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Laboratoire Montpellierain
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« Is there a relation between
trust and trustworthiness? »

Tamás KOVÁCS

Marc WILLINGER

DR n°2010-03

Unité de Formation et de Recherche d'Economie
Avenue Raymond DUGRAND C.S. 79606
34960 MONTPELLIER Cedex 2
Tel : 33 (0) 467158495 Fax : 33(0)467158467
E-mail : lameta@lameta.univ-montp1.fr

Is there a relation between trust and trustworthiness?

Tamás Kovács^a, Marc Willinger^b

Abstract

We provide new evidence about a positive correlation between the own amount sent and the own amount returned in the investment game. Our analysis relies on experimental data collected under the strategy method for establishing our main result. While the percentage returned is independent of the amount received for most of our subjects, it is strongly correlated to their amount sent as a trustor. Our analysis is based on a two-way classification of subjects : according to their trusting type and according to their reciprocal type. We show the existence of a strong correlation between trusting types and reciprocal types within subjects.

Key words: trust, reciprocity, trustworthiness, experimental economics, social psychology

JEL Classification: C72, C91

^a Eszterházy College, Eger, Institute of Business Economics (thomy@ektf.hu)

^b Université Montpellier, Institute LAMETA (willinger@lameta.univ-montp1.fr)

1. Introduction

Why do senders and receivers choose positive amounts in the investment game ? A variety of explanations has been provided to account for such behaviours. On the sender's side, other-regarding preferences (Cox, 2004, Dufwenberg & Gneezy, 2000), expectations about positive reciprocity (Rotter, 1980, Gambetta, 1988, Yamagishi and Yamagishi, 1994, Hardin, 2002, Ashraf et al., 2006, Bellemare and Kroeger, 2007), risk-attitudes (Bohnet & Zeckhauser, 2004, Sapienza et al., 2008, Naef & Schupp, 2009), unconditional giving (e.g. Kantian categorical imperative), warm glow of giving (Andreoni, 1990), have been suggested as possible motives for sending positive amounts. On the receiver's side, some of these motives account also for returning positive amounts, e.g. warm glow and other-regarding preferences. But there are additional reasons, for instance reciprocity and inequality aversion. Although trust and reciprocity are not the only motives for sending and returning positive amounts in the investment game, for expository reasons we shall abuse terminology and identify the sender as the trustor and the receiver as the trustee.

Isolating the motives for sending and returning in the investment game remains a difficult task, since these motives possibly interact within individuals. To take a step forward our aim is to investigate the extent to which some of these factors are related to each other. Our hypothesis is that trust attitudes and reciprocity attitudes are strongly correlated within individuals. A trustful person trusts strangers because he himself is a reciprocal person. In this paper we provide evidence that trust and reciprocity attitudes are correlated within individuals. Based on experimental data of a one-shot investment game, we show that more trustful subjects are also more trustworthy, and vice-versa. To show this we categorize individuals according to their level of trustworthiness which we measure as the percentage returned in the investment game. Then we show that in each category the conditional trustworthiness follows a uniform distribution across amounts sent.

Our experiment is based on the strategy method to collect individual data for both roles. As a trustor, each subject had to decide about the number of units of his endowment that he wants to send to an anonymous counterpart. As a trustee, each subject had to decide how many units he wanted to return to an anonymous counterpart, for each possible amount that he could possibly receive. Our main findings can be summarized as follows : i) the percentage returned is uniform across received amounts for a vast majority of subjects, ii) the percentage returned is positively correlated with the own amount sent, and iii) subjects identified as higher trusting types are also identified as higher reciprocal types.

In section 2 we provide a critical overview of previous investigations of the relation between trustfulness and trustworthiness. Section 3 describes the experimental design. Sections 4, 5 and 6 present our results. Section 7 is our conclusion.

2. Litterature review

Various methodologies have been used to investigate the relation between trustfulness and trustworthiness, by looking at a possible correlation between : i) the amount sent and the percentage returned, ii) trustworthiness and answers to trust-related attitudinal questions¹, iii) beliefs about trustworthiness and trustfulness, and iv) own trustfulness and own trustworthiness. We briefly review each of these attempts to identify a possible relation between trustfulness and trustworthiness, to discuss their limitations.

There is mixed evidence about a positive correlation between the amount sent and the amount returned in the investment game. In their seminal paper, Berg et al. (1995) found no correlation between these decisions. This finding was replicated in laboratory experiments (e.g. Willinger et al., 2003, Csukas et al., 2008), in field experiments (Barr, 2003) and in other trust-related experiments, such as the “lost wallet game” (Dufwenberg & Gneezy, 2000) or the gift exchange game (van der Heijden et al., 2001). But other experiments based on different versions of the investment game, found a positive relation between the amount sent by the trustor and the amount returned by the trustee : Güth et al. (2000), Glaeser et al. (2000), Bellemare & Kroeger (2007), Schotter and Sopher (2006), Chaudhuri & Gangadharan (2007), Ashraf et al. (2006), Greig & Bohnet (2008), and Bornhorst et al. (2009). Based of this mixed evidence about the correlation between the amount sent and the percentage returned, one cannot give a clear conclusion about the existence of a relation between trustfulness and trustworthiness. Since many reasons can lead the trustor to send and the trustee to return, even in cases where a positive correlation is well established, it is difficult to conclude that it is because of trustfulness and trustworthiness.

Answers to attitudinal questions can provide additional insights about the relation between trustfulness and trustworthiness. Although stated trust does not necessarily reflect genuine trust,

¹ The standard trust question of the General Society Survey (GSS) and European Social Survey (ESS round 4) is phrased as follows : “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?”. The percentage of „yes” answers is taken as a crude measure of trustfulness in the studied sample (in more recent versions respondents are asked to provide a rating between 0 and 10). Two additional questions are used to measure social confidence : „Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?”, and “Would you say that most of the time people try to be helpful¹ or that they are mostly looking out for themselves?”, and respondents are asked to provide a rating between 0 and 10.

answers to survey questions have been combined with experimental data. Glaeser et al. (2000) were the first to establish that attitudinal variables are only loosely related - or unrelated - to experimentally measured trust, a finding that was confirmed by Gaechter et al. (2004), Johansson-Stenman et al. (2005), Ermisch et al. (2007), Holm & Nystedt (2008) and Csukas et al. (2008). On the other hand, Glaeser et al. (2000) showed that there is a strong correlation between experimentally measured trustworthiness and several trust-related answers to standard attitudinal questions, confirmed by Karlan's (2005) study. Similarly, Csukas et al. (2008) found that responders who answer 'yes' to the GSS trust question return on average a 9% significantly higher share of the received amount². Glaeser et al. (2000) suggested "that the standard trust questions may be picking up trustworthiness rather than trust". However, other studies combining survey and experimental data lead to a different conclusion. Fehr et al. (2003) found exactly the opposite result than Glaeser et al. (2000) : their survey measures of trust (direct questions about trust in strangers and questions about past trusting behaviour) correlate with trusting behaviour in their experiment³ but are bad predictors of trustworthiness. The sharp contrast between these findings can be attributed to sample selection. While Glaeser et al. (2000) relied on a student sample (Harvard undergraduates), Fehr et al.'s (2003) study was based on a representative population sample. Sample effects were highlighted in other studies, such as Holm & Danielson (2005) who found that stated trust and trust behaviour are correlated in their Swedish sample but not in their Tanzanian sample (see also Sapienza et al., 2007). Likewise to the correlation between the amount sent and returned, there is mixed evidence about a correlation between trust behaviour and stated trust. The way the standard trust question is framed might actually measure something different than trust, and the amount sent in the investment game is potentially grounded on a combination of several motives. What exactly is measured in surveys and in experiments on trust remains however unclear. A slight change in either the survey measure of trust, or the experimental protocol⁴, may therefore lead to a different conclusion about the correlation between stated trust and experimentally measured trust (see Naef & Schupp, 2009).

