Inequality Aversion, Reciprocity and Efficiency – Experimental Studies on Other Regarding Preferences

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Contents

0 Overview

If people care about an opponent's well-being economists refer to other regarding preferences. Smith (1759) already considered that people comply to moral rules. However, research on other regarding preferences well-established has only been recent decades. Experimental economics is largely responsible for new findings on this research field. Numerous studies show that the idea of solely self-interest types needs revising. The large number of empirical findings has led to new theories. These works harmonize experimentally documented behavior and rationality in terms of utility maximization. Recent theories can be classified into outcome or intention based theories.

Outcome based models compare payoff differences across players. Important works are theories about inequality aversion by Fehr and Schmidt (1999) and Bolton and Ockenfels (2000). If someone is better (worse) off than an opponent (un)favorable inequality leads to a decrease in utility. Remorse and envy become part of utility in that way. The theory about quasi-maximin preferences introduced by Charness and Rabin (2002 henceforth C&R) is a similar model. However, envy – i.e., a decrease in the utility through unfavorable inequality – is not part of the model. In contrast to inequality aversion the utility is positively correlated with the opponent`s payoff even if the opponent is better off. Thus, efficiency consideration instead of avoiding unfavorable inequality becomes a main part of this model.

Intention based models are more complex. Besides outcome the expectations (beliefs) about the opponent's action and belief (second order belief) are part of the utility. Thus, not just the chosen action but also the alternative actions become relevant and determine an opponent's kindness. Since (un)kindness triggers (un)kindness this concept is well-suited to model reciprocity. Intention based models were introduced by Rabin (1993), C&R, Dufwenberg and Kirchsteiger (2004) and Falk and Fischbacher (2006).

These theories are often-cited but rarely applied game theoretically in experimental studies to deduce hypotheses and interpret results. However, without theoretical embedding serious interpretation of the experimentally observed behavior is difficult. Thus, these theories might help not just to document but also to understand human behavior. This is the main idea of my thesis.

A behavioral game theoretical background is the origin of all four experimental studies in the following chapters. They investigate the effects of inequality aversion, quasi-maximin preferences and reciprocity in different contexts.

Chapter 1 investigates the feasibility of efficiency gains in a principal agent relationship by voluntary leadership.[1] In a modified investment game a principal may leave the role of the investor to an agent or to take the investment decision himself/herself. The results show that voluntary leadership – i.e., if the principal take investment decision himself/herself – compared to an enforced leadership as well as to an exogenously determined sequence increases both investment and backtransfer. According to this, the voluntary leadership is a strong signal of trust that will be rewarded. Thereby, efficiency gains arise. This finding is even more interesting because it is game theoretically not predictable that ceteris paribus voluntary leadership triggers higher positive reciprocity than enforced leadership

Chapter 2 investigates negative reciprocity. If someone harms an opponent, we may expect negative reciprocity. But if a worse off player harms his/her better off opponent just to reduce an unfavorable inequality several models about other regarding preferences do not predict negative reciprocity. The study uses an experimental game of C&R. A worse off proposer may either choose an outside option that induces an outcome with unfavorable inequality or pass the decision to a better off responder. If the proposer does not choose the outside option, he can eliminate the inequality. However, not choosing the outside option reduces the payoff of the responder and he/she may punish the proposer for this. C&R document a substantial frequency of negative reciprocity. My study is a robustness test of C&R's findings in slightly modified games. In contrast to C&R's observations and in line with several theories about other regarding preferences negative reciprocity cannot be documented at all.

Chapter 3 is a principal agent game.[2] It investigates the performance and self-selection of heterogeneous agents in a group or an individual task. The principal offers linear pay con-

[1] Chapter 1 is a joint piece of work with Fabian Kleine and Manfred Königstein. This chapter was also part of the thesis "Asymmetry, Heterogeneity and Endogeneity in Principal Agent Relations" by Fabian Kleine in a similar form. However, only those parts were examinable for my thesis which were assigned to me. The examining board was notified about these parts and they were also attested by the co-authors. Furthermore, this chapter will be published in the *Journal of Economic Behavior and Organization* (forthcoming) in a similar version.

[2] Chapter 3 is a joint piece of work with Fabian Kleine, Manfred Königstein and Gabriele K. Lünser. This chapter was also part of the thesis "Asymmetry, Heterogeneity and Endogeneity in Principal Agent Relations" by Fabian Kleine in a similar form. However, only those parts were examinable for my thesis which were assigned to me. The examining board was notified about these parts and they were also attested by the co-authors.

tracts with a fixed wage and return share for both tasks. The productivity of the agents in the individual task is the same. In the group task 50% of the agents have a high productivity while 50% have a low productivity. Thus, high (low) types are more productive in the group (individual) task. However, shirking incentive compromises efficient allocation and effort level. The results show that the principal can influence both the task selection as well as an agent's performance – i.e., effort level. High productive agents more often choose group task and provide a higher level of effort. However, self-selection does not work perfectly so that the allocation is rather inefficient.

Chapter 4 investigates how the method of role uncertainty biases other regarding preferences. Role uncertainty is a way of collecting experimental data which is closely related to the strategy method. The method of role uncertainty is used in simple experimental distribution games like the dictator game and was applied by e.g., C&R and Engelmann and Strobel (2004). All participants – the proposer as well as the recipient – play the experiment in the role of the proposer. However, the participants learn their actual role only after the decision making. The method generates two times more observations and saves costs. I investigate role uncertainty in modified dictator games. The dictator has to decide between two allocations. The first allocation is in line with inequality aversion while the second allocation is in line with quasi-maximin preferences. However, the dictator's payoff is never affected by his/her choice. Under role (un)certainty most of the decisions are in line with inequality aversion (quasi-maximin preferences). The difference is significant, the method of role uncertainty biases other regarding preferences. Thus, to apply the method of role uncertainty in experimental studies is highly unadvisable.

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1 Voluntary Leadership in an Experimental Trust Game

1.1 Introduction

The trust game introduced by Berg et al. (1995) represents a basic two person conflict in which players may choose cooperative moves sequentially to achieve a mutually beneficial outcome. The first mover (trustor) chooses an investment which induces a return that accrues to the second mover (trustee). The second mover then can backtransfer money to the first mover but may also decide to keep the return for himself/herself. The first mover cannot use a court to enforce a payback of the initial investment or a part of the surplus in addition to investment. He/she may, however, trust that the second mover will reciprocate the given "gift".

Without trust there will be no surplus in this game. But if there is trust, and if higher investment leads to higher backtransfer, we refer to this as the "Trust-And-Reciprocity" mechanism.[3] Such a positive correlation between investment and backtransfer has been shown in many experimental studies including the seminal study by Berg et al. (1995). It is also documented in a recent meta-analysis by Johnson and Mislin (2011). From a pure rationalistic viewpoint this result is surprising: An egoistic and rational second mover should not backtransfer any money, and therefore the first mover should not invest in the first place. But the result is not surprising from everyday experience, which tells us that sequential gift exchange is common in social interaction. Despite this everyday experience it is interesting to study the forces that strengthen or weaken the Trust-And-Reciprocity mechanism. Camerer (2003) describes how several structural and individual factors, like e.g. stake size and nationality, influence behavior in trust games. Johnson and Mislin (2011)[4] investigate cultural differences in trust games. In addition to empirical studies theoretical models have been developed that might explain Trust-And-Reciprocity within a wider rationality framework (see e.g. the social preference models of Dufwenberg and Kirchsteiger(2004) and Falk and Fischbacher (2006)).

Our study here contributes to the research on trust games by investigating the influence of voluntary leadership. Voluntary leadership means that one of the two players can decide whether to be first mover or second mover in the trust game. In natural relationships it is quite

[3] Reciprocity in experimental labour markets is reported e.g. in Gächter and Fehr (2001).
[4] Furthermore, see the related studies on gift exchange experiments by Charness et al. (2004), Falk et al. (1999); Fehr et al. (1993), (1997) and (1998), and Gächter and Falk (2001).

usual that the sequencing of moves is not predetermined. The mere fact that one player takes the "burden of the first move" in such a situation (we call this an "endogenous trust game") could make a difference compared to a situation, where the order of moves is predetermined. In an endogenous trust game the order of moves may be open in the sense that either player may volunteer to make the first move. But one may also think of situations where one player has the right to determine the order of moves. In a hierarchical relationship, like e.g. the principal-agent relationship of a manager and a worker, it might be the principal's choice whether to make the first move himself/herself or whether to pass this to the agent. It is such a situation which we had in mind in designing our experiment.

We present a lab experiment on an endogenous trust game in which one player (the principal) may decide to leave the investment choice to the agent or to take the investment decision himself/herself. In the latter case we refer to this as "voluntary leadership". We show that voluntary leadership increases investment and increases backtransfer of the second mover compared to the alternative sequencing in which the agent is investor. We also show that investment and backtransfer is higher under voluntary leadership than in the control treatment with exogenously determined sequencing. Furthermore, we show that risk preference and inequality aversion as modelled formally by Fehr and Schmidt (1999) influence behavior in the endogenous trust game. Comparing effect sizes with standard results in trust games we find that voluntary leadership has a quite remarkable effect on behavior.

In the next section we summarize the related literature. In section 1.3 we describe our experimental game and provide a theoretical analysis. In addition to a benchmark theoretical solution based on standard preferences we analyze the game assuming inequality aversion and risk preferences. The analyses lead to a set of empirical hypotheses. Section 1.4 describes experimental procedures, and section 1.5 provides data analyses and empirical results. Section 1.6 concludes.

1.2 Related Literature

To our knowledge this is the first study on endogenous sequencing in trust games. Gächter and Renner (2005), Güth et al. (2007), Kumru and Vesterlund (2005) are related studies which consider a leader's choice in public good experiments. They report increased contributions and efficiency gains compared to simultaneous public good games due to high first mover contribution. In these studies leadership is not voluntary but predetermined by the experimenter.

There are only a few studies on endogenous leadership in experimental literature[5]. Closest to our design are the studies of Abrak and Villeval (2007) and Rivas and Sutter (2009). Abrak and Villeval (2007) investigate a public good experiment with endogenous leadership. On the first stage one group member can contribute voluntarily while other group members contribute simultaneously after observing the contribution of the leader. A substantial number of subjects (about one out of four) are willing to act as leader. These first movers contribute significantly more to the public good compared to the contributions in simultaneous public good games. As a result second mover`s contributions are rising. First movers earn less than second movers but voluntary leadership induces efficiency gains. Rivas and Sutter (2009) study several forms of leadership in public good games and compare exogenously enforced leadership and endogenous (voluntary) leadership. They also find higher contributions to the public good under endogenous leadership.

In our trust game with endogenous leadership the leader's payoff hinges on the decision of a single player, the second mover. Compared to a public good game the leader might find this more risky. Furthermore, the trust signal implied by voluntary leadership might have a different value in a two player trust game than in a public good game.

1.3 Experimental Game and Theoretical Predictions

1.3.1 The Trust Game with Endogenous Leadership and Symmetric Endowments

Consider a principal-agent game between two players, player *P* (principal) and player *A* (agent), which are both initially endowed with 10 money units. The game comprises three stages:

[5] Fonseca et al. (2005), (2006) and Huck et al. (2002) investigate duopoly games with endogenous timing. Firms can choose their quantities in one of two periods. Potters et al. (2005) investigate a Public Good Game with endogenous sequencing when some donors do not know the value of the Public Good. Nosenzo and Sefton (2009) investigate a Public Good Game with endogenous move structure. The players can choose their contribution in one of two periods. Furthermore, the players receive different returns of the public good.

Stage 1: P decides upon the sequencing of moves in the trust game that follows in stages 2 and 3. P has two options, sequence "*P-First*" or sequence "*A-First*", with the meaning that in case of *P-First* (see stages 2.a and 3.a) the trust game is played with P being investor (first mover) and A being trustee (second mover) and vice versa in case of *A-First* (see stages 2.b and 3.b).

If *P-First*:

Stage 2.a: P decides upon investment x_p with $x_p \in \{0,1,...,10\}$. Then A receives the amount $3x_p$.

Stage 3.a: A decides upon backtransfer y_a with $y_a \in \{0,1,...,10\}$. Then P receives the amount $3y_a$.

If *A-First*:

Stage 2.b: A decides upon investment x_a with $x_a \in \{0,1,...,10\}$. Then P receives the amount $3x_a$.

Stage 3.b: P decides upon backtransfer y_p with $y_p \in \{0,1,...,10\}$. Then A receives the amount $3y_p$.

Payoffs are determined as follows:

$$\pi_p = 10 - x_p + 3y_a \text{ and } \pi_a = 10 - y_a + 3x_p$$

(if *P-First*)

or

$$\pi_p = 10 - y_p + 3x_a \text{ and } \pi_a = 10 - x_a + 3y_p$$

(if *A-First*)

This concludes the description of the game. If P chooses *P-First* we refer to this as the principal's choice of "voluntary leadership". The game theoretic solution with egoistic and rational players – i.e., our benchmark solution – is straightforward. In stage 3 the trustee has no incentive to backtransfer money, therefore the backtransfer will be zero. Consequently, it does not pay to invest in the first place, so investment will be zero. Anticipating this outcome player *P* is indifferent with respect to the sequencing of moves. Thus, the game theoretic solution with rational, payoff-maximizing players predicts that each player keeps the 10 money units, foregoing a potential efficient payoff of 30 for each if investment and backtransfer were maximal.

Stages 2 and 3 of our game are similar but not exactly equal to the trust game of Berg et al. (1995). In our game investments and backtransfers are tripled whereas in Berg et al. (1995) only investments were tripled. Furthermore, in our case the strategy space for backtransfers is fixed – the numbers 0 to 10 – whereas in Berg et al. it is endogenous – the numbers 0 up to three times the investment. Our design allowed us to describe the strategy spaces and their payoff consequences independent of the chosen sequence (*P-First* versus *A-First*). Furthermore, our design allows the second mover to return more money than received which is excluded in standard trust games. We actually found that some participants do so.

We know from many experiments on these games that contrary to the benchmark solution players do cooperate: Players trust in the second mover (the trustee) by choosing positive investment levels, and trustees reciprocate by choosing positive backtransfers. If investment and backtransfer are positively correlated we interpret this as Trust-And-Reciprocity mechanism.

Our experiment is designed to investigate whether the Trust-And-Reciprocity mechanism is influenced by voluntary leadership – i.e., a player's choice of the first mover position in the trust game. We expect the following influences:

Hypothesis 1*: If the principal chooses to be leader (voluntary leadership) investment (Hyp. 1.a) and backtransfer (Hyp. 1.b) are higher than if the principal forces the agent to be first mover in the trust game.*

This is our main research hypothesis. It can be motivated as follows: If *P* chooses to be leader, he/she exposes himself/herself to higher risk, because being first mover in our trust game is a more risky position than being second mover. Therefore we consider this as a strong signal of trust in addition to the subsequent choice of investment. Player *A* reciprocates *P*'s trust by higher backtransfer – i.e., we predict higher backtransfer controlling for investment. To control for investment one may consider e.g. the backtransfer rate (backtransfer divided by investment) or backtransfer minus investment. If *P* anticipates a higher backtransfer rate due to voluntary leadership, incentives for investment are higher and consequently we predict higher investment. These arguments are intuitive but they are inconsistent with the benchmark solution of the game. In the next section we rely on more formal considerations of social preferences and risk aversion to motivate our hypotheses.

1.3.2 Social Preferences and Risk Preferences

While the standard model of egoistic and rational individuals cannot explain cooperation in trust games, this is possible under the assumption of other regarding (social) preferences. We will rely on the inequality aversion model of Fehr and Schmidt (1999 henceforth F&S). Accordingly an inequality averse player maximizes the following utility function (we refer to this as F&S-preferences):

$$U_j = \pi_j - \alpha_j \frac{1}{n-1} \sum_{i \neq j} \max\{\pi_i - \pi_j, 0\} - \beta_j \frac{1}{n-1} \max \sum_{i \neq j} \{\pi_j - \pi_i, 0\}$$

with restrictions $0 \leq \beta_j < 1$ and $\alpha_j \geq \beta_j$. The variables π_j and π_i represent monetary payoffs of players *j* and *i* while the parameter α_j (β_j) represents the degree of aversion against unfavorable (favorable) inequality. In Appendix A.1.1 we provide a theoretical analysis of the trust game with endogenous leadership assuming F&S-preferences and that the preference parameters are common knowledge. The following proposition can be shown to hold:

> ***Proposition 1****: If the trustee (second mover in the trust game) is sufficiently inequality averse $\beta_j \geq 1/4$ there exists a subgame perfect equilibrium (SPE) with maximal investment and maximal backtransfer and with player P choosing sequence P-First (voluntary leadership).*

Intuitively, since the trustee can always avoid unfavorable inequality, the backtransfer depends only on preference parameter β_j. Depending on β_j the trustee will either reciprocate positive investment $x_i > 0$ by choosing $y_j = x_i$ or will choose $y_j = 0$. Then, if $y_j = x_i$ is anticipated by the investor (player *i*), maximal investment x_i is rational even for egoistic players ($\alpha_i = \beta_i = 0$). If the principal knows that the agent is sufficiently inequality averse he/she may choose to be investor. Alternatively, there also exists an SPE with maximal investment, maximal backtransfer and the sequence *A-First*. Furthermore, the benchmark solution (zero investment, zero backtransfer, any sequence) is also an SPE if inequality aversion is sufficiently low. Thus, under complete information we can establish cooperative equilibria and voluntary leadership.

If the preference parameters are not commonly known as it is the case in an experiment, investment is risky. The investor does not know the trustee's parameter β_j and cannot be sure about the backtransfer. If $x_i = 10$ is chosen, the expected utility of a risk neutral investor is

$$E(U_i) = prob(\bar{\beta})30 + (1 - prob(\bar{\beta}))(-\alpha_i 40)$$

with $prob(\bar{\beta})$ representing the investors subjective belief about the trustee being sufficiently inequality averse to choose $y_j = 10$. Since $E(U_i)$ is increasing in $prob(\bar{\beta})$ and decreasing in α_i investment is more likely if the investor is more optimistic about the trustee being inequality averse, and investment is less likely if the investor is more averse against unfavorable inequality. Consequently, the principal's willingness to take voluntary leadership should also increase in $prob(\bar{\beta})$ and decrease in α_i.

In addition one may wonder about the investor's attitude toward risk. If investment is zero, backtransfer will be zero as well, so the investor will keep the endowment of 10 for sure. With positive investment the payoff will be either larger or smaller than 10. Therefore a larger degree of risk aversion reduces incentives to invest and the principal's willingness to take voluntary leadership. With respect to the backtransfer one may argue that risk aversion does not matter, since the trustee is sure about the consequences of his choice. However, if the trustee acknowledges that the investor had to bear more financial risk, an inequality averse player may consider it fair to compensate the investor for taking the risk (see *Hypothesis 1*). Note that in this paragraph we argue only partially along the F&S-model, since the F&S-model does not incorporate risk aversion. Furthermore, in our experiment we do not expect equilibrium behavior to occur necessarily. However, we find it instructive to derive qualitative predictions for investment and backtransfer based on social preferences and concern for risk.

Following these theoretical arguments we formulate the following empirical hypotheses:

> ***Hypothesis 2****: Investment is smaller if the investor is more risk averse (Hyp. 2.a), if the investor exhibits a stronger aversion against unfavorable inequality (Hyp. 2.b), and if the investor has a lower subjective belief of an inequality averse trustee (Hyp. 2.c).*

Hypothesis 3: *Backtransfer is increasing in the trustee's degree of favorable inequality aversion.*

1.3.3 Control Treatment: Trust Game with Exogenous Leadership

To investigate the influence of voluntary leadership (*Hypothesis 1*) we ran experimental sessions on the trust game with endogenous leadership and compare behavior under both sequences (*P-First* versus *A-First*). As explained above we interpret the choice of voluntary leadership as a signal of trust that leads to stronger reciprocation (higher backtransfer rate) than if the principal does not take leadership (and thus assigns the agent to be first mover in the trust game). A subtle question arising here is whether it is the choice of voluntary leadership that is perceived as a signal of trust or whether it is the refusal of voluntary leadership that is perceived as a signal of distrust or non-cooperative attitude. In the latter case an agent who is mandated to make the first move might choose low investment leading to low backtransfer. To discriminate the possibility of such a distrust-effect from the proposed trust-effect we ran a control treatment on a trust game with exogenous leadership. It is equivalent to the stages 2.a and 3.a of the trust game with endogenous leadership as described above (again with an endowment of 10 and payoff functions as above). The trust-effect should increase investment and backtransfer compared to the control treatment, while the distrust-effect should lower investment and backtransfer compared to the control treatment.

