Individual versus group behavior and the role of the decision making procedure in gift-exchange experiments*

Martin G. Kocher[†,#] and Matthias Sutter[†]

[†] University of Innsbruck
[#] Max-Planck-Institute for Research into Economic Systems, Jena

Abstract: We test for behavioral differences between groups and individuals in gift-exchange experiments. Related studies establish group behavior as typically closer to the game-theoretic equilibrium. We show that this result may depend crucially on the decision making procedure within groups. A novel decision making protocol opens up the black box of group decision making and allows to track important features of the group interaction process. We are able to show that the mere fact of being a group member shifts initial individual choices towards the game-theoretic equilibrium.

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1. Introduction

Several studies have established behavioral differences between individuals and small groups in experimental assessments. Unfortunately, the results are not clear-cut and sometimes even contradictory. Given this state of research, it has been forcefully argued repeatedly (among the first is Bornstein and Yaniv, 1998) that group decision making deserves more attention in economics, because many economically relevant decisions are in fact taken by small unitary groups[1] rather than by individuals.

Reading the literature however, there seems to emerge a bottom line of experimental results concerning decisions taken by unitary groups, but single experiments do not comply with it. The majority of the hitherto conducted studies find that groups behave more in line with game-theoretic predictions than individuals (e.g., Bone et al., 1999; Bornstein and Yaniv, 1998; Bornstein et al., 2002; Cox, 2002; Rockenbach et al., 2001). Contrary to that Cason and Mui (1997), Cox and Hayne (1998) and, to a certain extent, Kocher and Sutter (2002) cannot provide results that support the hypothesis of higher rationality of groups.[2]

There are several explanations for these inconclusive results: First, the number of studies on differences between individuals and groups is still small compared to the experimental evidence that exists for individual decision makers. Second, we still know very little empirically about the decision making process within groups. Third, economic experiments differ with regard to their nature. Assuming that there is a difference in decision-making between groups and individuals, the nature of the task may influence the two types of decision makers differently.[3]

This paper attempts to address the subject in a way that enables us to take into account these arguments. Moreover, we are able to propose an explanation for the

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[1] With unitary groups we denote groups that face no internal conflict in terms of payoff. By group decision we mean a single decision on which all group members have agreed upon, finally.

[2] When we speak of rationality and more rational behavior we implicitly include the assumption of selfishness, henceforth, as it is also the case for standard traditional game-theory. Reference points from standard game-theory just serve as a benchmark for behavior.

[3] See Kocher and Sutter (2002) for an overview of psychological taxonomies of tasks, which are relevant for group experiments.

inconclusive results so far by referring to group member motives and the group interaction process in decision making situations.

As our vehicle of research, we employ a simple, one-shot gift-exchange game that gives the opportunity to relate our results to prior findings with other bargaining games. A common feature of gift-exchange games is that party A can determine a 'transfer' for party B, and party B can reciprocate by choosing a certain level of effort (where a higher effort is more beneficial for party A, but has higher costs for party B). Hence, it is a bargaining game that is very much related to the trust or investment game, for which comparative results of groups and individuals exist, but it can also be interpreted as a market game.[4] It is obvious that in many gift-exchange situations groups are involved in one or in both roles. Wage negotiations, for instance, are typically conducted by negotiation teams on the employer as well as on the employee side.

An innovative feature of our experiments is the introduction of a treatment that allows to analyze the decision making process within groups in a way that has not been used hitherto and which can, to a certain extent, reveal what it is going on in the 'black box' of the group decision making process. A decent feature of our design is that we obtain strictly independent observations of decisions made by individuals alone and choices made by individuals as members of a group. This allows us to test for a possible difference between acting as a group member and acting individually.

The remainder of the paper is organized as follows. Section 2 gives a short overview of group experiments in economics and relevant results from psychology. In Section 3 we present important features of the gift-exchange game that we apply and the laboratory protocol. Section 4 is devoted to explain our research questions in greater detail, and Section 5 presents and discusses the results from the experiment. Finally, Section 6 concludes.

[4] See Section 3 for details.

2. The relevance and usefulness of group experiments

2.1 Groups and economic theory

Traditional economic theory does not properly address the influence of the type or nature of the decision maker – either being an individual or a group – on actual decisions. Of course, public choice and social choice theory deal with group decision-making, but typically from the perspective of how individual preferences can be aggregated to a group decision, which rules of decision making groups (should) apply and how these rules shape the outcome of a decision making process. Public choice theory, however, scarcely deals with the question of whether the resulting group decisions differ systematically from those of individuals and how communication and group interaction changes the choice of individuals by learning, imitation or other dynamics.

One straightforward explanation for the neglect of the influence of the type of decision maker on actual decisions in economics is the structure of economic models. For instance, if a Nash equilibrium or a maximizing choice exist, economic theory predicts the optimal strategy to be chosen, irrespective of the actual type of decision maker. If, however, decision making agents do not act according to equilibrium predictions, behavioral explanations for economic decisions gain importance (see Camerer, 2002). Thus, a growing body of literature has concentrated on the impact of different characteristics of the decision maker, among which the differences between male and female decision makers are most thoroughly studied (see Andreoni and Vesterlund, 2001; Eckel and Grossman, 1998, 2001; Sutter et al., 2002). Only very recently, the relevance of whether the decision maker is an individual or a small group has caught quite some attention in economics.

2.2 Groups and psychology

Contrary to the field of economics, the relevance of the type of decision maker has long been recognized in psychology. Results from social psychology, for instance, (see Levine and Moreland, 1998, for a survey of group research) tell us that when acting in groups, individuals may behave differently from when acting alone, and, as a consequence, group decisions may not necessarily be the simple sum (however aggregated) of individuals' decisions in case they had acted alone.

Frequently, groups perform better than individuals on (non-interactive) intellective tasks, meaning that groups are, on average, closer to the correct solution than individuals are (Hastie, 1986; Levine and Moreland, 1998). This is particularly the case for decision tasks which are highly demonstrable, because in such situations "truth wins", i.e. the group is most likely to adopt a correct solution even if advocated only by a single group member.

In case groups or individuals face repeated tasks, there is a widespread presumption that groups are better capable of processing task-specific information. According to information load theory, based on the work by Chalos and Pickard (1985), groups have higher decision consistency and are able to process high information load better than individuals in intellective tasks.

2.3 Results from experimental economics on group behavior in bilateral bargaining

In experimental economics, decision tasks are typically interactive, which means that they exhibit intellective as well as judgmental characteristics.[5] Groups, generally, consist of two or three subjects which can communicate without any restrictions and have to arrive at a common decision. In the following, we concentrate on results from bilateral bargaining games.

