Fairness versus Efficiency

– An Experimental Study of (Mutual) Gift Giving –

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Abstract

Fairness is a strong concern as shown by dictator and ultimatum experiments. Efficiency, measured by the sum of individual payoffs, is a potentially competing concern in games such as the prisoners' dilemma. In our experiment participants can increase efficiency by gift giving. In the one-sided treatment this is only possible for one of the two partners. The two-sided treatment allows for mutual gift giving. In both cases decisions can be conditioned on whether there is or there is not an efficiency gain by gift giving. Our results indicate that efficiency concerns are dominated by fairness concerns that are less stringent in mutual exchanges than in one-sided gift-relationships.

Keywords: Fairness; Efficiency; Reciprocity; Experimental Economics

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1. Introduction

In dictator experiments two parties, the dictator X and the recipient Y, can share a monetary pie p of fixed size. The task of the dictator is to choose x with $0 \le x \le p$, and thereby allocating monetary payoffs $p - x$ to himself and x to the recipient.[1] The dictator can, in principle, consider two dimensions of value, his own payoff $p - x$ and the fairness of the payoff vector ($p - x$, x). Depending on the size of x the two considerations will be either in harmony or conflict. If the dictator X cares for fairness, then every choice of x from the interval (p/2, p] is strictly dominated along both the personal gain and the fairness dimension by $x = p/2$. Over the range (0, p/2), on the other hand, any change in x either increases X's personal gain at the expense of rendering the distribution less egalitarian, or the fairness of the distribution is increased at the expense of a decreasing payoff for X.[2]

While in dictator experiments any final allocation is efficient, dictator dilemma experiments, as introduced by Ockenfels (1999), create a sharp trade-off between fairness

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[1] Bolton, Katok and Zwick (1998) and Andreoni and Miller (forthcoming) study various experimental dictator games and review earlier dictator game studies in experimental economics. Related experiments were performed by social psychologists who first let participants work and then allocate their common reward p knowing X's contribution to p; see, for instance, Shapiro (1975), and, for a more recent study with entitlements by experimental economists, Hoffman and Spitzer (1985).

[2] The theory of cognitive dissonance (Festinger 1964) suggests that participants might tend to avoid conflict through prioritizing either fairness, choosing $x = p/2$, or personal gain, choosing $x = 0$. In such cases the focus would be completely on one while leaving out of account the other concern completely. While this happens quite frequently, many other individuals are compromising in the sense of choosing an x from the range $0 < x < p/2$ where fairness and self-interest conflict.

and efficiency. More specifically, in dictator dilemma games recipient Y receives more than what X gives. Let e (> 0) denote X's monetary endowment. The choice x with $0 \leq x \leq e$ allocates the monetary payoff $e - x$ to X and the payoff mx, $m > 1$, to Y.[3] The larger x the larger the payoff sum $e + (m - 1)x$. Therefore, if people are motivated by efficiency concerns, choices of x in the range $x > e/(m + 1)$, that are dominated by fairness concerns, are possible in the dictator dilemma. Since dictator dilemma games do not create incentives for strategically motivated other-regarding behavior, they are an appropriate tool of measuring the relative impact of fairness and efficiency considerations.

The experiments whose result we describe and discuss subsequently combine aspects of the dictator and the dictator dilemma game. Like in the dictator game the player who has to make an actual decision can unilaterally allocate monetary amounts to himself and a recipient. What X gives to Y is either doubled, i.e., $m = 2$, or just passed on, i.e., $m = 1$. Doubling occurs with probability 5/6 while the monetary amount is passed on with complementary probability of 1/6. By allowing an X-participant to condition his gift on whether the gift is doubled (the gift x_2) or not (the gift x_1), we learn for every X-participant how he would behave in a dictator experiment and in a dictator dilemma experiment. Therefore, beyond Ockenfels (1999), "within"-subject comparisons are possible.[4]

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[3] For $m = 1$ we have the dictator game.

[4] One could argue that contrary to what rationality implies, X-participants will consider the overall stochastic choice problem. Since our data are in line with the results of Ockenfels (1999), this argument seems lacking importance.