1.4 Experimental Procedures

The experiment was run in the experimental economics lab at the University of Erfurt. It comprised 10 sessions with groups of 20 participants each, and it was computerized using the software z-Tree (see Fischbacher, 2007). The participants were students from different fields (social sciences and humanities) and recruited via Orsee (Greiner 2004). Each participant played only a single game, so the experiment was truly one-shot. Players received written instructions, were randomly paired and interacted anonymously (instructions are provided in Appendix A.1.3). The trust game with endogenous leadership was applied in 8 sessions, and the control treatment (exogenous leadership) was applied in 2 sessions. We ran more sessions on the endogenous treatment to collect enough observations on voluntary leadership. Namely, we anticipated correctly that voluntary leadership is more often refused rather than chosen.

After playing the trust game the participants played the lottery game of Holt and Laury (2002) to determine their degree of risk aversion and played the distribution game of Danneberg et al. (2007) to determine their F&S-preference parameters α_i and β_i. The collection of both, the degree of risk aversion and the F&S-parameters, were incentivized. We will use these measures to test *Hypotheses 2.a, 2.b* and *3*. Details on these procedures are provided in the Appendix. A.1.3. We also collected a measure of an individual's trust in other persons or society as a whole as it is collected by the World Value Survey (2005).[6] This measure may serve as a proxy for an investor's subjective belief of a reciprocal choice of the trustee and will serve to test *Hypothesis 2.c*. The participants also filled in the 16-PA-personality questionnaire of Brandstätter (1988) and provided some socio-demographic characteristics (age, gender, etc.) to allow for additional individual control measures. Thus, all in all we have a number of incentivized and non-incentivized measures. The experimental procedures are summarized in Table 1.1. Sessions took about 50 minutes, subjects were paid anonymously, and average earnings were about 10 EUR.[7]

Table 1.1: Overview about experimental procedures

Treatment	Sequence of Games	Observations
Endogenous Leadership	1. Trust Game with Endogenous Leaderhip 2. Holt/Laury Game, Danneberg et. al. Game 3. Trust Question, 16-PA-Questionnaire, Socio-Demographic Questionnaire	8 Sessions 80 Pairs 160 Participants
Exogenous Leadership	1. Trust Game With Exogenous Leaderhip 2. Holt/Laury Game, Danneberg et. al. Game 3. Trust Question, 16-PA-Questionnaire, Socio-Demographic Questionnaire	2 Sessions 20 Pairs 40 Participants

1.5 Empirical Results

1.5.1 Descriptive Statistics and Simple Analyses

Table 1.2 provides summary statistics of experimental decisions. Accordingly, in the trust game with endogenous leadership most principals decide for the sequencing *A-First*. However, 16 out of 80 principals (20%) choose voluntary leadership (*P-First*).

[6] The question is: Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people? Participants may answer "yes" or "no".
[7] An average earning for a student job at the time of the experiment was about 8 EUR per hour.

Table 1.2.a.: Summary Statistics

Treatment		Investment x	Backtransfer y	Backtransfer Rate y/x	# Obs.
Endogenous Leadership	*P-First* (Vol. Leadership)	9.13 (1.50)	8.06 (2.70)	0.89 (0.26)	16
	A-First	6.83 (3.09)	5.19 (3.09)	0.88 (0.64)	64
Exogenous Leadership		5.40 (2.76)	4.10 (3.09)	0.94 (0.86)	20

Notes: Table 1.2.a. includes means and standard deviations of investment, backtransfer and backtransfer rate by treatment.

Table 1.2.b.: Summary Statistics

Treatment		Investment x	Backtransfer y	Backtransfer Rate y/x	# Obs.
Endogenous Leadership	*P-First* (Vol. Leadership)	10.0 (2.0)	9.0 (3.0)	1.00 (0.17)	16
	A-First	7.5 (5.75)	5.0 (4.75)	1.00 (0.50)	64
Exogenous Leadership		5.0 (5.0)	3.0 (4.0)	0.67 (0.57)	20

Notes: Table 1.2.b. includes medians and inter-quartil range of investment, backtransfer and backtransfer rate by treatment.

Investment and backtransfer is higher in *P-First* than in *A-First* giving a first indication of support for *Hypothesis 1*. Means of investment and backtransfer are higher in the two endogenous leadership conditions than under exogenous leadership. Variances are relatively large, so we also look at medians. Table 1.2.b confirms that median investments and median backtransfers are higher under endogenous leadership than exogenous leadership. According to pairwise Mann-Whitney-U-tests the differences in investment are highly statistically significant for the comparison of *P-First* versus *A-First* and *P-First* versus exogenous leadership. Differences between *A-First* and exogenous leaderhip are only significant at a 10% level.

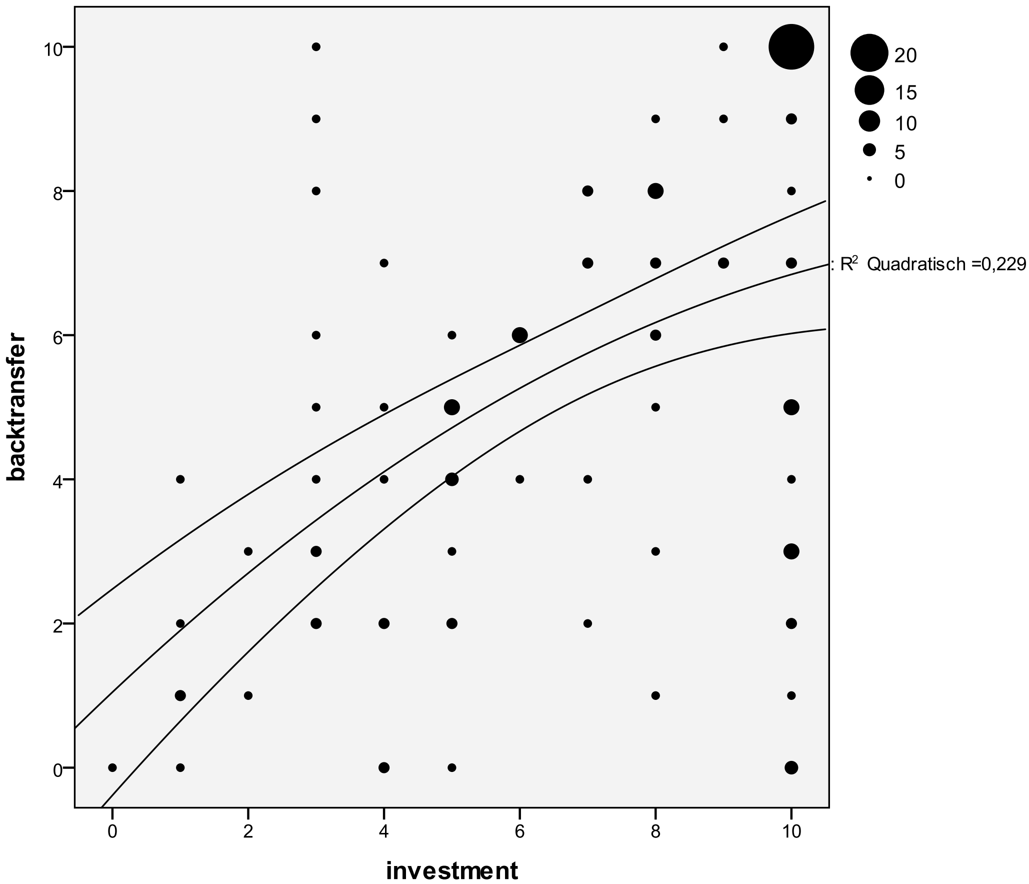
Table 1.3: Pairwise Mann-Whithney-U-tests of investment by treatments

Mann-Whitney-U-Tests of Investment	
P-First versus *A-First*	$p = 0.005$, $N = 80$
P-First versus Exogenous Leadership	$p < 0.001$, $N = 36$
A-First versus Exogenous Leadership	$p = 0.057$, $N = 84$

Notes: P-values are calculated for two-tailed tests.

Figure 1.1 is a scatterplot of backtransfer against investment. It illustrates the joint distribution of backtransfers and investments, and it clearly indicates a positive correlation. Different dot sizes represent clustering of observations. The reference lines represent a quadratic regression of backtransfer on investment with a 95%-confidence band. Obviously, agents behave reciprocally, responding larger backtransfer for larger investment. The Spearman rank correlation coefficient between backtransfer and investment is positive and highly statistically significant ($\rho = 0.449$, $p < 0.001$, $N = 100$) giving robust support for the Trust-And-Reciprocity mechanism.

Figure 1.1: Scatterplott of backtransfer against investment



Notes: Different dot sizes represent clustering of observations. Quadratic regression line included.

1.5.2 Regression Analyses of Investment

To investigate our hypotheses further we apply regression analyses controlling for the influence of social preferences, risk attitudes, personality characteristics, and other factors. Since Figure 1.1 also shows relatively large dispersion and that there is some clustering at the upper bound of the decision interval, we don't rely on OLS-regressions but apply median regressions and tobit regressions analyses. Table 1.4 shows the results of different model specifications for regressions of investment. Table 1.5 shows analogous analyses of the backtransfer. Details on explanatory variables are provided in Appendix A.1.2.

Model (1) in Table 1.4 reports the result of a median regression of investment.

Table 1.4: Regressions Results of Regressions on Investment

*Dependent variable: **Investment**, Base category is P-First-exogenous*				
	Model 1- Median Regression		*Model 2- Tobit Regression*	
Variable	*Coefficient*	*P-value (two-tailed)*	*Coefficient*	*P-value (two-tailed)*
A-First endogenous	1.531 (0.265)	0.000	1.215 (0.947)	0.203
P-First endogenous	4.107 (0.340)	0.000	6.533 (1.390)	0.000
Alpha_High	-2.249 (0.250)	0.000	-1.435 (0.888)	0.109
Alpha-missing	-0.836 (0.271)	0.003	-1.473 (0.966)	0.131
Risk aversion	-1.348 (0.227)	0.000	-2.385 (0.793)	0.003
Risk loving	2.548 (0.518)	0.000	4.085 (2.384)	0.090
Risk missing	-2.409 (0.347)	0.000	-2.578 (1.412)	0.071
Male	2.114 (0.224)	0.000	3.014 (0.848)	0.001
WV survey trust	0.440 (0.209)	0.038	1.223 (0.767)	0.114
Self control	0.126 (0.094)	0.185	0.258 (0.344)	0.455
Constant	5.410 (0.551)	0.000	4.753 (2.037)	0.022
Number of observations	100		100	
pseudo R2	0.310		0.117	

Notes: Table includes regression results for investment as dependent variable. Columns 2 and 3 contain coefficients and two-tailed p-values of the median regression. Column 4 and 5 contain coefficients and two-tailed p-values of the of tobit regression. Standard errors are included in parenthesis.

Overall the model fits well showing a Pseudo R^2 of 0.310. *P-First* and *A-First* are 0-1-dummies for the two endogenous leadership conditions. Both coefficients are positive and significant confirming higher investment compared to the reference category (exogenous leadership). Testing the coefficient of *P-First* against the coefficient of *A-First* shows also a highly significant difference ($p < 0.001$) supporting *Hypothesis 1.a*.

In line with *Hypotheses 2.b* a higher level of unfavorable inequality aversion (*Alpha_High*) decreases investment compared to the reference category (low inequality aversion).[8] The estimated coefficient is negative and highly significant. *Alpha_Missing* is a nuisance variable coded as 1 (and otherwise 0) if a participant did not provide a consistent measure of α (21 out of 100 cases). We included this in order not to confuse the reference category (low inequality aversion). Risk attitudes also influence investment in the predicted direction (*Hypothesis 2.a*): The coefficient of *Riskaverse_High* is negative, and the coefficient of *Riskloving* is positive.[9] The reference category is low riskaversion (including risk neutrality). *Riskaverse_Missing* is included to control for missing measures of risk aversion (8 observations). In line with *Hypothesis 2.c* participants who show more trust in others according to the world value survey measure (variable *Trusting*) choose higher investment as well.

Model (1) reports furthermore that male participants (variable *Male*) invest more than female. *Self-Control* is the only personality characteristic of those measured by the 16PA-questionnaire which we kept in the regression. The coefficient is positive but not significant.[10] We decided to keep one of the 16-PA factors in order to retain at least on intervalscaled variable in the regression. All other variables in model (1) are dummy variables. Backward elimination of insignificant regressors applied to the five 16-PA factors lead to *Self-Contol* as the best predictor out of the given five.

Model (2) is a Tobit regression using the same variables as model (1) and assuming for the dependent variable a lower bound of 0 and an upper bound of 10. It might be considered as a natural alternative for model specification, but it is less robust against outliers. The Tobit model qualitatively confirms model (1). All estimated coefficients show the same sign, but significance values differ. While the median regression model seems more adequate in our view, we will use the Tobit model later on for computing mean effect sizes.

[8] *Alpha_High* is a dummy coded as 1 if the value of α is in the upper quartile of the distribution (above 0.3), and it is coded as 0 otherwise.

[9] *Riskaversion_High* is 1 if the value of riskaversion as measured by the Holt/Laury procedure is above 0.7 (31 observations; about the upper 30%-percentile of the distribution). Otherwise it is 0. *Riskloving* is 1 if measured riskaversion is negative (otherwise 0). Only 3 participants were coded as riskloving.

[10] We decided to keep one of the 16-PA factors in order to retain at least on intervalscaled variable in the regression. All other variables in model (1) are dummy variables. Backward elimination of insignificant regressors applied to the five 16-PA factors lead to *Self-Control* as the best predictor out of the given five.

1.5.3 Regression Analyses of Backtransfer

Model (3) in Table 1.5 is a median regression of backtransfer. The model fits well overall (Pseudo $R^2 = 0.284$). All partial effects are significant.

Table 1.5: Regression Results of Regressions on Backtransfer

Dependent variable: ***Backtransfer****, Base category is P-First-exogenous*				
	Model 3- Median Regression		*Model 4 - Tobit Regression*	
Variable	*Coefficient*	*P-value (two-tailed)*	*Coefficient*	*P-value (two-tailed)*
Investment	0.742 (0.050)	0.000	0.604 (0.132)	0.000
A-First endogenous	1.067 (0.374)	0.005	0.211 (0.968)	0.828
P-First endogenous	2.468 (0.494)	0.000	2.719 (1.358)	0.048
Beta_High	1.086 (0.310)	0.001	1.646 (0.830)	0.050
Beta_Missing	0.686 (0.393)	0.084	1.172 (1.045)	0.265
Male	-0.596 (0.311)	0.058	-0.733 (0.847)	0.389
Emotional Stability	0.555 (0.111)	0.000	0.338 (0.288)	0.244
Tough-Mindedness	-0.390 (0.144)	0.008	-0.246 (0.378)	0.517
Constant	-1.719 (0.846)	0.045	-0.427 (2.291)	0.852
Number of observations	100		100	
pseudo R2	0.284		0.077	

Notes: Table includes regression results for backtransfer as dependent variable. Columns 2 and 3 contain coefficients and two-tailed p-values of the median regression. Column 4 and 5 contain coefficients and two-tailed p-values of the of tobit regression. Standard errors are included in parenthesis.

As predicted backtransfer is increasing in *Investment* and in the trustee's degree of favorable inequality aversion (*Beta_High*).[11] Furthermore, backtransfer is higher under voluntary leadership (*P-First*) than under exogenous leadership (the reference category). Testing the coefficient of *P-First* against the coefficient of *A-First* shows also a highly significant difference ($p = 0.005$). These estimation results clearly support our hypotheses (*Hyp. 1.b* and

[11] *Beta_High* is a dummy coded as 1 if the value of β is above 0.05 and is coded as 0 otherwise. The reference category includes observations of $0 < \beta < 0.05$ *Beta_Missing* represents observations with inconsistent measures of β .

Hyp. 3). Backtransfer is smaller for male participants, and for those who score high on the 16-PA factor *Emotional Stability*. The factor *Tough-Mindedness* enters negatively. The two (out of five) factors were retained after backward elimination of insignificant factors. Model (4) shows a Tobit regression with upper bounds 0 and 10 and using the same set of predictor variables. All effects show the same signs as in the median regression.

1.6 Discussion and Conclusions

Voluntary leadership increases investment and backtransfer in our trust game experiment. The influence is shown as highly statistically significant in median regression analyses. Computing mean effect sizes[12] we find that voluntary leadership (*P-First*) increases investment on average by 6.53 compared to the control group (exogenous leadership) and by 5.32 compared to *A-First*. An investment of e.g. 7 induces an average backtransfer of 7.88 under voluntary leadership compared to 5.15 and 5.36 under exogenous leadership and *A-First*, respectively.

In a meta-study on trust game experiments Johnson and Mislin (2011), henceforth JM, report an average investment of 49.7% of the available amount with a standard deviation of 14.3%. The average backtransfer is 36.8% of the available amount with a standard deviation of 11.5%. In the control treatment (exogenous leadership) of our experiment investments and backtransfer are somewhat higher than in JM, but within one standard deviation of the JM averages. One reason for this may be that backtransfers are tripled in our case so that there is an efficiency gain in both investment and backtransfer, whereas in JM backtransfer only serves to distribute earnings. More impressive, however, is the strong effect of voluntary leadership. Both average investment and average backtransfer are more than three standard deviations above the JM figures.

[12] Here we rely on the Tobit regression models (2) and (4).

Table 1.6: Average Investment and Backtransfer Rates

	Johnson, Mislin	Kleine, Königstein, Rozsnyoi	
		Exogenous Leadership	Voluntary Leadership
average investment rate	49.7% (14.3)	50%	100%
average backtransfer rate	36.8% (11.5)	67%	90%

Notes: Table displays a comparison of investment rates and backtransfer rates between Johnson and Mislin (2011) and our study here. The average investment rate (backtransfer rate) is calculated as average investment (backtransfer) divided by the average amount of money available for investment (backtransfer).

In line with other trust game experiments backtransfer increases strongly and significantly in investment. Voluntary leadership strengthens this Trust-And-Reciprocity mechanism. We interpret voluntary leadership as a trust signal of the principal to the agent. Surprisingly, investment and backtransfer are also higher under *A-First* compared to the control treatment (exogenous leadership). Thus, if the principal mandates the agent to make the first move in the trust game, this is not perceived by the agent as a signal of distrust or a non-cooperative attitude of the principal. In turn this supports our conclusion of voluntary leadership inducing a trust-effect rather than that the refusal of voluntary leadership is inducing a distrust-effect.

Risk preferences and social preferences modify behavior in manners predicted by our rational choice considerations (*Hypotheses 2.a, 2.b,* and *3*). Investment is lower for high levels of risk aversion and high levels of unfavorable inequality aversion (α). Backtransfer is larger for high levels of favorable inequality aversion (β). The FS-preferences of inequality aversion proved useful in deriving empirical predictions. Investment and backtransfer are furthermore modified by individual characteristics like gender, the degree of trust in others and 16-PA personality factors.