Bornstein and Yaniv (1998) have studied individual versus group behavior in a standard, *one-shot* ultimatum game. Their main result is that groups are more (game-theoretically) rational players than individuals by demanding more than individuals in the role of proposer and accepting relatively lower offers in the role of responder.

Cox (2002) has examined individual and group decisions in an investment game (Berg et al. 1995). He finds no significant difference between groups and individuals in amounts sent as trustors, but groups return significantly smaller amounts in the role of trustees, indicating that groups behave more in line with economic rationality in the

[5] The intellective characteristic is due to the necessity to understand the strategic nature of the game, whereas the judgmental characteristic arises from the need to think about the possible behavior of interaction partners.

latter role. Bornstein et al. (2002a) find that the type of decision maker matters in both roles of a trust game. Groups send less as trustors and return less as trustees than individuals do.[6]

Bornstein et al. (2002b) analyze individual and group behavior in simple centipede games, which can be interpreted as repeated trust games. They find that groups terminate the game at a significantly earlier stage than individuals, which indicates more rational behavior (under the assumption of maximizing own income) of groups compared to individuals.

Cason and Mui (1997), however, provide contradictory evidence. They have studied individual and group (of two subjects) behavior in dictator games, where an individual (group) dictates the allocation of c ($2c$) dollars. Their results indicate that group choices are more other-regarding (and, thus, further away from the game theoretic prediction) than individual choices, which is in contrast to the findings of group behavior in simple two-parties bargaining games.

As a preliminary summary we may conclude that individual and group decisions are different in many cases, with group decisions generally being closer to the equilibrium prediction in bargaining games. However, the results by Cason and Mui (1997) constitute a notable exception to this result. In market games, the experimental evidence is even more mixed. Whereas Cox and Hayne (1998) find that groups make less profits in auctions than individuals do (which might have been caused by phenomena like 'groupthink' or 'group polarization'), Blinder and Morgan (2000) or Kocher and Sutter (2002) find the opposite, i.e. groups outperforming individuals with respect to payoffs.[7]

[6] A noteworthy feature of their experimental design is that they consider also mixed treatments where groups bargain with individuals and vice versa. The results of the mixed treatments show that the pairing of decision makers matters such that as trustors groups send more to individuals than to groups, whereas individuals send more to groups than to individuals.

[7] Studying behavior in a beauty-contest game, Kocher and Sutter (2002) find that individuals and groups do not differ in first round choices with respect to the depths of reasoning. As far as we know, the only empirical paper with field data on the different performance of groups and individuals is on mutual fund management. Prather and Middleton (2002) find that there is no appreciable difference between the outcomes of team-managed and individually-managed funds. Note, however, that their study had considerable difficulties in distinguishing between team- and individually-managed funds.

3. Experimental design

3.1 The game in detail

The gift-exchange game has been introduced by Fehr et al. (1993) to test the impact of fairness on market prices. We apply a version of the game, which does not refer to the market notion, but to a bilateral bargaining notion. Fehr et al. (1998a) themselves present a treatment, in which they do not use a one-sided oral auction with buyers as price makers to determine prices, but a bilateral bargaining version, where pairing is randomly predetermined. Our experimental design follows this bilateral bargaining interpretation.[8]

The structure of the bilateral bargaining exchange-game is the following. The decision maker in role A with endowment $E > 0$ determines a transfer $w \leq E$. Then, the according decision maker in role B is informed on w and has to decide on a factor $f > 0$ that causes costs $c(f)$ for the decision maker in role B (with $c'(f) > 0$). Payoffs for both types of decision maker are defined as follows:

$$\pi_A = (E - w) \bullet f \tag{1}$$

$$\pi_B = w - c(f) \tag{2}$$

A game theoretically strictly rational and selfish decision maker in role B would choose the minimal possible factor to maximize payoff. The decision maker in role A would recognize that only the minimal level of f is enforceable. If the range of f is restricted to $f > 0$, she will choose the minimal transfer level possible to maximize payoff.[9]

The resemblance of the game structure to the labor market is obvious. Indeed, if we especially refer to the bargaining notion the similarity is striking. We would then denote w as wage level determined by the employer or by the firm and f as effort level chosen by the employee after being hired. Labor contracts are assumed to be incomplete, because effort is not stipulated in the contracts, which is a common assumption in labor

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[8] Similar structures are used by Charness (2000) and Hannan et al. (2002). The basic idea is, nevertheless, the same in the bargaining as well as the market framework. Buyers have to make price offers without knowing the quality of the good they receive from those sellers who accept their price offers. In the market environment matching is accomplished by simple auction designs. In the bargaining framework matching follows from random pairing of subjects, and/or groups in our case.

market models. The gift-exchange game is therefore associated with several efficiency-wage theories that can explain why wages exceed market-clearing levels.[10]

All gift-exchange experiments we are aware of arrive at a considerable amount of reciprocity, which contradicts the assumption that individuals are selfish payoff maximizers. Contrary to the focus of previous studies, however, we are not interested in reciprocity per se, but in the differences between individuals and groups as decision makers.

3.2 Laboratory protocol

Our gift-exchange experiment has the following parameters: Decision maker A is endowed (E) with 120 experimental points and can pass over any amount $w \in [10; 100]$ in steps of 10 units to decision maker B. B can then, after being informed about the transfer from A, decide on a factor $f \in [0.1; 1]$ in steps of 0.1 units, which causes costs of $c(f)$ given in Table 1. Final payoffs are determined by $(E-w) \bullet f$ for the decision maker in role A and $w - c(f)$ for the decision maker in role B. As usual in group experiments the monetary incentives per subject are kept constant in all treatments. That means that given the same choice an individual player and a group member earned the same amount of money.

Table 1: Factor f and associated costs c(f) for decision maker in role B

f	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
c(f)	0	1	2	4	6	8	10	12	15	18

[9] If $f = 0$ were also permissible, a selfish money maximizing decision maker would be indifferent between any value of w.

[10] The resemblance to the labor market has already been mentioned by Fehr et al. (1993), where however the less intuitive market frame was employed. In Fehr et al. (1998a) the bargaining notion is introduced and the labor market analogies are highlighted.

We designed three different treatments, of which the first two bear the usual characteristics of experiments addressing differences between individual and group decision making. The third treatment introduces a novel procedure to study the decision making process within groups in greater detail.

