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New Experimental Results on the Solidarity Game

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Abstract

This paper revisits and extends the experiment on the solidarity game by Selten and Ockenfels (1998). We replicate the basic design of the solidarity game and extend it in order to test the robustness of the "fixed total sacrifice" effect and the applied strategy method. Our results only partially confirm the validity of the fixed total sacrifice effect. In a treatment with constant group-endowment rather than constant winner-endowment (Selten and Ockenfels, 1998) the predominance of the fixed total sacrifice behavior is replaced by relative "fixed gift" behavior. We additionally introduce a measure of personality characteristics and compare its specific components with pro-social behavior resulted from our experiments. We don't find any correlations between actual gift behavior and measures of empathy driven pro-social behavior used in social science.

Keywords:experimental economics, game theory, fixed total sacrifice, solidarity

JEL classification:C91

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1 Introduction

Solidarity behavior has been studied in experimental economics introducing a particular type of game based on conditional gifts (Selten and Ockenfels, 1998; Ockenfels and Weimann, 1999). In this experimental solidarity game three participants play only once a game in which each of them has a two third probability of winning a fixed amount of money, and one third probability of ending up with nothing. Before knowing the result of the random draw, each participant must indicate the amount of money (gift) she would like to hand over in case she is going to be a winner, i.e. she has to specify the gift that she would dispense in the case of one loser and in the case of two losers in the group. The total gift can be any amount between zero and the total amount she might win. In this way one elicits subjects' preferences over the space of all possible outcomes of two random moves: to be a winner or loser and to be matched with one or two losers. This procedure corresponds to the "strategy method" introduced by Selten (1967).

The results of Selten and Ockenfels (1998) show two major features. First, the majority of subjects send positive gifts and second, the predominance of a behavior called by the authors the "fixed total sacrifice". Subjects of their experiments seem to use a two stage reasoning in which they first determine the amount they want to keep for themselves and then distribute the remaining amount (if any) between the needy person(s). This means that the total amount of gift is independent from the number of recipients, i.e., is the same for one or two recipients.

Selten and Ockenfels (1998) indicate that this type of behavior is inconsistent with the maximization of an utility function that includes payoffs of other individuals (altruistic utility function). In this sense, the fixed total sacrifice is an "anomaly of the anomalies", because it is related to the "anomalies" of giving to unrelated others (Camerer and Thaler, 1995) on the one hand, but is classified as purely "self-centered-fairness" behavior on the other hand.

Ockenfels and Weimann (1999) replicate the Selten-Ockenfels solidarity game in Magdeburg (East Germany) with exactly the same procedure as used in Bonn (West Germany). They find the fixed total sacrifice effect as well. Additionally they observe that eastern subjects give significantly less than western subjects, which is driven by a higher proportion of egoistical behavior (sending zero to both, to one loser and two losers).

There are two features of the original solidarity game that might have biased the results in favor of the total fixed sacrifice effect. First, in case of one winner and in case of two winners the total group gain varies, i.e., it is equal to 10

DM in the first case and 20 DM in the second case. The subjects might have found an "internal justification" for giving the same amount to one loser or to two losers considering that in the second case the total group endowment is reduced by the half. In order to test this possible effect we introduce a treatment with a constant group endowment for each random move outcome with at least one winner, i.e. for the case of $1, 2$ or 3 winners. At the same time, we keep the ex-ante expected winner and group endowment constant to the baseline treatment. If our hypothesis is true, "fixed gift" behavior should oust the "fixed total sacrifice" effect, which is then observed only for the case of (group endowment / 1 loser) = 2 (group endowment / 2 losers).

The second critical feature is the use of the strategy method. According to Stahl and Haruvy (2002), the use of the strategy method in the sense of making the decision without knowing whether one is a winner or not may bias the data by distorting incentives in favor of egalitarian behavior. Let us further describe this point. In the unconditional case, the solidarity game is analogous to a dictator game with prior random entitlement. Results on dictator games with random entitlement show that around twenty percent of the dictators send forty percent of the pie or more to the recipient (Forsythe, Horowitz, Savin and Sefton, 1994; Hoffman, McCabe and Smith, 1998). The robustness of this result shows the presence of other regarding preferences. The act of giving is free from any reasoning based on "explicit" reciprocity.

But in the conditional case, the motive could be an "implicit" indirect reciprocity. The interaction is characterized by an unfavorable situation that could potentially affect everybody but eventually will affect only a part of the population (the needy person(s)). Conditional on this fact the lucky person could give part of her fortune to the needy one(s), but at the time of the decision the threat to be affected by an unfavorable event is the same for all actors in this game. "I give because I would expect to receive help from others in case of necessity". This type of reasoning would still be considered as self-regarding (self-centered) (Andreoni, 1990)('warm glow' theory). Therefore, the strategy method induces a context in which solidarity might be generated. In order to control for any frame effects induced by the conditional case, we introduce a treatment of a partial play method, where people decide after learning that they are a winner.

In summary, the main goal of our study is to test the robustness of the fixed total sacrifice effect (1) with regard to the individual endowment of winners and the group endowment and (2) with regard to the strategy method involved when participants have to decide about their donations before knowing whether they

are a winner or not. Moreover, the role of expectations and their relationship with behavior is considered.

Additionally, in order to check whether the types of solidarity behavior classified by Selten and Ockenfels (1998) correspond to measures used in social science, we introduce a structured questionnaire on personality characteristics of pro-social behavior corresponding to the Interpersonal Reactivity Index (IRI, (Davis, 1980; Davis, 1983), see the next section for a more detailed description). The IRI is of common use in socio-psychological studies on pro-social behavior, i.e. behaviors that are intended to benefit other people (Carlo, Allan and Buhman, 1999).

The results of our experiments only partially confirm the predominance of the fixed total sacrifice effect in the solidarity game. The replication of Selten and Ockenfels (1998)'s experiment, and the introduction of the partial play method reproduce the original results; in contrast, we find that subjects give the same gift to one loser or to each one of the two losers in the treatment with constant group endowment. We additionally do not find any correlation between the IRI and the actual gifts. Our extensions of the original solidarity game give a better understanding of gift behavior.

