Abstract. In a within-subjects framework, we compare levels of transfer in the trust game and in the (triple) dictator game. We control preferences towards risk through the Holt and Laury test (2002) and social preferences with the ring test (Liebrand, 1984). We then provide evidence that social preferences correlate with levels of transfer, while risk attitudes do not. Finally, we also cast doubts on the predictive power of the two tests.

Key words: dictator game, trust game, risk attitude, social preference, experiment.

JEL classification: C72, C90

I. INTRODUCTION

The trust game (Berg et al., 1995) has been extensively used in experimental economics to measure trust at an individual level. The sender may regret the money that he transfers if he does not get enough return from the recipient. Thus transfer may be a risky decision and risk attitudes can affect it by confounding inferences about trust. Some studies consider the game as a measure of the willingness to take risks (Snijders and Keren, 1998; Ben Ner and Putterman, 2001; Lönnqvist et al., 2011). Apart from risk, the trust game may also involve social preferences. The sender may be willing to share the endowment with others, as has been widely shown in dictator games. Thus, altruism may impact the level of transfer. A considerable number of experiments in Economics have been dedicated to social preferences (see Cooper and Kagel, 2013, for a survey), using the trust (or investment) game as a tool to analyze them (Glaeser et al., 2000; Cox, 2004). This literature suggests that the question of the underlying attitude behind the transfer decision, that is, risk attitude or other-regarding behavior, still needs to be investigated.

In this paper we propose an experiment to discriminate between these two behavioral interpretations. To elicit subjects' preferences for risk, we implement the risk test proposed by Holt and Laury (henceforth H&L, 2002), which is widely used in Experimental Economics. To measure subjects’ social preferences, we rely on the so called “social value orientation” test (henceforth, SVO; Griesinger and Livingston, 1973; Liebrand, 1984). We consider two games: a Trust Game (henceforth, TG), with a sender’s transfer multiplied by three and a recipient’s return, and a triple Dictator Game (henceforth, tDG), similar to TG without return. Therefore, levels of transfer between our two games should only be triggered by trust (i.e. the sender’s belief that the recipient will give back). The experiment was conducted using a within-study design: each subject participated in each part (risk test, SVO test, the two games) of the experiment.
Recently, three studies considered an experimental design related to ours. In Eckel and Wilson (2004) and in Houser et al. (2010), subjects played the trust game before or after performing the H&L (2002) risk test. Both studies find no evidence of a systematic relationship between transfer decisions and risk attitudes. Kanagaretnam et al. (2009) performed both a risk test using the two-stage lottery mechanism designed by Becker, DeGroot and Marshak (1964) and the SVO test to measure social preferences. Like Eckel and Wilson (2004) and Houser et al. (2009), they do not find evidence that risk attitudes affect transfer decisions. On the other hand, they do find evidence that the social preference measure accounts for a significant variation of transfers.

We differ from the aforementioned studies by combining our trust game with a triple dictator game, as Ashraf et al. (2006) and Etang et al. (2011) did, to investigate the extent to which senders’ transfers in the trust game are motivated by other-regarding behavior rather than by risk attitudes. We ran a within-subject design. This design generates sharper statistical inferences because, as a single subject is observed in several conditions, it automatically controls for individual differences (Camerer 2003; Charness et al., 2012). By running both TG and tDG, we are able to measure gaps in transfer in two environments that only differ by the possibility of return from the recipient. By doing so, we isolate the part of transfers that are due to the expectation of reciprocity (strategic uncertainty) regardless of individual preferences with regard to others. In practical terms, the transfer premium between TG and tDG represents the amount the participant is willing to gamble on the reciprocal nature of her recipient. By taking into account only transfers in TG, weak risk attitudes may thus be confounded by social preferences and therefore become untraceable. We differ from Ashraf et al. (2006) and Etang et al. (2011) by also considering the SVO test rather than the tDG as a way to measure social preferences. The SVO test provides more exhaustive measures of social preferences than the tDG does: it determines for each individual a social value orientation along a spectrum ranging from altruistic to aggressive (Carpenter, 2003).

Results show that, in both games, risk attitudes elicited by means of lotteries do not predict levels of transfer. Nor do they explain gaps in transfers between the two games. On the other hand, levels of transfer are correlated with the participants’ social values. However, the predictive power of the SVO test is limited. For instance, so-called “egoists” in SVO do transfer positive amounts, even in the triple dictator game.

