Trust in cooperation or ability? An experimental study on gender differences[*]

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Abstract: We examine experimentally two different types of trust: trust in another party's cooperation and trust in ability. In the cooperation condition, player A sends $x \in \{0, X\}$ to player B. The amount x is multiplied by $c = 3$, and B can return $y \in \{0, 3x\}$. In the ability condition, c depends on B's performance in a mathematical test, with $c = 5/3/1$ for above average/average/below average performance. We examine the influence of gender on economic decisions. We find that gender has a strong effect in the ability condition, but no significant effect in the cooperation condition.

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1 Introduction

In recent years, the concept of trust has caught immense attention in the economics literature. In this literature, trust is, typically, defined as the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important for the trustor, irrespective of the ability to monitor or control that other party (Mayer et al., 1995). Trust in this interpretation promotes a society's social capital which, in turn, promotes efficient transactions, even among strangers, and economic growth (see, for instance, Alesina and La Ferrara, 2002; Glaeser et al., 2000; Knack and Keefer, 1997; Zak and Knack, 2001). A lot of interest has been shown whether there are differences in trust between children and adults (Harbaugh et al., 2002), between students and CEOs (Fehr and List, 2002) or between men and women (Croson and Buchan, 1999; Cox and Deck, 2002).

In this paper we will address the latter aspect, i.e. gender differences in trust, by means of an experiment. Contrary to the existing literature, we will, however, examine two different types of trust: trust in cooperation and trust in ability. Whereas the former type of trust has been studied extensively, the latter has not received careful examination yet. The empirical and – most of all – the experimental literature on the economic effects of trust has focused on trust in cooperation, that means on a person's expectation of others to cooperate and reciprocate. Most of the empirical studies on trust rely on questionnaire data on the general willingness to trust strangers, indicated by the degree of consensus to questions similar to "On a whole, do you trust other people to be basically honest?" or "Do you think other people are trustworthy?". The experimental studies of trust – initiated by the seminal paper of Berg et al.

(1995) – have examined the amount of trust in another (anonymous) person's willingness to (monetarily) reward trust.

These empirical and experimental studies have provided valuable insights into the determinants of trust, like the degree of social distance, or into the economic implications of trust, like its influence on efficiency in microeconomic transactions and on macroeconomic growth rates. However, they have shed light on a very narrow aspect of trust only. Trust is a much broader concept, including, for instance, to rely on another person (or organization) to provide correct information, perform an operation correctly, keep a secret or not to misuse information or resources (Rousseau et al., 1998).

In particular, the aspect of trusting others with respect to their ability to perform a certain action has almost completely been neglected in the existing literature on trust. Yet, in many (economic) transactions, trust in another person's ability to perform a certain action satisfyingly is essential. Think of doctors, teachers, car mechanics, fund managers etc. whom you would like to perform their task in your best interest. Seeing a doctor, for instance, requires trust in her prescribing the right treatment. When investing your money into a fund it is necessary to have a basic trust into the fund managers' ability to earn more money (for you) on the stock market than you or another fund could achieve. Hence, trust in another party's ability can also be regarded as an important determinant of economic behavior.

In this paper, we present an experiment on the influence of gender on trust in cooperation, respectively on trust in ability. We use a trust game as our vehicle of research: In the cooperation condition of our experiment, player A sends $x \in \{0, X\}$ to player B. The amount x is multiplied by $c = 3$, and B can return $y \in \{0, 3x\}$. The amount x can then be interpreted as a measure of trust in cooperation.[1] In the ability condition, c depends on B's performance in a

[1] In case player A does not expect to get back anything, x would rather be a measure of inequality aversion (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000), since transferring a positive x – without getting back anything – reduces the inequality among trustor and trustee. However, as players A expect to get back something

mathematical test, with $c = 5/3/1$ for above average/average/below average performance, and y is fixed at $y = cx/2$. Here, the amount x serves as an indicator of player A's trust in player B's ability, which determines c.

By examining gender differences regarding trust in cooperation or trust in ability, our paper is closely related to the research on general gender differences in economic decision making. This line of research bears immediate relevance for several economically important situations, like hiring people for jobs, negotiating salaries, raising charitable donations, making household decisions, contributing to public goods etc., which might all depend to a certain extent on the gender of the parties involved. As regards the influence of gender on trust, we are particularly interested whether gender stereotypes may help to explain economic behavior of men and women in two versions of a trust game. Gender stereotypes exist with respect to many personal characteristics and typical behavior, e.g. the tendency to cooperate or to act selfish, specific abilities, social orientations etc.. One widespread stereotypical gender difference is that women are more cooperative than men, or at least less competitive (see Eagly, 1995; Eckel and Grossman, 2001). Furthermore, stereotypes exist with respect to certain tasks which are assumed to be rather 'male' or 'female', implying that they are also done better by either males or females (see, e.g., Glick et al., 1995). It is established in social psychology that stereotypes which persons or groups have about each other can influence own behavior as well as expectations about others' behavior (deDreu et al., 1995; Fiske, 1998).

The rest of the paper is organized as follows: In Section 2 we give a brief account of the literature on gender differences in trust (in cooperation) and on related gender stereotypes. Section 3 introduces our experimental design. Section 4 reports the results, and Section 5 offers a conclusion.

(as will be discussed in the results section), it seems more natural to interpret x as a measure of trust in cooperation.

