatments A and C by gender

Men

Number of obs = 34 LR chi2(2) = 11.37 Prob > chi2 = 0.0034 Log likelihood = -39.1638

	Coeff.	Std. Err.	t	P>t	[95% Conf. Interval]	
α	0.348794	0.210453	1.66	0.107	-0.07989	0.777474
β	0.557361	0.245938	2.27	0.03	0.056401	1.05832
c	-1.25843	0.581275	-2.16	0.038	-2.44245	-0.07442

Observations summary: 16 left-censored obs. at amount returned ≤ 0; 16 uncensored obs.; 2 right-censored obs. at amount returned ≥ 3

Women

Number of obs. = 32 LR chi2(2) = 9.73 Prob. > chi2 = 0.0077 Log likelihood = -59.24727

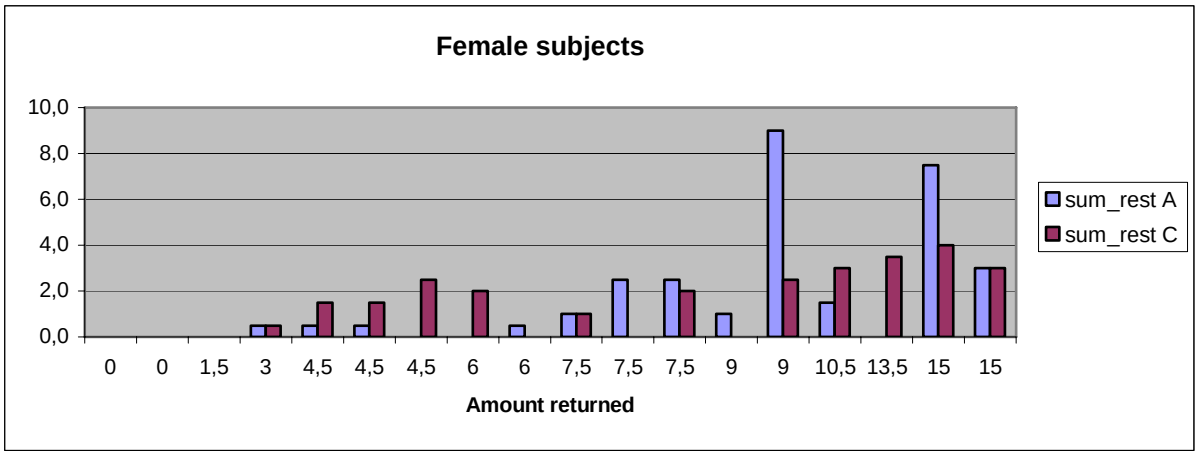
	Coeff.	Std. Err.	t	P>t	[95% Conf. Interval]	
α	0.144684	0.272998	0.53	0.6	-0.41285	0.702221
β	0.963728	0.340364	2.83	0.008	0.268612	1.658843
c	-1.27247	0.935356	-1.36	0.184	-3.18272	0.637785

Observations summary: 8 left-censored obs. at amount returned ≤ 0; 23 uncensored obs.; 1 right-censored obs. At amount returned ≥ 9

The tobit regressions exhibit a positive correlation between the amount returned and the amount received, as showed by the β coefficients of both genders (Table 7). The value of the α coefficient, which measures the differences in subjects' reactivity between the two treatments, is not significantly different from zero for women. The same coefficient is different from zero at 89.3% for men and this supports the hypothesis of positive reciprocity. Moreover, for men the estimate of the constant *c* is negative and significantly different from zero, and this result leads to exclude pure other-regarding preferences.[4]