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2 The Influence of Inequality Elimination on Reciprocal Behavior

2.1 Motivation

In consideration of the literature on other regarding preferences the issue of inequality aversion and reciprocity has attracted growing attention. While inequality aversion in experimental settings is defined as an aversion to unequal splits of payoffs for the participants, reciprocity is either the reward of experienced kindness (positive reciprocity) or punishment of experienced unkindness (negative reciprocity). The latter is mostly documented in various ultimatum games. A first mover (henceforth proposer) makes an offer on the division of an overall endowment to a second mover (henceforth responder). This offer can be either accepted or rejected. If the responder rejects, both of them get zero. Usually the proposer offers an unequal split so that he/she becomes better off than the responder who suffers from an unfavorable inequality if he/she accepts.[13] An offer that leads to inequality may be interpreted as unfair and as unkindness treatment.[14] Since the unequal division of the endowment may trigger negative reciprocity responders often reject unequal offers.[15] Thus, in ultimatum games negative reciprocity is documented as a response to an offer which creates inequality.

In contrast to the ultimatum game I investigate whether negative reciprocity can be documented if the proposer does not create – but even eliminates – inequality with his action. However, the elimination of inequality occurs at the responder's cost which may trigger negative reciprocity. I created an experimental design where two players get an asymmetrical endowment. The proposer, who receives a lower endowment, may eliminate the inequality at the first stage of the game. He/she cannot become better off than his opponent but he/she may realize an equal payoff for both players by reducing the responder's payoff. At the second stage of the game the responder may punish the proposer for reducing his/her payoff. This situation is like an act of sabotage: the proposer may sabotage his/her opponent while the responder may execute a counterstrike.

[13] (Un)favorable inequality occurs from a player *i*'s point of view if he receives a (lower) higher payoff than his/her opponent player *j*.
[14] The definition of (un)fair is in this study is as follows: A distribution is (un)fair if the players receive an (un)equal payoff.
[15] As summarized in Camerer (2003 p.49) "Offers of 40-50 percent are rarely rejected. Offers below 20 percent or so are rejected about half time." Detailed results of ultimatum experiments are summarized in Camerer (2003 p.48-59).

To the best of my knowledge there is only one similar experimental study. Charness and Rabin (2002 henceforth C&R) investigated reciprocal behavior in a series of experimental games. One of these games is the sequential two person game (henceforth Game 1) shown in Figure 2.1. The proposer may choose strategy *A* or *B*. After choosing strategy *A* the game ends. The realized payoffs are (100, 1000) where the first (second) number in the brackets always represents the proposer's (responder's) payoff. If the proposer chooses strategy *B*, the outcomes will be determined by the responder. He/she may choose strategy *C* or *D*. Strategy *C* leads to (75, 125) and strategy *D* leads to (125, 125). The game ends after the responder's decision.[16] A further game by C&R with the same structure is Game 2 shown in Figure 2.2. The strategy profiles (*AC*) and (*AD*) lead to (450, 900) while the strategy profile (*BC*) leads to (200, 400) and (*BD*) leads to (400, 400).[17] The proposer can reduce or even eliminate unfavorable inequality completely if he/she chooses strategy *B* without becoming better off than the responder. However, this implies heavy monetary losses for the responder as well as heavy efficiency losses. Both aspects may trigger negative reciprocity. The documented results of Game 1 (Game 2) are the following: 50% (15%) of the proposers choose strategy *B* and reduce unfavorable inequality with this decision. 33% (34%) of the responders reduce with strategy *C* and by doing so punish the proposer for choosing strategy *B*.[18]

[16] Strategy *B* can be interpreted as an action of sabotage since it leads to monetary losses for the responder. The responder may strike back if he/she chooses strategy *C* which leads to monetary losses for the proposer.
[17] The main difference between these games is that the proposer suffers from monetary losses in any case if he/she chooses strategy *B*. He/she can reduce the inequality with strategy *B* but he/she decreases his/her monetary payoff, too. In Game 1, on the contrary, he/she can reduce the inequality and increase his/her monetary payoff at the same time by choosing strategy *B*.
[18] C&R choose the strategy method. Thus, the data further contains the responders' reactions for cases where strategy *A* was chosen by proposer.

Figure 2.1: Game1

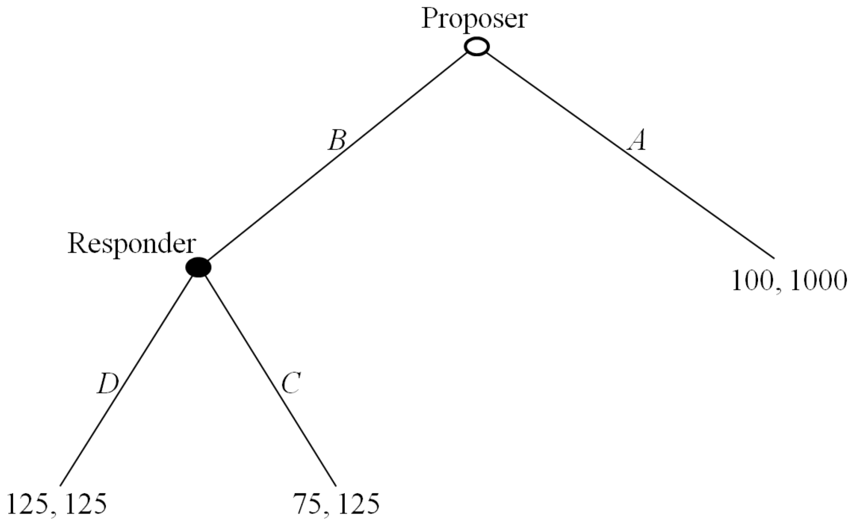
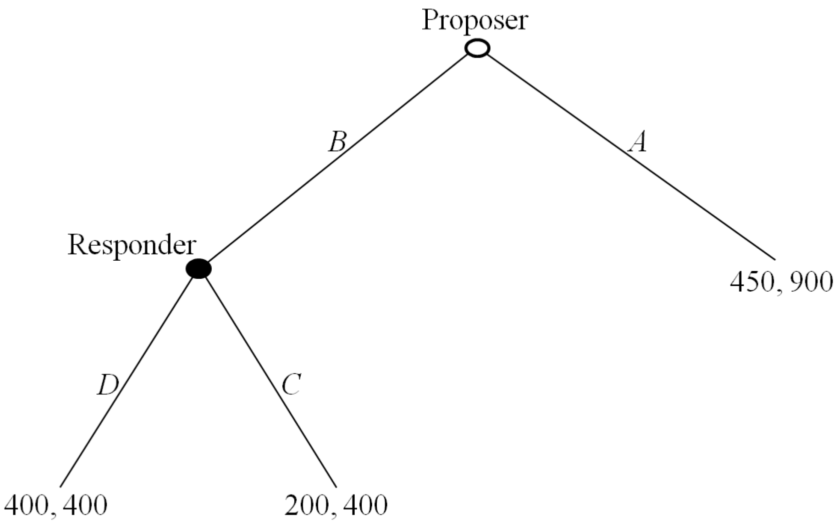


Figure 2.2: Game 2



Thus, C&R are the first to have documented negative reciprocity in a setting where a proposer eliminates unfavorable inequality at the responder's cost. The proposer is punished although he/she just tries to enforce an equal outcome. However, negative reciprocity is comprehensible since the proposer reduces the opponent's payoff as well as the overall outcome. Both these facts can be aspects of negative reciprocity so the question which of these facts is responsible for the documented negative reciprocity remains or how strong aspects are by comparison. Besides, one must ask how robust the results of C&R are. The documented negative reciprocity may be enforced and induced by extraordinary differences in endowment, efficiency losses and payoff losses for the responder.[19]

Keeping these problems in mind this study uses two further experimental games and can therefore serve as a robustness test concerning the results of C&R as wel as an investigation into the motives of negative reciprocity.

2.2 Experimental Design

The study comprises two sequential two-person experimental games which are henceforth called G100 and G150. The structure of these games is identical to those presented in section 2.1.

In G100 the proposer chooses either strategy *A* or *B*. If he/she chooses strategy *A* the payoffs are (100, 200) and the game ends. If he/she chooses strategy *B* the payoffs will be determined by the opponent's action. The responder chooses either strategy *C* or *D*. If he/she chooses strategy *C*, the payoffs are (100, 150) while the payoffs are (150, 150) if he/she decides to choose strategy *D*.

In G150 the proposer chooses either strategy *A* or *B*. If he/she chooses strategy *A*, the payoffs are (150, 200) and the game ends. If he/she chooses strategy *B*, payoffs will be determined by the opponent's action. The responder chooses either strategy *C* or *D*. If he/she chooses strategy *C*, the payoffs are (100, 150). If he/she chooses strategy *D*, the payoffs are (150, 150). Thus, G100 and G150 are identical except the payoff for the proposer if strategy *A* is chosen.

[19] Efficiency is defined in the study as the aggregated overall outcome of the players.

Figure 2.3: G100

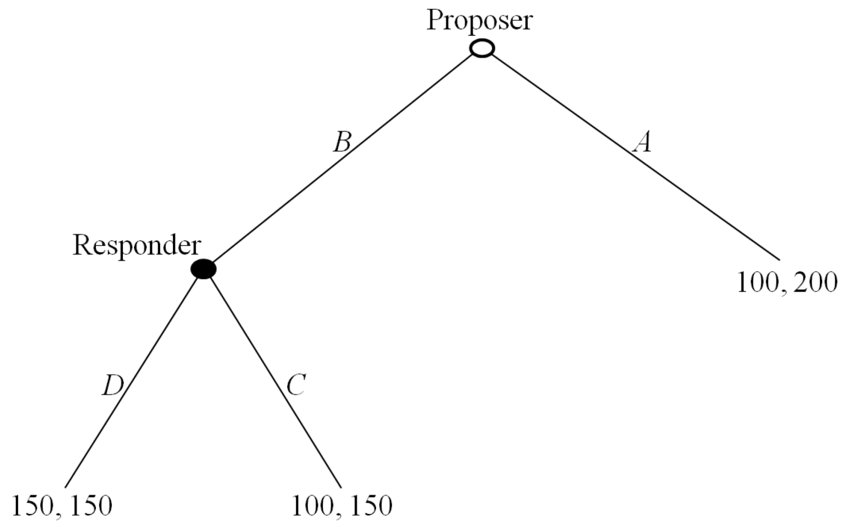
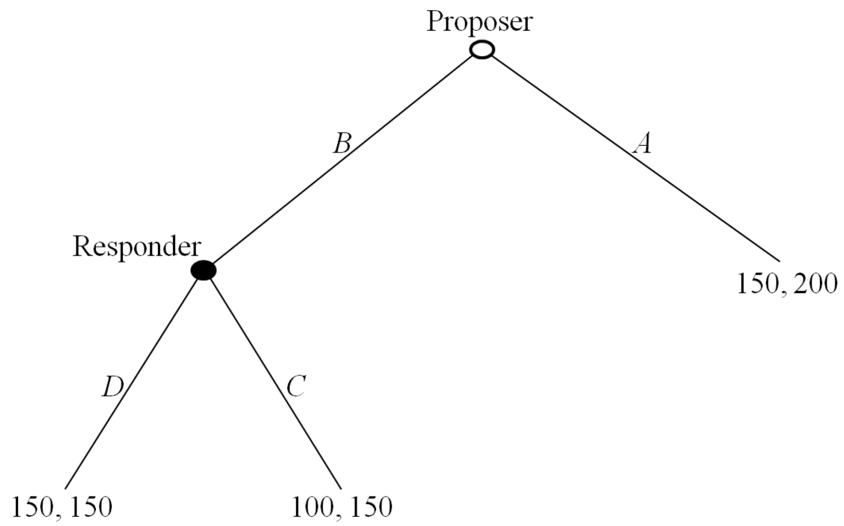


Figure 2.4: G150



There is, however, a fundamental difference between G100 and G150. For G100 the following holds: efficiency losses may only arise if the responder punishes the choice of strategy *B* – i. e., the responder chooses strategy *C* after observing strategy *B*. Thus, there is only one aspect which may trigger negative reciprocity: the desire to punish the proposer for reducing the responder's payoff. In contrast the following holds for G150: efficiency losses arise in any case if the proposer chooses strategy *B*. Thus, two aspects may trigger negative reciprocity:

the first aspect is to punish the proposer for reducing the responder's payoff while the second aspect is to punish the proposer for reducing the overall payoff. Thus, a comparison of the results of G100 and G150 makes it possible to distinguish between these different incentives of negative reciprocity. This is a major advantage of this study in comparison to C&R. Furthermore, monetary losses for the responder and efficiency losses are not as high as in the games of C&R. Thus, these experimental games may serve as a robustness test of the results of C&R, too.

2.3 Predictions of Behavior

Besides payoff maximization monetary payoff further incentives may have an influence on behavior: the proposer may have preferences to maximize the overall payoff or to reduce the inequality. But these aspects may induce a trade off. Furthermore the proposer's choice may trigger negative reciprocity. I apply outcome and intention based models to analyze G100 and G150. Calculations are shown in Appendix A.2.1.

2.3.1 Predictions with Selfish Preferences[20]

A selfish player maximizes his monetary payoff and does not care about the opponent's payoff. Thus, a selfish responder is indifferent between strategies *C* and *D*. This holds for G100 as well as for G150.

The proposer anticipates the responder's consideration. Since both strategies *C* and *D* may be chosen with a positive likelihood the proposer's expected payoff is higher than 100 but lower than 150 if he/she chooses strategy *B*. If he/she chooses strategy *A* he/she receives 100 (150) in G100 (G150). Thus, strategy *B* leads to a higher (lower) expected payoff than strategy *A* in G100 (G150).

In summary:

- *the responder is indifferent between strategy C and D in G100 as well as in G150*
- *strategy B is the dominant strategy for the proposer in G100*
- *strategy A is the dominant strategy for the proposer in G150*

[20] The results of 2.3.1 are not calculated separately in the Appendix. However, the results and calculations for selfish players are identical to the calculations for inequality averse players with: $\alpha_k = \beta_k = 0$.

2.3.2 Predictions with Inequality Aversion

Suppose that the social preferences of the players are well described by the model of Fehr and Schmidt (1999 henceforth F&S). Thus, the utility of a player *i* is given by:

$$U_i = \pi_i - \alpha_i \frac{1}{n-1}\sum_{j \neq i}^{n} \max\{\pi_j - \pi_i, 0\} - \beta_i \frac{1}{n-1}\sum_{j \neq i}^{n} \max\{\pi_i - \pi_j, 0\}$$

with restrictions $0 \leq \beta_i < 1$ and $\alpha_i \geq \beta_i$. The parameter (α_i) β_i represents the degree of inequality aversion against (un)favorable inequality. The monetary payoffs are represented by π_i and π_j while *n* is the number of players.

Assume that the players are not selfish and have got some aversion against favorable as well as against unfavorable inequality – i.e. $\alpha_k \geq \beta_k \neq 0$[21].

The responder's choice does not influence his monetary payoff after observing strategy *B*, but choosing strategy *C* induces an inequality. In contrast choosing strategy *D* assures an equal payoff for both players. Thus, strategy *C* is dominated by strategy *D*. This holds for G100 as well as for G150.

The proposer anticipates that the responder is going to choose strategy *D* after observing strategy *B*. Thus the proposer can not suffer from choosing strategy *B*, but he/she can reduce the inequality. Hence strategy *A* is dominated by strategy *B*.

In summary:

- *strategy D is the dominant strategy for the responder in G100 as well as in G150*
- *strategy B is the dominant strategy for the proposer in G100*
- *strategy B is the dominant strategy for the proposer in G150*

2.3.3 Predictions with Quasi-Maximin Preferences

The quasi-maximin preferences were introduced by C&R. Suppose the utility function of player *i* is given by:

$$U_i(\pi_1, \pi_2, ..., \pi_N) \equiv (1-\lambda)\pi_i + \lambda[\delta \cdot \min\{\pi_1, \pi_2, ..., \pi_N\} + (1-\delta)\cdot(\pi_1 + \pi_2 + ... + \pi_N)]$$

[21] For $\alpha_k = \beta_k = 0$ the predictions are identical to the predictions with selfish preferences.

$(1-\lambda)$ is the weighting factor that player *i* puts on his monetary payoff π_i while $\lambda \in [0,1]$ is the weight that player *i* puts on the social good. The social good is a weighted average of the payoff of the worst off player and the aggregated payoff of all players. $\delta \in (0,1)$ is the part that player *i* puts on worst off player`s payoff. This is the degree of the maximin preferences of player *i*. In contrast $(1-\delta)$ is the part which player *i* puts on total-surplus maximization and can be interpreted as the degree of efficiency orientation.[22]

Assume that players are not selfish – i.e., $\lambda \in (0,1]$.[23]

Suppose that the responder observes strategy *B*. If the responder chooses strategy *C* instead of strategy *D* he/she induces a lower overall payoff and a lower payoff of the worst off player than if he/she chooses strategy *D*. Thus, strategy *C* is dominated by strategy *D*. This holds for G100 as well as for G150. Furthermore, the proposer anticipates that the responder is going to choose strategy *D* after observing strategy *B*. Thus, the proposer anticipates that choosing strategy *B* leads to (150, 150).

In G100 the proposer increases his/her payoff if he/she chooses strategy *B*. At the same time he/she increases with strategy *B* the worst off player's payoff while the overall payoff is as high as choosing strategy *A*. Thus, strategy *B* is the dominant strategy.

In G150 strategy *B* does not increase the proposer's payoff. At the same time the worst off player's payoff does not increase but the overall payoff is lower than when choosing strategy *A*. Thus, strategy *A* is the dominant strategy.

In summary:

- *strategy D is the dominant strategy for the responder in G100 as well as in G150*
- *strategy B is the dominant strategy for the proposer in G100*
- *strategy A is the dominant strategy for the proposer in G150*

[22] It is easy to see that the opponent's payoff is always positively correlated with the payoff of player *i*. That is a fundamental difference to the concept of inequality aversion. The parameter α_i in the model of F&S represents envy. However, envy does not exist in the model of quasi-maximin preferences.

[23] For $\lambda = 0$ the predictions are identical to the predictions with selfish preferences.

2.3.4 Predictions with Quasi-Maximin Preferences and Reciprocity

C&R extend the quasi-maximin preferences with reciprocity to capture the intention of opponent's move. According to this negative reciprocity may arise if an opponent behaves selfishly – i.e., if he/she puts too little importance on the social good which is specified by the parameter λ. The right level of λ – i. e., not to trigger negative reciprocity – is λ^* is called the selflessness standard.[24] It is assumed that the selflessness standard is common knowledge and defined by C&R (p.855) as the follows: " λ^*-the weight they feel a decent person should put on social welfare".[25]

However the analysis of G100 and G150 with the advanced model of C&R leads to serious problems.

In G100 strategy *B* can be supported for any value of $\lambda \in [0,1]$.[26] Thus, by observing strategy *B* the responder does not know whether the proposer has disregarded the right level of λ^* or not. He/she may have the belief that λ^* has been disregarded and punishes the proposer although choosing strategy *B* is in line with efficiency and supports the worst off player's payoff, too.

Choosing strategy *B* in G150 is not conform to any $\lambda \in [0,1]$. The model of C&R, however, is only defined for $\lambda \in [0,1]$. Since choosing strategy *B* only corresponds to a negative value of λ it is not possible to ascertain whether the selflessness standard is violated. Furthermore, we cannot assume that strategy *B* is consistent with either selfish or prosocial behavior. The proposer can only reduce his/her payoff by choosing strategy *B* so that strategy *B* does not correspond with selfish behavior. On the other hand the proposer can only reduce the social good by choosing strategy *B* so that strategy *B* does also not correspond with prosocial behavior. Hence, it is not possible to predict any response with this model for G150.

2.3.5 Predictions with the Model of Falk and Fischbacher

The theory of Falk and Fischbacher (2006 henceforth F&F) can be considered as an advanced F&S model.[27] F&F measure an opponent's kindness by comparing expected payoff

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[24] Positive reciprocity does not exist – i.e., putting more weight on the social good than λ will not rewarded.

[25] Derivation and formulization of the quasi-maximin preferences with reciprocity is given in C&R.