The paper is organized as follows: in Section 2 and 3 we describe our experimental design and procedures, respectively; Section 4 reports and discusses the results of our experiments; and Section 5 concludes the paper.

2 Experimental Design

Our design consists of three treatments. The first is a replication of Selten and Ockenfels (1998) (further S-O) solidarity game with some variations in the experimental procedures. It serves as a baseline for the other two treatments.

In S-O and our first treatment (SO-R , S-O replication), subjects participate in a 3-person game. Each subject has the same probability (2/3) of winning 10 DM in S-O and 10 Euros in our first treatment, respectively. Before the random draws each participant is asked to fill out a decision form in which she must specify the amount of money she is willing to hand over to (a) loser(s) in her group in case she will win. Participants are asked to state two amounts, one for the case of one loser in the group and the other for the case of two losers. In the latter the amount specified goes to each one of the two losers, i.e. the winner pays twice this amount. There is no possibility to differentiate the gift among the two losers.

Our second experimental treatment (CGE - constant group endowment)

controls for group endowment effects. We maintain the total group endowment constant for each possible scenario of the game. We vary the individual endowment conditional on the cases in which there are three, two, one, or zero winners in a group. In case of three winners each of them gets 6.70 Euros; in case of two winners, each of them gets 10 Euros; and in the case of one winner, she gets 20 Euros. These parameters keep the expected group and individual endowments of the SO-R treatment constant (approximately).

In our third treatment (PPM - partial play method) we introduce a partial-play method of the SO-R design. The subjects know, before deciding, whether they are winners or losers. Conditional on that, they have to make a decision on how much they are willing to hand over to one or two possible losers in their group. [1] Results of this treatment would give us information about the effect of deciding before knowing ones role in a solidarity game, i.e. for the effect of the strategy method. This treatment serves also as a bridge between the solidarity game and the dictator game with random entitlement. Table 1 summarizes the design parameters.

In each of the three treatments, we asked subjects to answer a 28 items questionnaire corresponding to the Interpersonal Reactivity Index (IRI, (Davis, 1980; Davis, 1983)). The subjects had to indicate how a statement describes them on a 5-point scale (A, B, C, D, and E, with A "does not describe me at all", and E "describes very well"). There are items that are scored in a descending fashion (A=4, B=3, C=2, D=1, and E=0) and items that are scored in reverse fashion (A=0, B=1, C=2, D=3, and E=4). The questionnaire has four components. Each component is composed by 7 items. The four components are: perspective taking (PT), empathic concern (EC), personal distress (PD), and fantasy (FS). Examples of the items for each component are: "I try to look at everybody's side of a disagreement before I make a decision"(PT), "Other people's misfortunes do not usually disturb me a great deal"(EC -), "In an emergency situation I feel apprehensive and ill-at-ease"(PD), and "After seeing a play or movie, I have felt as though I were one of the characters" (F). These items refer to perspective taking, empathic concern (reversed-scored), personal distress, and fantasy, respectively. For the complete list of items see the Appendix.

[1] In other words: we transformed the strategy method, where every participant has to decide for every role in a game, to the strategy vector method, where participants decide only in their own role, but for each possible case of the other role's decision or random nature moves.

3 Experimental Procedures

The experiment was conducted at the experimental laboratory of the Max Planck Institute in Jena, Germany. Participants in this experiment were 96 undergraduate students from the local Friedrich-Schiller University. We ran six sessions with 16 participants (15 subjects plus a monitor) each. Therefore there are 30 (20) independent observations for the SO-R and CGE (PPM) treatment (see Table 1). The average age of the 90 active participants (without the monitors) was 23 years, 51 (39) were female (male). The experimental sessions lasted on average one hour; from the time the subjects entered the lab until the time they left it. The average earning was 9.73 Euro including a show-up fee of 2.50 Euro.

We used a double blind procedure, i.e., neither the experimenter nor the other subjects could ever deduce the name of the correspondent decision maker from a decision (see Instructions in Appendix). The SO-R and the CGE treatments followed the same protocol and had exactly the same instructions. They differed only with respect to the numbers in the decision form and the expectation form. The PPM treatment differs in a way that will be clarified with the following description of the procedure.

During the experiment, every subject received a code number. These codes were randomly generated sequences of numbers and letters, e.g. 800-C56-Z4B, or 379-V22-W7D, where the last letter in the code corresponded to the session number. The code number was printed on the backside of every form to fill out and on the payment envelope.
The complete procedure was as follows:

a The subjects entered the laboratory and were randomly seated in separated cubicles. When everybody was seated, the instructions were distributed and read aloud always by the same experimenter. Once the instructions were read, subjects' questions were answered privately.

b The subjects were asked to draw an envelope from a box. The box contained 16 "big" envelopes. Inside each envelope there was a card with a code number. In one of these envelopes there was a card marked with "monitor" instead of a code number. The monitor had to guarantee to the other subjects (further the "active" subjects), that the experiment was conducted according to the rules stated in the instructions. He or she did not participate actively in the game, but was the only contact between the experimenters and the subjects during the proceeding of the experiment. The monitor was informed privately that he or she will get

the average payoff at the end of the experiment. We asked her not to reveal this information.

c Inside the "big" envelopes there were three other "small" envelopes, a blue, a green, and a red one. The "active" subjects (all the subjects except the monitor) had to open first the blue envelope. In this envelope they found the decision form. On the decision form the subjects were informed about all the possible outcomes of the random draws for the winner/loser and the determination of groups. In the case of three, two, one and zero winners in a group each winner earned $10, 10, 10$ and 0 Euros in SO-R and PPM and $6.7, 10, 20, 0$ Euros in CGE, respectively. The subjects had to specify the amount of Euros (in ten Cent steps) they were willing to give to the loser in the case of two winners in the group and to each one of the two losers in the case of one winner. Note that the subjects could not specify two different amounts in the case of two losers. The amount specified had to be between 0 and the amount won in the one loser case and between 0 and the half of the amount won for the case of two losers. After filling out the form they had to put it back in the blue envelope. Once everybody had filled out the decision form the monitor collected them and put them in a box. In treatment PPM, at the top of the decision form players were informed whether they were a winner or a loser. The loser's form was empty, they just had to put it back into the envelope. The rest of the winner's form was the same like in SO-R. The proportion of forms was fixed in each session to 2/3 winners and 1/3 losers.