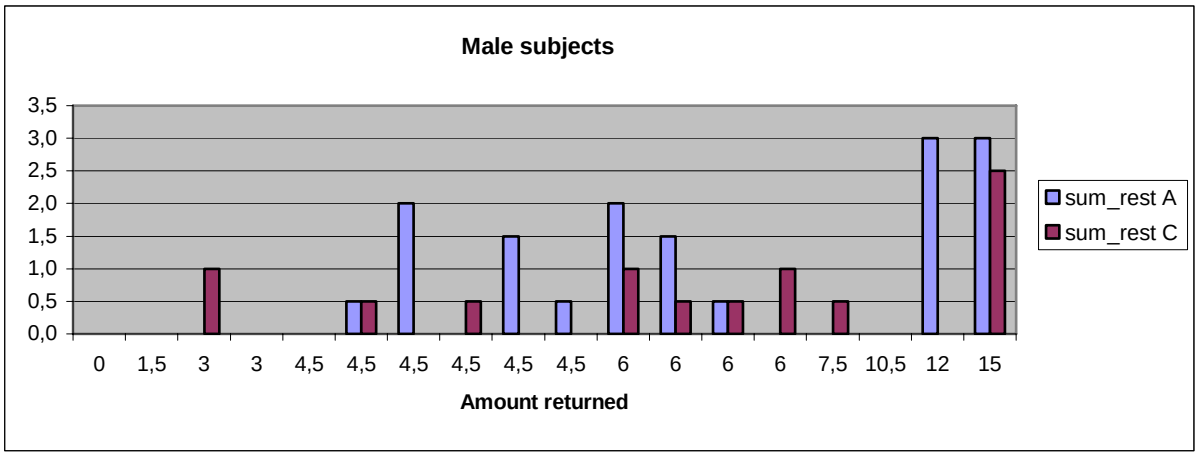
Figure 3a and 3b reports the amounts returned respectively by female and male subjects sorted by the amounts received in treatments A and C.

Figure 3a Amounts returned in treatments A and C by amounts received



[4] Cox (2002) reports a greater difference between genders. While women exhibits a positive and significant constant and other coefficients not different from zero, supporting the hypothesis of other regarding preferences, for men the estimation gives a constant not different from zero and significantly positive coefficients for α and β, which support the hypothesis of positive reciprocity.

Figure 3b Amounts returned in treatments A and C by amounts received



Finally, we consider the effect of gender pairing in trustworthiness. Table 8 reports that mixed pairs return more than same gender pairs only in Treatment A (19.0% and 13.2%, respectively). On the contrary, in Treatment C the order between the pairs is reversed (12.9% and 15.6%, respectively). The resulting degree of altruism is greater for same gender pairings than for mixed pairings (97.1% vs. 66.7%).

Table 8 Amounts returned in treatments A and C by gender pairings (average values)

	Treatment A				Treatment C			
	Amount returned	Dev. St.	Amount returned/ Amount received	N.	Amount returned	Dev. St.	Amount returned / Amount received	N.
Mixed	1.59	*(2.63)*	19.0%	16	1.06	*(1.38)*	12.9%	16
Same	1.09	*(1.21)*	13.2%	17	1.06	*(1.01)*	15.6%	17
All	1.35	*(2.05)*	16.2%	33	1.07	*(1.20)*	14.2%	33

	Amount sent Tr. C / Amount sent Tr. A (Altruism)
Mixed	66.7%
Same	97.1%
All	79.3%

By summarizing our findings, Hypothesis H.1 was confirmed by the comparison among the three treatments. Women exhibit a higher degree of altruism than men both for trust and trustworthiness, but the ratio between female and male altruism is greater for trustworthiness (1.64) than for trust (1.39). This result supports the thesis that women are more trustworthy than men because trustworthiness is more related to altruism than trust. Hypothesis H.2 was not supported by the data. Mixed gender pairs exhibit a higher degree of altruism than same gender pairs for trust but not for trustworthiness.

5. Conclusions

This paper provides experimental evidence against the t-pair assumption according to which the decisions of trusting and of being trustworthy are directly related. Most laboratory work on the trust game shows that women send less than men when playing as senders and

return back more than men as responders. We claim that this behaviour can be better explained by the fact that women are more altruist than men. Being trust mainly dependent on risk aversion and trustworthiness on altruism, differences in altruism explain gender differences in the trust game.

Our findings support this hypothesis. Women result more altruistic than men both for trust and trustworthiness. Moreover, the difference between genders in the degree of altruism, which is given by the across subjects comparison between the trust game and two dictator games in which senders and responders do not reciprocate, is greater for trustworthiness than for trust.

This result departs from Cox's (2002) findings, according to which men and women exhibit a nearly equivalent degree of altruism. In that experiment gender differences in altruism were not statistically significant for trust and only men exhibited significant positive reciprocity. Our test differs from Cox's because participants were informed of partner's gender. We conjecture that if women are more sensitive than men to the experimental context this change could have highlighted gender differences.

Lastly, we find mixed evidence on the gender pairing effect. The hypothesis that mixed pairs are more cooperative than same gender pairs and implement more efficient outcomes when trust is needed is not supported by our data.