1. **Treatment I**: The decision maker in role A and in role B, respectively, is an individual.
2. **Treatment FG**: Groups of three subjects each are the decision makers in both roles. Group members interact face-to-face (hence the F in the treatment abbreviation) and have enough time to discuss a common decision on *w* or *f*. Intra-group communication is not restricted in any way.
3. **Treatment CG**: Groups of three subjects act in each role. Here, the interaction between group members is restricted and computerized (hence the C in the treatment abbreviation) in the following way: Every group member in role A (B) has to make a proposal on *w* (*f*). All group members are informed about the proposals and have to vote on the implementation of each of the proposals consecutively (in random order). As soon as one proposal is unanimously accepted, this proposal is implemented as the group decision. If there is no unanimity on any of the three proposals[11], group members have to deliver new proposals (where it was pointed out clearly that it is possible to choose the same proposal as in the round before). Groups have up to ten rounds of proposals to reach a unanimous agreement.[12]

In all treatments full anonymity between decision makers in role A and in role B was ensured[13] and assignment to roles and groups was completely random. Every subject had to decide only in one role and participated only in one of the treatments. At the beginning of each session instructions were read aloud. The game instructions were neutral and phrased in terms of individual payoffs as a function of the decisions made in

[11] Group members are only informed about the sum of 'Yes'-votes for a given proposal, but they cannot link a group member's proposal to his voting behavior.

[12] In case a group did not come to a unanimous agreement in the tenth round, all group members received only the show up fee. For the paired group, a randomly chosen parameter was then applied. However, it occurred only once that a group failed to reach a unanimous vote even after 10 rounds.

[13] Note that in the FG-treatment, full anonymity even within groups was strictly enforced.

the game.[14] Participants were not instructed to maximize their earnings and no references to any strategies were made. Special emphasis was paid to mention that there is only one decision for every participant and that there will be no repetitions. Participants were told in advance that their decisions and their eventual payment would remain confidential, and were also assured that the experiment involved no deception. We spent especially much time for privately answering any questions of participants, because we think this is of particular importance in one-shot games.

Experimental sessions with treatments I and CG were run computerized using z-Tree (Fischbacher, 1999). Sessions in the FG-treatment were conducted as a paper and pen-experiment in the Aula, the largest lecture room of the Social and Economic Science Faculty of the University of Innsbruck where it is possible to separate groups such that there are about 8 meters distance between any two groups.[15] Sessions were run in July, October, November 2001 and January 2002. Participants were mostly undergraduate students of various subjects. Sessions lasted about 30 minutes (treatment I), respectively 45 minutes (treatments FG and CG).

Participants were paid privately in cash after each session. The conversion rate of experimental points into real currency had been made clear in the instructions. We paid 4 Austrian Schilling (ATS) (= 0.291 €; ≈ 0.25 US-$) for every experimental point, which means that E = 480 ATS (= 34.88 €), w can be between 40 and 400 ATS and $c(f)$ ranges from zero to 72 ATS.. In the individual sessions we paid a show-up fee of 20 ATS, in group sessions the show-up fee was increased to 80 ATS to account for the different duration. Average earnings amounted to 181 ATS (including the show-up fee), but varied quite strongly across treatments and roles.

In total, 296 subjects participated in the experiment. We have 56 participants for the I-treatment (28 observations), 144 participants for the CG-treatment (24 observations) and 96 for the FG-treatment (16 observations).

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[14] See the experimental instructions in the Appendix.

[15] We asked groups to speak with a low voice in their discussion and strictly forbid them to communicate with any other group.

4. Research questions

Our first research question concerns differences between individuals and groups as decision makers with regard to the transfer level *w* and the factor *f*. Most of the studies on bargaining games with group decision makers find that groups give less (in the ultimatum game and in the trust game), that they give back less (in the trust game) and accept lower offers (in the ultimatum game). In line with these observations groups seem to expect (correctly) other groups to behave more selfish than individuals (Bornstein et al., 2002a). Subscribing to the paradigm of methodological individualism, it is, of course, misleading to talk of the selfishness of a group. Rather we have to say that the group decision-making process induces single group members to agree on a less other-regarding behavior than they would exhibit when acting alone. However, assuming that individuals have, in principal, the same utility function and preferences when acting as group members as when acting alone, this frequently observed shift of behavior when acting in a group poses a puzzle which has, so far, not been properly accounted for in economic theory. Without modeling the group interaction process in detail, we will argue in Section 5, however, that even a very restricted group interaction gives rise to very different results of group decision making compared to individual decision making. To view the group interaction as a learning process might serve as a first approximation of what happens in a group decision making-process. In the spirit of Binmore et al. (1995) as well as Roth and Erev (1995), learning based on purely pecuniary preferences may be a promising explanation for the more game-theoretic rational behavior in groups. They argue that learning may be slow in some environment, for instance in the ultimatum game, but that it drives the results in repeated interaction towards the subgame perfect equilibrium. In our one-shot version of the gift-exchange game individuals are, of course, not able to learn, but the group discussion process may serve as a substitute for learning and, therefore, shift group choices towards the equilibrium even in an one-shot game.[16]

[16] The opportunity to simulate a beauty-contest game within a group contributes considerably to the superiority of groups over individuals in repeated beauty-contest experiments. See Kocher and Sutter (2002).

Our second research question deals with the impact of the decision making procedure on the group decision. This question can be explored by comparing decisions in the CG- and the FG-treatment. Recall that in the CG-treatment we can track the decision making process within a group by examining the proposals put forward and the voting behavior of group members. Thereby, we can address the following issues:

First, we are interested in the dynamics of the proposals and in the relationship between the approved proposal and the initial individual proposal. From a theoretic point of view one might expect two different scenarios. The first is: "game-theoretic truth wins", which means that proposals converge to the one proposal which is nearest to the game-theoretic equilibrium choice. This scenario is compatible with a hypothesis that the group interaction may serve as a learning device and that learning is able to shift choices towards the subgame perfect equilibrium. Although learning is highly restricted in treatment CG, making proposals and seeing the proposals of other group members might induce group members to think harder about the decision task. The second is: "a compromise wins", which would imply that the median proposals have the best chance to win and group interaction in this very rudimentary environment could be explained by a specific preference aggregation rule, as explored in public choice theory.

Second, we can directly compare proposals in this procedure with actual decisions of individuals and infer whether group membership plays a role per se, as social psychology has long been arguing. A robust and clear difference of choices that follows from the mere fact of being a group member or acting alone is, in our view, also highly relevant for economics, because we are not aware of any existing theory in economics that would be able to account for such a phenomenon.