d The active subjects were then asked to open the green envelope. Inside the green envelope they found another form in which they had to specify their expectations about the average amount of gift of all participants in the case of one loser or two losers. At the time they filled out the decision form they were not informed that they will be asked for their expectations, since knowing that they will have to specify their expectations could have affected their decision. The expectation forms were the same for all the treatments. Also the losers in treatment PPM had to fill out this form. The subjects got an extra Euro if one of the amounts specified was exact or differed less than 50 cents or 2 extra Euros if both of the amounts were exact or differed at most 50 cents from the average amount of gift.

e The green envelopes were collected by the monitor, and the active subjects finally opened and filled out the last form, which was in the red envelope.

The last form was the IRI questionnaire. The items of the questionnaire were presented in a random order among subjects. To prevent biasing, we decided to present the subjects the questionnaire before they learned whether there are a winner or a loser and their monetary income. Indeed, this could not be prevented in the PPM treatment. The monitor then collected the red envelopes.

f Once all the red envelopes were collected, in treatment SO-R and CGE the monitor drew one envelope at a time from the box containing the blue envelopes with the decision forms. The active subjects and the experimenter could control the monitor during this phase. The monitor threw a six-sided dice once for each blue envelope. If one of the numbers $1, 2, 3$, or 4 appeared, the monitor wrote "winner" on the envelope. If one of the numbers 5 or 6 appeared, she wrote "loser" on the envelope. After this procedure the monitor put the blue envelopes back into the box and mixed them. In treatment PPM there was no need for a random draw for the assignment of winner or loser type. The box already contained 10 winner and 5 loser envelopes.

g The monitor drew again the envelopes from the box. The envelopes were randomly matched in groups of three. The experimenters opened the envelopes that corresponded to each group and calculated the payoff. Once the payoffs of all the participants were calculated the experimenters opened the green envelopes with the subjects' expectations, and checked if they were correct. In the case one or two of the expected values turned out to be correct, the subject got one or two extra Euros, respectively.

h After the calculation of the payoffs, the experimenters put the money into the payment envelopes that were marked with the code numbers. After this the experimenters left the room and the monitor distributed the envelopes with the payment to the active subjects. They checked if the amount was exact and left the room after signing a list with all code numbers and the corresponding payoffs. They signed that they had received money in cash under one of the code numbers printed above. In this way their payoff was maintained anonymous.

4 Results

4.1 Gift Behavior

In the description of the results we denote g_1 as the gift to one loser and g_2 as the gift to each one of two losers; e_1 as subjects' expectation of the average g_1 and e_2 as subjects' expectation of the average g_2. Table 2 reports the mean absolute monetary values of conditional gifts (g_1 and g_2), and the mean absolute values of the expectations (e_1 and e_2), and the corresponding values from Selten and Ockenfels (1998) (S-O) and Ockenfels and Weimann (1999) (O-W). The relative frequencies of conditional gift giving are shown in Figure 1 and 2. In Table 3 we report the mean values of gifts and expectations relative to the winner's endowment. The whole collected decision data is reported in the Appendix.

The absolute values of gifts and expectations for each one of our treatments are higher than the ones observed by S-O and much higher than in O-W. Indeed, this may be due to the differences in the winner's endowment, which is 10 Euro in our treatments SO-R and PPM and 10 DM = 5.11 Euro in S-O and O-W; this sheds a first light on the fact that the subject's decision about the size of gifts is related to the size of their endowment and therefore relative to their wealth.

Give to one loser (g_1) The mean values of g_1 are $1.39, 1.62$, and 1.53 in treatments SO-R, CGE and PPM, respectively. We cannot report any differences between the means and distributions among our three treatments. The Kruskall Wallis Test (chi-square = .417, p-value = .812) as well as pair wise Mann-Whitney-U-tests cannot reject the null hypothesis of the same mean among the three treatments. The two-tailed Kolmogorov-Smirnov goodness-of-fit tests (K-S) comparing pairs of samples cannot reject the hypothesis of same distribution for the conditional gift of g_1 (p-values equal to .799, .997, and .723, for the treatments SO-R and CGE, SO-R and PPM, and CGE and PPM, respectively). This result indicates the stability of the experimental procedure between the treatments SO-R and CGE, where the experimental procedure and the parameters for the one loser case were the same, but also indicates that the introduction of the partial play method in treatment PPM has no effect on gifts to one loser in the group.

Gift to two losers (g_2) The mean values of g_2 are $.96, 2.84$, and 1.05, in treatments SO-R, CGE and PPM, respectively. The Kruskall Wallis Test (chi-square = 9.19, p-value = .010) rejects the null hypotheses of the same mean among the three treatments, while pair wise non-parametric Mann-Whitney-U-tests, as reported in Table 4, indicate this to be true only for the comparisons

of SO-R and CGE and PPM and CGE, while it is not true for a comparison of SO-R and PPM. The two-tailed K-S test rejects the hypothesis of the same distribution between treatments SO-R and CGE, and CGE and PPM (p-values equal to .000, and .002, respectively), but cannot reject the hypothesis of the same distribution between treatments SO-R and PPM (p-value = 1).

The higher endowment of the winner in the case of two losers yields significant differences in gift behavior. However, if we consider the conditional gifts as proportion of the winner's own endowment, we get no significant difference among the three means and distributions of gifts. [2] Therefore, the subjects seem to determine their gifts relative to their endowment. Moreover, compared to the results (conditional gifts relative on winner's own endowment) of S-O and O-W, our results from the East German town Jena seem to be close to the values of O-W from Magdeburg, East Germany, but lower than the data of S-O from Bonn, West Germany.