2 Gender, trust, and stereotypes

Croson and Buchan (1999) have run an experimental trust game where a person *A* passes $x \leq X$ to a person *B* (with *X* as both persons' initial endowment). The amount *x* is tripled, and person *B* can send back to person *A* any amount $y \leq 3x + X$. Gathering evidence from the U.S., China, Japan and Korea, Croson and Buchan (1999) find no significant effect of gender on the trust of person *A*, i.e. the amount *x* sent to person *B*. However, women return significantly more in the role of person *B*. A related study by Chaudhuri and Gangadharan (2002), however, finds men to be much more generous in the role of person *A* than women are. Chaudhuri and Gangadharan (2002) rationalize their findings with respect to person *A* ex post as caused by a larger risk aversion of women, which might induce them to send less in the role of person *A* than men do.[2] Concerning the behavior of person *B*, Chaudhuri and Gangadharan (2002) confirm Croson and Buchan's result of women being more generous. Scharlemann et al. (2001) note that in a slightly modified trust game, gender per se has no unambiguous effect on trust (decision on *x*) and reciprocity (decision on *y*, depending on *x*), but that the combination of the bargaining partners' gender plays a significant role. In particular, men are especially cooperative in the sense of showing high trust when paired with women, whereas women are least cooperative against women.[3]

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[2]Chaudhuri and Gangadharan (2002) suggest that the standard trust game of Berg et al. (1995) may not even measure the degree of trust of *A*-subjects, but rather something like "enjoyment of gambles" or simply risk aversion. However, we would argue that since the decision on *x* has consequences for another *person* (and not for the outcome of a lottery), social preferences and motives – like trust – do play an important role in the trust game as well.

[3]A similar influence of gender pairing, i.e. the combination of bargaining partners' gender, on economic decisions has also been found by Sutter et al. (2003) and Ben-Ner et al. (2002). Sutter et al. (2003) control for gender and gender pairing in a modified ultimatum-game, finding that bargaining behavior is toughest in same-gender-pairs, but most cooperative in mixed-gender-pairs. Ben-Ner et al. (2002) report similar results in dictator games where same-gender-pairs have the lowest transfers from dictators to recipients.

So far, it seems that the literature on gender differences concerning trust in cooperation has not produced definite results yet. A possible explanation for the mixed evidence is that not only 'real' gender differences in behavior, but also stereotypes about gender differences play a role, and this can have different effects, depending on the situation. For stereotypes to play a role, the context needs to be such that stereotypes become salient. When they are salient, they can work unconsciously, influencing thoughts and behavior (see, e.g., Greenwald and Banaji, 1995). Of course, to allow for gender stereotypes to have an effect in a trust game, players must know the gender of the players they are paired with. Not all of the economic games used in the studies mentioned above reveal the gender of the bargaining partner (only Scharlemann et al.'s (2001) study does), and they are relatively context-free. Therefore, most of them do not trigger gender stereotypes at all, and each might trigger a different definition of the situation.

When gender stereotypes become salient in a normal trust game, different effects on the behavior of A and B players can be imagined: Gender differences in player A behavior can be the result of 'real' gender differences in behavior, or can be influenced by the stereotypes A players hold about B players of a certain sex. Gender differences in player B behavior can be the result of real differences between the sexes, or of reactions towards (stereotype-led) behavior of A-players. But they can also result from the stereotypes B players hold about A players: Stereotypes can evoke certain expectations about the amount A players of a certain sex should transfer; e.g., B players could expect to get larger amounts (x) from 'cooperative' or 'low status' women than from men (see below). We start with a description of the possible effects of 'real' gender differences on players' behavior.

There is some evidence in the literature that women might be more relationship-oriented, and therefore react stronger to the behavior of others (Cadsby and Maynes, 1998; Ortmann and Tichy, 1999). Women are also found to be more interested in a fair outcome, which is, e.g., seen in the fact that women punish unfair and reward fair behavior more than men (Eckel

and Grossmann 1996). The former should rather influence player B behavior, in leading to more reciprocal reactions of women than of men, while the latter can influence the behavior of players A and B. The finding of Croson and Buchan (1999), that women return more in the role of B in a trust game, however, points more into the direction that women are more *cooperative* than men, not more reciprocal.

This is also one of the most common gender stereotypes (see Carli and Eagly, 1999; Eagly et al., 2000, Deaux and LaFrance, 1998): Women are stereotypically expected to be more cooperative – or at least less competitive (e.g. Eagly 1995, Eckel and Grossman, 1998, 2001). Expecting women in the role of B to be more cooperative than men might induce A players to send them less, expecting relatively high returns (y) in any case. If women are however expected to cooperate only if others cooperate, i.e., to be more *reciprocal* than men, this should lead to higher amounts sent to women than to men in the role of B, as they are then expected to be more likely to reciprocate this. Another factor contributing to different A-behavior towards women and men in the role of B might be status differences linked with gender stereotypes. Women are stereotypically of lower status than men and thus might, in certain situations, expect to get less or be expected to be content with less (e.g. Deaux and LaFrance 1998, Ball et al. 2001) which should lead to lower amounts sent to them[4] in the role of B. So far, our stereotypes have been used for explaining or predicting behavior of person *A* in our experiment, based on stereotypes person A might hold about person B. A gender-stereotype directly concerning behavior of person *A,* for which also some evidence has been found in the literature is the following: Men are assumed to be more risk-taking than women and more keen on gambling.[5] If B-players hold this stereotype, they should expect to get more

[4] See also a paper by Schwieren (2003), where it was found that women in a double auction with effort get lower 'wages', but reciprocate this with lower effort.

[5] Note, however, that the empirical evidence on gender and risk-taking has produced mixed results. Schubert et al. (1999), for instance, find no gender differences in risk attitudes and risk-taking. Dwyer et al. (2002), on the contrary, report less risk-taking of women in mutual fund investment decisions. However, they show that the

from men than from women in the role of A in both conditions (and might then react accordingly, depending on what they really get). If differences in risk-taking are not only a stereotype, but also a real gender difference, men in the role of A should send more money to B than women in the role of *A* do.

In the introduction we have already referred to the fact that trust in ability and its relation to gender has not been subject to examination yet. In general, we do not expect any 'real' gender differences in the task we used, i.e., no gender differences in player B's results, but there might be average gender differences in some real world tasks where trust is relevant[6], and there are certainly gender stereotypes about performance in certain tasks. 'Real' gender differences should influence player A behavior in the ability condition in a similar way as in the cooperation condition.