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Appendix

Instructions (translation from Italian)

Treatment A

This is an experiment in the economics of decision-making. The Ministry of University and the University of Siena have provided funds to conduct this research. The instructions you are about to read are self-explanatory. Two of us have been chosen as monitors and will check that the instructions are followed as they appear here. However, they will not answer any questions during this experiment. If you have any doubts, you should read back through these instructions. Now that the experiment has begun, we ask that you do not talk, at all, during this experiment. If you follow these instructions closely and make appropriate decisions, you can earn an amount of money that will be given to you in cash at the end of the experiment.

All the participants to the experiment will be divided in two groups, players A and players B. Each player A will be paired with a player B. You will not be told who the person you are paired with is either during or after the experiment. The only information you will have is the gender of the person to which you are paired with. Neither the monitors and the experimenters nor the other participants will be able to associate your choices to your name. Whatever decision you will take it will remain totally anonymous.

Each person will be given 5 euros as a show-up fee for this experiment. Each player A will have the opportunity to send in an envelope, some, all or none of their show-up fee to the player B which he is paired to. The amount sent will be tripled. For example, if player A sends an envelope that contains 2 euros, the envelope will contain 6 euros when it is given to the paired player B. If you send an envelope that contains 4 euros, the envelope will contain 12 euros when it is given to the paired player B. The player B will then decide how much money to send back to the paired player A and how much money to keep and the game will end.

The remainder of these instructions will explain exactly how the experiment is organized. These instructions are structured so that no one, including the experimenters and the monitors, will know the personal decision of people. Since your decision is absolutely private, we ask that you do not tell anyone your decision during the experiment.

The experiment is conducted as follows. Each of one will extract from a closed urn taken by the monitor a ticket that indicate if he or she is Player A or Player B. Then the other monitor will place a number of large unmarked envelopes in a closed box. Each of these envelopes contains 5 euros, two identical "identification cards" marked with a number that you are asked to remember during all the experiment, a "gender card" marked with the word "woman" or "man" and a small envelope. Then monitors will call each player A at a time to go to the isolated box placed in the back of the room.

Each person possessing the ticket "player A" will take an unmarked envelope from the box and will come back to his or her isolated desk.

Then he or she will privately open the unmarked envelope and wrote on the two identification cards the letter W if he is a woman or the letter M if he is a man. Please do not forget to include this information. Then each player A will place as many euros in the smaller envelope as he or she wants, keeping the rest. Examples: (a) put 2 euros in the smaller envelope and keep 3 euros; (b) put 4 euros in the smaller envelope and keep 1 euro. These are examples only; the actual decision is up to each person. It is important to keep in mind that the person who received the amount you sent will be a female if the word "woman" is written on the received gender card and a male if the word "man" is written on the received gender card.

Once each player A has made the decision, he or she will put the smaller envelope, one of the two identification cards and the gender card in the larger envelope. Then the monitors will call one player A at a time to go to the isolated box. Each person will put the larger envelope into the box. Notice that each returned envelope will look exactly the same and neither monitors nor others will be able to attribute individual choices to individual subjects.

After all the envelopes have been put in the return box, one of the two monitors will take the box in a separate room where the experimenter, one at a time, will take the smaller envelopes out of the larger envelopes, record on a sheet of paper the letter and the number written on the identification card and the amount of money inside the smaller envelope. Then the experimenters will triple the amount of money found in the smaller envelope, place the smaller envelope back into the larger envelope, and write an identification number out of the larger envelope. At this point, the experimenters will transfer again the envelopes in the return box.

The monitors will then take back the box to the experiment room and call one player B at a time to go to the isolated box to retrieve the larger envelope with his or her identification number marked on it. Do not open your envelope yet. This process will continue until every player B has retrieved his or her appropriate envelope and returned to his or her seat. When everyone is finished, monitors will ask if every player B has retrieved the correct envelope. If all the players B have taken the correct envelope, then the experiment will continue. If, however, an envelope has ended up with the wrong person, then the monitors will call one player B at a time again and the process will repeat until everyone has the correct envelope.

Then each player B will privately open the larger envelope and must decide how many euros to leave in the smaller envelope. The player B keeps the remaining euros. The smaller envelope should then be placed again in the larger envelope. When everyone has had the opportunity to make his or her decision, the monitors will call again one player B at a time. Each player B will return the larger envelopes to the isolated box. The monitors will then take back the box to the experimenters who will open the larger envelopes and record how much is in the smaller envelope. The experimenters will put the smaller envelopes in the larger envelopes, and the monitors will take them back in the experiment room.