4.2 Behavioral Types in Individual Data

Table 5 reports the relative percentage of types of behavior, resulting from a decomposition of conditional gift giving, for our treatments as well as for the original S-O solidarity game. Note, that for our treatment CGE we report the type classification based on absolute gifts and on relative gifts. We use the same definitions as Selten and Ockenfels (1998), but extend them with new characteristics of behavior we have observed. Thus, we define eight types of behavior:

Egoistical: Subjects in this category chose $g_1 = g_2 = 0$.

$g_1 > 2g_2$: One subject's behavior of $g_1 > 2g_2$ could not be classified as fixed total sacrifice up to rounding as described below. Thus we had to create this category.

Exact fixed total sacrifice: Gift behavior with the pattern $g1 = 2g2 > 0$, i.e. the same amount was given to one loser or to two losers together, was classified in this category.

Fixed total sacrifice up to rounding: According to Selten and Ockenfels (1998), we consider rounding of amounts to an integer multiple of the prominence level of 1.00. Cases in this category fulfill $g_1 > 2g_2 > 0$ or $2g_2 > g_1 > 0$. However, rounding the gift in this case can only be considered in treatments SO-R and PPM, because in treatment CGE (relative) fixed total sacrifice would lead to specifying the same amount for one loser as for two losers.

[2] Kruskall-Wallis Test, chi-square = 2.69, p-value = .26; pair wise Mann-Whitney-U-tests reported in Table 4; pair wise K-S tests on distributions with p-value equal to .134, and .139, for the treatments SO-R and CGE and CGE and PPM, respectively.

Intermediate: Behavior, which could not be classified in other categories, but where $2g_2 > g_1 > g_2 > 0$ holds true, was considered as intermediate.
Exact fixed gift to losers: When people chose $g_1 = g_2$, i.e. gave the same amount to each loser independent of whether there are one or two winners in the group, they were categorized here.
Fixed gift up to rounding: In our treatment CGE a (relative) fixed gift means that $g_1 = 1/2g_2$. Thus, analogue to the fixed total sacrifice behavior we consider rounding to the prominence level of 1.00. However, only 2 subjects fall under this category.
$g_2 > g_1 = 0$: In three cases, we observed this behavior (two times $g_2 = 1$ in SO-R, one time $g_2 = 2.5$ in CGE). This behavior may be explained by taking over responsibility as the only winner while letting the other winner pay in the two winner case.

Figure 3 shows the distribution of types, where the fixed total sacrifice and the fixed gift behavior are summarized with the corresponding behavior up to rounding, respectively. In the Appendix we classify each subject according to its type of behavior described above.

If we consider absolute gifts, we have to classify 63% of the behavior in treatment CGE as giving more to each of the two losers than to one loser in the group. This is not in line with the evidence from our other sessions and from S-O and O-W, while if one considers the conditional gifts relative to winners' endowment this portion shrinks to 3% (see Figure 3, CGE abs and CGE rel). Thus, again we have evidence that gift giving is relative to the own endowment rather than based on absolute values. In the following we consider results only on a relative basis.

Throughout the experiment we observe 27% of egoistic behavior. This proportion is analogous to the result of Selten and Ockenfels (1998), who reported 21% of egoistic behavior, and significantly less than the result in Ockenfels and Weimann (1999), 47%. However, the proportion of egoistic behavior is highest in CGE and lowest in PPM.

Overall, we observe an amount of 43% of fixed total sacrifice behavior in our replication treatment SO-R compared to 52% in the original S-O game. Note, that in the latter the portion of classification in this category due to rounding is about 31%, while it is 53% in our data. If there would be no rounding, most of these data points would belong to intermediate behavior.Despite of this, we can say that in SO-R we have replicated the S-O game also in the observed types of behavior. In the PPM treatment we observe 8% less fixed total sacrifice and more intermediate behavior, but the changes are rather small.

In treatment CGE the distribution of behavior changes completely. Only 7% of our participants exhibit the exact fixed total sacrifice behavior. The proportion of intermediate behavior rises to 23%, and about 37% of the subjects give a fixed gift, i.e. the same amount to one loser as to each of the two losers. On an absolute base, this result is in line with decreasing marginal utility of money (concave utility function). Taken relatively to the winner's own endowment, it is in line with inequality aversion. However, the fixed total sacrifice effect disappears. Subjects do not first specify the amount they want to keep or the amount they want to give and then distribute it.

Table 6 reports a Chi-Square-Test for differences in distribution of behavioral types on a relative base between our three treatments and the data from S-O and O-W. We excluded the three observations from $g1 > 2g2$ and $g2 > g1 = 0$ and formed 4 groups of behavioral types: "Egoistical behavior", "Fixed Total Sacrifice" (including rounding), "Intermediate" and "Fixed Gift" (including rounding). As it can be seen, we cannot reject the null hypotheses of the same distribution of behavioral types for our treatments SO-R and PPM compared to S-O and O-W, while the S-O and O-W distributions differ. The observed distribution of behavioral types in our treatment CGE is different from the observed distributions of all other treatments and experiments.

4.3 Expectations

Table 2 and 3 summarize subjects' expectations e1 and e2 in the three treatments for absolute and relative values, respectively. The values are very close too, but slightly higher than the observed conditional gifts. Overall, 18% of the subjects estimated both expected values correctly; 25% and 24% of the subjects guessed the value of the g_1 and g_2 correctly respectively. Moreover, the Spearman rank tests (rho=.64, for the g1 and e1, one-tailed p-value $< .01$; and rho=.653, for the g_2 and e_2 proportional to winner own endowment, one-tailed p-value $< .01$) show a high and significant correlation among choices and expectations. However, as Table 7 reports, Wilcoxon Matched Pairs Signed Ranks tests show that in treatments SO-R and PPM subjects expect significantly higher gifts from others than they actually contribute themselves.