Some other stereotypes might also play a role concerning the effects of gender on trust in ability. We used a mathematical task, and stereotypically, men are better in mathematics than women. If such a stereotype prevails in our ability treatment, we should expect men to be trusted more; hence, men should receive a higher *x*. Of course, this particular stereotype might be less pronounced among economics- and business-students, which is the main pool of subjects for our experiment. But, in a pre-test asking students whether in their perception men or women are in general better in mathematical tasks, we found that even among economics students the stereotype of men being better in math's than women prevails, though the difference was not significant. Still, another stereotype might be even more important. It says that female students usually take things more serious and put more effort in fulfilling their

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greater level of risk aversion among women can be substantially, though not completely, explained by knowledge disparities between men and women.

[6] However, as some statistics about student's performance at the department of business in Maastricht show (http://www.fdewb.unimaas.nl/miso/index.htm), here in general female students have better results than male students and also finish their study faster than male students, which might also be related to the second stereotype of importance here, women putting more effort in their tasks than men.

tasks[7]. Applied to our ability test in the experiment (see Section 3 below for details), women might be expected to take the task more serious and, therefore, to perform better than men. As a consequence, women should be trusted more, i.e., get higher amounts (x) sent to them by A players.

To conclude, different combinations of stereotypes and real gender differences in behavior might lead to different results with respect to gender differences in experimental trust games, which differ in the situational context, the information about the gender of the partner, and thus the salience of gender stereotypes. To take a closer look at both the effects of real gender differences and gender stereotypes, our experiment is designed such that participants are informed about the gender of their partners and the influence of different gender stereotypes, namely about different abilities and different levels of cooperativeness and reciprocity, can be analyzed separately.

3 Experimental design

We use two versions of a one-shot trust game for our study. In the first version – which we call the *cooperation condition* – subject A gets an initial endowment of X units of money. Subject B receives no initial endowment.[8] As a first move, A passes over an amount $x \in (0, X)$ to B. The amount x is multiplied by a constant $c = 3$, implying that B receives $3x$. As a second move, B can send back an amount $y \in (0, 3x)$ to A, resulting in final profits of $(X - x) + y$ for A, respectively $3x - y$ for B.

[7] See for example the discussion in the press after the Pisa-study, whether coeducation is good for girls and boys. In this discussion the argument that girls are more willing to learn and putting more effort into their work than boys and thus have better results at school has been put forward again and again (see e.g. www.dphv.de/informationen/Profil32003S8.cfm).

[8] In their seminal paper, Berg et al. (1995) had given both subjects A and B an initial endowment of X. Not giving X to subject B (as we do) does not change the game theoretic structure of the game. Behaviorally, it might induce relatively higher transfers x, which could make it easier to detect gender differences.

In the second version – which we call the *ability condition* – the constant c depends upon B's performance in a mathematical test[9]. Performance in the top, middle or lowest tercile of B-participants implies $c = 5$, respectively $c = 3$ or $c = 1$. Hence, the average factor for multiplying theamount$x$ sent by A is $c = 3$ both in the ability condition and in the cooperation condition. However, unlike in the cooperation condition – where $y \in (0, cx))$ – the return y of subject B in the ability condition was exogenously fixed as $y = cx/2$.

The reason for fixing the return y in the ability condition stems from our intention to disentangle trust in the bargaining partner's cooperation (through reciprocating in the cooperation condition) from trust in the bargaining partner's ability, without confounding both. Fixing y in the ability treatment guarantees that subject A bases his/her decision only on the expected ability of the bargaining partner, since it is profitable to send $x > 0$ if the partner's ability is at least in the middle tercile. Subject A, then, need not be concerned with person B's willingness to reciprocate a high transfer x, but only with person B's ability or effort exerted for solving the task.[10] As a consequence, there are two different sources of risk for person A in our two conditions: In the cooperation condition, person A faces the risk of person B not sending back any money; in the ability condition, person A faces the risk of person B performing below average in the ability test. As described in section 2, also different gender stereotypes may play a role in both conditions.

In each condition, we have four different treatments, resulting from a 2x2 matrix of the gender of subjects A and B. Participants were informed about the gender of the subject in the

[9] See the Appendix (Instructions for subject B – ability condition) for the 8 questions in the test.

[10] Of course, a high effort of subject B could be interpreted as cooperation, because it increases the pair's joint payoff (by raising the probability of achieving a higher c). However, in the instructions, subjects B were only told that their result in the test would be positively correlated with their *own* earnings, but not with the joint earnings of the pair. This was also known to subjects A, which implies that their prime concern was subject B's ability, but not its cooperation.

other role by stating its first name.[11] Nowhere else did we emphasize the role of sex in the game. We will abbreviate the four treatments by *ff*, *fm*, *mf*, *mm*, where *f* (*m*) stands for female (male) and the first letter indicates the sex of subject *A*.

The paper and pen-experiment was conducted sequentially in the following way. In a first session all participants were in the role of subject *A*. In a second session (typically one or two hours later), all participants were subjects *B*. Participants were told in advance that their decisions and their eventual payment would remain confidential and that payments could be collected at a pre-specified date in the experimenter's department.

The instructions for each condition were phrased in neutral terms.[12] Participants were not instructed to maximize their earnings and no references to any strategies were made. After having made their decision on *x*, *A*-subjects in both conditions were asked to state their expectations[13] on *B*'s decision on *y*. Subjects *B* in the cooperation condition had to indicate their expectation on *x* before being informed about the real *x*. Then they had to decide on *y*.

In the ability condition, *B*-subjects started the experiment with the mathematical test. They were only told that their performance in the test would be positively correlated with their possible earnings in a two-person game. After the test, *B*-subjects got the instructions of the ability condition, after which they were asked to state their expectation on *x*. Since the return was fixed as $y = cx/2$, *B*-subjects did not have to decide on the return *y*.