[26] As shown in Appendix A.2.1.2.3 proposer is going to choose strategy *B* if $(1-p) \geq \lambda(1-\delta)$. This condition may fulfilled by all $\lambda \in [0,1]$.

[27] A detailed derivation and formalization of the model is given in Appendix A 2.1.3.1.

differences.[28] Experienced kindness is rewarded while experienced unkindness is punished.[29] Roughly speaking the actions that support the opponent's payoff and do not induce unfavorable inequality from the opponent's point of view are kind. Actions that do not support the opponent's payoff and induce unfavorable inequality form opponent`s point of view are unkind. The latter triggers negative reciprocity. The following constriction of the model is very important for G100 and G150: no action is kind if unfavorable inequality occurs. This holds even if the action increases the worse off player's payoff. Furthermore, no action is unkind if favorable inequality occurs. This holds even if the action decreases the better off player's payoff.

Thus, we may conclude for the responder: because strategy *B* never leads to unfavorable inequality from the responder's point of view the choice of strategy *B* is not an unkind move. Furthermore, the responder may even support his opponent's payoff for reducing inequality. Thus, the responder has no incentive to punish the proposer at all. However, the responder might also be indifferent between strategy *C* and *D* since the choice of strategy *B* leads to monetary losses for him/her. Thus, observing strategy *B* may trigger callousness since the proposer does not support responder's highest feasible possible payoff. Therefore, the responder either prefers strategy *D* or is indifferent.

In G100 the proposer reduces the inequality by choosing strategy *B*. Furthermore, he/she can increase his/her payoff. Moreover: if he/she believes that the responder might choose strategy *C* he/she may interpret his/her opponent as being unkind and prefer strategy *B* to decrease the responder's payoff even more. Thus, strategy *B* is dominant in this contest.

In G150 the proposer may prefer strategy *B* because this move can reduce the inequality. Moreover, if the proposer believes that the responder is going to choose strategy *C* he/she may prefer strategy *B* to punish the opponent's unkind behavior. If the responder, however, is going to choose strategy *C* the proposer receives a lower payoff with strategy *B* than with strategy *A*. Thus, the proposer may also prefer strategy *A* to avoid expected payoff losses. Hence, in G150 the model can explain the choice of strategy *A* as well as the choice of strategy *B*.

[28] Note that the expected payoffs depend on the beliefs. The expectations of player *i* about the payoffs depend on his/her believe about his/her opponent *j*'s strategy (first order belief) and on his/her believe about what *j* does believe about *i*'s strategy (second order belief).

[29] Note that "experienced" does not mean inevitably that the kindness has already been experienced in the sense of an action has already been performed. It is rather expected kindness. F&F determine even for the recipient in a dictator game the experienced kindness by second order beliefs. In this manner even latent kindness may be interpreted as experienced kindness.

In summary:

- *strategy D is either the dominant strategy for the responder or he/she may be in different between strategy C and D in G100 as well as in G150*
- *strategy B is the dominant strategy for the proposer in G100*
- *both strategies may be dominant for the proposer in G150*

2.4 Experimental Procedures

The experiment was conducted in at the experimental economics lab at the University of Erfurt. The subjects were randomly invited via ORSEE (Greiner 2004). All subjects were seated in cubicles and received written instructions. They wrote their answers on the instructions sheets. Since the strategy method was used to evaluate responders' decisions all choices were made at the same time. The instructions sheets were collected after completion. While achieved payoffs have been calculated the subjects received a short questionnaire but did not receive any further payment for completing it.

48 students of various disciplines participated in G100 and 48 more in G150. Subjects participated either in G100 or in G150 and only one time. However, only 92 observations were collected since four participants gave an answer that could not be assigned to one of the feasible strategies. Fortunately exactly 23 observations could be collected for the proposers as well as for the responders in G100 and in G150.

Payoffs were denoted in points where the exchange rate was 20 points = 1 euro. Sessions took about 30 minutes and average earnings were about 7.50 euro paid anonymously after the experiment.

2.5 Results and Conformity with the Behavior Predictions

2.5.1 Results

The results of G100 (G150) are illustrated in Figure 2.5 (Figure 2.6).

Figure 2.5: Results of G100

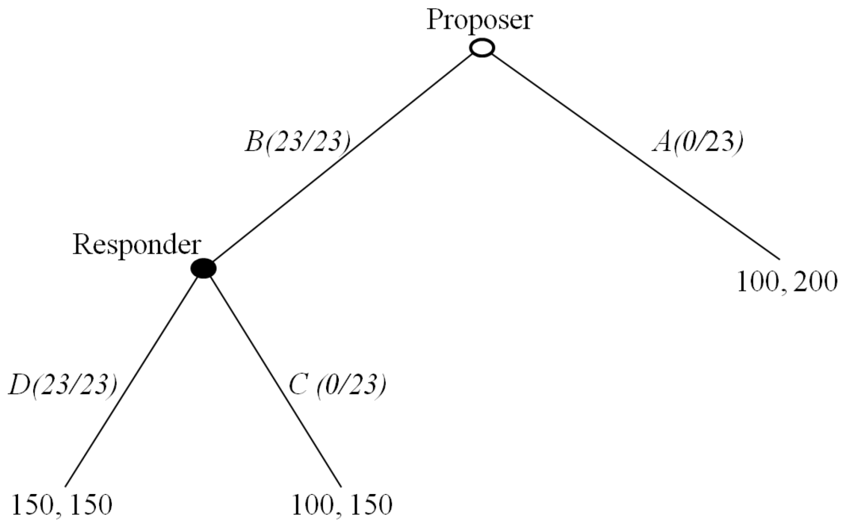
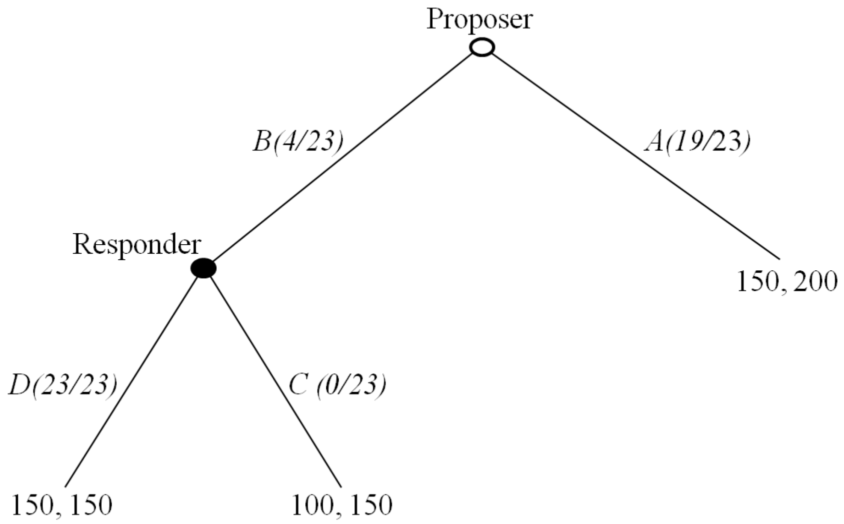


Figure 2.6: Results of G150



2.5.2 Proposers' Behavior

In G100 all proposers (23 out of 23) choose strategy *B*. Thus, they increase their (expected) monetary payoff and reduce unfavorable inequality.

In G150 four (19) out of 23 proposers choose strategy *B* (*A*). The majority prefers not to reduce unfavorable inequality but to maximize overall payoff. A Chi-Square test shows the hypotheses that there is no difference between the chosen strategies in G100 and G150 can be rejected. A $\chi^2 = 32{,}7$ with $df = 1$ results in $p < 0.001$.

The minority chooses strategy *B* preferring to reduce unfavorable inequality although their own monetary payoff does not increase and the overall payoff even decreases.

2.5.3 Responders' Behavior

In G100 all (23 out of 23) responders choose strategy *D* which leads to a redistribution of the endowments. Proposers and responders receive an equal payoff and no efficiency losses occur. Responder's payoff losses do not trigger any negative reciprocity.

In G150 all (23 out of 23) responders choose strategy *D* so that a reduction of the inequality arises accompanied with efficiency losses due to the responder's payoff losses. However, the responder's payoff losses – and even the reduced overall payoff – do not trigger negative reciprocity.

Thus, there is no negative reciprocity at all.

2.5.4 Conformity with Predictions for Proposers' Behavior

The explanatory power of the models differs for the proposer's behavior. In G100 all proposers choose strategy *B*. This is in line with F&S, F&F and the quasi-maximin preferences of C&R.

In G150 4/23 (19/23) of the proposers choose strategy *B* (*A*). Since strategy *B* causes efficiency losses the quasi-maximin preferences predict solely the choice of strategy *A*. Thus, 19/23 of the observations are in line with quasi-maximin preferences.

In contrast to quasi-maximin preferences F&S predict that the proposer prefers strategy *B* in G150. Thus, only 4/23 of the observations are in line with F&S. However, if we assume that the responder might be a selfish type too, – i. e., for the responder might hold $\alpha_k \geq \beta_k = 0$ – the model of F&S performs better since a selfish responder is indifferent between strategy *C* and *D*. Thus, if the proposer cannot exclude that strategy *C* might be chosen his/her expected monetary payoff is lower for strategy *B* than for strategy *A*. Thus, the choice of strategy *A* may be a rational choice even for inequality averse proposers.[30]

The intention based model of F&F is able to explain the mixed observations in G150. If the proposer believes that the responder is unkind he/she may begrudge his/her opponent the highest feasible payoff and choose strategy *B*. Otherwise the proposer prefers strategy *A* which ensures him/her the highest possible monetary payoff. However, the predicting power of F&F for the proposer's behavior is limited since the model may supports both strategies.

2.5.5 Conformity with Predictions for Responders' Behavior

All models of other regarding preferences introduced above support the observations in G100 as well as in G150.

The outcome based models of F&S support the results because punishing the proposer induces an inequality. The quasi-maximin preferences of C&R support the results because punishment induces efficiency losses and a decrease of worst off player`s payoff.

Also the intention based model of F&F is able to interpret observations but F&F offer a different approach: negative reciprocity is only accord with experienced unkindness. The proposer never behaves unkind since he/she just eliminates an inequality and does not become better off as the responder. The latter is a necessary condition to trigger negative reciprocity. Since eliminating unfavorable inequality is not unkind the responder shows sympathy for his/her worst off opponent and does not reciprocate negatively. Whether the proposer takes money away from his opponent or only destroys a part of responder's endowment does not matter. As long as the worst off proposer does not become better off negative reciprocity will not triggered.

[30] See for that the condition $\alpha_i \geq p/(1-p)$ in Appendix A.2.1.1.4.

2.6 Discussion and Conclusions

This study provides new findings about the (dis)appearance of negative reciprocity. These findings are even more interesting since they are not in line with the results of the similar study by C&R.

G100 is just a modified take game. If a proposer takes money away from a responder, a reallocation of the overall endowment can be realized if the responder does not punish his/her opponent. In fact all proposers take money away from the responder to equalize the unfavorable inequality and all the responders accept this without punishing proposer.

G150 is not a classic take game since taking money away from responder cannot induce a reallocation of the overall endowment. It just destroys a part of the responder's endowment. Thus, G150 is very similar to the structure of Game 1 and Game 2 investigated by C&R. In contrast to the results of C&R not one single observation of negative reciprocity is documented in G150. Thus, the study of C&R fails this robustness test. The negative reciprocity documented by C&R seems to be something an artifact triggered by the extraordinary high losses for the responder.

Careful note should be taken that not even one observations of negative reciprocity is documented in G100 and G150 while the similar study of C&R documents that about 1/3 of the responders show negative reciprocity. Furthermore, none of the presented models about other regarding preferences predict negative reciprocity. Thus, the observations of G100 and G150 are in line with behavioral theory. However, one has to keep in mind that the approaches of these models are different. According to F&S punishment – i.e negative reciprocity – is not observed because it would induce inequality. According to the quasi-maximin preferences there is no negative reciprocity because it would induce efficiency losses and losses for the worst off player. According to the intention based approach of F&F negative reciprocity is not triggered because the proposer just balances an unfavorable inequality. The study cannot conclusively clarify which of these approaches is responsible for the observed behavior. However, recent experimental evidences suggest that the intention is crucial for a response which is favors the approach of F&F.[31]

Finally the question of why C&R have documented negative reciprocity in their study remains. To the best of knowledge no behavioral model is able to explain the documented

[31] See the importance of intention in Falk et al. (2003), (2008) and McCabe et al. (2003).

negative reciprocity of C&R as well as the non-existence of negative reciprocity documented above. As shown in Appendix A.2.1 the theories of F&S, C&R and F&F do not predict negative reciprocity for Game 1 and Game 2.[32] Thus, the documented negative reciprocity of C&R is not robust and seems to be enforced by enormous monetary losses for the responder.

[32]The model of C&R with reciprocity introduced in 2.3.4 is able to explain the documented negative reciprocity in Game 1. Since strategy *B* may induce an increase in the proposer's payoff and reduces the overall outcome at the same time the selflessness standard can be violated. This may trigger negative reciprocity. However, the model cannot explain the negative reciprocity in Game 2. Choosing strategy *B* does not conform to any $\lambda \in [0,1]$. Thus, we do not know whether the selflessness standard is violated and we cannot make any prediction.

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3 Heterogeneous Agents, Incentives, Self-Selection and Group Performance

3.1 Introduction

Organizing work in teams may be beneficial for organizations since teams can be more productive than individuals. But teams might suffer from shirking incentives if work effort cannot be fully controlled. The employer (principal) might wonder whether effort in teams (agents) can be increased by monetary incentives. Furthermore, if there is self-selection – i.e., agents choose themselves whether to work in a team or individually – the principal might wonder whether this leads the “right” agents to join teams, i.e. agents that have high team productivity and are cooperative; or whether it invites the “wrong” agents, i.e. agents that have low team productivity and/or are egoistic. These questions are addressed in our experimental study.

3.2 Related Literature

As shown by Hardin (1968) and Olson (1968) free riding is the main dilemma for efficiency of teams. In situations well described by public good games not to contribute to the public good is a dominant strategy for selfish players. This might be a serious dilemma in principal-agent relationships too. If the agents’ wage is determined by group performance and is divided equally between them, free riding – i.e., not to contribute with positive effort – is the dominant strategy.

Nevertheless, positive contribution to the public good is documented in a lot of experimental studies. Marwell and Ames (1979) (1980) (1981) have done pioneering work in that field by investigating systematically which determinants are crucial for positive contributions to the public good. However, the contribution level is mostly far from being efficient. This is documented by Nalbantian and Schotter (1997) too, who were the first to investigate teamwork incentives under different payment schemes.

However, effort level is influenced by many aspects. Group composition and voluntariness of being in a group may have significant influence on group performance. Keser and Montmarquette (2011) compared voluntary and enforced teamwork in heterogeneous and homogeneous groups. Participants might choose between group tasks and private tasks. Homogeneous (heterogeneous) groups contain workers with the same (different) productivity.

The effort level in voluntary homogeneous groups is the highest. Furthermore, effort in voluntary homogeneous groups is significantly higher than in enforced groups. In heterogeneous groups the effort level does not differ significantly between enforced and voluntary groups. As summarized by Keser and Montmarquette (p.298): "In general, voluntary team effort will be higher than enforced team effort. The effect is likely to be the stronger the less heterogeneity there is."

Fellner et al. (2010) documented that contribution may increase in heterogeneous groups depending on being informed about the teammates' type and the amount of their contribution. Types with low productivity – i.e., with low marginal per-capita return (MPCR) – contribute more than high types if the heterogeneity is common knowledge and contributions cannot be linked to types. Fischer et al. (1995) documented similar behavior. In mixed groups high (low) types contribute less (more) than in homogeneous groups. This evidence that especially types with high MPCR contribute less effort in heterogeneous groups is alarming for any principal-agent relationship because types with high MPCR are more productive so that their effort in practicular should be high as possible.

Further studies deal with the selection into group task versus individual task. Abeler et al. (2005) documented that effort is significantly higher when receiving individual wages than when receiving group wages which are shared equally amongst the team members. Vandegrift and Yavas (2010) found no significant difference in performance between team production and individual piece rate. Moreover, Hamilton et al. (2003) documented in a field study that high-productivity workers prefer group tasks over individual tasks.

The principal may have a positive influence on the agents' performance in groups, even if a hold-up problem arises – i.e., if the principal cannot enforce positive effort after making payment to agents. This approach goes back to Akerlof (1982) and has been documented in several experiments on the gift-exchange game in which a principal makes a payment to an agent. After receiving payment the agent can reciprocate with positive effort. However, the principal has no enforcement power so that he relies on the agent's other regarding preferences. Nevertheless, payment level and effort level are positively correlated. These findings are robust even for one-employer–multi-worker cases as documented by Maximiano et al. (2007).

Reciprocity in principal-agent relationships is documented even if agents' payoffs are determined directly by their performance. Meidinger et al. (2003) designed an experimental setting with one principal and two agents. The principal may offer two kinds of incentive contracts. The contract which ensures the principal high (low) positive payment ensures the agents low (high) positive payment. If both agents reject the principal's offer, all three receive zero. Otherwise the contract is accepted and the agents have to make an effort in a group task. The group task is designed as a prisoner's dilemma. If the principal offers the more adverse contract from the agent's point of view, more than 50% reject the offered contract although. Furthermore, cooperation between agents is lower (higher) if the adverse (advantageous) contract is accepted. The study also investigates the influence of heterogeneity – i.e., the experiment was run with groups containing one low and one highly productive agent. The reported findings of homogeneous groups hold true for heterogeneous groups, too. However, the cooperation rate in homogeneous groups is higher than in heterogeneous groups. Thus, the principal may have a positive influence on effort level and can induce a higher level of cooperation between agents with high payment even the heterogeneous group has a negative influence on effort level.

A similar experiment with one principal and two agents was conducted by Cabrales and Charness (2011). Agents may be either high or low productive types. The probability for being a high or low productive type is equal high and types are private knowledge. The principal offers one out of three available contracts to his/her agents. The contract which ensures him/her the highest (lowest) payment ensures the agents the lowest (highest) payment. If either agent vetoes the offered contract, all players receive an equally high payment and the game ends. Otherwise the contract is accepted and the agents have to work together in a group task. The group task is designed as a prisoner's dilemma. The more adverse the offered contract for the agents the higher the rejection rate is. Furthermore, low productive types more often reject than high productive types and the probability of vetoing a contract is higher if the teammate has rejected an offered contract in the period before.

Königstein and Ruchala (2007) introduced a principal agent game with a group and an individual task.[33] They ran two treatments. In one of the treatments the agents are equally productive while in the second treatment the agents are highly or low productive. The principal may offer a contract for an individual task or for a group task. The group task is designed as a standard public good game. The principal may vary the return share and fixed wages of the offered contracts. The results show that the principal may increase the probability for selecting the group as well as the effort level in groups by offering a high return share for the

[33] Ruchala is the unmarried name of Lünser. Gabriele K. Lünser is co-author of this chapter.

group task. Furthermore, the agents' productivity influences the selection into group task and the chosen effort, too. The group task is chosen more often in the session with homogeneous agents. Furthermore, in a heterogeneous population the agents with high productivity provide higher effort levels than low productive types.

3.3 Motivation

Our principal-agent game contains one principal and 16 agents. The agents can choose either a group task (*GT*) or an individual task (*IT*) or no task (exit option). The group task has the structure of a public good game between four agents, so there are incentives to shirk by not providing effort in *GT*. Group return is splitting between the four team members and the principal according to a linear pay contract (*GT*-contract) that has been offered by the principal before the agents' choices of task. Alternatively, if agents choose *IT* they subsequently choose a productive effort resulting in an individual return which is splitting according to the *IT*-contract. The latter contract, as the *GT*-contract, is linear, comprising a fixed wage and a return share.