Two different treatments were used, both relying on the game sketched here. In the *one-sided treatment* there are players in the dictator role and others who are serving as recipients only. None serves in both roles. The *two-sided treatment* introduces symmetry in the sense that not only *X* chooses x_1 for $m_x = 1$ and x_2 for $m_x = 2$, but that also *Y* simultaneously makes corresponding decisions y_1 for $m_y = 1$ and y_2 for $m_y = 2$. Depending on the chance moves and their decisions x_1 and x_2 on the one, and y_1 and y_2 on the other hand, *X* respectively *Y* earn:

$$e - x_1 + y_1;\ e - y_1 + x_1 \quad \text{for} \quad m_x = m_y = 1$$

$$e - x_2 + y_1;\ e - y_1 + 2x_2 \quad \text{for} \quad m_x = 2, m_y = 1$$

$$e - x_1 + 2y_2;\ e - y_2 + x_1 \quad \text{for} \quad m_x = 1, m_y = 2$$

$$e - x_2 + 2y_2;\ e - y_2 + 2x_2 \quad \text{for} \quad m_x = m_y = 2$$

Contrary to the one-sided treatment, in the two-sided treatment gift giving can be supported by the hope that the partner will donate as well. Such expectations of reciprocity may lead to larger gifts, mainly in case of $m = 2$ but also when $m = 1$. In particular, efficiency would require $x_2 = y_2 = e$. However, donating the full endowment requires trust in the other's willingness to act likewise if fairness is the critical consideration. The experiments provide some insights in what may happen in such situations.

2. Experimental Procedure

The experiments have been performed at Humboldt University in Berlin. Participants were recruited from an undergraduate course in microeconomics. 24 participants played the two-sided treatment (since both partners decide independently, this provides 24 independent observations). In the one-sided treatment we also had 24 pairs yielding 24 independent observations for dictators X and 24 observations for recipients Y (who were asked for hypothetical choices: "What would you give if you were X instead of Y?").

Participants were urged to carefully read the instructions (the instructions are available from the authors upon request). Then they received their decision forms with two control questions, checking whether the rules were understood, and asking for the (actual and hypothetical) decisions. The final question elicits in an elementary way expectations about gift giving by others.

In the one-sided treatment three participants, one dictator and two recipients, did not answer both control questions correctly (see individual data file in the Appendix). In the more complex two-sided treatment also three participants (# 3, 11, and 17) failed to understand the experiment fully. Leaving these participants in our data file would not have questioned our principal effects. In our analysis, however, we rely exclusively on the choices of subjects who answered the control questions correctly.

An experimental session lasted about 30 minutes. The initial endowment was always e = DM 10. We allowed for non-integer choices x_1 and x_2. The data file in the Appendix lists all 72 observations (including the six that are left out in the analysis since they came from participants who did not answer the control question correctly).

3. One-sided gift giving

The actual rounded x_1 and x_2-choices by dictators in the one-sided treatment are graphically illustrated in Figure 1a, the corresponding hypothetical choices by recipients are illustrated in Figure 1b. Table 1 additionally provides summary statistics like the average relative gifts $x_1^r = x_1/10$, $x_2^r = x_2/10$, and $x^r = (x_1 + x_2)/20$, and their respective standard deviations (first rows). Participants' responses to the question of what they expected as donations are represented, too, by expectation-averages and their standard deviations (second rows).

FIGURES 1A AND 1B HERE.

TABLE 1 HERE.

Without exception we have $x_1 \leq 5$ and $x_2 \leq 10/3$ so that no *X*-participant ever granted a higher payoff to her *Y*-partner than to herself.[5] This clearly confirms

Regularity 1: In the one-sided treatment fairness concerns dominate efficiency concerns in the sense that dictators never put themselves at a relative disadvantage even if that be efficiency enhancing (for *m* = 2).

[5] In Ockenfels (1999), 26 out of 30 dictators in the dictator dilemma make sure that they do not receive less than the recipient. There too, nobody chose the total payoff maximizing gift.

In view of Regularity 1, one can speak of a one-sided fairness constraint in the sense of $x \leq e/(m+1)$ which makes sure that *X*-dictators never get less than their *Y*-partner. This, of course, does not exclude payoff vectors yielding less to *Y*-partners, i.e., allocations brought about by a choice $x < e/(m+1)$. Actually, since the average x_1^r is 27.3% and the average $2x_2^r$ is 34%, the *Y*-partners earn approximately 38% of what dictators get in case of $m = 1$, and only slightly more, 41%, in case of $m = 2$. As revealed by Table 1 this coincides pretty well with expectations. Since the average expectations of *X*-participants differ from average behavior only by 0.3% for x_1 and x_2, respectively, we can note

Regularity 2: Actual choices and expected choices of dictators *X* are nearly identical.