The experiment was run both at the Universities of Maastricht and Innsbruck in December 2001 and January 2002, respectively. Participants were 240 undergraduate

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[11] There was no risk of lifting anonymity by stating first names of bargaining partners, because subjects *A* and *B* were in different sessions. We could also have stated explicitly the gender of the subject in the other role, without revealing first names. Note that Holm (2000) has shown in a coordination game that experimental results were not significantly different under the following two conditions: (a) Subjects knew the gender, but not the first name, of the bargaining partner. (b) Subjects knew the first name of the bargaining partner, but were not explicitly informed about the gender.

[12] See the experimental instructions in the Appendix.

students. *A*-subjects were endowed with 10 units of money which could be transferred in steps of a half unit. In Maastricht, one unit was worth one Guilder. In Innsbruck, one unit was exchanged for one half Euro. Table 1 reports the number of observations per condition and treatment in both cities.

Table 1. Number of observations (pairs) per condition and treatment

Cooperation condition			*Ability condition*		
treatment	Innsbruck	Maastricht	treatment	Innsbruck	Maastricht
ff	9	7	ff	7	8
fm	8	8	fm	11	7
mf	6	7	mf	6	8
mm	6	8	mm	7	7

4 Experimental results

4.1 Overview of the data and examination of 'condition'-effects

We start our analysis by presenting in Table 2 average decisions in our two experimental conditions. Recall that *A*-subjects had 10 units of money at their disposal. Both in the cooperation and the ability treatment they transfer on average two thirds of their endowment to subject *B*, the difference in means between both conditions not being significant. Referring to the distribution of transfers, we find no significant difference as well. Three (respectively one) *A*-subjects transfer nothing ($x = 0$) in the ability (respectively cooperation) condition, whereas 19 (respectively 25) *A*-subjects transfer their full endowment ($x = 10$).

[13] Note that when asking for expectations, subjects (both in role *A* or in role *B*) could also state not to have any expectation at all. About 13% of participants chose this option.

Table 2. Average decisions

	cooperation	*N*	ability	*N*
x (transfer of *A* in units)	6.57	59	6.89	61
y (return of *B* in units)	7.42	59	cx/2*	
y/3x	0.34	59	-	
Profit *A*	10.85	59	13.64	61
Profit *B*	12.29	59	10.89	61
expected *x* (by subject *B*)§	3.32	49	4.75	51
expected *y* (by subject *A*)§	6.66	56	-	
expected *y/3x* (by subject *A*)§	0.29	56	-	

* *y* was fixed exogenously in the ability condition.

§ Note that subjects were allowed to state no expectation. Hence, the number of observations with respect to expectations can be different from the number of observations on *x* and *y*.

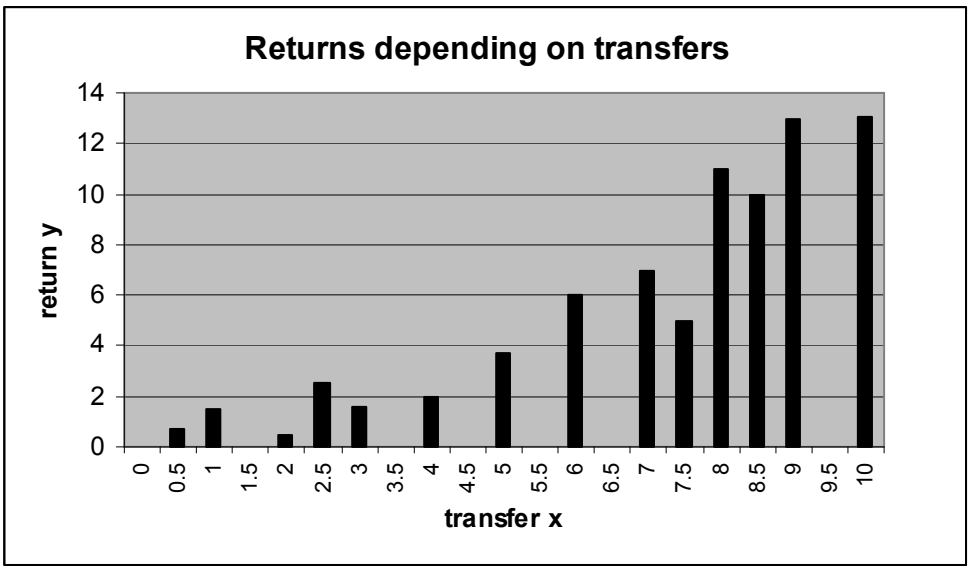

Figure 1: Average returns depending on transfers in the cooperation condition

B-subjects in the cooperation condition return on average about one third of the tripled amount (y = 7.42), yielding an average profit of 10.85 (12.29) units of money for *A*-subjects (*B*-subjects). That means that *A*-subjects earn on average slightly (but not significantly) more

than in case they had kept their full endowment for themselves, implying that trust does not always pay off for *A*-subjects. But note that there is a high correlation between subject *A*'s transfer *x* and subject *B*'s return *y* ($r = 0.76$; $p < 0.001$). This is a clear indication of reciprocal behavior, as can also be judged from Figure 1.[14]

Interestingly, in both conditions *B*-subjects expect a much lower transfer *x* from subjects *A* than they actually receive, ranging from about half of the actual transfer in the cooperation condition (3.32 expected vs. 6.57 actual transfer; $p < 0.01$; two-sided Mann-Whitney U-test) to about two thirds in the ability condition (4.75 vs. 6.89; $p < 0.01$; two-sided U-test). That means that *B*-subjects are on average far too pessimistic about *A*'s transfer. *A*-subjects, on the contrary, have rather precise expectations on the actual return of *B*-subjects in the cooperation condition. They expect on average to get back 6.66 units of money, which is not significantly different from the average actual return of 7.42.[15]