In view of the above conclusions, within-subject experiments provide a more straightforward test for establishing a correlation between trustfulness and trustworthiness. Several studies allowed each subject to play both roles, either by direct observation of subjects' choices or by relying on

² Gaechter et al. (2004) provided evidence that beliefs about others' trustworthiness is correlated with their cooperative behaviour in a voluntary contribution game to a public good.

³ See also Naef & Schupp (2009)

⁴ For instance Johansson-Stenman et al. (2005) showed that increasing the stakes in the investment reduces significantly the proportion of the endowment sent by the trustor.

the strategy method : Glaeser et al. (2000), Ashraf et al. (2006), Chaudhuri & Gangadharan (2007) and Altmann et al. (2008). Glaeser et al. (2000) found that the own amount sent has a significantly positive but small effect, on the own percentage returned. Ashraf et al. (2006) found that own expectations about trustworthiness play a key role for the trustor's decision to trust. They included many variables (e.g. demographic, attitudinal,) in their regression analysis, but found that the only significant variables affecting positively the amount sent by the trustor are his expectation about the amount returned by the trustee and by his "unconditional kindness" (i.e. his amount sent) while risk-aversion and answers to the trust-question have no effect on trust. The trustee's decision to return depends crucially on his unconditional kindness and his attitude towards the trust-question. In an experiment using the strategy method, Chaudhuri & Gangadharan (2007) found that the more trustworthy subjects are also the more trusting ones. Trusting subjects (defined as those who send at least 50% of their endowment) are not more reciprocal than non-trusting subjects (those who send less than 50% of their endowment), but trustworthy subjects (those who return at least 1/3) are clearly more trusting than the untrustworthy ones (those who return less than 1/3). Their findings suggest that trustworthiness implies trustfulness while the opposite is not true⁵. Finally Altmann et al. (2008) elicited trustfulness and trustworthiness also by using the strategy method. For each subject they regress the amount sent back as a trustee on the possible amounts received by the trustor⁶. The regression coefficient (r) is used to classify subjects : "reciprocal" subjects are defined as those for which $r > 1$ and "selfish" ones by $r = 0$ (the remaining category, $0 < r \leq 1$, is called "intermediary"). They show that the more reciprocal subjects are those who are the most trustful. While these findings suggest that trust and reciprocity attitudes are correlated within individuals, a more careful analysis is needed in order to understand how the level of trust is linked to the level of reciprocity within individuals.

3. Experimental design

The experiment was run at the University of Miskolc (Hungary) in December 2003, and involved 74 participants. 4 sessions, involving 9-10 subject-pairs each, were organized. All subjects were university students and were recruited through various means: advertisements through mailing lists, posters, loud voice advertisements in classes.

⁵ Barr (2003) found a positive relation between the amount sent (s) by the trustor and the percentage returned by the trustee (r/s) : an increase in r/s leads to an increase in s (while r/s is independent of s in the regression of r/s with respect to s).

⁶ They rely on OLS and force the constant to be zero.

Upon arriving at the experimental lab, subjects were assigned randomly either to room I or to room II. To implement the investment game, we used a triple-blind procedure, slightly different from the one used by Berg & al. (1995). Participants received a detailed instructions sheet which they were asked to read privately. After self-reading the experimenter read out loudly the instructions to implement common knowledge of the game. Eventual questions were answered privately.

Each participant received an endowment of 10 virtual Euros at the beginning of the experiment. Earnings accumulated during the experiment were added to the residual endowment, and converted into Hungarian Forint at the rate of 160 HUF/€.

We used the strategy method to collect individual data for both roles: sender and receiver. As a sender subjects had to decide how much (S) of their initial Euros they wanted to transfer to an anonymous receiver. Only integer amounts between 0 and 10 could be submitted. Sent amounts were tripled by the experimenter before being transferred to the receiver who earned 3S. Then the receiver could decide how much of his received amount he wanted to return (R) to the sender. In the instructions the sender was called “player A” and the receiver “player B”.

The questionnaire was split into two parts. In part 1 (sender role) all participants had to decide how much Euros (if any) they wanted to transfer to the receiver. In part 2 (receiver role) they were asked how much they wanted to return for any possible received amount.

Participants were told that their actual role in the experiment would be decided randomly, only after they had answered the two parts of the questionnaire. After collecting part 2 questionnaires, the experimenter chose randomly the subjects' role and informed each subject about his player type: all subjects in one room were assigned to role A and all players in the other room were assigned to role B. Since the number of participants was equal in the two rooms this procedure guaranteed that the number of A players was equal to the number of B players. Each A player was randomly matched with a B player. For each randomly formed player pair the experimenter matched their decisions by taking into account the decision of player A in part 1 and the corresponding decision of player B in part 2. This matching determined the final payoff of each player, as explained above.⁷

⁷ The experiment started with 74 participants, who were equally split between room I and II, which means 37 subjects in each room. However during the experiment one participant stopped reading and filling the questionnaires and left the room. Since we had odd number of participants, one randomly selected B player was actually matched with two A players in order to determine the final payoff of the remaining A player. The selected player B received his payoff according to the decision of the first player A. This had not influence on our data, although it affected the final payoff of one of the A players.

Before all participants were paid off they were asked to fill out a final questionnaire about their demographic data (gender, age, academic major, academic year, pocket money and whether they lived or not with their parents).

The final payoffs were calculated as follows: for the sender, the final payoff was equal to $(10 - S + R)$ and for the receiver $(10 + 3S - R)$, where S is the amount sent and R the amount returned.

4. Sent and returned amounts

4.1.Sent amounts

In this sub-section we report the amounts sent according to various demographic variables that were observed in our final questionnaire. Our aim is to ascertain that our data is not at odds with the typical findings of the literature about the investment game.