This game has been studied before in Königstein and Ruchala (2007) for homogenous population of agents as well as for heterogeneous population of agents. Under heterogeneity the agents differ with respect to their productivity in *GT*. We implement a new variant of the game by introducing observability of productivity types. Before the team members make their choice of effort in *GT* they are informed about all team members' productivities. This treatment, which differs from Königstein and Ruchala (2007) where types were unknown to team members, allows the agents to discriminate their effort with respect to the teams productivity. As a consequence it might lead to stronger separation of player types between tasks.

We use the social preference model of Fehr and Schmidt (1999) as a workhorse to provide empirical predictions regarding the influence of contracts and productivity on task selection and effort in *GT*. The standard preference model of neoclassical economics is of no help here. It predicts zero effort in *GT* and no choice of *GT* at all, but these predictions are rejected right away by tons of data on public good experiments. Cooperation in public good games is predicted by several models of social preferences. We rely on the Fehr-Schmidt model for reasons of tractability. Comparing this model with other social preference models is not within the scope of our study.

Our main hypotheses are, first, that the principal can positively influence effort in *GT* by offering higher return shares. Second, we predict that effort increase in team productivity. Finally, we predict that self-selection into *GT* depends on productivity and can be positively influence by the terms of the *GT*-contract. Overall, the compound hypothesis of social preferences and rational play results in structural variables (monetary incentives and productivity) having strategic value which they don't have under standard neoclassical preferences.

The paper continues as follows: Next we describe the experimental game in detail (section 3.4), and provide theoretical analyses and empirical hypotheses (section 3.5). Then we report experimental procedure (section 3.6) and empirical results (section 3.7). The final section summarizes findings and has concluding remarks.

3.4 Experimental Game

The experimental game is the same as introduced by Königstein and Ruchala (2007).[34] Consider a principal-agent-game with one principal (manager) and 16 agents (indexed below by $j = (1, 2, ..., 16)$). Work of agents can be organized either in individual tasks (*IT*) or in group tasks (*GT*). Productivities of agents differ between tasks and agents. Half of the agents are high productive the others low productive. The proportion of high and low productive agents is common knowledge while actual productivity is privately known. High productive agents have a productivity of 7.5 in *GT*. Low productive agents have a productivity of 2.5 in *GT*. We also refer to these players as high types (HT) or low types (LT). In *IT* both types of players have the same productivity of 3. Thus low productive agents are relatively high productive in *IT* and high productive agents are relatively high productive in *GT*.

The principal offers two linear pay contracts, one for *IT* and one for *GT*. The agents can choose one of these contracts or reject both. Effort in *IT* results in an observable, individual return. In *GT* workers are organized in groups of four. The effort choices of the four team members determine the joint return (group return). Prior to effort choices in *GT* the workers are informed about all team members' productivities.[35] The game is played over 10 periods. In each period the principal offers new pay contracts, each agent selects a task and chooses effort. The stages of the game are now described in detail.

[34] The description of the game is taken from Königstein and Ruchala (2007). Thus, this part is similar to Königstein and Ruchala (2007).
[35] This differs from Königstein and Ruchala (2007) where the game is the same but productivities of the team members are not observable.

Stage 1: The principal offers linear pay contracts for *IT* $w^{IT} = (f^{IT}, s^{IT})$ and *GT* $w^{GT} = (f^{GT}, s^{GT})$. Each contracts comprises a fixed wage f^{IT}, f^{GT} and a return share s^{IT}, s^{GT}. Fixed wages and return shares are restricted as follows:

$$s^{IT}, s^{GT} \in \{0\%, 10\%, ..., 100\%\}$$
$$f^{IT}, f^{GT} \in \{-15, -14, ..., +15\}$$

Stage 2: Each agent may choose one of the tasks (*IT* or *GT*) which means that he or she accepts the terms of the contract. If the agent neither accept w^{IT} nor w^{GT} he or she decides for the exit option where he or she earns nothing in this period. If w^{IT} is accepted, the agent works individually and will be paid according to w^{IT}. Accepting w^{GT} doesn't ensure that an agent will work in a group. Since agents are matched in teams of four, accepting w^{GT} is a preliminary decision. Those agents who cannot be matched are asked for an alternative (final) choice of either *IT* or the exit option.

Stage 3a: Agents *j* who decided for *IT* choose individual work effort $e_j \in \{0,1,...,10\}$. Work effort is associated with the cost function $c(e_j) = 2e_j$. The individual return in *IT* is determined by $r_j^{IT} = 3e_j$.

Stage 3b: Agents *j* who decided for *GT* are informed about the productivities of their group members. Then they choose individual work effort $e_j \in \{0,1,...,10\}$. Work effort is associated with the cost function $c(e_j) = 2e_j$. The joint return in *GT* of group *k* is determined by:

$$r_k^{GT} = \sum_{l=1}^{4} q_l e_l .$$

r_k^{GT} is a weighted sum of efforts of all group members with weights $q_j \in \{2.5, 7.5\} \forall \ j = 1,2,...,16$ given by the individual productivity parameters. Individual productivity q_j is determined at the beginning of the game, is privately known and stays constant throughout all 10 periods. Payoffs of agents are determined as follows:

In *IT*:

$$\Pi_j^{IT} = f^{IT} + s^{IT} r_j^{IT} - c(e_j).$$

In *GT*:

$$\Pi_j^{GT} = f^{GT} + s^{GT} \frac{1}{4} r_k^{GT} - c(e_j)$$

for all members *j* of team *k*. If the exit option is chosen *j*'s payoff is 0. The principal's payoff is determined as follows. He or she has to pay fixed wages to all agents in *IT* and *GT* and collects residual returns. Thus the principal earns

$$\Pi_P = \sum_{j \in IT} \left((1 - s^{IT}) r_j^{IT} - f^{IT} \right) + \sum_{k \in GT} \left((1 - s^{GT}) r_k^{GT} - 4 f^{GT} \right)$$

with $j \in IT$ representing an agent who has chosen *IT* and with $k \in GT$ representing a group of four agents who have chosen *GT*.

All subjects were informed that roles of players are randomly chosen and that roles as well as types of productivity are fixed for all ten periods. Furthermore all subjects know that they were playing a repeated game with a single principal facing 16 agents and that groups in *GT* were formed randomly in each period. The disclosure of productivities of team members was such that agents could not identify each other by player number or otherwise. Thus, they could not track each other's productivity or past choices.

3.5 Theoretical Analysis and Behavioral Hypotheses

We describe in an intuitive manner theoretical solutions to the game from the perspective of efficiency as well as individual rationality conditional on egoistic or social preferences. A more detailed analysis can be found in Königstein and Ruchala (2007).

The efficient solution of the game mandates low type agents to choose *IT* and provide maximal effort and high type agents to choose *GT* and provide maximal effort. To see this note that marginal productivities are higher than marginal cost at all effort levels, that the low type agent is more productive in *IT* than in *GT* and that this is vice versa for the high type agent. These choices maximize the joint payoff of the principal and all agents together and this payoff could be distributed evenly or unevenly by an appropriate choice of the contract. However, this collectively optimal outcome cannot be reached under individual rationality if players have egoistic preferences. Namely, as in any public good game it is not rational to contribute positive effort in *GT*. Therefore, effort in *GT* will be zero no matter how strong monetary incentives s^{GT} are, and the principal should not offer a positive fixed wage f^{GT}. The best that the principal may do is to induce all agents to choose *IT* and provide maximal effort. This can be reached by a contract that satisfies $s^{IT} \geq 2/3$ (incentive compatibility constraint) and $f^{IT} \geq 20 - 30s^{IT}$ (participation constraint).

This solution follows from the standard assumption of economics of egoistic and rational players. However, social preference models offer an alternative that is able to explain cooperation in public good games like in our group task. Assuming social preferences of the Fehr-Schmidt[36] type (1999 henceforth F&S):

$$U_j = \pi_j - \alpha_j \tfrac{1}{n-1} \sum_{i \neq j}^{n} \max\{\pi_i - \pi_j, 0\} - \beta_j \tfrac{1}{n-1} \sum_{i \neq j}^{n} \max\{\pi_j - \pi_i, 0\}$$

with restrictions $0 \leq \beta_j < 1$ and $\alpha_j \geq \beta_j$. The parameter (α_j) β_j represents the degree of inequality aversion against (un)favorable inequality. Monetary payoffs are represented by π_j and π_i while *n* is the number of players.

Königstein and Ruchala (2007 p. 28) have already shown in their proposition 2: "If a group consists of *two high* productive agents $q_j = \frac{15}{2}$ and *two low* productive agents $q_j = \frac{5}{2}$, there exists a SPE with $e_j^* = 10$ for all $j = 1,2,3,4$ if agents are sufficiently inequality averse. Here, the proposed solution requires $\beta_j = \frac{11}{16}$ for low productivity agents and $\beta_j = \frac{1}{16}$ for high productivity agents."

We extend this proposition to:

Proposition 1: *Given that all group members are sufficiently inequality averse, the dominant strategy for all j = 1,2,3,4 within a group is to provide* $e_j^* = 10$ *if* $\beta_j \geq 1 - \frac{q_j}{8} s^{GT}$. *The principal can induce these choices by* $s^{GT} \geq \frac{8(1-\beta_j)}{q_j}$.[37]

[36] See Fehr and Schmidt (1999).

[37] It is obvious that the agents have only incentives to choose group task if the principal makes the contract for individual task sufficiently unattractive and if f^{GT} is high enough to earn at least just a positive payoff. Proof of the proposition is provided in Appendix A.3.1.

These conditions show that cooperation is reached more easily among highly productive types, if players are inequality averse and if monetary incentives are stronger. Thus, contrary to the benchmark solution with egoistic preferences the solution with F&S-preferences predicts that the principal's design of the *GT*-contract has strategic value: Team production may vary with incentives. Specifically, our empirical hypotheses are as follows:

Hypothesis 1.a*: In GT a higher return share* s^{GT} *offered by the principal induces higher effort.*

Hypothesis 1.b*: In GT effort of high productive types is larger than that of low productive types.*

Hypothesis 1.c*: Effort in GT is positively correlated with the degree of inequality aversion.*

The influence of the second payoff variable, the fixed wage, is less clear. On the one hand changes in f^{GT} leave payoff differences between team members unaffected for all effort choices. Therefore, f^{GT} should have no influence on effort in *GT*. On the other hand, the solution proposed by Königstein and Ruchala (2007) assumes that considerations of equality are taken only with respect to other team members but not with respect to the principal. If however, the participants in the experiment consider the principal's payoff as well, they might respond higher fixed wages by reciprocally choosing higher effort. An additional complication is that fixed wage and return share should be correlated negatively. This is predicted theoretically via the participation constraint and it will in fact hold empirically. For these reasons we do not propose a clear influence of f^{GT} of effort in *GT*.

Since Hypothesis 1 proposes positive effort in *GT* this should affect the choice of task as well. The agent's choice of task is not necessarily *IT* as predicted for egoistic players but it may be *GT*. Specifically, it depends on expected earnings under both tasks and thus it depends on fixed wage, return share and productivity type.

Hypothesis 2.a*: GT is chosen more likely the higher the offered GT-payment is and the lower the offered IT-payment is. Offered payments depend on both, fixed wages and return shares.*

Hypothesis 2.b*: GT is chosen more likely by high productive types than by low productive types.*

Hypothesis 2.c*: The probability of choosing GT is positively correlated with the degree of inequality aversion.*

Hypotheses 1.a, 1.b, 2.a and 2.b were also investigated in Königstein and Ruchala (2007). They did not study 1.c and 2.c since they did not take measures of inequality aversion. Furthermore, a novel feature of our design here is that the team members observe each other's productivity type before choosing effort. This allows agents to discriminate their effort choice with respect to the average productivity of the team. Consequently, under observable types it will be more difficult for low productive types to successfully join teams than under non-observable types. Therefore we predict a stronger, and thus more efficient, separation of types in our experiment than under non-observable types as in Königstein and Ruchala (2007).

Hypothesis 3*: Separation of productivity types is stronger here than in Königstein and Ruchala (2007) in the sense that of all agents who choose GT the proportion of low types vs. high types is smaller here than in Königstein and Ruchala (2007).*

Hypotheses 1 to 3 are our main behavioral hypotheses. It should be mentioned that our experiment is not intended to test and propose the F&S-preference model against other social preference models. Cooperation in public good games is also predicted by other social preference models. Showing which one is more successful is not within the scope of our study. We rather rely on the F&S-model as a workhorse. The mere fact that social preferences can generate cooperation (if preference parameters are chosen appropriately) is an important step forward compared to standard neoclassical preferences. Namely, the influence of structural variables like monetary incentives may change with changes in preferences and it makes little sense to assume preferences that are immediately refuted by the data as it is the case with standard neoclassical preferences.

3.6 Experimental Procedures

The experiment was conducted at the experimental economics lab at the University of Erfurt. It was computerized by using the software z-Tree (Fischbacher, 2007) and all participants are recruited via ORSEE (Greiner, 2004). In total 153 students of various disciplines participated in the experiment. Each student participated only in one session. In the laboratory participants were separated by cabins. They received written instructions and examples to ensure that they had understood the rules of the game.

Participants were randomly and anonymously assigned to one of the roles. Roles were labelled "participant A" for the principal, "participant B" for agents with low productivity and "participant C" for agents with high productivity. The game was played according to the rules described above. At the end of each period the period payoffs were calculated by the computer program and displayed on screen. Agents were informed about their own payoff and group return of their own team. The principal was informed about task selection as well as all return resulting from IT and GT. Payoffs were shown in points and the exchange rate of EUR and points was commonly known. The exchange rate was 1 euro per 100 points for the principal and 1 euro per 10 points for agents. Show-up fees were 0.5 euro for the principal and 5 euro for agents. [38]

After the participants had played the game we ran additional experiments and used questionnaires to collect additional data on individual characteristics. We elicit social preferences as proposed by Danneberg et al. (2007) and risk preferences as proposed by Holt and Laury (2002). Both elicitation mechanisms were incentivized. Screenshots of the procedure as well as the instructions of the game are attached to Appendix A.3.3. Finally, the participants had to fill out the 16-PA personality questionnaire of Brandstätter (1988) and some questions about socio-demographics (gender, age, etc.).

Sessions took about one hour and 45 minutes. Average earnings where about 15 €. Decisions were taken privately and payments were made such that subjects did not see each other's payments.

3.7 Empirical Results

3.7.1 Descriptive Statistics

Table 3.1 presents an overview of the collected experimental data. Since the game had 10 periods and we ran 9 sessions we collected a total of 90 principal decisions and 1440 agent decisions. The majority of agents decided for the group task rather than the individual task or none. Effort in *GT* is positive and is on average about 4.5. Contract design is such that the four contract variables are correlated. Table 3.2 shows Spearman rank correlation coefficients. Specifically, return share and fixed wage in *GT* as well as return share and fixed wage in *IT* are negatively and highly significantly correlated. This should be expected from a theoretical

[38] The experimental procedures of the principal agent game are almost the same as in Königstein and Ruchala (2007). Thus, the description is partially taken from there.

viewpoint. It has to be taken into account later since it may lead to multicollinearity in regression analyses. Return shares of the two tasks and both fixed wages are positively but not significantly correlated.

Table 3.1: Overview of Experimental Data

Number of Periods		10	
Number of Principal Choices	Contract Design	90	
Number of Agent Choices	Task Choice, Effort	1440	
Contract Design (Mean, Std. Dev.)	Return Share *GT*	63.6%	(27.3)
	Fixed Wage *GT*	-0.8	(7.8)
	Return Share *IT*	69.3%	(22.1)
	Fixed Wage *IT*	-2.5	(7.1)
Choice of Task (Freq.)	Group Task (*GT*)	928	
	Individual Task (*IT*)	370	
	None (Exit Option)	142	
Effort (Mean, Std. Dev.)	Group Task (*GT*)	4.511	(3.084)
	Individual Task (*IT*)	5.831	(3.410)

Table 3.2: Correlations of Contract Variables

Correlation	Spearman's Rho	P-Value
Return Share *GT* ~ Fixed Wage *GT*	-0.534	0.000
Return Share *IT* ~ Fixed Wage *IT*	-0.483	0.000
Return Share *GT* ~ Return Share *IT*	0.139	0.192
Fixed Wage *GT* ~ Fixed Wage *IT*	0.167	0.116
		N = 90

3.7.2 Effort in *GT*

We now look at effort in *GT*. As expected a substantial fraction of the participants choose *GT* and provide positive effort in teams. Figure 3.1 shows frequency distributions separately for high productive types and low productive types (Fig. 3.1.a), and furthermore separately for teams of different levels of average productivity (Fig. 3.1.b). While it seems that effort increases in average team productivity (see Figure 3.1.b), a difference between high and low types can hardly be detected (see Figure 3.1.a).

Figure 3.1.a: Effort in *GT* by agent's productivity type

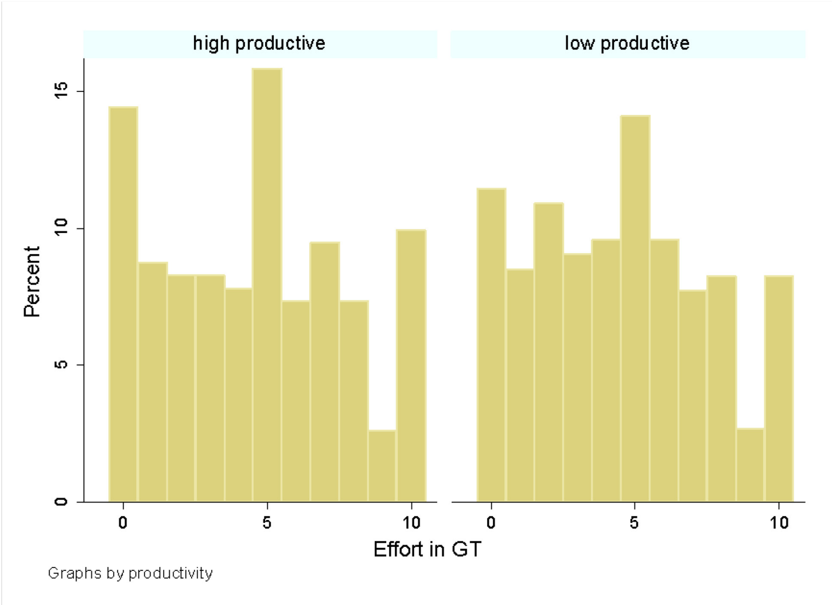
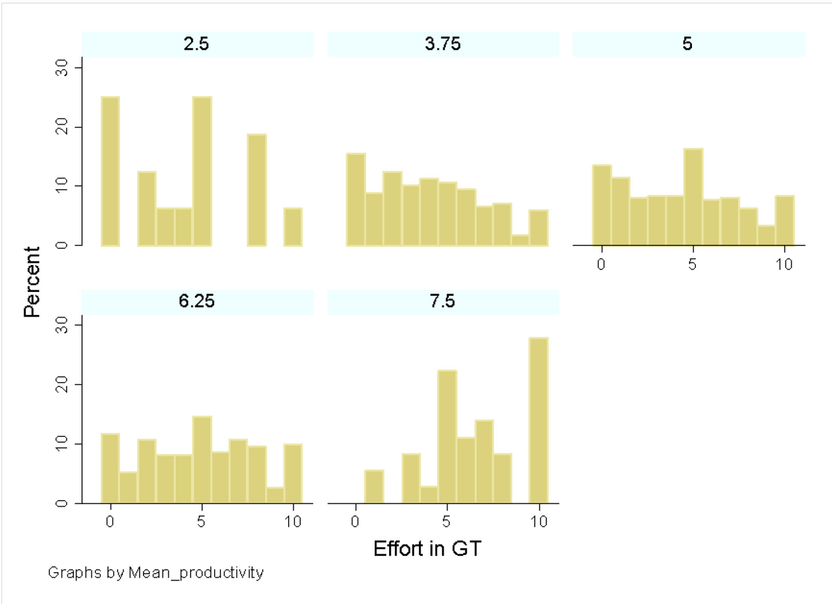


Figure 3.1.b: Effort in *GT* by average productivity of teams



To gain a more accurate view we have to control for other influencing factors. This is done in a regression analysis reported in Table 3.3. It is a Tobit regression analysis on effort choice in GT as dependent variable with lower bound 0 and upper bound 10. The influence of return share, fixed wage and productivity was estimated separately for symmetric teams – i.e., all four team members have the same productivity – and asymmetric teams. In asymmetric teams the variables return share, fixed wage, team productivity and a dummy for asymmetric teams (the reference category are symmetric and highly productive teams) are highly statistically significant.[39]

Result 1.a and 1.b*: The influences of return share and productivity clearly support Hypotheses 1.a and 1.b.*

For symmetric teams neither the return share nor the fixed wage have a significant influence. But this hardly weakens Results 1.a and 1.b for two reasons: First, insignificance does not mean that Results 1.a and 1.b are wrong but just that they don't hold for all subgroups. Second, symmetric teams comprise only a small fraction (6.5%) of all teams. We will look at the influence of incentives in symmetric teams in more detail below. Symmetric teams of low productivity provide significantly lower effort than symmetric teams of high productivity (see dummy low team productivity). Furthermore there is a decrease in provision of effort over time (see the influence of period).