The expected *x*-transfers differ significantly between our two conditions, with significantly higher expected transfers in the ability treatment than in the cooperation treatment ($p < 0.01$; two-sided U-test). One might interpret this difference as arising from the exogenously determined return rate of one half of the multiplied transfer in the ability condition, which is significantly higher than the actual return rate (of 0.34 on average) in the cooperation condition. Therefore, *B*-subjects who are forced to return a relatively high share (i.e. half) of the money at their disposal might reasonably expect *A*-subjects to transfer larger

[14] We checked (by a Chow-test) whether the degree of reciprocity (i.e. the dependence of *y* on *x*) differs significantly between our four different treatments with respect to gender. However, all tests were insignificant, indicating that gender and gender pairing have no significant effect on reciprocity, i.e. on the relation of the returns *y* to the transfers *x* in the cooperation condition.

[15] The reason for *A*-subjects to have more accurate expectations than *B*-subjects is simply that *A*-subjects can state their expectation on *y* on the basis of having already decided on transfer *x*. No wonder that there is a high correlation between the expected *y* and the actual *x* chosen by *A*-subjects ($r = 0.78$; $p < 0.001$).

amounts because the mandatory return rate provides a safety-belt for *A*-subjects against exploitation by the discretionary power of *B*-subjects in the cooperation condition.[16]

Table 3. Average decisions in Maastricht and Innsbruck

	cooperation		ability	
	Innsbruck	Maastricht	Innsbruck	Maastricht
x (transfer of *A* in units)	6.17	6.95	6.79	7.00
y (return of *B* in units)	5.56	9.22	-	-
y/3x	0.26	0.43	-	-
Profit *A*	9.38	12.27	14.17	13.10
Profit *B*	12.96	11.63	10.96	10.82
expected *x* (by subject *B*)	3.42	3.20	5.31	4.10
expected *y* (by subject *A*)	5.28	8.36	-	-
expected *y/3x* (by subject *A*)	0.25	0.33	-	-

So far, we have pooled the data from Maastricht and Innsbruck. In Table 3, we present average decisions separately for both universities. Transfers *x* of *A*-subjects do not differ significantly between Innsbruck and Maastricht, neither in the cooperation nor the ability condition. However, *B*-subjects in Maastricht give higher returns in the cooperation condition than those in Innsbruck ($p = 0.054$ for the absolute returns *y*; $p = 0.043$ for the relative returns *y/3x*; two-sided U-test). Interestingly, *A*-subjects in Maastricht also expect higher returns from *B*-subjects than those in Innsbruck ($p = 0.093$; two-sided U-test), even though the *x*-transfers of *A*-subjects do not differ between Maastricht and Innsbruck. Hence, in both cities, *B*-subjects basically meet the expectations of their respective *A*-subjects. We cannot reject the hypothesis that actual returns *y* and expected returns are drawn from the same distribution, neither for Maastricht nor for Innsbruck separately (Kolmogorov-Smirnov-test). *B*'s

[16] Note that return rates in the standard trust game are typically around one third of the multiplied transfer (see Berg et al., 1995; Croson and Buchan, 1999; Camerer, 2003).

expectation of the transfer x does not differ significantly between Maastricht and Innsbruck, neither for the cooperation condition nor for the ability condition. Given the significant differences in returns, it comes as no surprise that *A*-subjects earn significantly less money in Innsbruck than in Maastricht ($p = 0.026$; two-sided U-test). Profits of *B*-subjects do not differ significantly.

Since the decisions of *A*-subjects do not differ significantly between Innsbruck and Maastricht, we will pool the data of *A*-subjects from both cities for the analysis to follow. With respect to *B*-subjects we will present both aggregate data as well as separate data for Innsbruck and Maastricht. After having analyzed general effects of our two experimental conditions, we will now turn to investigating the effects of gender in each of the conditions separately.

4.2 Gender and trust in cooperation

Table 4 summarizes average decisions, profits and expectations, for male and female decision makers. The figures in Table 4 reveal that male and female decision makers behave rather similar in the cooperation condition. In fact, none of the variables shows a significant difference between male and female decision makers, not even if we control for the city where the experiment was conducted.[17] Note that in Table 4 we do not consider the particular pairing of decision makers in our four treatments.

Table 5 presents separate data for the four treatments. Transfers x range from 6.04 in the *mm*-treatment (where both subjects are male) to 7.15 in the *mf*-treatment (where the *B*-subject is female). However, neither pairwise comparison of transfers yields a statistically significant difference, indicating that gender or gender pairing does not cause any differences concerning trust in cooperation.

[17] This is also true if we split the data into Maastricht and Innsbruck *B*-subjects, respectively.

Table 4. The influence of gender in the cooperation condition

	decision maker	
	male	female
x (transfer of *A* in units)	6.57	6.56
y (return of *B* in units) – overall	6.82	8.03
y (return of *B* in units) – Maastricht	8.91	9.57
y (return of *B* in units) – Innsbruck	4.44	6.60
y/3x	0.31	0.37
Profit *A*	11.61	10.21
Profit *B*	11.83	12.76
expected *x* (by subject *B*)	3.77	2.86
expected *y* (by subject *A*) – overall	7.02	6.32
expected *y* (by subject *A*) – Maastricht	8.21	8.55
expected *y* (by subject *A*) – Innsbruck	5.83	4.83
expected *y/3x* (by subject *A*)	0.39	0.30

Table 5. Treatments in the cooperation condition

	treatment (observations)			
	ff (16)	fm (16)	mf (13)	mm (14)
x (transfer of *A* in units)	6.75	6.38	7.15	6.04
y (return of *B* in units)	6.53	7.01	9.88	6.61
y/3x	0.31	0.30	0.45	0.33
expected *x* (by subject B)	2.10	3.07	3.75	4.46
expected *y* (by subject A)	4.23	7.96	6.45	7.50
expected *y/3x* (by subject A)	0.22	0.36	0.23	0.32

As regards returns *y*, there are some differences. On average, female *B*-subjects return the largest amount to male *A*-subjects (treatment *mf*). However, the returns in *mf* are not significantly larger than in *fm* or *mm*, and only weakly significantly larger than in *ff* (p = 0.083; two-sided U-test). Relative returns *y/3x* are significantly larger in *mf* than in *ff* (p =

0.029), weakly significantly larger in *mf* than in *fm* ($p = 0.056$), and not significantly different between any other pairwise comparison.