Third, we are able to learn more on what kind of purpose the group interaction process fulfills for group members. One popular line of argument starts with a well-known characteristic of groups that has been proposed by Moscovici and Zavalloni (1969) as the *group polarization hypothesis* (see also Baron et al., 1992; Davis, 1992; Kerr et al., 1996; Myers and Lamm, 1976). It basically states that group discussion moves decisions to more extreme positions. Although there is some counterevidence that groups tend to moderate extreme positions (Moscovici, 1985), the group polarization hypothesis is quite well-established in the psychological research (see also Cason and Mui, 1997). In economics the group polarization hypothesis is sometimes referred to as the *risky shift*. With that expression one captures the interesting fact that group discussion may shift initial positions to even more risky positions (Stoner, 1968; Teger and Pruitt, 1967).

Cason and Mui (1997) name two dominant explanations for the risky shift and the group polarization hypothesis, respectively: *Social Comparison Theory* (SCT) and *Persuasive Argument Theory* (PAT). The bottom-line of PAT is that group discussion is able to shift choices in favor of the pre-discussion or initial tendency by a higher attentiveness towards more persuasive arguments in favor of one's initial position (Bishop and Myers, 1974; Burnstein et al., 1973). Contrary to that, SCT states that people have a tendency to appear and present themselves in a way which is deemed socially desirable. After having observed other people's behavior or choices, the own behavior is modified to appear more in line with social norms. In that case the group discussion serves as a social comparison and can lead to behavior that is more other-regarding in social terms.

The major difference between the two explanations is that according to SCT the group discussion process is essentially a process of information collection to form believes on what is socially desirable, whereas PAT emphasizes the role of convincing arguments within group discussion, regardless of social desirability.

We can test for SCT and PAT in our CG-treatment, because group members have to submit a proposal before group interaction commences. We did not want to do the same in the FG-treatment, because eliciting initial proposals before the group interaction starts would make a comparison of our FG-treatment with existing results in bargaining games more complicated and unreliable.

It seems obvious that our CG-treatment, which guarantees anonymity even within groups, should have a tendency to favor the PAT explanation. Relatively rational and selfish proposals are even reinforced by the proposal and voting mechanism. It is very likely that single group members insist strongly on a payoff maximizing strategy in face of the anonymity they are granted. Thus we hypothesize that PAT explains the data from our CG-treatment well and that final choices should be clearly nearer to the subgame perfect equilibrium than in the I-treatment.[17] Similarly one could argue that

[17] Note that the rudimentary communication in the CG-treatment, of course, is no exchange of real arguments, but proposals of group members might be viewed as arguments in the spirit of PAT.

SCT should be able to explain the results from our FG-treatment. At least, we expect the choices from the FG-treatment to be less selfish than from the CG-treatment, because the direct and free communication should elicit more socially desired behavior than the anonymous group interaction.[18]

5. Experimental results and discussion

5.1 Groups versus individuals

We start by analyzing transfers *w* and factors *f* of groups and individuals in the three treatments. Note that we henceforth report the results in terms of experimental points and not in terms of payoffs. Table 2 provides average values and standard deviations of transfers and factors for the three treatments. We also report average payoffs of decision makers in roles A or B, to which section 5.5 will refer.

The results obtained in Table 2 are rather striking. As expected, we observe more rational behavior of groups when we compare the individual treatment (I) and the computerized group treatment (CG), where group interaction is restricted to proposing parameters and voting upon them. Note that the difference in transfer levels *w* between I and CG is significant (Mann-Whitney-U-test; two-sided; $p = 0.02$), which means that groups appear to be game-theoretically more rational decision makers (when we disrespect the results for the FG-treatment for a moment). There is no significant difference in effort levels *f* between I and CG, which is a little bit surprising.

When we take into account the results of the FG-treatment, in which group members could communicate freely and had to present a single decision, explanations are not that straightforward. Remember that there is only one result in the literature on group decision making in bargaining that finds that groups are more altruistic and, therefore, less game-theoretically rational than individuals (Cason and Mui, 1997). Their findings are based on the dictator game, which actually is not a real bargaining game, because one bargaining partner has zero bargaining power, and they have two-

[18] This is only an indirect test for SCT, because we did not ask for initial individual choices before group interaction in the FG-treatment to be able to compare the results from this treatment to the existing literature.

person groups, which is an exception to the general rule of having at least three group members. Nevertheless, their result is relevant in our case. Comparing across our two group treatments, Table 2 reveals that in the FG-treatment we arrive at significantly higher transfers (U-test; two-sided; $p = 0.04$) and effort levels (U-test; two-sided; $p < 0.01$) than in the CG-treatment. It is therefore clear that the procedure or protocol of the decision making process within a group matters a lot. The FG-treatment even leads to significantly higher effort levels than in the individual I-treatment (U-test; two-sided; $p = 0.02$), but transfers are not significantly different between the I- and FG-treatments.

Table 2: Descriptive results for w, f and payoffs

	Transfer w		*Factor f*		*Payoffs*[*]		
Treatment	*mean*	*std. dev.*	*mean*	*std. dev*	*role A*	*role B*	*N*
I	45.71	20.80	0.27	0.27	73.6	172.0	28
CG	32.92	16.01	0.20	0.12	65.2	120.7	24
FG	48.13	23.16	0.43	0.30	99.5	171.3	16

I = individual treatment; CG = group treatment with communication through the computer screen by proposals and votes; FG = group treatment with face-to-face communication.
Abbreviation: std. dev. = standard deviation.
[*] payoffs exclude the show-up fee.

Note that all hitherto performed group bargaining experiments in economics we are aware of have used unitary groups with free discussion and communication. With the already noted exception of Cason and Mui (1997) they have found that groups tend to be nearer to the game-theoretic prediction. We cannot confirm this result for groups with free communication (FG). However, our results in the CG-treatment, where groups interact anonymously through the computer, are clearly in line with the majority of previous studies. How can we reconcile the different findings in our two group treatments?