4.4 Demographic Characteristics

The results of our experiment show the absence of a gender effect (two-tailed Mann-Whitney U-tests, p-values equal to .86, and .697, for the one loser case and the two losers case, respectively). The proportion of egoistical behavior, i.e. zero gifts in both cases, is not significant between sexes. This result is different

from the finding of Selten and Ockenfels (1998), but is similar to other results in dictator games (Bolton and Katok, 1995). There is also no correlation between gifts and expectations on the one hand and age or semester of university study on the other hand.

We observe an effect, which one could call economist effect. Table 8 reports means of gifts and expectations for different fields of studies. A two-tailed Mann-Whitney-U test for the relative gifts and expectations in all treatments yields that subjects studying economics and related studies come from a different population than subjects from other fields regarding actual gifts g_1 ($p = 0.047$) and g_2 ($p = 0.012$), while the same distribution of expectations e_1 ($p = 0.220$) and e_2 ($p = 0.227$) cannot be rejected. The fact that economists behave differently has also been found out by other studies. Marwell and Ames (1981) report that economics graduate students were much more likely to free ride than any other of their groups of subjects. Frank, Gilovich and Regan (1993) conducted a prisoner's dilemma game in which they compared the defection rates of economic majors and non-majors. Their results show that economic majors are more likely to behave self-interested than others students. The defection rates are 60.4% compared to 38.8%.

We cannot say where these differences come from. They might be due to the education of the subjects which means that the subjects adopt the basic axioms of their studies. That would denote that there is learning. On the other side, the differences might be due to personal characteristics. Carter and Irons (1991) propose a hypothesis in which they argue that people with certain attitudes self select into economics. In a study they accomplished with freshmen and senior economists and non-economists, they had to reject the learning hypothesis but they could confirm the selection hypothesis. Thus, they argue, "Economists are born, not made."

4.5 Personality Characteristics

We do not find a significant correlation among the scores on the Interpersonal Reactivity Index (IRI) and the individual conditional gifts and expectations in the solidarity game (except a positive non-parametric Spearman correlation between PD and e_2 at the 5%-level with $p = 0.048$). Indeed, subjects that hand over a higher amount of their endowment to the loser(s) did not score higher in the IRI. Higher score on the IRI means a higher pro-social behavior. Table 9 shows average scores for the four components of the IRI, perspective taking, fantasy, empathic concern, and personal distress. The table shows no significant difference among the three levels of conditional gifts, low, medium,

and high. Table 10 considers the decomposition in types of behavior: egoistic behavior, fixed total sacrifice, fixed gift, and positive gift to two losers and zero gift to one loser. This table does not report any particular pattern of behavior related to any specific feature of the IRI.

5 Conclusion

We can summarize our findings in seven observations:
Observation 1: At an aggregate level our results in treatments SO-R and PPM replicate the findings of Selten and Ockenfels (1998) and Ockenfels and Weimann (1999); even if we introduced the following variations: laboratory pen and paper experiment, double blind with a monitor, no lottery, and instant payment.
Observation 2: Gift giving (helping) behavior is based on relative shares of the amount to distribute rather than on the absolute monetary value.
Observation 3: The observed values of gift giving in the Selten and Ockenfels (1998) design are not due to the strategy method, i.e. deciding without knowing if one is a winner or not.
Observation 4: At an aggregate level, the extend of gift giving measured as the share of the winners' endowment does not change if we introduce a constant group endowment in treatment CGE.
Observation 5: However, on the level of individual behavior, the type of conditional gift behavior is a function of the winner's endowment. The predominance of "fixed total sacrifice" behavior is displaced by "fixed gift" behavior in a treatment with constant group rather than constant winner endowment.
Observation 6: Expectations of gift behavior are close in mean, but significantly higher than actual decisions in pair wise comparisons.
Observation 7: There is no correlation between individual characteristics measured by the Interpersonal Reactivity Index and actual gift behavior.

Our experimental analysis confirms that the fixed total sacrifice is the most common behavior in the solidarity game when the winner's endowment remains constant over all the possible scenarios of the game (in SO-R, and PPM). As shown in Selten and Ockenfels (1998) this behavior is inconsistent with the maximization of an altruistic utility function. This theoretical and experimental result is analogous with the findings of Bolton and Zwick (1995), Bolton, Katok and Zwick (1998), and Bolton, Brandts and Ockenfels (2003). In the solidarity game the subjects choose the amount they think is "fair" to keep for them and then they assign the rest to the needy person(s). This reasoning

is independent from the number of potential recipients. As a result there is a decreasing of losers' (needy people) expected payoff as the number of losers increases. As shown from subjects' expectations about the average conditional gift, the fixed total sacrifice is correctly anticipated. The results of our treatment with constant group endowment show that the predominance of the fixed total sacrifice is replaced by the fixed gift to losers, i.e. the subjects gave the same amount to one loser or to each one of two losers. Finally, if we consider the winner's expected gains as a proportion of own endowment, we find that the subjects chose to keep the same proportion (around 80%) of their endowment in both cases (one or two winners case) and among our three experimental treatments. This result shows that the gift giving in the solidarity game is a self-centered behavior.

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Table 1: Experimental treatments and parameters (note: Ind. indicates individual, Gr. indicates group, End. means endowment, Ob means observation, exp. are expectations, SO-R is Selten-Ockenfels replication, CGE is the constant group endowment treatment and PPM stands for partial play method)

		Parameters								
Treatment	Winner	3	2	1	0	Ex-ante exp.	Sess.	Part.	Mon.	Ind. Ob
SO-R	Ind. End.	10	10	10	0	6.66	2	15	1	30
	Gr. End.	30	20	10	0	20				
CGE	Ind. End.	6.6	10	20	0	6.4	2	15	1	30
	Gr. End.	20	20	20	0	19.26				
PPM	Ind. End.	10	10	10	0	6.66	2	15	1	20
	Gr. End.	30	20	10	0	20				

Table 2: Descriptive Statistics: Average gifts and expectations in Euro (S-O and O-W results relying on a pie of 10 DM = 5.11 Euro are calculated with the official exchange rate 1 Euro = 1.95583 DM), standard deviations in brackets. Note: g_1 is the conditional gift to one loser, and g_2 is the conditional gift to each one of two losers; e_1 indicates subjects' expectation of g_1, and e_2 indicates subjects' expectation of g_2.