These results imply that women send as much to men as to women and that women get back approximately the same amount from both. Men, however, send as much to women as women do, but get significantly more back from women. The reverse side is that women send significantly more back to men than to women. And, also, women send more back to men than men send back to women.

Overall, our results on actual transfers *x* and returns *y* are in line with those of Croson and Buchan (1999), in that there are no gender differences with respect to the decisions of *A*-subjects, but that women send – at least on average – more back than men do. Furthermore, our detailed results for the single treatments imply that *B*-subjects are, on average, willing to return larger amounts to *A*-subjects of the opposite gender, even though the difference is only significant for female *B*-subjects.

Finally, the lower part of Table 5 presents average expected transfers and returns. The only difference which comes close to being significant is the expected return by *A*-subjects, which is larger in *fm* than in *ff* ($p = 0.058$; two-sided U-test). That means that women expect higher returns from men than from women, which tends to support that gender pairing is important for behavior. However, all other pairwise comparisons of expectation figures yield no significant differences below the 10%-level.

4.3 Gender and trust in ability

Recall that in the ability treatment, the decision on the transfer *x* is the only economic decision variable since subject *B* has to return *cx/2*. Yet, the parameter *c* depends on *B*'s performance in a mathematical test. On average, female *B*-subjects performed slightly better than their male colleagues, resulting in a slightly (but not significantly) higher multiplication factor for the transfer *x* ($c = 3.08$ for females vs. $c = 2.88$ for males). In contrast to the

cooperation condition, we find a strong gender effect in the ability condition regarding the transfer (see Table 6). Male *A*-subjects transfer about 30% more than female *A*-subjects (7.88 vs. 6.06 units of money; $p < 0.01$; two sided U-test).

Table 6. The influence of gender in the ability condition

	decision maker	
	male	female
x (transfer of *A* in units)	7.88	6.06
c (multiplication of *x*)	2.88	3.08
Profit *A*	16.66	11.09
Profit *B*	9.69	12.22
expected *x* (by subject *B*)	4.25	5.26

Since the multiplication of the transfer is basically the same for male and female *B*-subjects and since the return rate is fixed at one half, male *A*-subjects earn significantly more than female ones due to the higher transfers ($p < 0.01$; two-sided U-test). Profits of male and female *B*-subjects do not differ significantly, which results from *A*-subjects giving about the same amount to male and female *B*-subjects respectively (see Table 7 below). Overall, female *B*-subjects get transfers of 7.36, whereas those received by male *B*-subjects amount to 6.47 ($p = 0.181$; two-sided U-test). Male *B*-subjects expect slightly, but not significantly, lower transfers than female ones.

Turning to the effects of our treatments in the ability condition (see Table 7) we find a significant general treatment effect on the transfer decision ($p = 0.014$; Kruskal-Wallis-test). However, gender pairing *per se* (mixed-gender vs. same-gender) does not make a genuine difference, even though the following pairwise comparisons show statistically significant differences: Male *A*-subjects send more to female *B*-subjects than female *A*-subjects do (*mf* vs. *ff*; $p = 0.016$; two-sided U-test), and males send more to females than females send to

males (*mf* vs. *fm*; $p < 0.01$; two-sided U-test). Expected transfers do not differ between any two of our treatments.

Table 7. Treatments in the ability condition

	treatment (observations)			
	ff (15)	fm (18)	mf (14)	mm (14)
x (transfer of *A* in units)	6.30	5.86	8.50	7.25
expected *x* (by subject B)	5.04	4.43	5.50	4.00

Overall, the picture in the ability condition tells us that male *A*-subjects trust more in the abilities of their partners by giving larger transfers than females do. Turning once more back to the possible effects of our two experimental conditions, we may say that men are relatively more trusting when trust is relatively more rewarded, as it is in the ability condition with its fixed return rate for transfers, which is clearly higher than the return rate in the cooperation condition (and in all other studies of the standard trust game).

5 Conclusion

In this paper, we have addressed the influence of gender on two different types of trust: trust in cooperation and trust in ability, respectively. Whereas the former type of trust has received a lot of attention in economics research, investigating the latter type of trust is – to the best of our knowledge – a novel feature of our paper.

As regards trust in cooperation, we have not found any gender differences with regards to the behavior of *A*-subjects, even when controlling for the gender of the paired *B*-subject. This finding is, basically, a confirmation of the earlier results of Croson and Buchan (1999), but is opposite to Chaudhuri and Gangadharan's result of men being more generous in the role of *A*-subjects. Concerning behavior in the role of *B*-subjects, Croson and Buchan (1999) and

Chaudhuri and Gangadharan (2002) report women to return significantly larger amounts *y*. Our data support their findings only insofar as women return more on average, but the difference to men is not significant in our experiment. The only weakly significant gender effect is the fact that men get higher returns from women than women get from women. The latter result is further evidence for more cooperative behavior in mixed-gender-pairings than in same-gender pairings, as was already observed in other two-person bargaining experiments by Ben-Ner et al. (2002) and Sutter et al. (2003). An explanation in terms of gender stereotypes does not seem applicable for these results.