To illustrate the results we estimated a revised version of model 1 eliminating the insignificant regressors return share and fixed wage for symmetric teams (see Table A.3.2 in Appendix A.3.2). Relying on this regression model Figure 3.2 shows predicted values of effort in GT for different levels of the return share and for different teams. Accordingly, symmetric teams with high average productivity of 7.5 provide higher effort than all other teams and do so independent of the offered return share. Average effort is about 7. This is different for asymmetric teams. These teams have an average productivity of 3.75, 5.0 or 6.25, and effort responds strongly to changes in return share s^{GT}; at low return share levels effort is close to minimal; at high return share levels effort is about 6. The predicted effort lines are ordered according to productivity which illustrates that effort is positively correlated with average productivity of the team. Finally, the predicted effort line is flat for symmetric teams of low productivity (productivity = 2.5). At high return share levels $s^{GT} > 0.6$ predicted effort in these teams is lowest of all teams. However, at low levels of return share it is larger than ef-

[39] To account for repeated measurement the standard errors where determined by assuming clustering on individuals. Since the choice of effort in GT is made conditional on the choice of task there might be a selection bias in effort choices. To check this possibility we estimated an alternative specification following the Heckman procedure Heckman (1979). We found the selection effect to be insignificant.

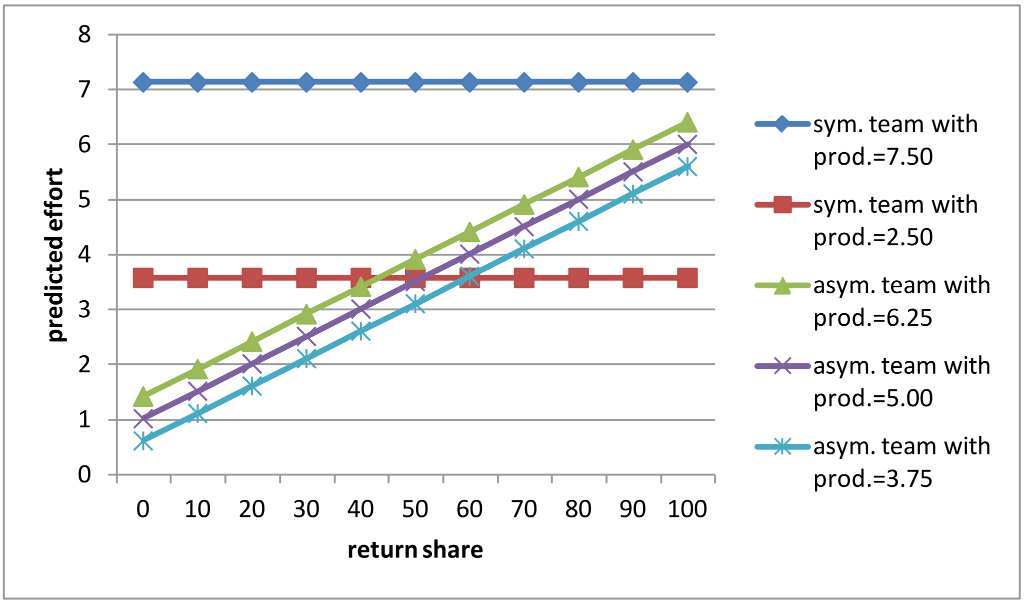
fort in teams that are asymmetric but have higher average productivity. Symmetry seems to stimulate higher effort.

Table 3.3: Regression Analysis of Effort Choice in *GT*

Variable		*Coefficient*	*Robust Std. Error*	*P-Value*
Asymmetric Team	Return Share	0.050	0.008	0.000
	Fixed Wage	0.071	0.028	0.012
	Team Productivity	0.323	0.141	0.023
	Dummy Asym. Team	-8.932	3.328	0.007
Symmetric Team	Return Share	-0.015	0.043	0.478
	Fixed Wage	0.079	0.112	0.729
	Dummy Low Team Productivity	-3.495	1.201	0.004
Period		-0.266	0.056	0.000
Constant		9.720	3.220	0.003
Model Statistics:	N = 800 P-Value: 0.000 Pseudo R2: 0.0324			
Dependent Variable:	Effort in *GT*			
Method:	Tobit Regression			

Overall it seems that in high productive and symmetric teams effort is close to the upper bound so there is little scope for monetary incentives to further increase cooperation. This may explain why the return share has no significant influence in these teams. In symmetric and low productive teams effort does not respond positively to return share variations either. In such teams average individual productivity is 2.5 while individual marginal cost is 2. Thus, the team as a whole can benefit from higher production only at very high return shares $(s^{GT} > 0.6)$.

Figure 3.2: Predicted Value Plot for Regression Model 1



Notes: Figure 3.2 displays predicted values of effort in *GT* for teams according to average team productivity dependent on return share. The calculation of the predicted value is done with the results of the regression model in Table A.3.2 at Appendix A.3.2.

Contrary to Hypothesis 1.c inequality aversion as measured by the Danneberg et al experiment had no significant influence on effort in *GT*. We tried several regression specifications (not reported here) but never found significance for effort in *GT*. We see two possible reasons for this. First, effort in *GT* is taken conditional on self-selection into *GT*. It may be that only the selection of *GT* is positively influenced by inequality aversion (which will turn out below) but not the effort in *GT* conditional on that choice. Secondly, the Danneberg et al. experiment might be a weak empirical measure of F&S-preferences. There is some indication of this possibility due to the large fractions of players for which either the α-measure or the β-measure is missing (36 of 144 agent = 25%).

3.7.3 Choice of Task

According to the game rules the agents may choose one out of three tasks, *GT* or *IT* or none of these (exit option). The frequencies of choices are shown in Table 3.4.[40] Accordingly agents of high productivity type choose *GT* more frequently than low productivity types.

[40] These are frequencies of initial task choices. Final choices differed somewhat since agents in *GT* had to be matched in teams of 4 participants. Specifically, the number of final choices of *GT* was 800.

Table 3.4: Frequency of Task Choices

Agent's Choice	Group Task	Individual Task	Exit Option	Total
Low Productive Agents	441	205	74	720
High Productive Agents	487	165	68	720
Total	928	370	142	1440

Table 3.5: Regression Results of Regression on Task Choices

Choice of Tasks, multinomial logistic regression			
	GT versus IT		
Variable	*Coefficient*	*Std. Error*	*P-Value*
Share in GT	0.036	0.004	0.000
Fix in GT	0.133	0.016	0.000
Share in IT	-0.032	0.005	0.000
Fix in IT	-0.177	0.019	0.000
HT	0.476	0.166	0.004
Alpha-high	0.499	0.191	0.009
Alpha-missing	0.268	0.234	0.252
Beta-high	0.284	0.175	0.104
Beta-missing	-0.359	0.285	0.207
Period	0.237	0.096	0.014
$Period^2$	-0.016	0.008	0.052
Constant	-0.506	0.550	0.358
	Exit Option versus IT		
Variable	*Coefficient*	*Std. Error*	*P-Value*
Share in GT	-0.002	0.006	0.695
Fix in GT	-0.094	0.021	0.000
Share in IT	-0.021	0.008	0.008
Fix in IT	-0.260	0.031	0.000
HT	0.404	0.334	0.226
Alpha-high	0.801	0.403	0.047
Alpha-missing	-0.097	0.625	0.877
Beta-high	0.335	0.336	0.318
Beta-missing	-1.377	0.586	0.019
Period	0.382	0.232	0.101
$Period^2$	-0.019	0.017	0.283
Constant	-2.959	1.023	0.004
Model Statistics:	N = 1440 P-Value: 0.000 Pseudo R^2: 0.2462		

To investigate the influence of contract design and productivity on task choice we ran a multinomial logit regression reported in Table 3.5. The upper panel of Table 3.5 shows estimation results for the choice of *GT* versus the reference category *IT*. The lower panel shows estimation results for the choice of the exit option versus *IT*. We are mainly interested in the choice of *GT* versus *IT* therefore we focus on the upper panel. With respect to the influence of return shares and fixed wages we find that each of the four estimated coefficients shows the predicted sign and is highly statistically significant.[41]

Result 2.a*: In line with Hypothesis 2.a the probability of choosing GT increases in the payment offered by the GT-contract (*s^{GT}, f^{GT}*) and decreases in the payment offered by the IT-contract (*s^{IT}, f^{IT}*).*

Result 2.b*: High productive types choose GT more likely than low productive types.*

The latter is indicated by the positive and significant coefficient of dummy high productivity. Table 3.5 furthermore reports positive influences of the F&S-preference parameters α and β. A joint test for $\alpha = \beta = 0$ shows that the coefficients are jointly statistically significant ($p = 0.016$). We collect this finding as

Result 2.c*: GT is chosen more likely by individuals that are more inequality averse.*

Finally we find that the probability of choosing *GT* increases over time and does so at a decreasing rate (see variables period and period^2).

A subtle question with respect to the influence of productivity is whether productivity simply shifts the probability of choosing *GT* upward or whether high types respond in a different manner on return share or fixed wage than low types. Table A.3.3 in Appendix A.3.2 reports a refined regression model that allows for interaction effects of the dummy high productivity and the four payment variables. While three of the four interaction terms are significant the main effect of dummy high productivity becomes insignificant. We consider this result as non-conclusive.

As a final step in the empirical analysis we want to assess Hypothesis 3. Table 3.6 shows predicted values (according to the regression model of Table 3.5) for the fraction of low types and high types under observable productivity for two different levels of s^{GT}. All variables of the regression model except s^{GT} and dummy high production were set to mean values. For comparison Table 3.6 also shows the respective predictions under non-observable

[41] Standard errors are adjusted for clustering on individuals.

productivity as reported in Königstein and Ruchala (2007). In line with Hypothesis 3 there is stronger separation of types when types are observable; the fraction of low productivity types entering *GT* is smaller than with non-observable productivity. But the separation is far from being efficient. Efficiency calls for a percentage of high types in *GT* of 100%. The self-selection of participants into tasks has led to an allocation of types that is only somewhat more efficient than a random allocation of types which would lead to an expected fraction of 50%.

Table 3.6: Separation of Productivity Types

	Observable Productivity		Non-observable Productivity (Königstein/Ruchala)	
	$s^{GT} = 0.5$	$s^{GT} = 0.8$	$s^{GT} = 0.5$	$s^{GT} = 0.8$
Low Productive Agents	46.1%	48.3%	48.4%	49.3%
High Productive Agents	53.9%	51.7%	51.6%	50.7%

3.8 Summary and Concluding Remarks

In our experiment we find that effort in *GT* increases in the return share offered by the principal (result 1.a). The terms of the linear *GT*-contract also influence the choice of task (result 2.a.). Thus, monetary incentives have strategic value for self-selection into teams and for the degree of team cooperation even if the group task has the structure of a public good game. This is counter to the standard neoclassical prediction but it can be rationalized assuming F&S-preferences.

Team cooperation increases in the team's average productivity (result 1.b). The participants anticipate this in their task choice which leads high productivity types to choose *GT* more likely than low productivity types (result 2.b). But the separation of types is far from complete: Theoretically, the efficient allocation of types requires all high types to choose *GT* and all low types to choose *IT*. But in fact, for $s^{GT} = 0.5$ the empirically predicted proportion of high types is just 53.9%. Thus, self-selection leads to a very inefficient allocation of types to tasks. This result is moderated by observability (result 3). If the team members are informed about types prior to effort choices, the separation of types is stronger than under unobservable types as reported by Königstein and Ruchala (2007).

However, there is a large gap for possible efficiency gains and one might speculate why the allocation of types is so inefficient. Again this question should be discussed within a framework of social preferences. The regression model for the choice of task showed that the F&S-preference parameters have positive and significant influence on the probability of choosing *GT* (result 2.c). This suggests that there are low productive but inequality averse agents who enter teams in order to prevent inequality. In addition there might be a fraction of egoistic types that enter teams in order to shirk. But the fraction of egoists must be small because otherwise cooperation in teams would cease rather fast.

Counter to what should be expected the F&S-preference parameter did not prove significant within the *GT*-effort-regression. Thus, it may be that only the choice of task is correlated with inequality aversion but not the effort choice which is conditional the task choice. Another possibility we mentioned is that the empirical measure of F&S-preference parameters is weak and should be improved.

We found some indication that at low levels of incentives symmetric teams of low types show higher levels of cooperation than asymmetric teams of higher average productivity. It seems that symmetry helps to establish cooperation. But since only a small fraction of our observations are on symmetric groups, this effect should be seen as preliminary.

In concluding we emphasize that the compound model of F&S-preferences and rationality was successful in producing theoretical predictions that are well supported by the data. Of course, other models of social preferences might have been used instead. But to discriminate between such models was not our issue here. Rather we studied the influence of team incentives and productivity within a social preference framework to allow for predictions that are not to be rejected right away, which is the case if one follows the standard assumption of egoistic preferences.

3.9 References

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4 The Method of Role Uncertainty – A Cheap Way of Data Collection and its Impact on Other Regarding Preferences

4.1 Motivation

4.1.1 Strategy Method and its Possible Behavioral Influences

During the last few years the issue of other regarding preferences has received growing attention as an important determinant of individual behavior. At the same time there is an ongoing discussion in the field of experimental economics about at least two different methods to elicit these preferences. One increasingly prominent way to collect data on other regarding preferences is to leave the subjects in the dark about their actual role and therewith also about their payoff-relevant actions. However, there is also some evidence that the elicitation method itself has an effect on subjects' decisions. This study investigates whether eliciting other regarding preferences under role uncertainty induces different results than the more conservative way in which subjects know their role before they take their decision. This could present a serious problem a fortiori if the results gained by one of the two methods are compared with results generated with the other one. Moreover, there might be a systematic bias in the observed preferences if subjects' decisions are affected by role uncertainty.

Whenever subjects participate in a sequential game only one response can be generated by the direct response method. Consequently, Selten (1967) introduced an alternative method which asks for more than only one response. He asked the subjects to state their actions for all possible decision nodes and in doing so to give responses to all possible actions of the opponent. Subjects only learnt the actual decision of the opponent after giving responses to all possible actions. This method is known as the strategy method. The main advantage of the strategy method is that one may elicit the behavior for the complete strategy space and generate more observations.

The downside of the strategy method is that it may induce different experimental results than the direct response method does. If the responder gives his/her response to an actual chosen action, the direct response method may cause stronger emotions than the strategy method. This seems to hold especially if the proposer chooses an action which is unexpected for the responder because the responder may pay less attention to unexpected actions since they seem to be less relevant. A growing number of experimental studies have investigated behavior differences triggered by the strategy method. A survey of this literature is given by Brandts and Charness (2011 henceforth B&C). The survey analyses 29 studies. B&C identify four studies that report clear behavior differences between collecting data with the direct response and strategy method.[42] At the same time they found nine studies with mixed evidence. Studies with mixed evidences provide only behavior differences that could not refer clearly to the different way of collecting data. Moreover, 16 studies have not found behavior differences. However, there seem to be systematical differences between the direct response and strategy method – i.e., within specific types of experimental designs there are more often differences between the methods.

B&C investigate which types of games lead more often to behavioral differences. One type of experiments that induce significant differences are experiments with emotions.[43] However, B&C found in general that studies involving emotions more often report behavioral differences between the direct response and strategy method. Such as – a subcategory of experiments involving emotions – in experiments with the opportunity of punishment subjects more often punish more often and heavilier under the direct response method.

The second types of experiments which are sensitive to the strategy method are experiments with only two strategies for the participants. B&C classified the experiments into groups with two and more than two available strategies for the subjects. Experiments with only two strategies differences between the direct response and the strategy method are more often documented than experiments with more than two strategies.

4.1.2 Role Uncertainty and its Possible Behavioral Influences

This study investigates the method of role uncertainty which is strongly related to the strategy method but which has been less investigated. Eliciting decisions under role uncertainty means that subjects learn their role only after they have already made their decisions. For example in the dictator game all subjects make their decisions in the role of the dictator. After making their decisions subjects learn which one of them is actually in the role of the dictator and the recipient.. It is easy to see that the method of role uncertainty has a similar advantage to the strategy method. We may elicit more observations than by the direct response method. Thus, the cost of an experiment can be reduced.

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[42] Brandts and Charness (2003), Brosig et al. (2003), Murphy et al. (2007) and Casari and Cason (2009) have found differences.

[43] Studies on other regarding preferences belongs to the group of experiments involving emotions. B&C classify in general experiments on industrial organization like pricing etc. as studies not involving emotions.

The method is applied in some prominent publications like Charness and Rabin (2002 henceforth C&R) or Engelmann and Strobel (2004 henceforth E&S).[44]

However, to the best of my knowledge there is only one study which investigates the influence of role uncertainty on subjects' behavior. Iriberri and Rey-Biel (2011 henceforth I&R) investigate role uncertainty in three-person dictator games. In these games the dictator may choose between three options. He may choose a selfish action, a surplus creating or a surplus destroying action. The selfish action ensures him/her a marginally higher payoff than the other actions. Thus, for a selfish dictator to choose the selfish option is a dominant strategy. Subjects who prefer efficiency – i.e, subjects who prefer to maximize the overall outcome – would choose the surplus creating action.[45] Inequality averse dictators should prefer the surplus destroying action in order to reduce inequality. The result of the study is well summarized in the survey of B&C (p. 394): "They (I&R) find clear evidence that selfish behavior is more common when one knows one will be the dictator, while social-welfare-maximizing behavior is more common when one does not know one will be the dictator."[46]

I&R document that (p. 172) „there is something inherent to the role uncertainty procedure that makes them choose differently than under role uncertainty." According to I&R people put more value on other regarding preferences under role uncertainty while people behave more selfishly under role certainty. Thus, the degree of other regarding preferences seems to be less pronounced under role uncertainty.

However, the question remains what happens if there is no selfish option. Assume that subjects also behave differently under role uncertainty without the selfish option. From this we can conclude that other regarding preferences are not only less pronounced but biased by the method of role uncertainty. This question is not only of relevance for future studies which may apply the method of role uncertainty but also for the debate which theory of other regarding preferences best describes these preferences.

I&R choose experimental games which are almost a replication of the study of E&S compared the theories of other regarding preferences of Fehr and Schmidt (1999 henceforth

[44] C&R introduce in this study the quasi-maximin preferences while E&S compare in this publication the performance of quasi-maximin preferences with theories of inequality aversion.

[45] Efficiency is a synonymous in this study for the overall payoff maximization.

[46] B&C discuss role uncertainty separately as a related method to the strategy method.