We start by taking a closer look at the CG-treatment. Recall that we hypothesized that our special protocol should elicit behavior in accordance with PAT. We check for that by comparing intra-group means of initial proposals (in the first round) with actual decisions after reaching a unanimous consent. According to PAT initially low mean proposals should be reinforced and go further down, whereas initially high mean proposals within a group should lead to an even higher group decision. As benchmark to distinguish between initially high and low proposals we take the mean over all groups in the CG-treatment (*w*: 31.94; *f*: 0.26) and classify all groups according to the mean of the proposals in the first round either as below or above this threshold. We then just have to check whether the final decision of those initially below (above) is lower (higher) than the proposal in the first round. If this is the case the group complies with PAT.[19] Indeed, we find 22 cases which comply with PAT and 9 cases that do not comply with this theory.[20] A binominal test with the assumption that both cases – complying with PAT and not complying – should be equally probable confirms the impression that PAT is a good predictor of group influence on decision making of individuals in our CG-treatment (two-sided; $p = 0.03$).[21]

We still have to dwell upon the results from our FG-treatment with free communication. Of course, it is easy to conclude that, analogous to Cason and Mui (1997), the SCT offers a good explanation of what happens within the groups when they can discuss freely before coming up with a group decision, as we already hypothesized in the previous section. The challenging question is why some related experimental studies found that groups are more selfish than individuals (Bornstein and Yaniv, 1998; Bornstein et al., 2002a; Cox, 2002). In the following we offer two promising explanations for this puzzling result that both refer to the special structure of the gift-exchange game: threat power and costs of being other-regarding.

Compared to other bargaining games the initial threat power of the responder, generally definedas the possibility to be able to impose a great loss on somebody else at a relatively low cost (Fellner and Güth, 2002), is unusually high in the gift-exchange game. In the trust game, for instance, the responder is only able to exert his dictator power if the sender passes over a positive amount of money, whereas in the gift-exchange game responders can readily reciprocate low transfer levels by choosing low

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[19] We do not take the overall median instead of the mean, because more cases would have to be excluded. The general picture would however remain the same by taking the median as the benchmark to distinguish between low and high initial proposals.

[20] 16 cases cannot be assigned, either because of the fact that the within group mean of first round proposals is the same as the overall mean or there is no difference between the first round mean and the approved decision. A single group did not reach a unanimous vote within 10 rounds of proposals and consecutive votes and had to be excluded, therefore.

[21] Note that SCT is very unlikely to be confirmed in such an environment, because socially desirable behavior cannot be assigned by group members to a face or a person.

effort levels. Compared to the ultimatum game negative reciprocity is even costless in the gift-exchange game.

It is, therefore, obvious that decision makers in role A try to trigger positive reciprocity by choosing higher transfer levels w. This seems to be perfectly what is happening in the FG-treatment, and group discussion seems to strengthen this reciprocity argument. As a consequence, if the results are analyzed under efficiency considerations, the FG-treatment fares extremely well.[22]

Hence, in the special environment of the gift-exchange game the often observed difference between individuals and groups with free communication vanishes, probably because being more selfish leads to a strong decrease in payoffs. It is, however, somewhat surprising that threat power does not seem to play an important role in determining the results for groups in the CG-treatment. Perhaps groups in role A expect that the anonymous interaction of responder groups will lead to very low effort levels, more or less regardless of their wage level choices. Hence, they agree upon low and, therefore, inefficient transfer levels, which is a perfectly rational behavior given very low expected effort levels.

The second argument concerns the costs of being other-regarding in the gift-exchange game, compared to the related trust game. As is obvious from the payoff functions it is rather cheap for decision makers in role B to increase the payoff of decision makers in role A. Assuming that at least some group members raise the issue of income distribution across groups A and B (which is very likely; see Henning-Schmidt, 1999), the probability of a more other-regarding behavior of unitary groups with free communication is higher in the gift-exchange game than in the trust game. Decision makers in role A may be aware of this fact and choose higher levels of w, since they expect higher f values in return, and similar arguments as raised above in connection with threat power apply with respect to the differences between the three treatments. To corroborate this explanation one can simply calculate marginal costs of being altruistic or other-regarding. Contrary to other bargaining games, costs of being other-regarding in the role of responder are rather small in the gift-exchange game.[23]

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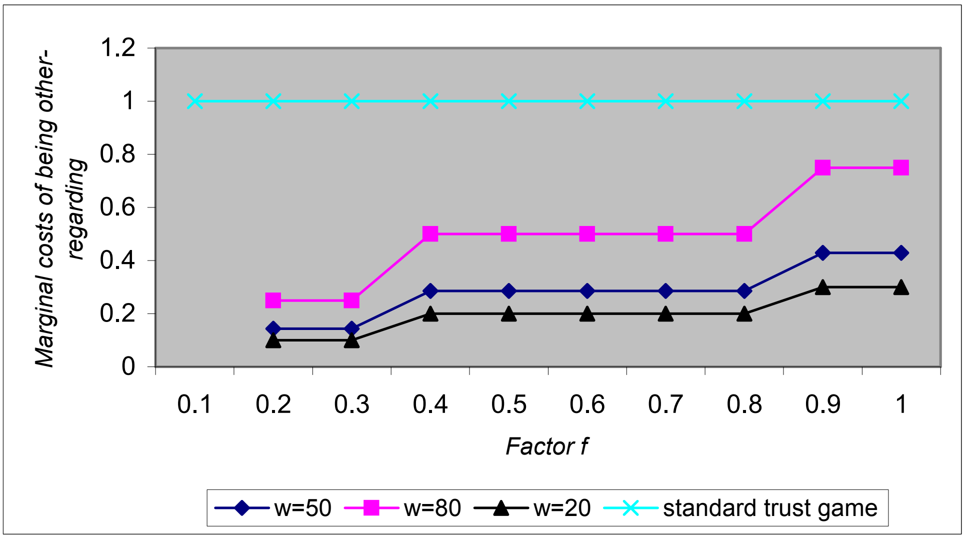
[22] See Subsection 5.5 for more information on efficiency.

[23] It seems rather likely that in our FG-treatment this feature of the gift-exchange game dominates choices, whereas it is not strong enough to raise choices with respect to w and f in the CG-treatment,

For a comparison take a standard trust game. Every unit of money a responder passes back to the sender reduces her own payoff by the same amount. Hence, marginal costs of being other-regarding equal 1. Figure 1 shows marginal costs of being other-regarding for different levels of *w* in the gift-exchange game depending on *f*. For reasons of comparison we present the marginal costs of being other-regarding in a standard trust game (in the sender role), represented by the horizontal line at 1, which is of course independent of *f* in fact. Consider, for example, *w = 50* and *f = 0.2*. Raising the payoff of the decision maker in role A by one unit results in a 0.14 unit reduction[24] in terms of B's payoff, which is significantly below the zero-sum situation in the trust game.[25]

Figure 1: Marginal costs of being other-regarding as responder



because in the anonymity of the latter social values play a rather minor role in shaping decisions. As mentioned above SCT, for instance, makes no sense in the context of anonymous encounters.