In the ability condition, gender plays an important role in the sense that men trust much more in the (mathematical) abilities of their interaction partners than women do. Like in the cooperation condition, there are some notable effects of gender pairing, in particular that men send significantly more to women than women send to women. Likewise, women send less to men than men to women. The result of men trusting more in the abilities of their partners, in particular of women, may be explained by the stereotype of women taking the task more serious than men do and, therefore, investing more effort in the task. This is surprising, because it can be interpreted as the expectation of more 'cooperative' behavior on the side of women in the sense that women work harder to perform well in the mathematical task and, thus, raise the economic surplus for the pair. This expectation, however, should also have an effect in the cooperation treatment, which was not the case in our experiment. Maybe this indicates that real-effort tasks are a better indicator for real-life expectations and behavior, and allow for stereotypes to have a larger effect on behavior than the very artificial tasks where just points are sent forth and back. Stereotypes might get a larger impact when the situation is more 'rich'.

Another possible explanation has to do with the relative price of trust. Andreoni and Vesterlund (2001) as well as Cox and Deck (2002) have shown that different behavior of men and women in (experimental) bargaining games can be explained by women being more

sensitive than men to the economic costs of being generous in bargaining. In particular, they argue that women are more generous the higher the payoffs, i.e. the more expensive generosity is, and the lower the social distance between interaction partners. In our experiment, social distance is kept constant (by ensuring anonymity between experimental participants), but the relative price of trust (generosity of *A*-subjects) differs between both conditions of our game. In the ability condition, showing trust is relatively cheaper (and less risky) since it guarantees a return rate of *cx/2*. Hence, the greater amount of trust (x) of men, relative to women, is compatible with the argument of Andreoni and Vesterlund (2001) and Cox and Deck (2002), meaning that our results support their earlier findings.

In summary, our paper has found different effects of gender when two different types of trust are analyzed. These differences suggest that the effects of gender on trust are too complex to be analyzed by the standard trust game of Berg et al. (1995) alone. Rather, trust has many facets which need more careful examination. Our paper has tried to disentangle the effects of gender on trust in cooperation versus trust in ability. Of course, our design for measuring trust in ability has focused on a very specific ability, i.e. (relatively simple) mathematical skills, and ability may still in part have been confounded with effort – which cannot be avoided completely. It might be an interesting topic for future research to examine gender effects when other skills are crucial, like those of doctors, mechanics or fund managers.

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Appendix – The following instructions would be made available on a webpage in case of publication. (Remarks for referees are printed in *italics*.)

Instructions for subject A (*cooperation condition*)
Dear participant,
Thank you for participating in this experiment in decision-making. During the experiment you may earn real money that will be paid to you, privately and in cash, at the end. The instructions you are about to read are self-explanatory. If you have any questions please raise your hand and wait until the experimenter comes to your place to answer your question privately. Please do not talk at all during the experiment.

The interaction in the experiment will be in pairs. You are called student A and the student you are matched with is called student B. The participants in the role of student B are from another tutorial group at the Faculty of Economics here in Maastricht.
At the beginning of the experiment you will receive 10 guilders and student B, the student you are linked with, will not receive any guilders. You are asked to decide whether you whish to transfer any amount of these 10 guilders (in half guilders) to the student you are matched with and if so, how much. We will triple the amount you transfer and give it to student B; that is, for each guilder that you transfer, student B will receive 3 guilders.
Later, students of another economic tutorial group will perform the role of student B.
We will ask student B to decide if (s)he wants to return any of the guilders (s)he received (three times what you sent); and if so, how much. This amount will not be tripled. This will conclude the experiment and the money will be paid. When making his/her decision, subject B will also be informed about your first name (as you are the other way round), but not about the group you are in. Since subjects B will make their decision only in the afternoon, you will be paid at the beginning of the next group meeting.

Decision sheet:
Name of the student you are matched with (student B): _____
Your name: _____
Amount of guilders you want to send to_____:
(Please remember that this amount should be between 0 and 10 guilders, in half-guilder steps)
_____

The following questions were distributed on a separate sheet of paper after decision sheets of subjects A had been collected.
Please answer now the following questions about your decision in the game:

1) If you did send subject B any guilders: Why did you do so?
2) Do you expect to receive any guilders from subject B? If yes, how many and why?

Instructions for subject B (*cooperation condition*)
Dear participant,
Thank you for participating in this experiment in decision-making. During the experiment you may earn real money that will be paid to you, privately and in cash, at the end. The instructions you are about to read are self-explanatory. If you have any questions please raise your hand and wait until the experimenter comes to your place to answer your question privately. Please do not talk at all during the experiment.
The interaction in the experiment will be in pairs. You are called student B and the student you are matched with is called student A. The participants in the role of student A are from another tutorial group at the Faculty of Economics here in Maastricht and have already played in the morning.
This is the second period. In the first period, another economics student, called subject A, has received 10 guilders. He/she was informed about your first name (as you are the other way round), but not about the group you are in. He/she was asked if he/she would like to transfer any of these 10 guilders (between 0 and 10) to you. We have tripled the amount of guilders he/she voluntarily decided to transfer to you. Subject A knew that the amount he/she transferred would be tripled. The number of guilders he/she didn't transfer remained his/her guilders. In this second period, you perform the role of subject B. You have been matched with a specific subject A, and other subjects B have been matched with other subjects A and have received different amounts of guilders. Your decision will conclude the experiment, and the money will be paid**. Subject A has received the same kind of information about this experiment as you have.**

Name of the student you are matched with (student A): _____
Your name: _____

Before you see how much subject A, _____ sent to you, we would like to ask you about your expectations:

1) Do you expect to receive any guilders from subject A, _____?
2) If yes, how many and why?

The decision sheet was distributed only after having collected sheets with expectations.
Decision sheet:
Name of the student you are matched with (student A): _____
Your name: _____

_____ has given to you:_____ * 3 = _____ guilders. We ask you how much, if any, of these guilders you would like to send back to subject A. Note that the amount you send will not be tripled and the game ends.