F&S), Bolton and Ockenfels (2000 henceforth B&O) with the quasi-maximin preferences of C&R.[47]

The main difference between these theories of other regarding preferences is also highly relevant for this study. Assume the two-player case that the payoff of the player *i* is fixed and the opponent player *j* is better off. The theories of F&S and B&O predict: the higher the opponent's outcome the higher the unfavorable inequality and the lower the utility of an inequality averse subject.[48] In contrast C&R's quasi-maximin preferences predict: the higher the opponent's outcome the higher the overall outcome and the higher the utility of a subject with quasi-maximin preferences.

The difference between these approaches can be illustrated in a simple dictator game: suppose that the dictator is subject A while his opponent is subject B. The dictator may choose between allocation 1 and allocation 2. The payoffs of allocation 1 are represented by π_{A1}, π_{B1} while the payoffs of allocation 2 are represented by π_{A2}, π_{B2}. Furthermore, suppose that $\pi_{B2} > \pi_{B1} = \pi_{A1} = \pi_{A2}$. Thus, allocation 1 induces an unfavorable inequality for the dictator while allocation 2 induces an equal outcome but a lower overall outcome. However, the dictator's payoff is equal for both allocations. Thus, an inequality averse dictator would prefer allocation 2 while a dictator with quasi-maximin preferences would prefer allocation 1.

While I&R found evidence that other regarding preferences are less pronounced under role uncertainty this study makes a further step. I investigate whether the characteristic of other regarding preferences will is impaired by the method of role uncertainty. This question is addressed by two-person dictator games.

4.2 Experimental Design and Predictions

I conduct a two-person dictator game which allows the dictator to choose an action either to eliminate unfavorable inequality or to maximize the overall outcome associated with

[47] The study of E&S met with divided response. See for that issue comments and replies by Bolton and Ockenfels (2006), Fehr and Naef (2006) and Engelmann and Strobel (2006).

[48] The main difference between the models of F&S and B&O is as follows: according to B&O the player *i*'s utility is decreasing with the opponents' payoffs if *i* receives less or more than the aggregated payoff of all players. In contrast, according to F&S each single inequality between the players influences the utility of player *i* negatively. For an illustration assume a three-player-case. Furthermore, suppose that player *i* receives the payoff 10 while his/her opponents receive 9 and 11. According to B&O these inequalities do not influence *i*'s utility because *i* receives the average payoff. But according to F&S each of these inequalities reduce *i*'s utility. However, for the two-player-case this difference between the models is not relevant since any inequality in a two-player-case reduces *i*'s utility in both models.

unfavorable inequality. The payoff of the dictator is not influenced by his/her action. However, his/her action influences the opponent's payoff. The dictator is subject A and decides eleven times between two pairs of payoffs. His/her opponent subject B has no decisions to make. The pairs of payoffs are illustrated in Table 4.1.

Table 4.1: Subjects' payoffs for each decision

#	Column 1	Column 2
1	Subject A: **10**; Subject B: **10**	Subject A: **10**; Subject B: **10**
2	Subject A: **9**; Subject B: **9**	Subject A: **9**; Subject B: **10**
3	Subject A: **8**; Subject B: **8**	Subject A: **8**; Subject B: **10**
4	Subject A: **7**; Subject B: **7**	Subject A: **7**; Subject B: **10**
5	Subject A: **6**; Subject B: **6**	Subject A: **6**; Subject B: **10**
6	Subject A: **5**; Subject B: **5**	Subject A: **5**; Subject B: **10**
7	Subject A: **4**; Subject B: **4**	Subject A: **4**; Subject B: **10**
8	Subject A: **3**; Subject B: **3**	Subject A: **3**; Subject B: **10**
9	Subject A: **2**; Subject B: **2**	Subject A: **2**; Subject B: **10**
10	Subject A: **1**; Subject B: **1**	Subject A: **1**; Subject B: **10**
11	Subject A: **0**; Subject B: **0**	Subject A: **0**; Subject B: **10**

Subject A decides in each row between the payoffs in column 1 and 2. In row one the payoffs are equal in both columns. In rows 2-11 the payoffs in column 1 are decreasing from nine to zero and ensure an equal outcome for both subjects. In column 2 the payoffs for subject A are the same as in column 1 but the payoffs for subject B are always equal to ten. Thus, choosing column 2 induces higher overall payoffs but generates an inequality between the subjects. In contrast, choosing column 1 leads to equal payoffs for the subjects but generates reduced overall payoffs. Disregarding the first row an inequality averse subject A would choose column 1 in any row. An efficiency oriented subject A – i.e., a subject A with quasi-maximin preferences – would choose column 2 in any row since the overall payoff is maximized by column 2.[49]

Before decision making the subjects saw all the dictator games – i.e., they saw Table 4.1. – and did not get the eleven rows separately presented on the screen. Furthermore, to avoid irrational choices subjects were allowed to switch between the columns once. Row one was introduced to grant the option to switch also for subjects who prefer to choose the same column in rows 2-11.

It is easy to see that efficiency losses increase with the row number when choosing column 1 while unfavorable inequality increase with the row number when choosing column 2. It is conceivable that for some of the subjects efficiency is more (less) imported than the elimination of inequality when the degree of efficiency losses (gains) increases. Thus, switching between the columns may be evidence that the preferences of the subjects are better described by a hybrid model of inequality aversion and quasi-maximin preferences.[50] However, switching twice or even more often between the columns cannot rationalized. Thus, it was not allowed to avoid irrationality during the experiment

One part of the subjects played the dictator games under role certainty (henceforth RC) while the other part played them under role uncertainty (henceforth RU). Under RC subjects learned their role before seeing Table 4.1 and reading the instructions. Under RU all subjects made decisions in the role of subject A. However, they knew that they would learn their type only after all decision making. This way used RU was the same one adopted by I&R, E&S and C&R, too.

Since theoretically the method of RU must not have any influence on subject`s behavior the following hypotheses can be formulated:

Hypothesis 1*: the amount of observations of subjects choosing column 1 is identical under RU and RC.*

Hypothesis 2*: switching behavior between the columns is identical under RC and RU.*

[49] Proofs are shown in Appendix A.4.1.
[50] Erlei (2008) introduced a hybrid model of inequality aversion and quasi-maximin preferences.

4.3 Experimental Procedures

In total 108 students from various disciplines participated in the experiment. Students who had been involved in similar experiments were not allowed to participate. Subjects were randomly invited via ORSEE (Greiner 2004) and matched into one of the treatments. Each student participated only one time. Written instructions were handed out to all subjects and read out by the author. Subjects were randomly and anonymously assigned to the role of subject A or B. Under RU all subjects made their decisions in the role of subject A. Under RC subjects B had to estimate the opponent's decision while subject A made their decision. However, all subjects knew that the payoffs will be determined only by the decision of subject A. After decision making a short written survey was carried out. All subjects were seated in cubicles. The experiment was conducted in the "Laboratorium für experimentelle Wirtschaftsforschung (eLab)" at the University of Erfurt. The experimental software was written with z-tree (Fischbacher 2007). During the experiment payoffs were given in points. The amount of earned points was converted into euro at an exchange rate of 1 euro = 2 points. After the experiment one of the eleven rows was picked. The points from the chosen column of the picked row were paid out. Subjects were paid after the end of the experiment immediately. Each session took about 30 minutes and subjects earned about 7 euros on average. Decisions and pay-out were made anonymously.

4.4 Results

At first I compare the ratio of equal or efficient distribution decisions in the different role conditions RU and RC.[51] As can be seen in Table 4.2 the relative frequency of contribution decisions changes completely under RU and RC. While only one third of the dictators choose the equal distribution (column 1) under RU, almost 60% do so under RC. Consequently two third of the dictators choose the efficient distribution which lead to an unfavorable inequality (column 2) under RU and about 40% do so under RC.

[51] The chosen columns of the first row are not part of the analyses since payoffs are identical in both columns.

Table 4.2: Relative frequency of distribution decisions

	Equity	Efficiency
Role uncertainty (RU)	32.22 %	67.78 %
Role certainty (RC)	59.44 %	40.56 %

The same holds true if we look at the single decisions for the 10 different pairs of distributions. Figure 4.1 illustrates the remarkable shift from the efficient to equal choices if the subjects do not know their role during the decision task. The probability that the relative share of choosing column 1 is the same under RU and RC and thereby the observed distribution of choices (or an even more extreme one) occurs by chance is smaller than 0.01 according to Fishers' exact test. Thus, we can reject the first hypothesis that the amount of observations of choosing column 1 is identical under RU and RC – i. e., that the role information conditions do not influence the subjects' distribution preferences.

Figure 4.1: Choices in single distribution decisions

In order to avoid any undue speculation about subjects' motives we also have to consider those decisions that are inconsistent over the different distributions – i.e., those subjects who switched between the two columns more than once. In the RC treatment 6 out of 36 subjects decided inconsistently and switched from one column to the other between the second and the last row. Although the number of inconsistently deciding subjects is higher (10 out of 36) in the RU treatment there is no significant difference in the absolute values according to Fishers' exact test ($p = 0.168$).

However, to test the second hypothesis a closer look to the switching behavior in both data collecting methods is necessary. First of all one could mention that most switching decisions (81.25%) happened in the lower part of the payoff table when the difference between the two alternatives is more pronounced. Surprisingly the switching direction differs between the RC and the RU treatment. While 5 out of 6 subjects switched from efficient to equal distribution in RC, only 2 out of 10 moved in this direction in the RU treatment. Although the number of cases is quite small a Fishers' exact test states a probability of $p = 0.035$ that this distribution occurs by chance. Thus, the second hypothesis, although it cannot be rejected with regard to the absolute values of inconsistent decision behavior, has to be rejected if we look at the direction of subjects switching decisions.

Table 4.3: Relative frequency of distribution decisions (without inconsistent decisions)

	Equity	Efficiency
Role uncertainty (RU)	23.08 %	76.92 %
Role certainty (RC)	60.00 %	40.00 %

Table 4.3 clearly shows that the frequency of efficient distribution decisions is much higher under role uncertainty than under full role information conditions even if we skip those subjects with inconsistent decision behavior. Accordingly the number of subjects who prefer equal distributions is more than two times higher in RC than in RU. The probability that the relative share of choosing column 1 is the same under RU and RC and thereby the observed distribution of choices (or an even more extreme one) occurs by chance is smaller than 0.01 according to a Fishers' exact test.

4.5 Conclusions

The results show highly significant difference behavioral differences under RC and RU. Thus, the study joins the criticism of I&R on the method of role uncertainty.

Under RC the dictator knows for sure that he is acting in the role of the dictator. In contrast to RU where the dictator is enforced to put himself/herself in the position of the recipient because he/she knows that he/she could be appointed as the recipient. This is shown by the results. The dictators under RU are more willing to choose allocations that do not harm the recipient. Under RU only about 1/3 of the observations are in line with inequality aversion while about 2/3 are in line with quasi-maximin preferences. Thus the majority does not harm the recipient under RU. However, under RC about 60% of the observations are in line with inequality aversion while only 40% of the observations are in line with quasi-maximin preferences. Thus the majority does harm the recipient under RC.

Even after excluding the switchers there is a highly significant behavioral difference under RU and RC. However, I have not found significant difference in the absolute number of switching between the columns under RU and RC. Also the number of switchers is relatively low. Nevertheless, switching could be evidence that a hybrid model of inequality aversion and quasi-maximin preferences may better describe the preferences other regarding preferences.

The method of RU is an unnatural setting to model one-shot interactions since in reality these roles are not determined by accident and after making decisions. Thus, eliciting other regarding preferences with RU will strongly bias the true preferences so that using this method in future experimental studies is highly unadvisable.

4.6 References

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Appendix A.1

A.1.1 Proof of Proposition

***Proposition 1**: If the trustee (second mover in the trust game) is sufficiently inequality averse $\beta_j \geq 1/4$ there exists a subgame perfect equilibrium (SPE) with maximal investment and maximal backtransfer and with player P choosing sequence P-First(voluntary leadership).*

Proof:

Suppose that players' other regarding preferences are described by the following utility function (Fehr and Schmidt, 1999):

$$U_j = \pi_j - \alpha_j \frac{1}{n-1}\sum_{i \neq j} \max\{\pi_i - \pi_j, 0\} - \beta_j \frac{1}{n-1}\max\sum_{i \neq j} \{\pi_j - \pi_i, 0\}$$

with restrictions $0 \leq \beta_k < 1$ and $\alpha_k \geq \beta_k$. Furthermore, we assume that all parameters are common knowledge.

It is easy to see that for fixed π_j trustee's (player *j* the second mover) utility is decreasing with π_i (player *i* the first mover) if $\pi_j < \pi_i$. Thus, backtransfer will never exceed investment and the trustee's utility function can be reduced to: $U_j = \pi_j - \beta_j(\pi_j - \pi_i)$.

Thus the trustee's utility is given by:

$U_j = 10 + 3x_i - y_j - \beta_j[(10 + 3x_i - y_j) - (10 - x_i + 3y_j)]$ with the restriction $x_i \geq y_j$.[52]

Due to the linearity of the utility function the trustee (player *j*) maximizes his/her utility by a corner solution. Thus, he/she will either reciprocate positive investment by $y_j = x_i$ or will not reciprocate at all – i.e., $y_j = 0$.

For reciprocating positive investment the trustee's utility is given by:

$U_j = 10 + 3x_i - y_j$ which can be reduced to $U_j = 10 + 2x_i$.

[52] x_i represents the first mover's investment while y_j represents second mover's backtransfer.

For not reciprocating at all the trustee's utility is given by: $U_j = 10 + 3x_i - \beta_j[(10 + 3x_i) - (10 - x_i)]$ which can be reduced to $U_j = 10 + x_i(3 - 4\beta_j)$.

Since for any positive backtransfer $y_j = x_i$ holds we may substitute y_j by x_i. Thus, the trustee will reciprocate positive investment if:

$U_j = 10 + 2x_i \geq 10 + x_i(3 - 4\beta_j)$ which is equivalent to $\beta_j \geq 1/4$.

It is easy to see that to reciprocate (not to reciprocate at all) – i.e., to choose $y_j = x_i$ (to choose $y_j = 0$) – is the dominant strategy for $\beta_j > 1/4$ ($\beta_j < 1/4$) while the trustee is indifferent if $\beta_j = 1/4$.

Since backtransfer never exceeds investment the first mover's utility can be reduced to: $U_i = \pi_i - \alpha_i(\pi_j - \pi_i)$.

Thus, the first mover's utility is given by: $U_i = 10 - x_i + 3y_j - \alpha_i[(10 + 3x_i - y_j) - (10 - x_i + 3y_j)]$ with the restriction $x_i \geq y_j$.

If the trustee reciprocates – i.e., $\beta_j \geq 1/4$ so that $y_j = x_i$ – the first mover's utility is given by:

$U_i = 10 - x_i + 3y_j$ which can be reduced to $U_i = 10 + 2x_i$.

It is easy to see that the first mover's utility is increasing with x_i so that choosing maximal investment – i.e., $x_i = 10$ – is the dominant strategy.

Since $U_j = U_i = 10 + 2x_i$ the sequence of the game does not matter and choosing P-First (voluntary leadership) with $y_j = x_i = 10$ is a SPE if $\beta_j \geq 1/4$.

A.1.2 Variable List of Chapter 1

Table A.1.1 Variable List of Chapter 1

Variable	Scale	Description
Investment	0, 1,2, …, 10	amount invested by the first mover
Backtransfer	0, 1,2, …, 10	amount sent back by the second mover
Average belief	(0,10)	average belief of firstmover about amount sent back
A-First endogenous	0-1 coded	P decides that A has to move first
P-First endogenous	0-1 coded	P decides to move first
P-First exogenous	0-1 coded	P has to move first exogenously (control treatment)
Alpha	0-1 coded	high unfavored inequality aversion
Alpha missing	0-1 coded	unfavored inequality aversion is missing value
Beta	0-1 coded	high favored inequality aversion
Beta missing	0-1 coded	favored inequality aversion is missing value
Risk aversion	0-1 coded	Risk aversion according to Holt and Laury (2002)
Risk loving	0-1 coded	
Risk missing	0-1 coded	
Male	0-1 coded	person is male
WV survey trust	0-1 coded	person trusts the most people
Self control	(1,2, …,10)	16 PA personality factors according to Brandstätter (1988)
Emotional Stability	(1,2, …,10)	
Independence	(1,2, …,10)	
Tough-mindness	(1,2, …,10)	
Extraversion	(1,2, …,10)	

A.1.3 Instructions

Instructions for the Experiment of Chapter 1 (translated from German)

General Instructions

You are participating in various decision experiments. At the end you will be paid according to your performance. Thus it is important, that you fully understand the following instructions. In the following you read the instruction to experiment 1. The instructions for the other experiments take place on the computer screen.

Depending on your decisions you can earn money within the experiments. Earnings will be added to your account while loses will be subtracted. In the end of the experiment your earnings will be paid in cash. Earnings are denoted by points. The conversion into Euro will be announced in each experiment.

Please note that during the experiment communication is not allowed. If you have any question, please raise your hand out of the cubicle. All decisions are made anonymously. No other participant will experience your name and your monetary payoff.

Best of luck!

Exogenous Treatment

Experiment 1

The participants will be divided into groups with two persons each group. They are called player A and B. Players are randomly assigned to their groups and types and your type is displayed on your screen. Points are converted into euros according to the following rule:

10 points = 3 euro

1. Each participant receives an endowment.
   Participant A receives 10 points
   Participant B receives 10 points

2. Participant B transfers an amount x ($0 \leq x \leq 10$) to participant A.

3. Participant A gains 3x i. e. participant A receives three times the amount transferred by B.

4. Participant A transfers an amount y ($0 \leq y \leq 10$) to participant B.

5. Participant B gains 3y i. e. participant B receives three times the transferred amount.

6 The experiment is done.

Endogenous Treatment

Experiment 1

The participants will be divided into groups with two persons each group. They are called player A and B. Players are randomly assigned to their groups and types and your type is displayed on your screen. Points are converted into Euros according to the following rule:

10 points = 3 euro

1. Each participant receives an endowment.
   - Participant A receives 10 points
   - Participant B receives 10 points

2. Participant B decides about the sequence to choices. There are two feasible sequences. B-A or A-B. If B-A is chosen the experiment continues as described in 3.a to 7.a. If A-B is chosen the experiment continues as described in 3.b to 7.b.

Sequence B-A

3a. Participant B transfers an amount x ($0 \leq x \leq 10$) to participant A.

4a. Participant A gains 3x i. e. participant A receives three times the amount transferred by B.

5a. Participant A transfers an amount y ($0 \leq y \leq 10$) to participant B.

6a. Participant B gains 3y i. e. participant B receives three times the transferred amount.

7a. The experiment is done.

<u>Sequence A-B</u>

3a. Participant A transfers an amount x ($0\leq x \leq 10$) to participant B.