The paper proceeds as follows. Section 2 presents the design of our experiment. Section 3 reports our results. Section 4 concludes.

II. EXPERIMENTAL DESIGN AND PROCEDURE

The experiment was divided into three parts: the two games played in the same order, the triple dictator game first, then the trust game (tDG-TG); H&L; and SVO for risk and social preferences. Instructions were given only when each new part started. To control possible order effects, the three parts were sorted differently in every experimental session. No information on payoffs or on others’ decisions was given before the end of the experiment. As in Kanagaretman et al. (2009) and in Houser et al. (2010), all parts of the experiment were based on monetary incentives and were computerized.

One part of the experiment consisted of playing the triple dictator game and the trust game. In both games, two players, the sender S and the recipient R, share 8 euros. Of the 8 euros, x euros can be sent by S. The remaining 8-x euros are assigned to S. The investment of x euros is multiplied by 3 and assigned to R. In the triple Dictator Game (tDG), the 3x euros belong to R. The monetary payoffs are 8 - x for agent S and 3x for agent R. In the trust game (TG), part of the 3x euros produced can be paid back to the sender through a non-negative return r\(\leq 3x\). Subjects played the games according the strategy method (Selten, 1967). At the
end of the experiment, for each game, one role (Sender or Recipient) is assigned to each subject, who is matched with another subject.

Another part of the experiment was the risk elicitation task. This test is a menu of 10 paired lottery choices (sets of two options, one of which has to be chosen by the subject), designed to make inferences about risk preferences under various payment conditions. The subjects can choose the safe option (A) when the probability of obtaining the higher payoff is small, and then cross over to the risky option (B) without ever going back to A. The number of safe choices made by the subjects (before the switch to B) determines their risk attitude. If subjects choose four safe options (i.e. the switch occurs at the fifth set of choices), they are risk neutral; fewer than four signals risk attraction, and more than four risk aversion.

Subjects performed also the SVO test, which measures individuals' value orientations along a spectrum ranging from altruistic to aggressive. Subjects were asked to make binary choices between 24 (own, other) combinations of payoffs. These choices were presented to each subject in a different order. Each subject was told that each (own, other) combination allocated an amount of tokens between them and another subject in the room who remained anonymous. Furthermore, subjects were told that the sum of the tokens they chose to allocate to themselves, in addition to the tokens allocated to them by their partner, would be translated into a monetary payoff (100 tokens = 5 euros) that they would receive in private at the end of the experiment. The data collected from the 24 responses generated a motivational vector for each participant. This vector was calculated by adding up all the allocations opted for. The vector was then mapped back into an original circle (the 24 pairs of outcomes are evenly distributed in this circle) thanks to its conversion into an “angle of social value”. This angle was then used to characterize the subject with one of five categories. The length of the motivational vector (the sum of the chosen vectors) was a measure of the consistency of each subject's series of choices.

The experiment proceeded as follows. As they arrived in the laboratory, subjects received a personal code both to preserve their anonymity and to log into the software dedicated to the experiment. They were told that they would be paid in cash at the end of the experiment. In our experiment, the average payoff was about 30 euros, including a participation fee of 5 euros. Each experimental session lasted about 2 hours. Instructions were given at the beginning of each part and were read out loud to ensure that everyone received the same information. The subjects’ understanding of the instructions was checked using a simple quiz. At the beginning of the experiment, subjects were told that the session would be divided into several parts and that all those parts were to involve a monetary incentive. They were also told that they would be given the amount of their payoffs and receive them only at the end of the experiment. They did not learn about any results during the experiment. More specifically, for each game (tDG and TG), a sender and a recipient were randomly selected and matched at the end of the experiment to be paid according to their choices in the corresponding game. So did we for the SVO test (two subjects were randomly matched). In order to get their payoff for the H&L test, a computer program enabled subjects to throw a 10-sided die twice: the first time to determine the relevant lottery, and the second time to determine the payoff for the chosen option. Likewise, this procedure was carried out at the end of the experiment, to ensure that the subjects’ behaviors in the games were not influenced by their earnings in the risk test. Payoffs to lotteries were labeled in Euros and were similar to those of the H&L (2002) test.