	N	g_1	g_2	e_1	e_2
SO-R	30	1.39	0.96	1.87	1.34
		(1.30)	(0.82)	(1.33)	(1.01)
CGE	30	1.62	2.84	1.79	2.99
		(1.40)	(2.31)	(1.04)	(1.79)
PPM Winners	20	1.53	1.05	2.09	1.38
		(1.47)	(0.86)	(1.51)	(0.92)
PPM Losers	10			2.75	1.37
				(1.21)	(0.76)
SO (West)	118	1.26	0.80	1.26	0.78
O-W (East)	58/56	0.83	0.52	0.82	0.55

Table 3: Descriptive Statistics: Average gifts and expectations in share of winner's endowment.

	N	g_1	g_2	e_1	e_2
SO-R	30	0.139	0.096	0.187	0.134
CGE	30	0.162	0.142	0.179	0.149
PPM Winners	20	0.153	0.105	0.209	0.138
PPM Losers	10			0.275	0.137
S-O (West)	118	0.246	0.156	0.247	0.153
O-W (East)	58/56	0.162	0.101	0.160	0.108

Table 4: Non-parametric statistics: 2-tailed Mann-Whitney-U tests on differences in mean between treatments CGE and SO-R, PPM and SO-R.

Exact Significance, 2-tailed	N	g_1	g_2	e_1	e_2
SO-R vs. CGE based on absolute values	30 vs. 30	n.s.	0.000	n.s.	0.000
SO-R vs. CGE based on shares of winner'own endowment	30 vs. 30	n.s.	n.s.	n.s.	n.s.
PPM winners vs. SO-R	20 vs. 30	n.s.	n.s.	n.s.	n.s.

Table 5: Relative frequencies of types of behavior. Entries for treatment 'CGE ab' and 'CGE rel' consider the absolute conditional gift and the conditional gift in proportion of the winners own endowment, respectively.

Types	Egoistical	$g_1 > 2g_2$	Fixed total sacrifice		Intermediate	Fixed gift to loser		$g_2 > g_1$
			exact	up to round.		exact	up to round.	
SO-R	0.27	0.03	0.20	0.23	0.07	0.13		0.07
CGE ab	0.30					0.07		0.63
CGE rel	0.30		0.07		0.23	0.30	0.07	0.03
PPM	0.25		0.15	0.20	0.15	0.25		
S-O	0.21		0.36	0.16	0.11	0.16		
O-W	0.47		0.26	0.09	0.05	0.14		

Table 6: Results from Chi-Square tests for differences in distribution of behavioral type groups "Egoists", "Fixed Total Sacrifice", "Intermediate" and "Fixed Gift" based on conditional gifts relative to winner's endowment between treatments SO-R, PPM and CGE and the data from S-O and O-W. Significance values in brackets. * significant on the 5%-level. ** significant on the 0.1%-level

		Expected				
	χ^2	S-O	O-W	SO-R	PPM	CGE rel
Observed	S-O	-	-	-	-	-
	O-W	22.928**	-	-	-	-
		(< 0.0001)	-	-	-	-
	SO-R	1.321	3.404	-	-	-
		(0.747)	(< 0.318)	-	-	-
	PPM	2.487	7.553	3.820	-	-
		(0.488)	(< 0.056)	(< 2.280)	-	-
	CGE rel	25.700**	40.317**	31.687**	8.552*	-
		(< 0.0001)	(< 0.0001)	(< 0.0001)	(0.036)	-

Table 7: Are expectations greater than donations? Results from 1-sided Wilcoxon Matched Pairs Signed Ranks Test of e_1 vs. g_1 and e_2 vs. g_2 for SO-R, CGE and PPM winners and from one-sided Mann-Whitney-U test between e_1 (e_2) of PPM losers and g_1 (g_2) of PPM winners. *significant on the 5%-level, one-tailed; **significant on the 2.5%-level, one-tailed; ***significant on the 1%-level, one-tailed

	N	e_1 vs. g_1	e_2 vs. g_2
SO-R	30	0.017**	0.036*
CGE	30	n.s.	n.s.
PPM Winners	20	0.016**	0.017**
PPM Losers	10 vs. 20	0.007**	n.s.

Table 8: Groups of fields of studies and actual decisions and expectations

Field of Study	1	2	3	4
Description	Economics and related	Pedagogies and psychology	Other human sciences	Natural Sciences
	Business Administration (25), Economics (3), Business Informatics (2), Business Education (1), Labor Law and Human Resource Management(1)	Educational Sciences (11), Psychology (5), Teacher (3), Social Work (1),	Sociology (5), Media Sciences (2), Law (6), English (3), German (8), Eastern Slavonic Studies (1), Policy (1), Cultural History (1), Philosophy (1), History (2)	Geography (1), Information Science (4), Mathematics (1) Nutrition Science (2)
N	32	20	30	8
N w/o PPM Losers	30 (36%)	18 (22%)	25 (33%)	7 (9%)
g_1	0.112	0.176	0.173	0.177
g_2	0.082	0.138	0.125	0.171
e_1	0.164	0.227	0.195	0.186
e_2	0.119	0.144	0.158	0.161

Table 9: Average scores in the perspective taking, fantasy, emphatic concern, and personal distress for low ($g1 < 0.5$), medium ($0.5 <= g1 < 2.5$), and high ($g1 >= 2.5$) conditional gift to one loser.

	LOW	MED	HIGH
N	26	30	24
IRI	55.81	55.10	55.88
PT	14.15	13.87	14.00
FS	13.19	13.90	14.46
EC	14.88	15.00	14.33
PD	13.58	12.33	13.08

Table 10: Average scores in the perspective taking, fantasy, emphatic concern, and personal distress for types of behaviors.