The average sent amount is 5.10 Euro from the possible maximum of 10 Euro, which is not significantly different (two-tailed t-tests, 5% significance level) from the average amount sent in the BDMc no-history treatment (5.16\$) or from the average sending of the Hungarian subsample in the intercultural experiment of Csukás & al. (2008) (5.68 Euro). Table 1 (see appendix) provides summary results for the amount sent according to demographic variables.

On average males send 1.4 Euro more than females, a significant difference (ANOVA-test $p = 0.035$, and Mann-Whitney one-sided-test $p = 0.0375$). For other grouping variables the average sent amounts are not significantly different : neither age, academic year, major, pocket money and living circumstances (with or without parents) cause any significant difference in the amount sent (see table 2 with the calculated F-values of ANOVA-tests.)

grouping variable	F-statistics	p
<i>gender</i>	4.605	0.035
<i>age</i>	2.595	0.112
<i>academic year</i>	2.461	0.121
<i>academic major</i>	1.525	0.221
<i>pocket money</i>	0.540	0.465
<i>live with parents</i>	0.131	0.718

Table 2: ANOVA-tests for demographic variables

Figure 1 shows the frequency distribution of sent amounts, which is bimodal in accordance with other experiments. For example, in the data of Berg & al. (1995), Willinger & al. (2003) and Csukás & al. (2008), typical sent amounts range between 2 and 6, and show a spike at 10. These amounts – between 2 and 6 or 10 – are chosen by 82% of the participants (60 out of 73). While the standard predicted amount - sending nothing - was observed only once, the other extreme the socially optimum level (i.e. 10) - was observed for 15% of the participants.

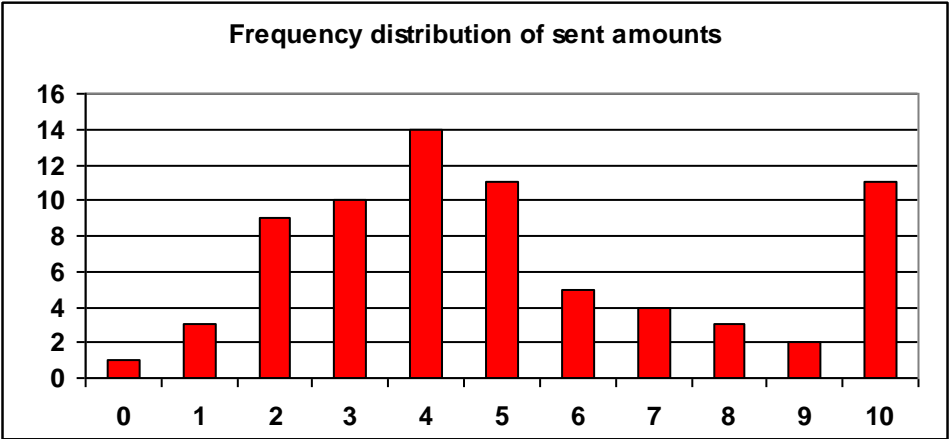


Figure 1: Frequency distribution of sent amounts

A regression for which the sent amount is the dependent variable⁸ (see table 3) confirms the results of the ANOVA test about the gender effect: males (coded 1) send on average 1.37 Euro more to their counterparts than females, a significant difference ($p=0.029$). Besides gender, the academic year (coded from 1 to 5 as in table 1) turns out also to be significant in the regression analysis (see table 3)⁹.

Independent variables	Coefficients
Constant	2.57*
Gender	1.37* (2.22)
Academic year	0.68** (3.23)
s	2.56
R ²	18.3%

* significant at 5% level, (t-values)

⁸ A multivariate linear regression was fitted by the method of least-squares and backward elimination (all insignificant independent variables were eliminated until we reached this last regression in which all variables were significant (i.e. gender and academic year).

⁹ Note, that in table 1 average sending according to academic year show monotone increase (students of 5th year sent almost double than 1st year students) which variable just slightly fails to be significant (with a p-value of 0.12) by ANOVA test, mainly because of the low number of observations in different academic year categories.

** significant at 1% level, (t-values)

Table 3: Significant explanatory variables for sent amount

4.2. Relation between sent and returned amounts

In this subsection we provide a preliminary statement of our main result that we detail in the next section : the relation within individuals between the own level of trust (sent amount) and trustworthiness (returned percentage). To start with, we investigate the following simple regression :

$$r_i = \alpha + \beta S_i + \gamma T_i + \varepsilon_i ,$$

where r_i is the percentage returned by the second mover, S_i is the amount sent by the first mover in subject pair i and T_i is the amount that the responder would have sent as a first mover, which we interpret as the responder's own level of trust.

Since all participants acted as senders in the first part of the experiment, and as responders in the second part of the experiment, we are able to compare all subjects' level of reciprocity (returned percentage in all possible cases) to their own level of trust (sent amount as player A). The sample consists of 67 participants: we therefore collected 67 independent observations for sent amount, 67×10 observations¹⁰ for returned amounts.

Independent variables	Coefficients
Constant	0.255**
Sent (S_i)	-0.001 (-0.39)
Own trust (T_i)	0.030** (11.06)
s	0.191
R^2	15.5%

** significant at 1% level, (t-values)

Table 4: Regression coefficients of returned percentage (R^2)

Table 4 summarizes the regression coefficients and their significance. While β does not differ significantly from zero, γ is highly significant (at 0.1%) which supports the hypothesis that returned percentages depend strongly on the own level of trust of the responder.

However the 670 observations are not independent, since each participant provided a vector of 10 returned amounts. We therefore run a new regression by taking the average returned

¹⁰ Note, that total number of participants was 73, but six observations had to be excluded, since these six participants failed to answer entirely the questionnaire as player B.

percentage of the second mover ($m(r_i)$) as the dependent variable, with a reduced sample of only 67 independent observations:

$$m(r_i) = \alpha + \gamma T_i + \varepsilon_i ,$$

The results are reported in table 5. Although taking averages reduces sharply the number of data points, we find that the value of γ is unchanged and is significantly larger than zero ($p < 0.01$). Furthermore the elimination of the variable S_i (sent amount) from the regression increases significantly the explanatory power (R^2 increases from 15.5% to 19.2%) although the number of observations is divided by 10. Note, that the constant is also significant (t-value = 5.76).

The value of the constant may be interpreted as the average percentage returned by a responder who sends nothing to her counterpart, i.e. the unconditional return. In our sample this percentage (one-quarter of the received amount) is slightly lower than in other studies. For instance, Cox (2002) found that the average returned percentage does not significantly differ from one-third of the received amount. This percentage is typically returned partly based on altruism and partly on reciprocal behaviour and ensures that the first mover is compensated for his investment effort.

Independent variables	Coefficients
Constant	0.249**
Own trust (T_i)	0.030** (3.93)
s	0.17
R^2	19.2%

** significant at 1% level, (t-values)

Table 5: Significant regression coefficient of average returned percentage (Mean(R^0_i))

The significance of the coefficient γ supports our conjecture about the role of the own level of trust on the percentage returned : acting as a first mover, every Euro increase in the sent amount increases the returned percentage by 3%. Therefore, a first mover with the highest level of trust is willing to return on average 55% of the received amount when acting as a responder, i.e. subjects who exhibit the maximum level of trust, return about half of the amount received.