Regularity 2 is based on averages and therefore would not in principle exclude the possibility that generous *X*-participants expect meager gifts and vice versa. This possibility is, however, ruled out by the strong positive correlation between x_1, respectively x_2-choices and their corresponding expectations for others (the highly significant Spearman rank correlation coefficients are 0.633 for x_1 and 0.753 for x_2).[6] This justifies

Regularity 3: Generous donors expect generosity to prevail in general.

[6] Such correlation can be attributed to the so-called 'false consensus effect' (Ross et al., 1977; see also Selten and Ockenfels, 1998, who observe a similar effect in the context of their solidarity game) or to reciprocity considerations (one wants to match (expected) generosity by others).

Table 1 also includes hypothetical choices of recipients *Y* who were asked to imagine that they were in fact acting in the dictator role. It is remarkable that *Y*-participants in their imagined decision chose on average lower x_1- and x_2-values. Since *Y*-choices are purely hypothetical, it would have been cheap (talk) to display generosity. Yet the differences between the distributions of actual and hypothetical choices are insignificant (two-sided Mann-Whitney *U*-test, p = 0.127 and 0.186 for x_1 and x_2, respectively). However, *Y*-participants expect significantly lower x_1- and x_2- gifts by others (p = 0.003 and 0.061 for x_1 and x_2, respectively) than *X*-participants. Expectations distinguish *X*- and *Y*-participants according to

Regularity 4: While hypothetical gifts are only slightly smaller than payoff-relevant gifts, recipients are substantially less optimistic about gift giving by others than dictators.

Intra-personal comparisons reveal that many participants (52% *X*-participants and 41% *Y*-participants) chose their gifts (x_1, x_2) such that the recipient receives the same positive payoff independent of *m*, i.e., $x_1 = 2x_2 > 0$. For these subjects we have $0 < x_2 < x_1$, implying that gifts are *lower* if they positively affect efficiency. Moreover, there was no *X*- and only one *Y*-participant who gave more when efficiency considerations dictate so, i.e., only one out of 55 subjects chose (x_1, x_2) such that $x_2 > x_1 \geq 0$.

4. Mutual gift giving

Figure 2 graphically illustrates the (rounded) x_1- and x_2-choices observed in the two-sided treatment. Due to the symmetry of mutual gift giving all participants encounter the same decision problem. To distinguish from the asymmetric roles of *X* and *Y* in the one-sided treatment we refer to these participants as *Z*-players.

Comparing Figure 2 with Figures 1a and 1b the distributions are much more spread out:[7] Neither $x_1 > 5$ nor $x_2 > 10/3$ are excluded.

FIGURE 2 HERE

Table 2 shows that, compared to unilateral dictators, mutual gift givers choose slightly (but not significantly) lower x_1-gifts but significantly larger x_2-gifts (two-sided Mann-Whitney *U*-test, $p = 0.052$). Most importantly, while in the one-sided treatment x_1^r is substantially larger than x_2^r, both among dictators and among recipients, the opposite is true in case of mutual gift giving.

TABLE 2 HERE.

[7] The standard deviations are smallest for actual dictators, intermediate for hypothetical dictators, and largest for mutual gift givers.

This justifies to state the following

Regularity 5: The possibility of receiving a donation from the recipient of one's own donation strengthens efficiency considerations for m = 2 while leaving the proclivity to donate unaffected in the absence of efficiency gains; i.e., if m = 1.

Similar to Regularities 2 and 3, average expectations concerning gift giving by others are only insignificantly below actual average choices while expectations and own choices are highly significantly correlated (the Spearman rank correlation coefficients are 0.586 for x_1 and 0.600 for x_2).

Intra-personal comparisons reveal that compared to the dictator dilemma case the pattern $x_1 = 2x_2 > 0$ is quite rarely chosen in case of mutual gift giving (14% vs. 52% for the *X*-participants in the one-sided treatment; χ^2-test, p = 0.017). At the same time, both the efficiency-guided pattern $x_2 > x_1 \geq 0$ (23% vs. 0%) and the egoistic pattern $x_1 = x_2 = 0$ (33% vs. 9%; χ^2-test, p = 0.086) range rather prominently. This indicates that mutual gift giving induces more extreme behavior than one-sided gift giving. The reasons for this may be that trust and uncertainty play a much stronger role in the case of two-sided gift giving than in case of unilateral donations. For the dictator uncertainty about the receiver is naturally absent and therefore such uncertainty cannot provide a reason or an excuse for non-generous behavior. In the shadow of uncertainty about the behavior of others in the case of mutual gift giving, however, individuals may feel that they are not acting egoistically if they do not contribute efficient amounts. What in the one-sided case would be unfair "greed" is now "protection" against exploitation (defensio in Hobbes' terminology of the *De Cive*, see also the English translation 1998).