Then monitors will call one player A at a time to go to the isolated box to retrieve the larger envelope with the appropriate identification number marked on it. Do not open your envelope yet. This process will continue until everyone has retrieved his or her envelope and returned to his or her seat. When everyone is finished, monitors will ask if every player A has retrieved the correct envelope. If the people have all taken the correct envelope, then the experiment is finished. If, however, an envelope has ended up with the wrong person, then the monitors will collect all the smaller envelopes again and the process will repeat until everyone has the correct envelope.

At this time, you should take all your belongings and leave the experiment room when you are done. When everyone in the room has left, the experiment is over, and the monitors will be paid for their participation.

Treatment B

This is an experiment in the economics of decision-making. The Ministry of University and the University of Siena have provided funds to conduct this research. The instructions you are about to

read are self-explanatory. Two of us have been chosen as monitors and will check that the instructions are followed as they appear here. However, they will not answer any questions during this experiment. If you have any doubts, you should read back through these instructions. Now that the experiment has begun, we ask that you do not talk, at all, during this experiment. If you follow these instructions closely and make appropriate decisions, you can earn an amount of money that will be given to you in cash at the end of the experiment.

All the participants to the experiment will be divided in two groups, players A and players B. Each player A will be paired with a player B. You will not be told who the person you are paired with is either during or after the experiment. The only information you will have is the gender of the person to which you are paired with. Neither the monitors and the experimenters nor the other participants will be able to associate your choices to your name. Whatever decision you will take it will remain totally anonymous.

Each person will be given 5 euros as a show-up fee for this experiment. Each player A will have the opportunity to send in an envelope, some, all or none of their show-up fee to the player B which he is paired to. The amount sent will be tripled. For example, if player A sends an envelope that contains 2 euros, the envelope will contain 6 euros when it is given to the paired player B. If you send an envelope that contains 4 euros, the envelope will contain 12 euros when it is given to the paired player B.

The remainder of these instructions will explain exactly how the experiment is organized. These instructions are structured so that no one, including the experimenters and the monitors, will know the personal decision of people. Since your decision is absolutely private, we ask that you do not tell anyone your decision during the experiment.

The experiment is conducted as follows. Each of one will extract from a closed urn taken by the monitor a ticket that indicate if he or she is Player A or Player B. Then the other monitor will place a number of large unmarked envelopes in a closed box. Each of these envelopes contains 5 euros, the "identification card" marked with a number, a "gender card" marked with the word "woman" or "man" and a small envelope. Then monitors will call each player A at a time to go to the isolated box placed in the back of the room. Each person possessing the ticket "player A" will take an unmarked envelope from the box and will come back to his or her isolated desk.

Then he or she will privately open the unmarked envelope and wrote on the identification card the letter W if he is a woman or the letter M if he is a man. Please do not forget to include this information. Then each player A will place as many euros in the smaller envelope as he or she wants, keeping the rest. Examples: (a) put 2 euros in the smaller envelope and keep 3 euros; (b) put 4 euros in the smaller envelope and keep 1 euro. These are examples only; the actual decision is up to each person. It is important to keep in mind that the person who received the amount you sent will be a female if the word "woman" is written on the received gender card and a male if the word "man" is written on the received gender card.

Once each player A has made the decision, he or she will put the smaller envelope, the identification card and the gender card in the larger envelope. Then the monitors will call one player A at a time to go to the isolated box. Each person will put the larger envelope into the box. Notice that each returned envelope will look exactly the same and neither monitors nor others will be able to attribute individual choices to individual subjects.

After all the envelopes have been put in the return box, one of the two monitors will take the box in a separate room where the experimenter, one at a time, will take the smaller envelopes out of the larger envelopes, record on a sheet of paper the letter and the number written on the identification card and the amount of money inside the smaller envelope. Then the experimenters will triple the amount of money found in the smaller envelope, place the smaller envelope back into the larger envelope, and write an identification number out of the larger envelope. At this point, the experimenters will transfer again the envelopes in the return box.

The monitors will then take back the box to the experiment room and call one player B at a time to go to the isolated box to retrieve the larger envelope with his or her identification number marked on it. Do not open your envelope yet. This process will continue until every player B has retrieved his or her appropriate envelope and returned to his or her seat. When everyone is finished, monitors will ask if every player B has retrieved the correct envelope. If all the players B have taken

the correct envelope, then the experiment will continue. If, however, an envelope has ended up with the wrong person, then the monitors will call one player B at a time again and the process will repeat until everyone has the correct envelope.

Then each player B will privately open the larger envelope and take the euros found in the smaller envelope. At this time, all the participants should take all your belongings and leave the experiment room. When everyone in the room has left, the experiment is over, and the monitors will be paid for their participation.