One can still argue against the use of average returned percentages, since the substitution of the original 10 returned percentages by their mean for each responder can easily lead to poor explanatory power from the data. This is true except if the 10 substituted returned percentages are not significantly different from each other and thus from their average. In other words, if the returned percentages of a given responder follow uniform distribution then these values do not

deviate significantly from their mean and can therefore be safely substituted by their mean value. We show in the next section that the hypothesis of uniform distribution of returned amount is satisfied for most of our subjects.

5. Uniform distribution of returned percentages

5.1 Average returned percentages and reciprocal types

We start by looking at the average returned percentage as a function of the received amount for the whole sample. Figure 2 shows the average returned percentage for each possible received amount. The null hypothesis of uniform distribution cannot be rejected ($p < 0.01$). The vertical bars show ± 1 standard deviation from the average returned percentages, indicating a considerable variance of returned amounts. However, the hypothesis of equal standard deviations across received amount cannot be rejected ($p < 0.05$).

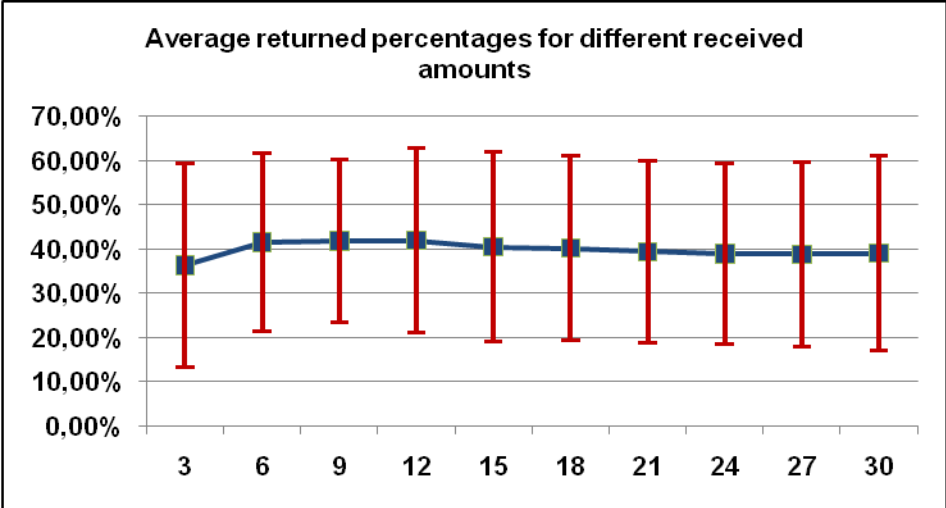


Figure 2: Average returned percentages per amount received and standard deviations

At the individual level, the null-hypothesis of uniform distribution of returned percentages is accepted for 43 subjects out of 67 (χ^2 -test, 5% significance level) : for 64.2% of the responders the returned percentage is independent of the received amount. However, not all of the subjects follow such a uniform pattern. We therefore classify each subject into one of the four types of behavioural patterns according to the general shape of their returned percentage (see figure 9 in the appendix) :

- Uniform type* : the percentage returned is independent of the amount received;
- Increasing type* : the percentage returned increases with the amount received;
- Decreasing type* : the percentage returned decreases with the amount received;
- Random type* : the percentage returned does not exhibit any clear pattern.

Table 6 shows the frequency of each type. Obviously the uniform and the random types are the most frequent patterns of behaviour in our data.

Type	Frequency	Proportion (%)
Uniform	43	64.2
Increasing	2	3.0
Decreasing	6	9.0
Random	16	23.8
Total	67	100.0

Table 6: Subjects' types according to the distribution of returned percentages

Figure 3 shows the average returned percentages for each type. The pattern for the random type looks very similar to the one of the uniform type. If we neglect the lowest received amount (3), the hypothesis of uniform distribution of returned amount cannot be rejected for the random type (5% level).

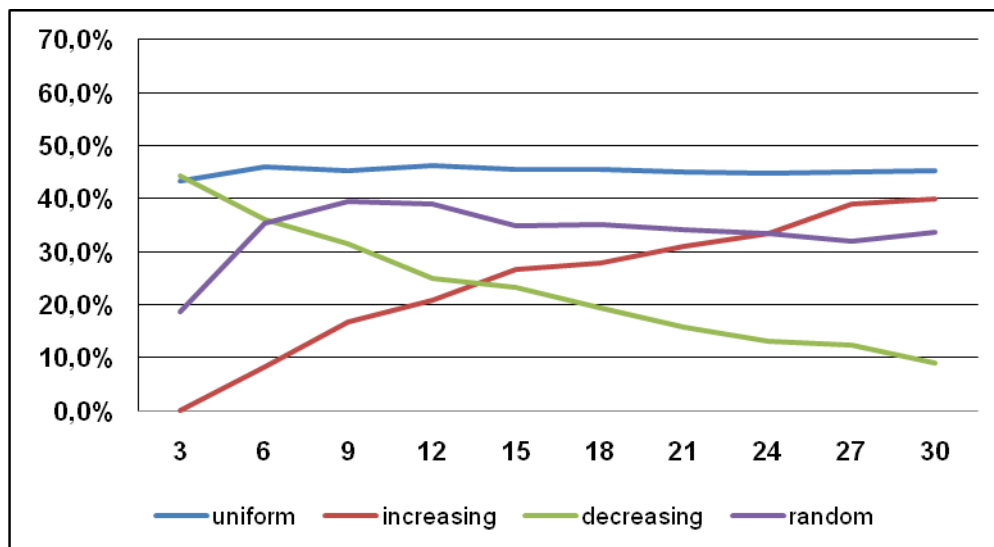


Figure 3: Average returned percentages per subject-type

5.2 Average returned percentages and own level of trust

In figure 4 we report the frequency distribution of sent amounts and the average returned percentages of responders belonging to each sent amount category. The horizontal axis indicates the amount sent by subjects in player A's role. The left axis measures the frequency of subjects who send the corresponding amount, and the right axis measures their average returned percentage. The continuous line indicates the average percentage returned (for all possible received amounts) for each sent amount category. For example, for the sent amount 1 (horizontal axis), the frequency is equal to 3 subjects (left vertical axis), and their average returned amount is equal to 20.7% (right vertical axis).