The fact that in the one-sided treatment recipients in their imaginary role as dictators are less generous than actual dictators supports the view that the lack of generosity in the two sided treatment may be triggered by pessimistic expectations. Likewise, more optimistic expectations may induce the opposite behavior. This discussion provides some clue why we do observe

Regularity 6: The possibility of two-sided contributions facilitates the emergence of more diverse behavioral types, especially by making egoistic (or distrustful) and efficiency-minded (or trustful) behavior more prominent.

5. Conclusions

The striking feature of the one-sided gift relationship is that actual dictators never put themselves at a disadvantage, i.e., they always obey the fairness constraint. So, an increase of *m*, which measures the potential efficiency gains by gift giving, from 1 to 2 induces *lower* gifts (one-sided: $x_1^r > x_2^r$). In mutual gift giving, on the other hand, the fairness constraint becomes non-binding. All gift levels (x_1, x_2) with $0 \leq x_1, x_2 \leq 10$ can be justified as fair if the partner is expected to be either equally generous or equally egoistic. This reasonably explains the considerably larger heterogeneity of mutual gifts – that are highly correlated with the corresponding expectations about others' gifts– and that gifts increase with *m* (two-sided: $x_1^r < x_2^r$).

Overall, our results show that gift giving systematically depends on the interaction of the degree of the reciprocal relationship with the recipient (one- or two-sided) and the degree of potential efficiency gains (m = 1 or 2).[8] The level of giving is bounded from above by fairness constraints in the sense that gifts do not put gift givers at a disadvantage. Efficiency gains may further gift giving only when reciprocal fairness is expected.

[8] These findings are in line with theories of fairness such as Fehr and Schmidt (1999) and Bolton and Ockenfels (2000). However, if furthering efficiency is free of any monetary cost or very cheap, that is if m becomes large, some studies found a more important role for efficiency considerations (Charness and Rabin, 2000, Engelmann and Strobel, 2001).

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Tables

			passing on		doubling		both	
			x_1^r	$\sigma_{x_1^r}$	x_2^r	$\sigma_{x_2^r}$	$x^r = \frac{x_1 + x_2}{20}$	σ_{x^r}
one-sided	X	chosen	27.3	16.7	17.0	9.1	22.1	12.6
	$N = 23$	expected	27.0	13.9	16.7	9.8	21.8	11.5
	Y	chosen	21.6	24.8	15.9	21.7	18.8	22.8
	$N = 22$	expected	13.8	13.9	11.3	11.2	12.5	11.8
	$\varnothing$	chosen	24.4	20.7	16.4	15.4	20.4	17.7
	$N = 45$	expected	20.4	13.9	14.0	10.5	17.2	11.6

Table 1 *Averages and standard deviations of relative donations of X and Y in the one-sided treatment (in percent)*

			passing on		doubling		both	
			x_1^r	$\sigma_{x_1^r}$	x_2^r	$\sigma_{x_2^r}$	$x^r = \frac{x_1 + x_2}{20}$	σ_{x^r}
two sided	Z	chosen	23.1	26.5	33.0	36.0	28.0	28.2
	$N = 21$	expected	17.9	16.5	25.7	28.4	21.8	18.8

Table 2: *Averages and standard deviations of relative donations of Z in the two-sided treatment (in percent)*