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1 The angle $\theta$ of a subject's motivational vector is the inverse tangent of the other/own ratio calculated from that subject's motivational vector. For instance, for egoists, $-22.5^\circ \leq \theta < 22.5^\circ$, and for cooperators, $22.5^\circ \leq \theta < 67.5^\circ$.

2 Subjects who choose randomly are expected to have a short motivational vector (if the length of the motivational vector is below 33% of the maximum length, here 200, players are making inconsistent decisions and are not included in the analysis).
We conducted 12 experimental sessions from October 2011 to January 2012, with a total of 180 subjects. Subjects were undergraduates from different universities and engineering schools, with no background in game theory.

III. RESULTS

III.1. Risk attitudes and social preferences

In all the sessions we were able to categorize 154 of 180 subjects following the rules of classification given by Holt and Laury (2002). Our subjects are overwhelmingly risk averse (79%), 15% are risk neutral and 6.6% are risk prone. Although our data proportionally include fewer risk neutral subjects and more risk averse subjects than H&L’s risk aversion classification (Figure 1), the distributions in both studies are similar (contingency test - $\chi^2=10.8$, Dof=8, $p=0.213$).

A total of 166 subjects participated in the SVO test. Figure 1 shows the value orientation circle for our subjects, divided into the standard categories, from the most to the least pro-social. Among all the subjects, 2 have been classified as altruists (only concerned about the other's payoff), 79 have been classified as cooperative (concerned about the sum of both their own and the other's payoff), 70 have been classified as egoistic (only concerned about their own payoff), 8 have been classified as competitive (concerned about the difference between their own and the other's payoff), and 2 have been classified as aggressive (concerned only to minimize the other's earnings). The remaining 5 subjects displayed a low level of consistency and could not be classified. Consistently with the literature, nearly 90% of the participants are either egoists or cooperators. We found a significantly higher proportion of cooperators (49.1% vs 26%) and a lower proportion of egoists (43.5% vs 59%) than did Carpenter (2003) (Fisher Exact). Inversely, Liebrand (1984), found more cooperators (53%) and fewer egoists (31%). We found a high level of consistency (86%) which corresponds to that presented in the literature (between 76% and 90%).

III.2. Transfers, risk attitudes and social preferences

We now look at whether risk preferences measured by H&L’s test are correlated to transfer decisions in our games. We find no evidence of correlation between subjects' risk behaviors in H&L’s risk test and the subjects' transfers. We cannot exclude the hypothesis of independence between the number of safe choices in the risk test and the level of transfers in the two games. This result is consistent with Houser et al. (2010) who found no systematic relationships either, between transfer decisions in the trust game and risk attitudes as they are measured in H&L’s test.

We found a strong correlation between the amount sent by senders in our games and the corresponding angle of their motivational vector in the SVO test. In the two games (tDG and TG), Spearman and Kendall coefficients are highly significant: the more subjects care about others in the SVO test, the bigger the amount transferred in the two games. For instance, cooperators opted for the maximum level of transfer more often than did egoists: 7% and 19%

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3 The remaining 23 subjects were withdrawn from the analysis either because they switched back from B to A at least once (they opted for the safe choice even though they preferred the risky option with a lower probability of obtaining the higher payoff) or because they preferred a certain payoff of 4 rather than another payoff of 7.70 (when choosing between the tenth pair of options).
of the egoists invested the maximum amount ($x=8$) in the $tDG$ and in the $TG$ respectively, whereas $24\%$ and $41\%$ of the cooperators did so.

![Graph](image)

**Figure 1.** Experimental results for the risk test and for the $SVO$ test

To provide additional evidence on the relationship between risk attitudes, social preferences and transfer decisions, we conducted an ordered Logit analysis for each of the two games (Models I and II). To obtain comparable results, we considered the same analysis set in order to consider the return effect on the transfer (Model III), before running a fixed effects model on the pooled data set (Model IV). All the results of these analyses are reported in Table 1. Risk attitudes and social preferences are quantitative variables: the risk is the number of the lottery pair, and the social preference is the value of the angle of the social value vector. To control the order of the different parts of the experiment, we considered three dummy variables indicating the relative order for each pair of parts. We note that order has a significant impact on transfers but does not affect relationships between transfers and social and risk preferences.