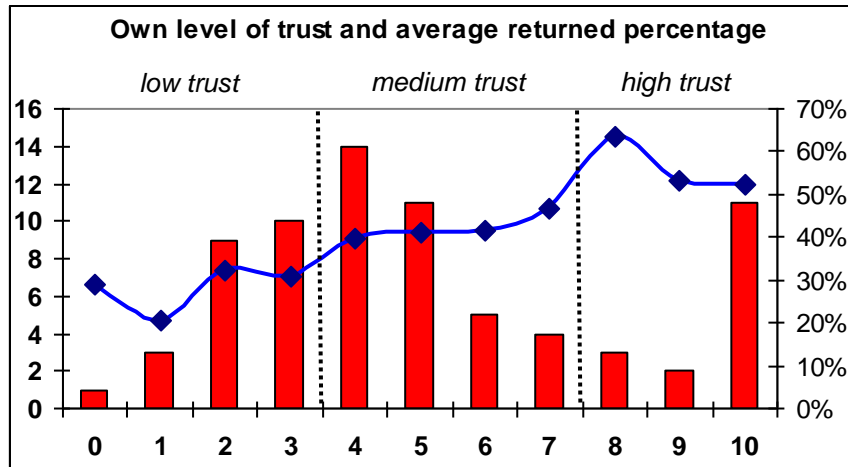


Figure 4: Average returned percentages as function of own level of trust

In accordance with our previous findings figure 4 shows an increase of the average returned percentage with the level of the amount sent by the responder. The average returned percentage increases sharply between trust levels 3 and 4 and between trust levels 7 and 8. We tentatively group our subjects into 3 categories according to their own level of trust : *low* (0-3 Euros), *medium* (4-7 Euros), and *high* (8-10 Euros). In figure 4, these groups are separated by vertical broken lines. For the low trust category the average returned percentage is less than 33%, while for the medium trust category it varies between 39 and 47%, and for the high trust category it varies between 53-64% (see table 7).

Sent amount (as trustor)	0	1	2	3	4	5	6	7	8	9	10
<i>frequency</i>	1	3	9	10	14	11	5	4	3	2	11
average returned%	28.7	20.7	32.4	30.7	39.7	41.0	41.4	46.6	63.3	53.0	52.3
st.dev. of average ret.%	0	0.9	17.9	19.0	15.8	13.0	7.8	19.1	20.5	18.5	27.5

Table 7: Average returned percentages as function of own level of trust

Inspection of figure 4 and table 7, suggests the two following refined hypotheses about the relation between the own level of trust and the own returned percentage : in each trust category (low, medium, high) the level of reciprocity is 1) independent of the amount received, and 2) determined by the own level of trust of the subjects. We state these observations as hypotheses to be tested: according to hypothesis 1 the three curves of average returned percentages are quasi parallel (see figure 5), and according to hypothesis 2 the differences between the three curves are

point-wise significant. In order to test for point-wise difference between any two distribution curves, we rely on two sample t-tests for pairwise comparisons.

Hypothesis 1: The average returned percentage follows a uniform distribution across received amounts in each trust category (low, medium and high).

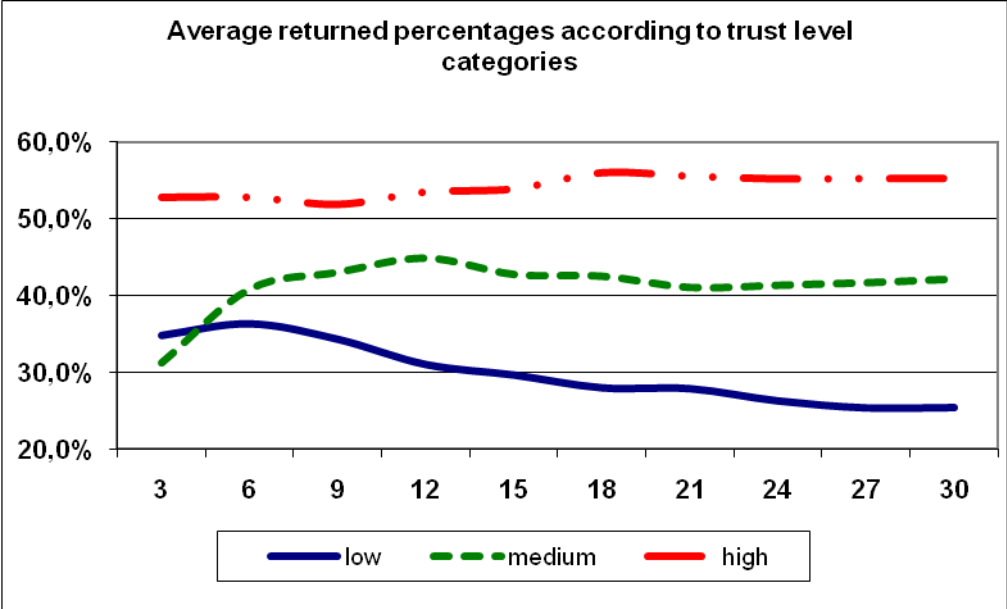


Figure 5: Distribution of average returned percentages according to trust level categories

Figure 5 shows the distribution of average returned percentages for each received amount and for each trust category (low, medium and high). Figures 6, 7 and 8 (see appendix) provide details about standard deviations.

We rely on the χ^2 -statistic to test the null hypothesis that the returned percentages follow uniform distribution in each trust level category. Table 8 reports the average returned percentages for each category and for all possible received amounts. The two right-most columns report the calculated χ^2 and the critical values. Comparing the calculated values to the critical values we conclude that in all trust level categories the hypothesis of uniform distribution cannot be rejected, which means that the level of reciprocity¹¹ is independent of the received amount.

¹¹ To control for this statement we also run a χ^2 -test to check whether the difference between two trust categories of average returned percentages follow uniform distribution. The pairwise difference of average returned percentage is independent from the level of received amounts. This fact can also be observed visually on figure 5.

trust level	Received amounts										χ^2	Cr. value
	3	6	9	12	15	18	21	24	27	30		
low	34.8%	36.4%	34.3%	31.1%	29.7%	28.0%	27.9%	26.3%	25.4%	25.5%	4.92	16.92
medium	31.3%	40.9%	43.1%	44.9%	42.8%	42.6%	41.1%	41.4%	41.8%	42.2%	2.95	16.92
high	52.8%	52.8%	51.9%	53.5%	53.9%	56.0%	55.6%	55.2%	55.2%	55.3%	0.34	16.92

Table 8: Average returned percentages for different trust level categories for all possible received amounts and χ^2 -tests of uniform distribution

Since the hypothesis of uniform distribution cannot be rejected, we can test for the pairwise differences between returned percentages.