Figures

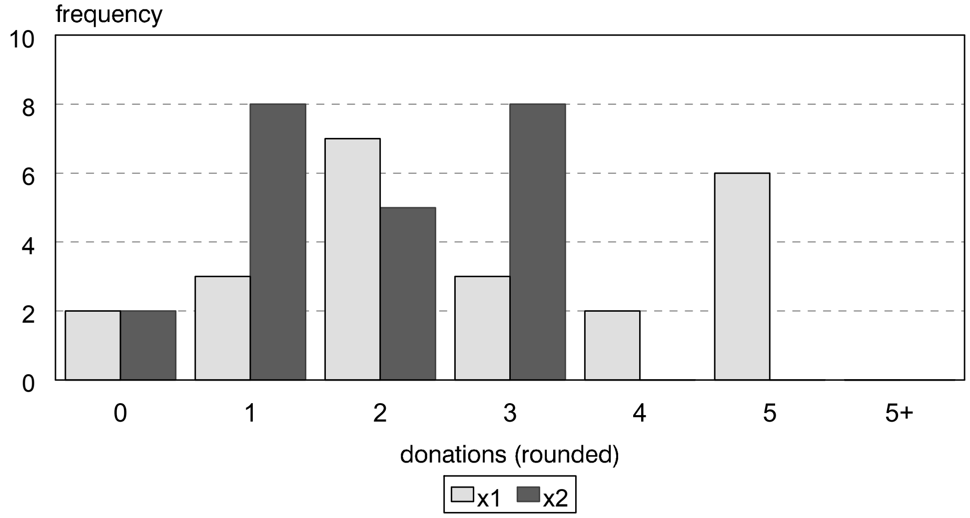

Figure 1a: *Distribution of the donations of X in the one-sided treatment*

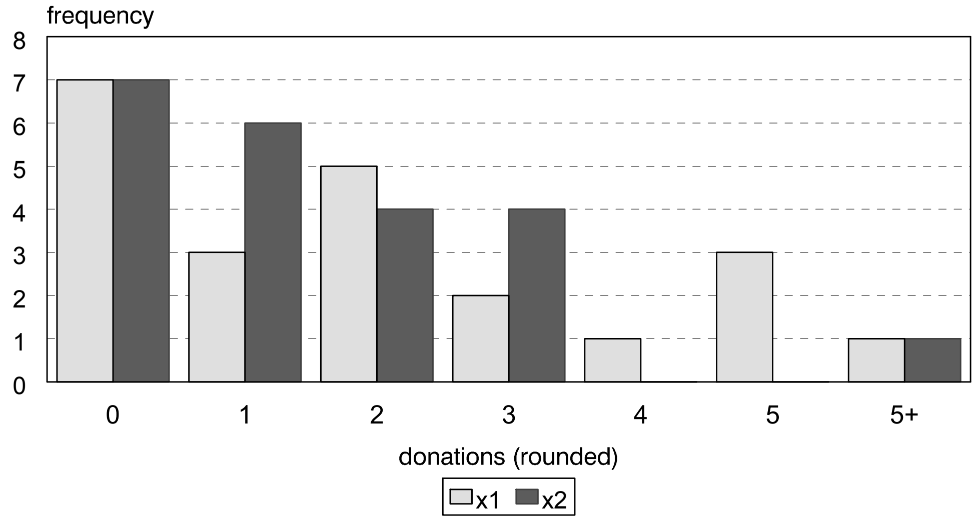

Figure 1b: *Distribution of the hypothetical donations of Y in the one sided treatment*

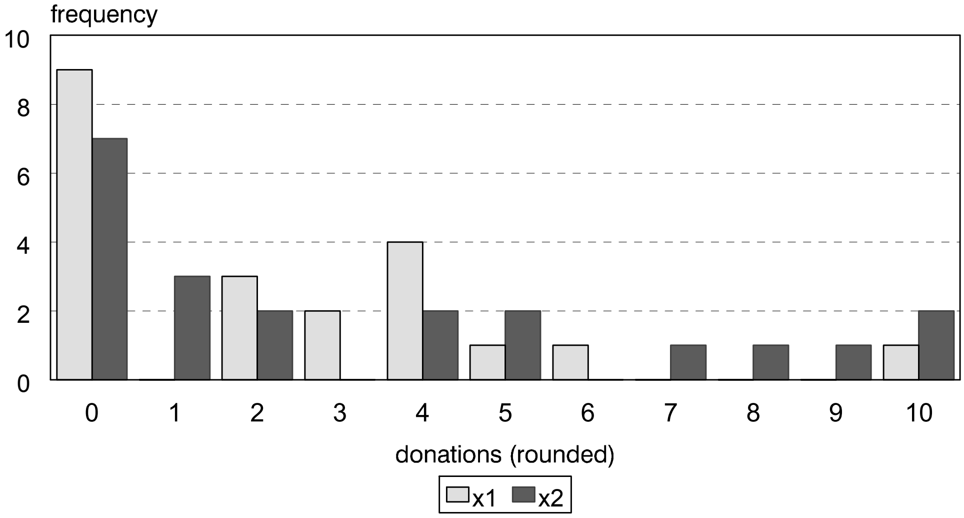

Figure 2: *Distribution of the donations in the two-sided treatment*

Appendix

The following list presents first 24 independent observations for the two-sided treatment, then the 24 choices of the *X*-participants, and finally the 24 choices of the *Y*-participants in the one-sided treatment. After the participant number, a "1" in the second column indicates that both control questions were answered correctly; "0" signals at least one mistake. The third column gives the choice vectors (x_1, x_2), i.e. the gift x_1 in case of m = 1 and x_2 for m = 2, where the last 24 choice vectors (numbers 49 to 72) are, of course, purely hypothetical. The final column lists the expectations concerning the average gift giving by others, both for m = 1 and m = 2.