The four models are highly significant at the $1\%$ level. We find that risk attitudes have no significant effect on the probability to transfer in both games, contrary to social preferences whose effect on transfer is highly significant in both games. Regarding the social preference variable, the coefficient must be considered according to the value of the social value angle. In our case, it means that the more cooperative subjects are, the more they transfer. Statistical tests both on qualitative and quantitative variables (Chi2, Pearson, Spearman and Kendall) show that there is no correlation between social preferences and risk attitudes.

III.3. Treatment effects

As participants made transfer decisions in both $TG$ and $tDG$, we are able to directly measure the impact of the opportunity to get a return on the level of transfers. Unsurprisingly, transfers are significantly higher in $TG$ as the expectation of a positive return gives the sender an extra incentive to transfer. Models III and IV enable one to visualize this. We set $tDG$ as the reference value of the dummy variable “game”. We observe that the effect of the variable

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4 The size of the bubbles is proportional to the number of individuals that share the same motivational vector. Subjects with consistent behaviors are represented outside the smallest circle and vice versa.

5 We used the mixed effects model in order to get more robustness of results, in presence of a within-subject design, especially for the game effect which we considered as a fixed effect in the regression. Results are qualitatively the same as in the ordered Logit model.

6 We also ran the five regressions without the dummy variables indicating the relative order of the parts of the experiment. Results are qualitatively the same.
“game” is highly significant (p-value <0.0001 in both Models III and IV). Playing the TG has a significant effect on the subjects’ likelihood of transferring more in comparison with tDG. This shows that the opportunity to get a return leads subjects to transfer higher amounts in the trust game.

More interestingly, as only strategic anticipation of return distinguishes decisions made in tDG from decisions made in TG, this suggests that participants who transfer more in TG are willing to take a risk regardless their social preference. Figure 2 shows transfers by egoists and cooperators in both games. We ran an ordered Logit model (Model V) to estimate whether transfer gaps between tDG and TG can be explained by social preferences or risk attitudes (141 observations). We found no correlation between the dependent variable and both risk attitudes and social preferences. The regression coefficients for risk attitudes and social preferences are not significant either (p = 0.1932 and p=0.5868, respectively)\(^7\).

Apart from the econometric analysis that shows a correlation between the social values and the levels of transfers, Figure 2 shows that the majority of egoistic players (as determined by $SVO$) transfer positive amounts in the tDG. This casts doubt on the predictive power of $SVO$, while the dictator game is the simplest way to reveal social preferences.

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\(^7\) The absence of correlation is confirmed by many parametric and non-parametric tests.
### Table 1. Regression results for the transfer level