Hypothesis 2: Returned percentages are larger for higher trust categories for each received amount

Table 9 reports the results of a two-sample one-tailed t-test (5%) for pairwise differences of average returned percentages between trust level categories¹². In the upper part of table 9 the comparison of medium and low trust categories are presented. The H1 hypothesis states that for a given received amount the average returned percentage is larger for the medium trust category than for the low trust category. In the lower part of table 9 the equivalent comparison is made for the high and medium trust categories : the H1 hypothesis states that for a given received amount the average returned percentage is larger for the high trust category than for the medium trust category.

trust level	Received amounts									
	3	6	9	12	15	18	21	24	27	30
H1: $\mu(\text{medium}) > \mu(\text{low})$	-3.5%	4.5%	8.8%	13.9%	13.1%	14.6%	13.2%	15.1%	16.3%	16.8%
p-value	0.771	0.188	0.025	0.004	0.006	0.001	0.003	0.001	0.000	0.001
H1: $\mu(\text{high}) > \mu(\text{medium})$	21.5%	11.9%	8.8%	8.5%	11.1%	13.4%	14.4%	13.8%	13.5%	13.1%
p-value	0.006	0.045	0.076	0.111	0.057	0.019	0.010	0.009	0.013	0.024

Table 9: Pairwise comparison of average returned percentages between trust level categories

The H1 row reports the pairwise differences of returned average percentages for each possible received amount. The next row shows the p-values for these differences. Bold characters correspond to cases where the H1 hypothesis is accepted at the 5% level. In 15 cases out of 20, subjects in the higher trust category return a significantly larger percentage of the received amount than subjects in the lower trust category.

¹² The precondition for these t-tests in case of small samples is equality of variances. The F-statistics reveals no significant differences (5% level) between each pair of the categories. The equality of standard deviations can also be visually observed on figures 6, 7 and 8 in the appendix.

Comparing the average returned percentage of the low and the medium trust categories (upper part of table 9) only two differences are insignificant, the ones that correspond to the two lowest amounts, 3 and 6 Euro (see figure 5). In the first case medium trust subjects return even less than low trust subjects. If the received amount is 9 Euro the medium trust subjects return on average 8.8% more, a significant difference. When the received amount is larger than 9 Euro the difference varies between 13.1% and 16.8%, a highly significant difference (less than 1%) as can be inferred from figure 5.

Comparing the average returned percentage for medium and high trust categories, there are three insignificant differences : for received amounts equal to 9, 12 and 15 Euros. For all the other received amounts the differences are significant at the 5% level, and below the 1% level in a few cases.

If we impose the less stringent significance level of 10%, only three of the differences turn out to be insignificant : the first two cases (returning from 3 and 6 Euro) between low and medium trust level categories¹³ and the case of 12 Euro received amount between medium and high trust level categories. Anyway, in 75% of the cases the difference between the average returned percentages are significant at the 5% level, and in 50% of the cases the differences are significant at the 1% level.

Finally, we also carried out a one-sided Mann-Whitney test to compare the average returned percentages in different trust level categories¹⁴. All the differences are significant at the 5% level.

Since hypotheses 1 and 2 cannot be rejected, we conclude that the average returned percentage is independent from the received amount. The observed difference between the quasi-parallel curves of average returned amounts (see figure 5) can be attributed to differences in own trust levels of responders. These findings are in line with the result of our regression analysis. Taken together, both analyses support the hypothesis that trusting behaviour and trustworthiness are strongly correlated within individuals.

6. Relation between trust types and reciprocity types

A final question is whether there is any relation between trusting types (low, medium and high) and reciprocity types (uniform, increasing, decreasing and random). Table 10 shows the subjects'

¹³ It can also be viewed on figure 5 where the curves of the two lowest trust level categories cross each other.

¹⁴ For each category we calculate the average returned percentage for each subject (i.e. 22 observations in low, 33 in medium and 12 in high trust categories). The alternative hypothesis is that subjects in the higher trust category show a higher level reciprocity.

classification according to both criteria. The distributions of returned percentages of each subject can be visually observed in figure 9 (see Appendix) according to the classification of table 10.

Subjects' types according to		distribution of returned percentages				
		uniform	increasing	decreasing	random	total
trust level	low	10	0	5	7	22
	medium	21	2	1	9	33
	high	12	0	0	0	12
	total	43	2	6	16	67

Table 10: Classification of subjects according to their trust category and their reciprocity profile

We test for independence between the two categorical variables reported in table 10. The calculated value of $\chi^2=16.296$ can be rejected at the 5% level of significance ($p=0.012$). We therefore conclude that there is a significant relation between a subject's trusting type and reciprocity¹⁵ type. For instance high trust subjects belong to the uniform reciprocity type.

7. Conclusion

In this paper we investigated the relation between trustfulness and trustworthiness within individuals by analyzing the amounts sent and amounts returned by the same individual in the investment game. Our goal was to provide a more refined test of such a relation than those currently available in the existing literature. Previous experiments tried to identify such a link mainly on the basis of three methods : the relation between sent and returned amounts when subjects play a single role, the relation between the returned amount and the stated own level of trust, and the relation between sent and returned amounts by the same individual. While the first two methods provide conflicting results across studies, experiments based on within subject data suggest a positive relation between the own level of reciprocity and the own level of trust. In accordance with the latter findings, our research hypothesis was that more trustful subjects are also more trustworthy.

We implemented the strategy method in order to collect individual data for both roles : sender and receiver. While the same method was already used in other experiments on the investment game (Glaeser et al. (2000), Ashraf et al. (2006), Chaudhuri & Gangadharan (2007) and Altmann et al. (2008)), the originality of our paper lies in our data analysis. We first showed that the returned percentage is significantly affected by the responder's own level of trust but not by the

¹⁵ The Cramer measure calculated from table 10 also shows a medium strength relation between the two variables ($C=0.35$). We take this as further evidence that trusting behaviour and trustworthiness are correlated within individuals.

amount received from their counterparts. We then classified each subject into a trust category and a reciprocity category. We next showed that a subject who belongs to a higher reciprocity category belongs also to a higher trust category. Our key finding, which allows us to establish a correlation between trust categories and reciprocity categories, is that for most subjects the returned percentage is independent of the received amount. Furthermore, such a uniform pattern of reciprocity behaviour is observed in our three trust categories (low, medium and high).

Besides our main finding about the correlation between trustfulness and trustworthiness within individuals, our findings are consistent with the findings of the psychological process of “projection”. Individuals who exhibit projective behaviour attribute their own faults, wishes or characteristics onto other persons (e.g. McMahon et al., 1982, Wittig and Williams, 1984, Fröhlich, 1994). Straker (2004) distinguishes three types of projection among which “complementary projection” assumes that others do, think and feel in the same way as oneself.

According to Spear et al. (1988), in unfamiliar situations or when one’s internal feeling or thought contrasts with one’s perceived reality the psychological process of projection can solve the conflict. In the trust game such a conflict between perception and self-conception arises whenever the partner’s trust differs from the own trust. The projective reasoning hypothesis suggests that this conflict can be solved if the responder projects his own level of trust onto his partner and fits the level of reciprocity to her projected level of trust. In other words, a responder with a high level of trust expects that his trusting action will be reciprocated if he were acting as a trustor. Since he acts as a responder, the projective reasoning hypothesis predicts that he will project his own level of trust onto the sender and will do exactly what he expects from others to do unto him. Similarly, a responder with a low level of trust, chooses a low level of reciprocity, because he projects his own low level of trust onto the sender and reciprocates at this lower level. The projection hypothesis is consistent with our main finding that the percentage returned is independent from the amount sent for most subjects.