Player #	control questions (1 = correct)	Decisions		Expectations	
		x_1	x_2	x_1	x_2
Mutual gift givings					
1	1	0,00	10,00	0,00	10,00
2	1	5,00	5,00	2,00	2,00
3	0	2,50	2,00	1,50	1,80
4	1	2,00	1,00	2,00	1,00
5	1	3,00	5,00	2,00	4,00
6	1	2,50	1,25	5,00	2,50
7	1	4,00	2,00	3,00	1,50
8	1	2,00	7,00	1,00	5,00
9	1	0,00	0,00	1,00	1,00
10	1	0,00	0,00	0,00	0,00
11	0	10,00	5,00	0,00	0,00
12	1	10,00	10,00	0,00	0,00
13	1	4,00	4,00	4,00	4,00
14	1	0,00	0,00	2,00	1,00
15	1	0,00	0,00	0,00	2,00
16	1	2,00	2,00	1,00	1,00
17	0	5,00	3,00	5,00	1,00
18	1	6,00	4,00	3,00	2,00
19	1	4,00	8,00	4,00	4,00
20	1	4,00	9,00	5,00	10,00
21	1	0,00	1,00	0,00	0,00
22	1	0,00	0,00	0,50	1,00

23	1	0,00	0,00	1,00	1,00
24	1	0,00	0,00	1,00	1,00
Dictator givings					
25	1	3,75	2,50	3,50	2,50
26	1	5,00	3,00	4,00	3,00
27	1	2,50	1,50	1,50	0,50
28	1	2,00	2,00	2,00	1,00
29	1	2,50	2,50	4,00	4,00
30	1	2,00	2,00	4,00	3,00
31	1	5,00	2,50	4,00	2,00
32	1	4,00	3,00	3,00	2,00
33	1	1,00	1,00	2,00	1,00
34	1	2,00	1,00	4,00	2,00
35	1	2,00	1,00	4,00	2,00
36	1	5,00	2,50	5,00	2,50
37	0	10,00	5,00	10,00	5,00
38	1	2,00	1,00	2,00	1,00
39	1	1,00	1,00	1,00	1,00
40	1	3,00	2,00	4,00	2,00
41	1	0,00	0,00	0,00	0,00
42	1	0,00	0,00	0,00	0,00
43	1	2,00	1,00	2,00	1,00
44	1	5,00	2,50	3,00	2,00
45	1	5,00	3,00	3,00	2,00
46	1	1,00	1,00	2,00	1,00
47	1	2,00	1,00	1,00	1,00
48	1	5,00	2,00	3,00	2,00
Recipients' hypothetical givings					
49	1	3,00	2,00	2,00	1,00
50	1	0,00	0,00	1,00	1,00
51	1	1,00	1,00	1,00	1,00
52	1	5,00	3,00	1,00	1,00
53	1	0,00	0,00	0,00	0,00
54	1	0,00	0,00	0,00	0,00
55	1	10,00	10,00	0,25	0,25
56	1	4,00	2,00	4,00	2,00
57	1	2,00	1,00	2,00	1,00
58	1	2,00	1,00	2,00	1,00
59	1	2,00	1,00	2,00	2,00
60	1	3,00	3,00	3,00	3,00
61	1	2,00	2,00	2,00	2,00
62	1	5,00	2,50	0,00	0,00
63	1	0,00	0,00	5,00	2,50
64	1	0,00	0,00	0,00	0,00
65	1	0,00	0,00	0,00	0,00
66	1	2,00	1,00	0,00	0,00
67	1	1,00	2,00	2,00	4,00
68	1	5,00	3,00	0,00	0,00
69	0	5,00	5,00	2,00	2,00

70	0	3,00	1,50	3,00	1,50
71	1	0,00	0,00	2,00	1,00
72	1	0,50	0,50	1,00	2,00