<table>
<thead>
<tr>
<th>Variables</th>
<th>(I) tDG Ordered logit</th>
<th>(II) TG Ordered logit</th>
<th>Game effect (III) Ordered logit</th>
<th>(IV) Mixed effects regression</th>
<th>(V) Difference TG-tDG Ordered logit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social preference</td>
<td>0.028***</td>
<td>0.026***</td>
<td>0.0268***</td>
<td>0.037***</td>
<td>0.00369</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.004)</td>
<td>(0.007)</td>
<td>(0.00639)</td>
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<tr>
<td>Risk attitude</td>
<td>-0.105</td>
<td>-0.042</td>
<td>-0.077</td>
<td>-0.107</td>
<td>0.1467</td>
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<tr>
<td></td>
<td>(0.110)</td>
<td>(0.109)</td>
<td>(0.078)</td>
<td>(0.125)</td>
<td>(0.1136)</td>
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<tr>
<td>Game (TG=1)</td>
<td></td>
<td></td>
<td>0.8248***</td>
<td>1.127***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.216)</td>
<td>(0.201)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order1 (TG after HL=1)</td>
<td>-0.773***</td>
<td>-0.420**</td>
<td>-0.585***</td>
<td>-1.597***</td>
<td>0.8268**</td>
</tr>
<tr>
<td></td>
<td>(0.191)</td>
<td>(0.183)</td>
<td>(0.131)</td>
<td>(0.417)</td>
<td>(0.3784)</td>
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<tr>
<td>Order2 (TG after SVO=1)</td>
<td>0.862***</td>
<td>0.389**</td>
<td>0.615***</td>
<td>1.690***</td>
<td>-0.9705**</td>
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<tr>
<td></td>
<td>(0.205)</td>
<td>(0.196)</td>
<td>(0.140)</td>
<td>(0.447)</td>
<td>(0.4040)</td>
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<tr>
<td>Order3 (HL after SVO=1)</td>
<td>-0.561***</td>
<td>-0.365*</td>
<td>-0.444***</td>
<td>-1.113*</td>
<td>0.1454</td>
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<tr>
<td></td>
<td>(0.195)</td>
<td>(0.191)</td>
<td>(0.135)</td>
<td>(0.435)</td>
<td>(0.3887)</td>
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<td>Constants</td>
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<td>α0: -1.250*</td>
<td>α0: -1.934***</td>
<td>4.009***</td>
<td>α0: -6.0884***</td>
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<td>(0.769)</td>
<td>(0.753)</td>
<td>(0.551)</td>
<td>(0.912)</td>
<td>(1.3038)</td>
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<td>α0: -0.993</td>
<td>α0: -1.682***</td>
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<td>(0.765)</td>
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<td>(0.759)</td>
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<td>α0: 0.333</td>
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<tr>
<td></td>
<td>(0.754)</td>
<td>(0.748)</td>
<td>(0.541)</td>
<td>(0.8404)</td>
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<tr>
<td></td>
<td>α0: 0.258</td>
<td>α0: 0.844</td>
<td>α0: 0.172</td>
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<tr>
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<td>(0.751)</td>
<td>(0.541)</td>
<td>(0.8328)</td>
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<tr>
<td></td>
<td>α0: 1.945**</td>
<td>α0: 1.833**</td>
<td>α0: 1.538**</td>
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<tr>
<td></td>
<td>(0.771)</td>
<td>(0.767)</td>
<td>(0.550)</td>
<td>(0.8235)</td>
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<tr>
<td></td>
<td>α0: 2.714***</td>
<td>α0: 2.547***</td>
<td>α0: 2.284***</td>
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<tr>
<td></td>
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<td>(0.794)</td>
<td>(0.566)</td>
<td>(0.8302)</td>
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<td>R-Squared</td>
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<td>0.2586</td>
<td>0.2696</td>
<td>0.0727</td>
</tr>
</tbody>
</table>

- For significance of the parameters based on p-values, we respectively used ***, ** and * for 1, 5 and 10% significance levels. The standard error is in brackets.
- In ordered logit models, a constant $\alpha_i$ is associated with each level of transfer. In Models I, II and III, $\alpha_i$ is associated with the transfer’s level of more than $i-1$. In Model V, $\alpha_0$ is the constant associated with non-negative levels of gaps. Each of the other constants $\alpha_i$ is associated with the difference level of more than $i-1$.

![Figure 2. Levels of transfer of “egoistic” and “cooperative” participants in the Trust Game and in the triple Dictator Game](image-url)
IV. CONCLUSIONS

In this paper, consistently with other studies (Kanagaretnam et al., 2009; Houser et al., 2010), we provide evidence suggesting that the social preference measure that we used accounts for a significant part of the transfer level in the (triple) dictator game and in the trust game, while the risk measure does not. We then look at gaps of transfer from one game to the other. By doing so, we isolate the effect of the strategic interaction, regardless of individual preferences concerning others. Here again, risk attitudes do not explain the results. The absence of correlation between risk attitudes and the gaps of transfer suggest two assumptions for further research. First, the Holt and Laury’s lottery choice task does not fit with strategic contexts when individuals are endowed with a collective utility function. Other risk tests may be designed, for example tests based on questionnaire measures, which seem to have better empirical power than the Holt and Laury’s test to analyze behaviors in the trust game (Lönnqvist et al., 2011). Second, risk is not what motivates or undermines trust. Risk taken by the sender in the trust game is somewhat less dramatic than in other games, such as the ultimatum game, in which both players can lose everything. Thus, the sender’s transfer amount actually submitted to risk may be too weak to induce a relation between the sender’s behavior and her risk attitude through a lottery choice task. More relevant measures must be proposed.

Although behaviors in the SVO test correlate well with behaviors in our trust game and dictator game, its predictive power remains limited. Transfers in the dictator game should be triggered only by social preferences. Even so, the pseudo R-squared remains weak and the vast majority of "egoistic" players transfer positive amounts. One reason may be that the SVO test does not take into account inequity aversion motives, which may be an explanation for behaviors in the (triple) dictator game and the trust game. If not, that leaves us with questions on the stability of preferences.

References


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