Acknowledgements

We thank for the valuable comments by Csongor Csukás, concerning the experimental design.

We gratefully acknowledge the financial support by CNRS in the frames of Eco-net Programme.

Tamás Kovács gratefully acknowledges the financial support by the János Bolyai Research Scholarship of the Hungarian Academy of Sciences.

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A P P E N D I X

gender	#	mean	st. dev.
female	45	4.56	2.53
male	28	5.96	3.02
Total	73	5.10	2.79
academic major	#	mean	st. dev.
economics	2	6.50	4.95
law	14	6.36	2.65
engineering	20	4.95	2.86
human arts	37	4.62	2.67
Total	73	5.10	2.79
live with par.	#	mean	st. dev.
no	19	4.89	2.28
yes	54	5.17	2.97
Total	73	5.10	2.79
academic year	#	mean	st. dev.
1	14	3.71	2.33
2	20	4.40	2.54
3	10	5.40	3.03
4	15	5.87	2.59
5	14	6.43	3.06
Total	73	5.10	2.79
age	#	mean	st. dev.
- 20	23	4.04	2.53
21 - 22	25	5.40	2.71
23 -	25	5.76	2.93
Total	73	5.10	2.79
pocket money	#	mean	st. dev.
0 - 5000	36	4.75	2.47
5001 - 10000	24	5.46	3.09
10001 -	13	5.38	3.18
Total	73	5.10	2.79

Table 1: Average sent amounts according to demographic variables

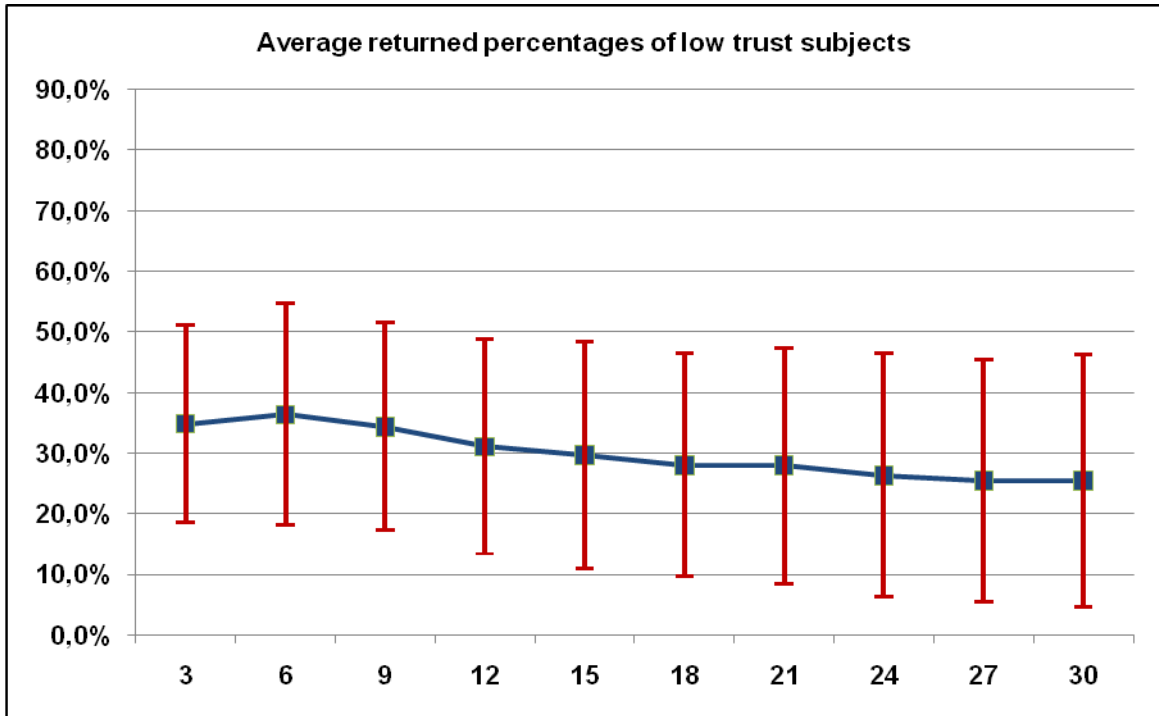


Figure 6: Distribution and standard deviation of average returned percentages in case of low trust subjects

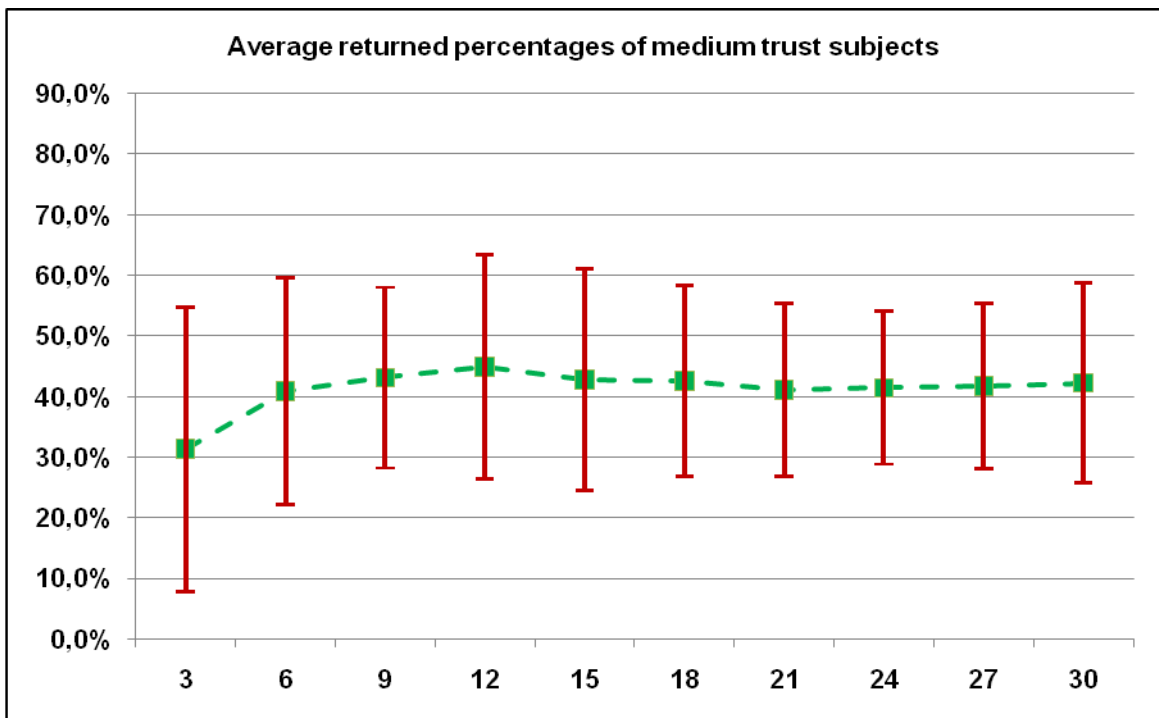


Figure 7: Distribution and standard deviation of average returned percentages in case of medium trust subjects