	Egoistical	$g_1 > 2g_2$	Fixed total sacrifice	Intermediate	Fixed gift	$g_2 > g_1 = 0$
N	22	1	23	11	20	3
PT	13.91	13.00	13.00	14.18	14.95	15.67
FS	13.32	15.00	13.57	14.73	14.50	11.67
EC	15.09	16.00	14.91	14.45	14.50	13.67
PD	13.18	13.00	13.61	10.82	12.65	16.33

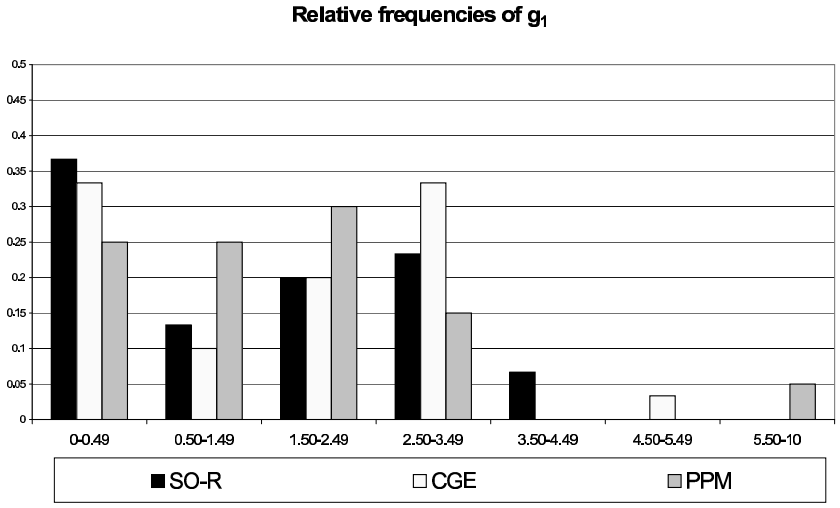

Figure 1: Relative frequencies of gifts to one loser in group (g_1)

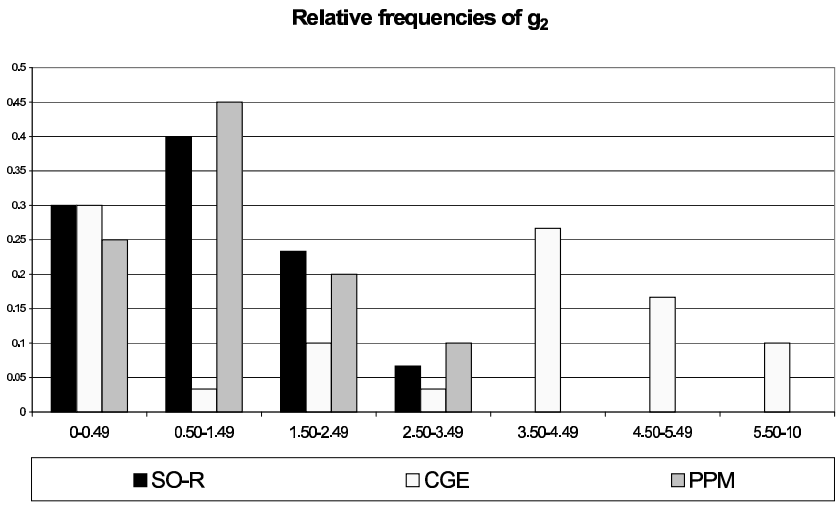

Figure 2: Relative frequencies of gifts to two losers in group (g_2)

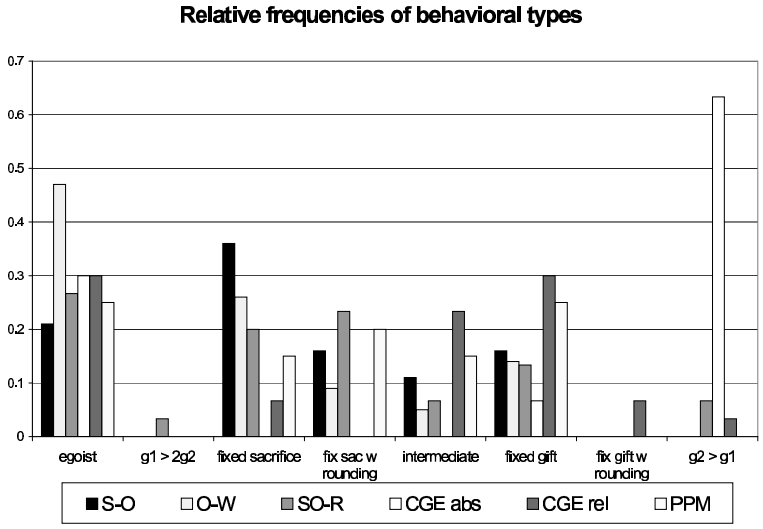

Figure 3: Relative frequencies of types of conditional gift, based on absolute and relative gifts. Note that for S-O, O-W, SO-R and PPM the categorization is indeed the same on the base of absolute and relative gifts, while this is not true for the treatment CGE.

A Instructions

Translated from German.

Welcome and thanks for participating in this experiment. Please read these instructions carefully. If you have any question, please raise your hand. We will come to your place and answer your questions. It is prohibited to communicate with the other participants during the experiment. Otherwise, we shall have to exclude you from the experiment and from all payments.
These instructions are identical for all participants. Furthermore, all forms, which have to be filled out during this Experiment, are identical for all participants.

The experiment

Each participant is a member of a randomly formed three-person-group. Each member of a group might win a certain amount of money that will be specified in the decision form. The probability to win is $\frac{2}{3}$. The probability to loose is therefore $\frac{1}{3}$. So obviously there are four possibilities:

1. the three members of a group win
2. one member wins and the other two loose
3. two members win and the other one looses
4. the three members loose

If you are a winner you will receive the amount specified in the decision form. From this amount you can voluntarily hand something over to the losers in your group. Your payoff is therefore the amount you received minus the amount you gave to the loser(s) in your group.
Your decisions are absolutely anonymous. Due to the following procedure it is guaranteed that neither the other participants nor the experimenters can assign decisions which were made to certain persons.