[24] This is calculated as follows: $0.14 \approx \frac{c(f=0.3)-c(f=0.2)}{(e-50)*0.3-(e-50)*0.2} = \frac{2-1}{21-14} = \frac{1}{7}$.

[25] Interestingly, the structure of the gift-exchange game with the widely used parameters we apply has it that being other-regarding has strictly decreasing marginal costs in terms of one's own payoff with decreasing levels of *w*. Thus, it becomes relatively cheaper to be other-regarding as decision-maker in role B, when the decision of the player in role A is more selfish and, hence, nearer to the game-theoretic prediction.

Note finally that several experimental studies on the impact of anonymity between decision makers in bargaining situations exist (for an overview, see Camerer, 2002), which may be analogously applied to the results of our CG-treatment. They all show that lowering anonymity and introducing communication triggers more other-regarding behavior, which is, in a sense, not very surprising. However, we are not aware of any study that touches upon the influence of anonymity among group members in unitary groups.[26] We believe that we do not stretch the argument too far if we consider these results analogously valid for the behavior of group members in our CG-treatment in the sense that socially desired behavior does not play any role there, whereas it seems to play an important role in the FG-treatment. Similarly, socially desired behavior is less likely to occur in anonymous bargaining without communication than in non-anonymous settings or by introducing communication.

5.2 Decision making process within groups (CG-treatment)

Our decision making protocol in the CG-treatment allows studying the decision making process in greater detail. It is quite amazing that the modal value of proposal rounds necessary to reach an unanimous agreement within the group is 1. The details of the distribution are given in Table 3.

Table 3: Number of rounds necessary to reach an agreement in CG-treatment

	Agreement reached in round									
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
w (absolute frequency)	9	3	3	3	1	1	0	2	0	2
f (absolute frequency)	14	3	1	2	1	2	0	0	0	1

[26] This is, of course, a rather special case, but it has the advantage of partly opening the black box of the discussion and decision making process within the group, which has been neglected so far or sometimes traced by audio- or video-taping (Henning-Schmidt, 1999). Both approaches have its advantages and its disadvantages. Our approach offers the opportunity to do straightforward quantitative analyses, which is rather difficult for audio- and video-taping.

There is no clear evidence on a relationship between the speed of agreement and the choice of parameters, neither for *w* nor for *f*.[27] The decision making process within groups has nevertheless a few notable features. Those group members that propose the lowest level of *w* in the first proposal round increase their proposal significantly until the last proposal round of the relevant group, provided there are at least two proposal rounds (Wilcoxon-signed-ranks-test; two-sided; $p < 0.01$). The reverse is true for the group members with the highest levels of *w* initially, who decrease their proposal (Wilcoxon-signed-ranks-test; two-sided; $p < 0.01$). Hence, there seems to be a tendency that a compromise among the group members is enforced. The details are given in Table 4. For instance, the mean of the transfer level of the individuals with the lowest offer in the first round is 16.11. Those individuals who have proposed these lowest offers raise their proposal until the last proposal round to 31.11. Groups that could reach an agreement in the very first proposal and voting round had to be excluded, of course, to calculate the values in Table 4.

With respect to effort levels, the dynamics are somehow different, with the lower cost alternative becoming more attractive in the group decision making process. Subjects with the lowest proposal in the first round increase their proposals slightly, but not significantly (Wilcoxon-signed-ranks-test; two-sided; $p = 0.10$). Those subjects with the highest initial proposal, however, significantly decrease their proposals until the last proposal round (Wilcoxon-signed-ranks-test; two-sided; $p < 0.01$). This asymmetry may perhaps be explained by the fact that there is a single payoff maximizing strategy for decision makers in role B, whereas the actual payoff maximizing strategy for decision makers in role A depends on their expectations concerning the extent of other-regarding behavior among participants in role B. In the light of this fact low offers of decision makers in role A in the CG-treatment are ex post empirically legitimized. Finally, note that almost all groups agree unanimously on the median proposal of the last proposal round. Only 3 out of 24 groups do not comply with that fact.

[27] Note that opportunity costs of time should not play a role for the speed of reaching an agreement, because subjects knew that they had to wait in any case until the last group reached a unanimous decision in the session before the experiment would proceed.

Table 4: Dynamics of proposals over time (CG-treatment)

transfer level proposals: lowest offer in the first round (w)	*mean*	*median*	*stand. dev.*	*N*
first round	16.11	10.00	7.78	18
last round	31.11	35.00	14.91	18
transfer level proposals: highest offer in the first round (w)				
first round	52.22	50.00	12.63	18
last round	40.56	40.00	13.92	18
effort level proposals: lowest offer in the first round (f)				
first round	0.11	0.10	0.03	10
last round	0.16	0.10	0.10	10
effort level proposals: highest offer in the first round (f)				
first round	0.50	0.40	0.25	13
last round	0.26	0.30	0.10	13

Groups that could reach an agreement in the very first proposal and voting round had to be excluded.
Abbreviation: stand. dev. = standard deviation.
N: number of observations. Note that if two offers were identical in the first round, both were classified as either lowest (in case the third proposal was higher) or highest (in case the third proposal was lower). Therefore, the number of observations may be larger than the number of groups with more than one round of proposals (with 15 such groups with respect to wages, and 10 such groups with respect to effort levels).

5.3 Proposals of group members vs. decisions of individuals

As mentioned above our design allows comparing directly between individual choices in the I-treatment and independent individual choices in the first round proposals of the CG-treatment. Contrary to the field of economics, where the type of the decision maker should not matter according to standard theories and group decisions generally are considered to be some variant of individual preference aggregation, there is a widely held belief in psychology that the mere fact of being a group member might modify individual behavior or choices (see, e.g., Cason and Mui, 1997).

Our environment is ideal to test for this hypothesis from psychological research, because observations in the I- and CG-treatments are strictly independent and comparable. Both treatments have been conducted computerized with analogous instructions. Note that the two theories, PAT and SCT, we dwelled upon in Section 4 implicitly assume that group interaction can affect choices and decision making of individuals, but not the initial judgment of individuals before interaction in the groups starts.