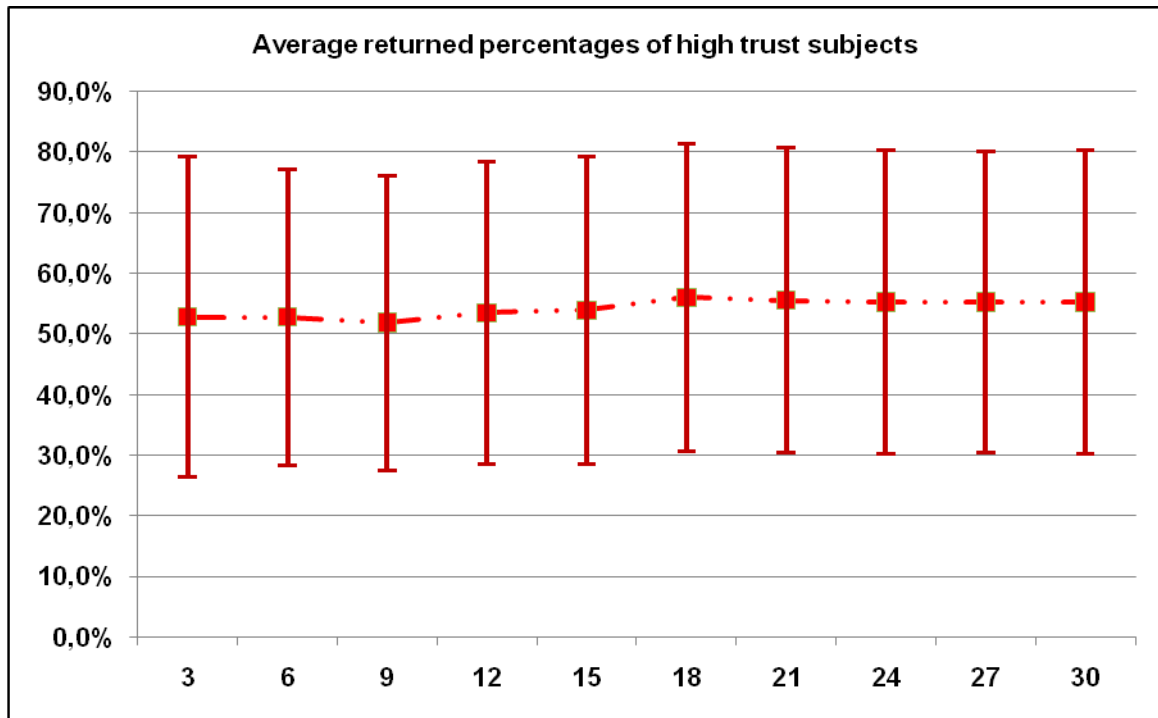


Figure 8: Distribution and standard deviation of average returned percentages in case of high trust subjects

The continuous blue line and the red vertical bars represent the average returns and the corresponding standard deviations of low trust subjects for each possible received amount. The dashed green line and the red vertical bars show the same in case of medium trust subjects, while the dotted dashed red line with the red vertical bars are for the high trust subjects.

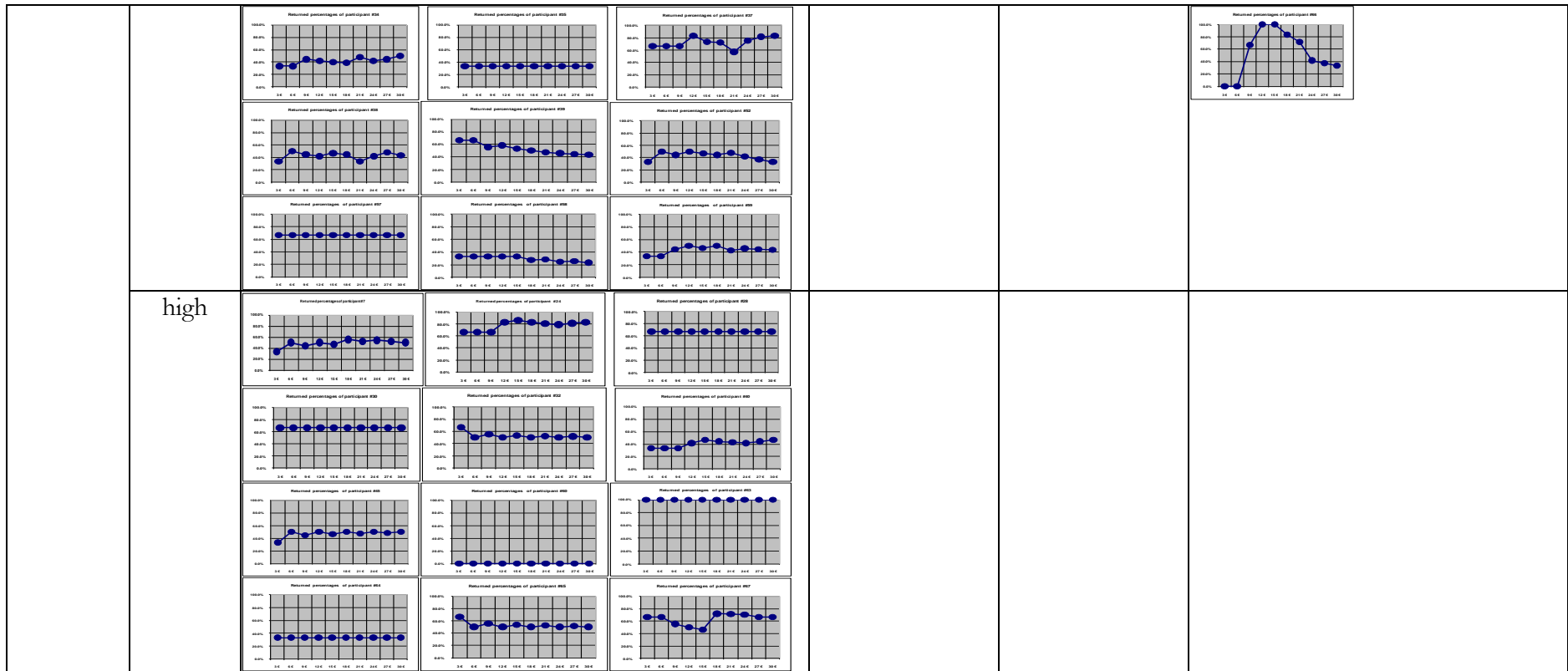


Figure 9: Distribution of returned percentages according to the subjects' trust category and reciprocity profile

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Contact :

Stéphane MUSSARD : mussard@lameta.univ-montp1.fr