Amount of guilders, if any, you want to send back to _____
(Please remember that this amount should be between 0 and 10 guilders, in half-guilder steps)
_____

The following questions were distributed on a separate sheet of paper after decision sheets of subjects B had been collected.
Please answer now the following question about your decision in the game:
If you did send any guilders back to subject A: Why did you do so?

Instructions for subject A *(ability condition)*

Dear participant,

Thank you for participating in this experiment in decision-making. During the experiment you may earn some money that will be paid to you, privately and in cash, at the end. The instructions you are about to read are self-explanatory. If you have any questions please raise your hand and wait until the experimenter comes to your place to answer your question privately. Please do not talk at all during the experiment.

The interaction in the experiment will be in pairs. You are called student A and the student you are matched with is called student B. The participants in the role of student B are from another tutorial group at the faculty of Economics here in Maastricht.

At the beginning of the experiment you will receive 10 guilders and student B, the student you are linked with, will not receive any guilders. Student B later has to fulfil a short test – solving mathematical problems. He/she will only know that the result of this test determines the amount of money both of you may earn in this experiment – the better he/she does, the more money both of you can get. Student B does not know exactly how the relationship between performance and payment is and when he/she solves the mathematical problems, he/she does not yet know how much money you sent.

You are now asked to decide whether you want to send any of your 10 guilders to the student you are matched with; and if so, how much. The amount of guilders you send to student B will be multiplied by a factor depending on how well student B did in the solving of mathematical problems.

- If he/she did very well, i.e., if he/she was in the top third of students, the amount you sent would be taken times 5, that is, for every guilder that you send, student B would receive 5 guilders.
- If student B performs on an average level, i.e., if he/she was in the middle third of students, the guilders would be tripled; that is, for every guilder that you send, student B would receive 3 guilders.
- If student B performs very poor, i.e., if he/she was in the lowest third of students, the guilders would not be multiplied at all.

The multiplied number of guilders will then be **distributed equally** between subject A and B, i.e., between you and the person you are paired with.

Guilders you do not send will remain your guilders.

Later, students of another economic tutorial group will perform the role of subject B, doing the mathematical test. This will conclude the experiment, and the money will be paid. When making his/her decision, subject B will also be informed about your first name (as you are the other way round), but not about the group you are in. Since subjects B will make their decision only in the afternoon, you will be paid at the beginning of the next tutorial group.

Decision sheet:

Name of the student you are matched with (student A): _____

Your name: _____

Amount of guilders you want to send to _____:

(please remember that this amount should be between 0 and 10 guilders, in half-guilder steps)

_____

The following questions were distributed on a separate sheet of paper after decision sheets of subjects A had been collected.

Please answer now the following questions about your decision in the game:

1) If you did send subject B any guilders: Why did you do so?
2) How well do you expect subject B to do in the mathematical problem-solving task and why do you expect so?

Instructions for subject B *(ability condition)*

Dear participant,

Thank you for participating in this experiment in decision-making. During the experiment you may earn real money that will be paid to you, privately and in cash, at the end. The instructions you are about to read are self-explanatory. If you have any questions please raise your hand and wait until the experimenter comes to your place to answer your question privately. Please do not talk at all during the experiment.

The interaction in the experiment will be in pairs. You are called student B and the student you are matched with is called student A. The participants in the role of student A are from another tutorial group at the Faculty of Economics here in Maastricht and have already played in the morning.

First, you are asked to solve the following mathematical problems. The common reward of you and subject A depends on how well you do in this mathematical test!

Mathematical exercises:

1) 34 horses need 169 strawballs á 2.4 Kg in 18 days. How many strawballs á 26 Kg will 51 horses need in 13 days?
2) The price of chocolate increased from 1.4 Euro to 1.75 Euro. How much is the price increase in percent?
3) A product's contents was increased by 12%. It now contains 0.6 Kg more than before. How heavy is the new product?
4) Mr. K. gets a 4% increase on top of his salary of 3200 Euro.
    a. How high is his salary after the increase?
    b. How high would his salary be if his salary would have been reduced by 4%?
5) A company's stock was worth 56 Euro per share at the beginning of 2002. Since then, the share's value increased by 175%. How much is the share's price now?
6) A city's population increased by 8% to 48,600 within one year. How many citizens had there been one year before?
7) 3 chickens breed 8 eggs in 3 days. How many eggs are breed by 6 chickens in 12 days?
8) A fixed-interest bond yields 6% per year. What is the capital gain after two years if one starts with 2,500 Euro?

This is the second period. In the first period, another student, called subject A, has received 10 guilders. He/she was asked if he/she would like to send any of these 10 guilders (between 0 and 10) to you. The amount of guilders he/she voluntarily decided to send to you is now multiplied depending on how well you did in the mathematical test.

- If you did very well, i.e. you were in the top third of students, it would be taken times 5, that is, for every guilder that you got, you would receive 5 guilders.
- If you performed on an average level, i.e. you were in the middle third of students, it would be tripled; that is, for every guilder that you got, you would receive 3 guilders.
- If you performed very poor, i.e. you were in the lowest third of students, the guilders would not be multiplied at all.

The multiplied number of guilders will be distributed equally between subject A and B, i.e., between you and the person you are paired with. Subject A knew the rules of the game and the type of the mathematical test and your first name (but not the group you are in). The number of guilders he/she didn't send remained his/her guilders.

You have been matched with a specific subject A, and other subjects B have been matched with other subjects A and have received different amounts of guilders. Your solving of the mathematical problems has concluded the experiment, and the money will soon be paid.

Before you see how much subject A sent to you, we would like to ask you about your expectations:

Name of the student you are matched with (student A): _____

Your name: _____

1) Do you expect to receive any guilders from subject A?
2) If yes, how many and why?