Table 5: Individuals acting alone or as group members

transfer level proposals/choices (w)				
	mean	*median*	*stand. dev.*	*N*
individual choices (I)	45.71	50.00	20.80	28
first round proposals (CG)	31.94	30.00	19.76	72
last round proposals (CG)*	33.33	30.00	17.44	72
transfer level proposals/choices (f)				
individual choices (I)	0.27	0.10	0.27	28
first round proposals (CG)	0.26	0.20	0.20	72
last round proposals (CG)*	0.21	0.20	0.14	72

Treatment variable in parenthesis.
Abbreviation: stand. dev. = standard deviation.
* Note that last round proposals include those proposals already unanimously agreed upon in the first round.

Table 5 gives the details of the comparison. We present summary statistics for choices in the I-treatment and for first and last round proposals in the CG-treatment. With last round we mean the proposals in the round in which a unanimous vote was adopted within a group. As can be seen from Table 5 there is large difference between means and medians for the transfer level *w* between the I- and CG-treatments and this difference is indeed highly significant, irrespective whether you take first round or last round proposals in the CG-treatment for the comparison (U-test; two-sided; $p < 0.01$ in both cases). We find no significant difference between the effort levels *f*, which might be due to the fact that effort levels are contingent on transfer levels and that the comparison of contingent values is always more difficult than for completely independent choices.

We are convinced that our results provide evidence on a subject which has long been almost neglected in economics: the influence of being member of a group on decision-making and choices. Therefore, the analysis of the conditions and patterns of this influence is a promising avenue for further research in economics. One way of interpreting our results from an economist's point of view would be the assumption that individuals behave strategically when they know that their proposals will be the starting point of a group interaction.

5.4 Reciprocity

Reciprocity per se was not at the heart of our analysis in this paper, because for a deeper analysis more data would be required. For the gift-exchange game with individuals as decision makers the evidence is comprehensive on this subject (Fehr et al 1993, 1998a, 1998b; Fehr and Falk, 1999). Nevertheless, we are of course interested in a first comparative assessment of reciprocity of individuals and groups.

Recall that a money-maximizing decision maker in role B would always choose $f = 0.1$, irrespective of w. Hence, there would be no reciprocity. Yet the low costs for reciprocity and altruism, mentioned above, should lead to a considerable extent of reciprocal behavior, given the experience from prior studies.

Figure 2 gives a visual sense of the results with regard to reciprocity, contingent on the treatment. If reciprocity exists, a higher wage level on the abscissa should be associated with higher average effort levels on the ordinate.

Interestingly, the I-treatment and the CG-treatment display a rather high level of aggregate reciprocity in Figure 2, whereas the FG-treatment shows no obvious pattern of reciprocity. Note that there are very few observations for the FG-treatment on the left-hand side of Figure 2, only one for $w = 10$ and two for $w = 20$. The visual impression may, therefore,be misleading.

Figure 2: Reciprocity in the three treatments

Fig. 2.a: I-treatment

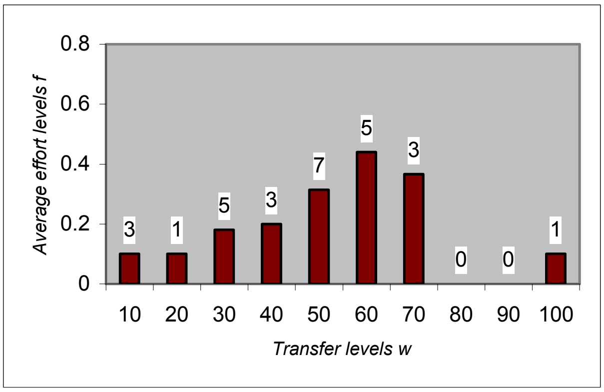


Fig. 2.b: CG-treatment

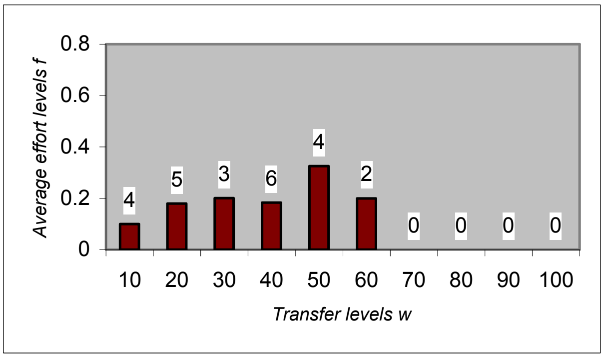


Fig. 2.c: FG-treatment

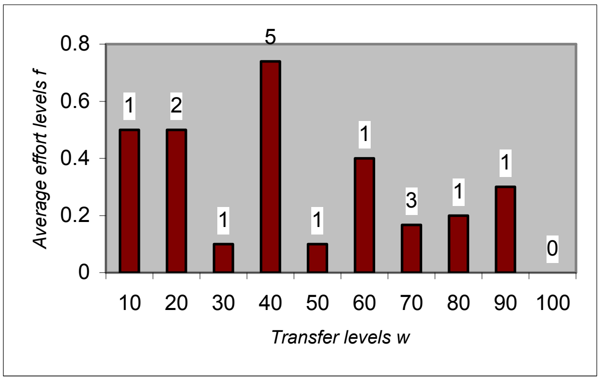


Table 6: Reciprocity of individuals and groups

Dependent variable: effort levels (censored Tobit-regression)

	Coefficients		
Constant	-0.190	*Adj. R^2*	0.11
	(0.243)	*No. of Obs.*	68
w	0.031**		
	(0.011)		
w^2	-0.3E-03*		
	(0.1E-03)		
Dummy I-treatment	-0.361**		
	(0.131)		
Dummy CG-treatment	-0.384**		
	(0.136)		

standard errors in parentheses
** significant on the 5%-level; * significant on the 10%-level.

In order to obtain a better impression we conducted a standard econometric analysis to assess the issue of reciprocity. Table 6 displays the results of a two-way censored Tobit-regression model.[28] We pool data over all three treatments and introduce two dummies to account for the treatment effects. Given the relatively small data set for this purpose, the results are convincing in the sense that they are in line with existing experimental findings. We find a highly significant and considerable level of reciprocity, indicated by the significantly positive coefficient of the transfer *w*. The dummy variables suggest that the intercept of the data from the FG-treatment is significantly above the ones from the I-treatment and from the CG-treatment, which is also apparent from Figure 2 to a certain extent. We did not account for interaction effects between the coefficients and the dummies because of the small number of observations. Note finally that the negative coefficient of w^2 means that the effort level is increasing with the wage level, but with a decreasing rate. This result, based on observations with individuals as well as groups as decision makers is also perfectly in line with prior findings for individuals as decision makers.