Treatment C

This is an experiment in the economics of decision-making. The Ministry of University and the University of Siena have provided funds to conduct this research. The instructions you are about to read are self-explanatory. Two of us have been chosen as monitors and will check that the instructions have been followed as they appear here. However, they will not answer any questions during this experiment. If you have any doubts, you should read back through these instructions. Now that the experiment has begun, we ask that you do not talk, at all, during this experiment. If you follow these instructions closely and make appropriate decisions, you can earn an amount of money that will be given to you in cash at the end of the experiment.

All the participants to the experiment will be divided in two groups, players A and players B. Each player A will be paired with a player B. You will not be told who the person you are paired with is either during or after the experiment. The only information you will have is the gender of the person to which you are paired with. Neither the monitors and the experimenters nor the other participants will be able to associate your choices to your name. Whatever decision you will take it will remain totally anonymous.

Each player B will be given 5 euros as a show-up fee for this experiment plus another amount of money that he or she will have the opportunity to send in an envelope, some, all or none of their show-up fee to the player A which he is paired to. Each player A will be given an amount of money that depends on the amount of money received by the sum received by the player B whom he or she is paired with. For example, if player B receives 6 euros in addition to the show-up fee, the paired player A will receive 3 euros. If player B receives 12 euros in addition to the show-up fee, the paired player A will receive 1 euro. These are examples only; the actual decision is up to each person. All the possible pairs of initial endowments of players A and B will be shown in a sheet that each player will be given during the experiment.

The remainder of these instructions will explain exactly how the experiment is organized. These instructions are structured so that no one, including the experimenters and the monitors, will know the personal decision of people. Since your decision is absolutely private, we ask that you do not tell anyone your decision during the experiment.

The experiment is conducted as follows. Each of one will extract from a closed urn taken by the monitor a ticket that indicate if he or she is Player A or Player B. Then the other monitor will place a number of large unmarked envelopes in two closed boxes. Each of these envelopes contains an amount of money, the sheet indicating the possible pairs of initial endowments of players A and B, the "identification card" marked with a number, a "gender card" marked with the word "woman" or "man" and a small envelope.

Then monitors will call each player A at a time to go to one of the isolated box placed in the back of the room. Each person possessing the ticket "player A" will take an unmarked envelope from the box and will come back to his or her isolated desk.

Then he or she will privately open the unmarked envelope and wrote on the identification card the letter W if he is a woman or the letter M if he is a man. Please do not forget to include this information. Then each player A will take the euros he or she finds in the envelope.

Then monitors will call each player B at a time to go to the other the isolated box placed in the back of the room. Each person possessing the ticket "player B" will take an unmarked envelope from the box and will come back to his or her isolated desk.

Then he or she will privately open the unmarked envelope and wrote on the identification card the letter W if he is a woman or the letter M if he is a man. Please do not forget to include this information. Then each player B will place as many euros in the smaller envelope as he or she wants, keeping the rest. It is important to keep in mind that the person who received the amount you sent will be a female if the word “woman” is written on the received gender card and a male if the word “man” is written on the received gender card.

Once each player B has made the decision, he or she will put the smaller envelope, the identification card and the gender card in the larger envelope. Then the monitors will call one player B at a time to go to the isolated box. Each person will put the larger envelope into the box. Notice that each returned envelope will look exactly the same and neither monitors nor others will be able to attribute individual choices to individual subjects.

After all the envelopes have been put in the return box, one of the two monitors will take the box in a separate room where the experimenter, one at a time, will take the smaller envelopes out of the larger envelopes, record on a sheet of paper the letter and the number written on the identification card and the amount of money inside the smaller envelope. Then the experimenters will transfer again the envelopes in the return box.

The monitors will then take back the box to the experiment room and call one player A at a time to go to the isolated box to retrieve the larger envelope with his or her identification number marked on it. Do not open your envelope yet. This process will continue until every player A has retrieved his or her appropriate envelope and returned to his or her seat. When everyone is finished, monitors will ask if every player A has retrieved the correct envelope. If all the players A have taken the correct envelope, then the experiment will continue. If, however, an envelope has ended up with the wrong person, then the monitors will call one player A at a time again and the process will repeat until everyone has the correct envelope.

Then each player A will privately open the larger envelope and take the euros he or she finds in the smaller envelope. At this time, all the participants should take all your belongings and leave the experiment room. When everyone in the room has left, the experiment is over, and the monitors will be paid for their participation.