Procedure

1. You will be asked to draw an envelope from a box. This box contains as many envelopes as participants in this experiment. Inside each envelope you find a card with a code number that just you know. Please keep this card and show it to no other participant or to one of the experimenters except to the monitor mentioned under point 8 in this procedure.
   One of these cards is marked with the word "monitor". This "monitor" will guarantee that this experiment will be conducted as it is written here. The monitor himself will not participate in this experiment.
   If you are not the monitor, you find three further envelopes. (blue, red, green) Please do not open these envelopes before we ask you to do so. We will tell you when to open each particular envelope respectively.

2. Then everybody except the monitor has to open the blue envelope. In this envelope you will find a decision form, which is marked with your code number on the backside. Please fill out this decision form completely. After you have filled out this form please put it back into the envelope and close the envelope. Once everybody has filled out the decision form, the monitor will collect them all with a box.

3. Then every participant (except the monitor) will open the green envelope when we ask them to do. Inside you will find another form with your code number on the backside. Please fill in this form completely, put it back into the envelope and close the envelope. Once everybody has filled out the form, the monitor will collect the green envelopes.

4. After this we will ask you to open the red envelope. Inside you will find a third and last form. Please fill out this form completely as well and put it back into the envelope. Once everybody has filled out the form, the monitor will collect the red envelopes.

5. The monitor will draw one envelope at a time from the box containing the blue envelopes with the decision forms. She / he will throw a normal six-sided dice once for each decision form. If one of the numbers 1, 2, 3, or 4 appears, the monitor will write "winner" on the envelope. If the one of the numbers 5 or 6 appears he or she will write "loser" on the envelope. After this all envelopes are put back into the box and are mixed again.

6. The monitor will draw again the blue envelopes from the box. The envelopes will be randomly matched in groups of three. For each group the

experimenters will open the envelopes and calculate the payoff. Please notice that the experimenters don't know and won't know the identity of the participants.

7. After the calculation of the payoffs, the experimenters will put the money into envelopes which are marked with the code numbers. After this the experimenters leave the room.

8. The monitor will now come to each of the participants. Please give her/him your code number. The monitor will give you then the according envelope. Please do not yet open the envelope.

9. When all envelopes are distributed the monitor will take the experimenters in again. When we tell you to do so, please open the envelope and check the money.

10. After this you can leave the room. At the door there will be a list with all code numbers and the according payoffs. Please sign there that you received money in cash under one of these code numbers. Due to this your payoff stays anonymous.

B Forms

Translated from German.

Decision form.

Your group consists of three participants.
In case of *three winners* in your group each of you receives ten euro.

In case of *two winners*in your group each of the two winners receives ten euro, the loser receives zero euro.
In case that you are one of the two winners in your group:
How much of your ten euro would you give to the loser in your group? (each amount between zero and ten euro is possible, in ten cent steps)
Please enter the amount here: .....

In case of *one winner* in your group, the winner receives ten euro, the both losers receive zero euro.
In case that your are the winner :
How much of your ten euro would you give to each of the two losers in your group?(each amount between zero and ten euro is possible, in ten cent steps)
Please enter the amount here: .....

In case of *no winner* in your group each of you receives zero euro.

Please put this decision form back into the blue envelope and close it.

Expectations form.

In the previous form you could say how much you would give to the loser(s) in your group in case that you are a winner.. How much do you think do the other participants give *on average to each loser in the group*?

in case of *one* loser in the group:.....
in case of *two* losers in the group:.....

Please notice, you get one extra euro if one of the amounts is exact or differs at most 50 cent, or two euro extra if both of the amounts are exact or differ at most 50 cent each.

Please put this form back into the envelope.

3rd form: Interpersonal Reactivity Index Questionnaire

1. I daydream and fantasize, with some regularity, about things that might happen to me. (FS)
2. I often have tender, concerned feelings for people less fortunate than me. (EC)
3. I sometimes find it difficult to see things from the "other guy's" point of view. (PT-)
4. Sometimes I don't feel very sorry for other people when they are having problems. (EC-)
5. I really get involved with the feelings of the characters in a novel. (FS)
6. In emergency situations, I feel apprehensive and ill-at-ease. (PD)
7. I am usually objective when I watch a movie or a play, and I don't often get completely caught up in it. (FS-)
8. I try to look at everybody's side of a disagreement before I make a decision. (PT)
9. When I see someone being taken advantage of, I feel kind of protective towards them (EC)
10. I sometimes feel helpless when I am in the middle of a very emotional situation. (PD)
11. I sometimes try to understand my friends better by imagining how things look from their perspective. (PT)
12. Being extremely involved in a book or movie is somewhat rare for me. (FS-)
13. When I see someone get hurt, I tend to remain calm. (PD-)
14. Other people's misfortunes do not usually disturb me a great deal. (EC-)
15. If I'm sure I'm right about something, I don't waste much time listening to other people's arguments. (PT-)
16. After seeing a play or a movie, I have felt as though I were one of the characters. (FS)

17. Being in a tense emotional situation scares me. (PD)

18. When I see someone being treated unfairly, I sometimes don't feel very much pity for them. (EC-)

19. I an usually pretty effective in dealing with emergencies. (PD-)

20. I am often quite touched by things that I see happen. (EC)

21. I believe that there are two sides to every question and I try to look at them both. (PT)

22. I would describe myself as a pretty soft-hearted person. (EC)

23. When I watch a good movie, I can very easily put myself in the place of a leading character. (FS)

24. I tend to lose control during emergencies. (PD)

25. When I'm upset at someone, I usually try to "put myself in his shoes" foe a while. (PT)

26. When I'm reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me. (FS)

27. When I see someone who badly needs help in an emergency, I go to pieces. (PD)

28. Before criticizing somebody, I try to imagine how I would feel if I were in their place. (PT)