[28] Censoring *is necessary, because the dependent variable – the effort level – is bounded from below* ($f \geq 0.1$) and from above ($f \leq 1$).

5.5 Payoffs

It has already been mentioned that there is some evidence in the group literature that groups tend to earn more than individuals in economic tasks where the intellective component is strong (Blinder and Morgan, 2000; Kocher and Sutter, 2002). In bargaining situations a more rational and selfish behavior may, however, lead to inferior results in terms of payoffs, since there is often a trade-off between efficiency and selfish rationality. Being closest to the game theoretic equilibrium, the CG-treatment has the lowest average payoffs in both roles (see Table 2, where payoffs exclude the show-up fee). Lacking trust and low effort levels lead to earnings which are significantly *below* the earnings in the individual I-treatment in role B (U-test; two-sided; $p = 0.02$). Given the high values for w and f, group members in the FG-treatment earn significantly more than participants in the CG-treatment in both roles (U-test; two-sided; $p < 0.05$ for any role). They even earn more than individuals in role A (U-test; two-sided; $p = 0.04$), but not significantly more than individuals in role B.

6. Conclusion

By introducing two different group treatments into the standard bargaining version of the gift-exchange game we were able to address quite some interesting questions in the field of economic group research.

A major result for the usefulness of group research in economics is the fact that individuals behave and choose differently when they are acting alone compared to when acting as a member of a small group. Hence, the group interaction alone can change individual choices and decisions. Given numerous economically relevant situations, where actually groups decide, we think that it is high time to devote more interest to the inherent differences between individual and group decision making also in economics.

Our CG-treatment where anonymity among group members was granted by a special protocol that allowed group members to communicate through proposals on the computer screen only, elicited behavior that is in line with the Persuasive Argument Theory. Decisions of groups are generally more game-theoretically rational and selfish than individual decisions. Our decision making procedure is a first step with the aim to open the black box of unitary group decision making. At the cost of free communication we gained more control in the lab. The according results suggest that the approach is very useful as an alternative to audio- and videotaping experiments. Hence, we believe that it may serve as a possible starting point for future studies on unitary group decision making that concentrate not only on the differences between groups and individuals, but also on the nature and causes of these differences.

Contrary to prior studies we did not observe a difference between individuals and unitary groups in our FG-treatment where group members can communicate and discuss freely. In our experiments group members that could communicate freely behaved more in line with Social Comparison Theory. A possible explanation for that behavioral difference between groups in different experimental settings is the fact that in an anonymous environment Social Comparison Theory can hardly prevail as an explanation for behavior. The fact that prior studies on group decision making find a difference between unitary groups with free discussion and individuals in the sense that groups are closer to the game-theoretically rational equilibrium, but that we do not find such a difference in our FG-treatment, might be explained by the low costs of being other-regarding in the gift-exchange game compared to other bilateral bargaining games such as the trust game.

Another notable finding dwells upon reciprocal behavior. Our data confirm prior studies on reciprocity, but also show that there does not seem to be a major difference in reciprocity between groups and individuals.

In general, the paper shows that the issue of group decision making in economics has been neglected for too long and that our results and the results of related studies show that, first, there are some good reasons to analyze group decision making in economically relevant situations in greater detail and that, second, it is still some way to go until a coherent picture of group decision making compared to individual decision making and the underlying forces of the group decision making process may emerge.

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Appendix

Instructions for I-treatment (originally in German)[‡]

Welcome at the experiment und thank you for your participation

Please do not talk to other participants in the experiment from now on.

You are about to participate in an experimental study on decision making. You can 'earn' real money, which will be paid to you privately and confidentially in cash right after the end of the experiment. The following text will be framed neutrally with regard to gender to make it easier to read.

Show-up fee

The show-up fee is 20 ATS (Austrian Schillings). You receive this show-up fee regardless of the decisions in the experiment. It will be added to your earnings from the experiment right after the end of the experiment.

2 types of participants

You will be assigned to a type (**A or B**) randomly, and pairs of A and B will be formed randomly as well. You will not learn during the experiment nor afterwards, which participant you were paired with. Your decisions are completely **anonymous**.

Initial Endowment

Each participant of type A receives an initial endowment of **120 experimental points (EP).**

2 Phases of the experiment

The experiment consists of two phases. In Phase 1 participants A take a decision, in Phase 2 participant B takes a decision. Hence, every participant takes only **one** decision. There are no further decisions and no repetitions.

Phase 1: Participant A chooses a transfer

Participant A has to choose a **transfer w**. This transfer determines how many experimental points of the initial endowment of participant A is transferred to participant B after Phase 1. The transfer chosen by participant A must be between 10 and 100 and can only be determined in steps of 10. This means that only the values 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 are feasible.

Phase 2: Participant B chooses a factor

The participant B, which is paired with the according participant A, is informed about the transfer. Participant B now decides on a **factor f**. The factor f must come from the range **0.1 to 1.0** and can only be determined in steps of 0.1.

[‡] The instructions for the group treatments are available upon request from the authors.

The factor f is important for the payoff of participant A. It however causes also **costs c(f)** for participant B according to Table 1. The higher the chosen factor, the higher the costs for participant B.

Table 1: Factor f and costs c(f) for participant B

f	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
c(f)	0	1	2	4	6	8	10	12	15	18

Results and earnings

The result in experimental points after the two phases is the following:

For determining the result of **participant A** his or her initial endowment (120 EP), the chosen transfer w and the factor f that is chosen by participant B are relevant. To arrive at the resulting experimental points, the difference between the initial endowment and the transfer has to be multiplied by the factor. Mathematically,

Result (participant A in experimental points) = (120 – w)•f

For the result of participant B the transfer from participant A and the cost of the chosen factor f are relevant. To arrive at the resulting experimental points, one has to calculate the difference between the transfer w and the costs c(f)

Result (participant B in experimental points) = w – c(f)

The result in points will be converted to ATS (Austrian Schillings). The conversion rate is 1:4, which means

1 point = 4 Schilling

Total earnings of every participant consist of the results converted to ATS and the show-up fee.

Summary

Participant A chooses in Phase 1 a transfer between 10 and 100. Participant B will be informed about this transfer before Phase 2.

Participant B chooses in Phase 2 a factor f between 0.1 and 1.0. A factor is associated with costs c(f) according to Table 1.

The result of participant A depends on the chosen transfer and the factor that is determined by participant B. The result of participant B depends on the transfer from participant A and the costs of the chosen factor.

Means of help

At your place you find a pen and a calculator. Please do not take them with you after the experiment.