4a. Participant B gains 3x i. e. participant B receives three times the amount transferred by participant A

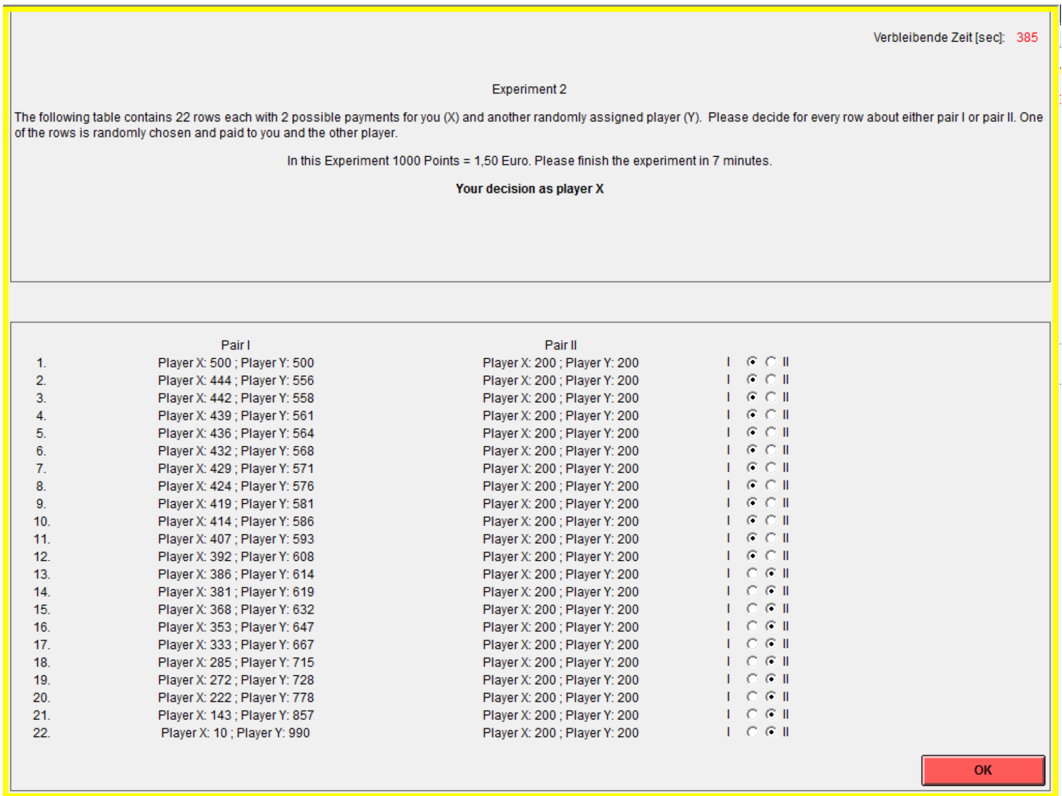
5a. Participant B transfers an amount y ($0\leq y \leq 10$) to participant A.

6a. Participant A gains 3y i. e. participant A receives three times the amount transferred by participant B.

7a. The experiment is done.

Experiment 2

Figure A.1.1: Z-tree screenshot of Elicitation of unfavored inequality aversion



Verbleibende Zeit [sec]: 385

Experiment 2

The following table contains 22 rows each with 2 possible payments for you (X) and another randomly assigned player (Y). Please decide for every row about either pair I or pair II. One of the rows is randomly chosen and paid to you and the other player.

In this Experiment 1000 Points = 1,50 Euro. Please finish the experiment in 7 minutes.

Your decision as player X

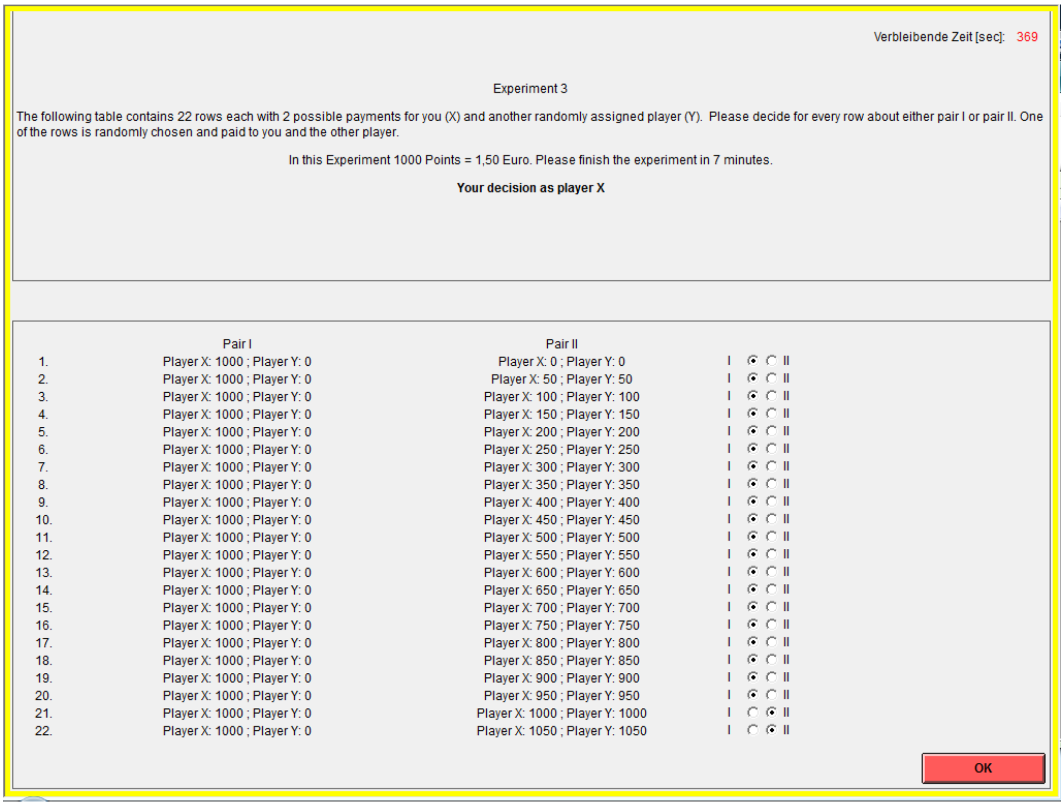
	Pair I	Pair II	
1.	Player X: 500 ; Player Y: 500	Player X: 200 ; Player Y: 200	I II
2.	Player X: 444 ; Player Y: 556	Player X: 200 ; Player Y: 200	I II
3.	Player X: 442 ; Player Y: 558	Player X: 200 ; Player Y: 200	I II
4.	Player X: 439 ; Player Y: 561	Player X: 200 ; Player Y: 200	I II
5.	Player X: 436 ; Player Y: 564	Player X: 200 ; Player Y: 200	I II
6.	Player X: 432 ; Player Y: 568	Player X: 200 ; Player Y: 200	I II
7.	Player X: 429 ; Player Y: 571	Player X: 200 ; Player Y: 200	I II
8.	Player X: 424 ; Player Y: 576	Player X: 200 ; Player Y: 200	I II
9.	Player X: 419 ; Player Y: 581	Player X: 200 ; Player Y: 200	I II
10.	Player X: 414 ; Player Y: 586	Player X: 200 ; Player Y: 200	I II
11.	Player X: 407 ; Player Y: 593	Player X: 200 ; Player Y: 200	I II
12.	Player X: 392 ; Player Y: 608	Player X: 200 ; Player Y: 200	I II
13.	Player X: 386 ; Player Y: 614	Player X: 200 ; Player Y: 200	I II
14.	Player X: 381 ; Player Y: 619	Player X: 200 ; Player Y: 200	I II
15.	Player X: 368 ; Player Y: 632	Player X: 200 ; Player Y: 200	I II
16.	Player X: 353 ; Player Y: 647	Player X: 200 ; Player Y: 200	I II
17.	Player X: 333 ; Player Y: 667	Player X: 200 ; Player Y: 200	I II
18.	Player X: 285 ; Player Y: 715	Player X: 200 ; Player Y: 200	I II
19.	Player X: 272 ; Player Y: 728	Player X: 200 ; Player Y: 200	I II
20.	Player X: 222 ; Player Y: 778	Player X: 200 ; Player Y: 200	I II
21.	Player X: 143 ; Player Y: 857	Player X: 200 ; Player Y: 200	I II
22.	Player X: 10 ; Player Y: 990	Player X: 200 ; Player Y: 200	I II

OK

Notes: Players have to decide upon one of each column in every row. The procedure is as proposed by Danneberg et al. 2007.

Experiment 3

Figure A.1.2: Z-tree screenshot of Elicitation of favored inequality aversion



Verbleibende Zeit [sec]: 369

Experiment 3

The following table contains 22 rows each with 2 possible payments for you (X) and another randomly assigned player (Y). Please decide for every row about either pair I or pair II. One of the rows is randomly chosen and paid to you and the other player.

In this Experiment 1000 Points = 1,50 Euro. Please finish the experiment in 7 minutes.

Your decision as player X

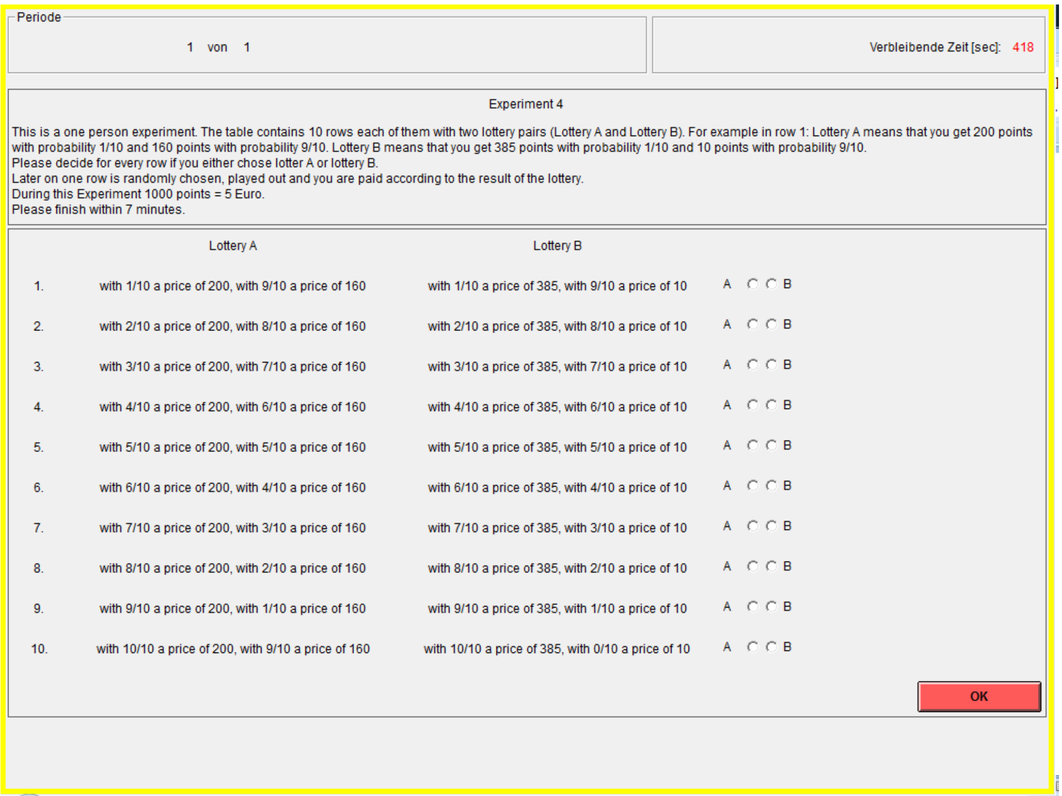
	Pair I	Pair II	
1.	Player X: 1000 ; Player Y: 0	Player X: 0 ; Player Y: 0	I ◉ ○ II
2.	Player X: 1000 ; Player Y: 0	Player X: 50 ; Player Y: 50	I ◉ ○ II
3.	Player X: 1000 ; Player Y: 0	Player X: 100 ; Player Y: 100	I ◉ ○ II
4.	Player X: 1000 ; Player Y: 0	Player X: 150 ; Player Y: 150	I ◉ ○ II
5.	Player X: 1000 ; Player Y: 0	Player X: 200 ; Player Y: 200	I ◉ ○ II
6.	Player X: 1000 ; Player Y: 0	Player X: 250 ; Player Y: 250	I ◉ ○ II
7.	Player X: 1000 ; Player Y: 0	Player X: 300 ; Player Y: 300	I ◉ ○ II
8.	Player X: 1000 ; Player Y: 0	Player X: 350 ; Player Y: 350	I ◉ ○ II
9.	Player X: 1000 ; Player Y: 0	Player X: 400 ; Player Y: 400	I ◉ ○ II
10.	Player X: 1000 ; Player Y: 0	Player X: 450 ; Player Y: 450	I ◉ ○ II
11.	Player X: 1000 ; Player Y: 0	Player X: 500 ; Player Y: 500	I ◉ ○ II
12.	Player X: 1000 ; Player Y: 0	Player X: 550 ; Player Y: 550	I ◉ ○ II
13.	Player X: 1000 ; Player Y: 0	Player X: 600 ; Player Y: 600	I ◉ ○ II
14.	Player X: 1000 ; Player Y: 0	Player X: 650 ; Player Y: 650	I ◉ ○ II
15.	Player X: 1000 ; Player Y: 0	Player X: 700 ; Player Y: 700	I ◉ ○ II
16.	Player X: 1000 ; Player Y: 0	Player X: 750 ; Player Y: 750	I ◉ ○ II
17.	Player X: 1000 ; Player Y: 0	Player X: 800 ; Player Y: 800	I ◉ ○ II
18.	Player X: 1000 ; Player Y: 0	Player X: 850 ; Player Y: 850	I ◉ ○ II
19.	Player X: 1000 ; Player Y: 0	Player X: 900 ; Player Y: 900	I ◉ ○ II
20.	Player X: 1000 ; Player Y: 0	Player X: 950 ; Player Y: 950	I ◉ ○ II
21.	Player X: 1000 ; Player Y: 0	Player X: 1000 ; Player Y: 1000	I ○ ◉ II
22.	Player X: 1000 ; Player Y: 0	Player X: 1050 ; Player Y: 1050	I ○ ◉ II

OK

Notes: Players have to decide upon one of each column in every row. The procedure is as proposed by Danneberg et al. 2007.

Experiment 4

Figure A.1.3: Z-tree screenshot of Elicitation of Risk Preferences



Notes: Players have to decide upon one of two lotteries in every row. The procedure is as proposed by Holt and Laury (2002).

Appendix A.2

A.2.1 Predictions

A.2.1.1 Predictions with Inequality Aversion

A.2.1.1.1 Model of Fehr and Schmidt

Suppose that the utility function of a player *i* is given by:

$$U_i = \pi_i - \alpha_i \frac{1}{n-1} \sum_{j \neq i}^{n} \max\{\pi_j - \pi_i, 0\} - \beta_i \frac{1}{n-1} \sum_{j \neq i}^{n} \max\{\pi_i - \pi_j, 0\}$$

with restrictions $0 \leq \beta_i < 1$ and $\alpha_i \geq \beta_i$. The parameter (α_i) β_i represents the degree of inequality aversion against (un)favorable inequality. The monetary payoffs are represented by π_i and π_j while *n* is the number of players.

A.2.1.1.2 Prediction for the Responder's Behavior in G100 and G150

Suppose that the proposer is player *j* while the responder is player *i.* Assume that the proposer has chosen strategy *B*. Strategy *C* induces $\pi_i = 150$ and $\pi_j = 100$ while strategy *D* induces $\pi_i = 150$ and $\pi_j = 150$. Since $\pi_j > \pi_i$ cannot arise the responder's utility function can be reduced to $U_i = \pi_i - \beta_i(\pi_i - \pi_j)$. I denote the responder's utility for choosing strategy *C* by $U_i(C)$ and for choosing strategy *D* by $U_i(D)$. The responder (weakly) prefers strategy *D* if $U_i(D) \geq U_i(C)$. This condition is fulfilled if: $150 - \beta_i(150-150) \geq 150 - \beta_i(150-100)$ which is equivalent to $\beta_i \geq 0$.

It is easy to see that the responder is indifferent between strategies *C* and *D* if $\beta_i = 0$. For $\beta_i > 0$ he prefers strategy *D* since $U_i(D) > U_i(C)$. Assume that the players dislike favorable and unfavorable inequality – i.e., $\alpha_k \geq \beta_k \neq 0$ so that the condition $\beta_i > 0$ is always fulfilled. Thus:

- strategy D is the dominant strategy for the responder in G100 as well as in G150.

A.2.1.1.3 Prediction for the Proposer's Behavior in G100

Suppose that the responder is player *j* and the proposer is player *i*. Strategy *A* induces $\pi_i = 100$ and $\pi_j = 200$ while strategy *B* induces $\pi_i = 100$ ($\pi_i = 150$) and $\pi_j = 150$ if the responder chooses strategy *C* (*D*). Since $\pi_j < \pi_i$ cannot arise the responder's utility function can be reduced to $U_i = \pi_i - \alpha_i(\pi_j - \pi_i)$. I denote the proposer's utility for choosing strategy *A* by $U_i(A)$ and for choosing strategy *B* by $U_i(B)$. Furthermore, the proposer's subjective probability that the responder chooses strategy *C* after observing strategy *B* is *p* and his subjective probability that the responder chooses strategy *D* after observing strategy *B* is $(1-p)$. The proposer will (weakly) prefer strategy *B* if $U_i(B) \geq U_i(A)$. This condition is fulfilled if: $(1-p)150 + p(100 - \alpha_i(150-100) \geq 100 - \alpha_i(200-100)$ which is equivalent to $\alpha_i \geq (p-1)/(2-p)$.

It is easy to see that the proposer prefers strategy *B* or he/she is indifferent between strategy *A* and *B* if $\alpha_i = (p-1)/(2-p)$ which only holds if $p = 1$ and $\alpha_i = 0$ are fulfilled. Otherwise see that $\alpha_i > (p-1)/(2-p)$ and $U_i(B) > U_i(A)$. However, strategy *C* is a (weakly) dominated. Thus, $p = 1$ is an implausible belief and $\alpha_i = (p-1)/(2-p)$ cannot be fulfilled. Therefore, strategy *B* becomes strong dominant even for $\alpha_i = 0$. Furthermore, assume that $\alpha_k \geq \beta_k \neq 0$ so that the condition $\alpha_i > (p-1)/(2-p)$ is always fulfilled. Thus:

- *strategy B is the dominant strategy for the proposer in G100.*

A.2.1.1.4 Prediction for the Proposer's Behavior in G150

Suppose that the responder is player *j* and the proposer is player *i*. Strategy *A* induces $\pi_i = 150$ and $\pi_j = 200$ while strategy *B* induces $\pi_i = 100$ ($\pi_i = 150$) and $\pi_j = 150$ if the responder chooses strategy *C* (*D*). Since $\pi_j < \pi_i$ cannot arise the responder's utility function can be reduced to $U_i = \pi_i - \alpha_i(\pi_j - \pi_i)$. I denote the proposer's utility for choosing strategy *A* by $U_i(A)$ and for choosing strategy *B* by $U_i(B)$. Furthermore, the proposer's subjective probability that responder chooses strategy *C* after observing strategy *B* is *p* and his subjective probability that the responder chooses strategy *D* after observing strategy *B* is $(1-p)$. Proposer will (weakly) prefer strategy B if $U_i(B) \geq U_i(A)$. This condition is fulfilled if: $(1-p)150 + p(100 - \alpha_i(150-100) \geq 150 - \alpha_i(200-150)$ which is equivalent to $\alpha_i \geq p/(1-p)$.

For the assumption that players dislike favorable and unfavorable inequality – i.e., $\alpha_k \geq \beta_k \neq 0$ – strategy D is strong dominant for the responder. Therefore, any rational proposer has to assume $p = 0$ and $\alpha_i > p/(1-p)$ is fulfilled. Thus:

- strategy B is the dominant strategy for the proposer in G150.

A.2.1.2 Predictions with Quasi-Maximin Preferences

A.2.1.2.1 Model of Charness and Rabin

Suppose that a player *i*'s utility function is given by:

$$U_i(\pi_1, \pi_2, ..., \pi_N) \equiv (1-\lambda)\pi_i + \lambda\left[\delta \cdot \min\{\pi_1, \pi_2, ..., \pi_N\} + (1-\delta)\cdot(\pi_1 + \pi_2 + ... + \pi_N)\right]$$

$(1-\lambda)$ is the level player *i* puts on his monetary payoff π_i while he puts level $\lambda \in [0,1]$ on the social good. The social good is a weighted average of the worst off player's payoff and the aggregated payoff of all players. $\delta \in (0,1)$ is the part a player *i* puts on the worst off player`s payoff. In contrast $(1-\delta)$ is the part a player *i* puts the on total-surplus maximization. For a two player case the utility of player *i* can be simplified to:

$$U_i = (\pi_i, \pi_j) = \begin{cases} \pi_i + \lambda(1-\delta)\pi_j & \text{if} \quad \pi_i \leq \pi_j \\ (1-\lambda\delta)\pi_i + \lambda\delta\pi_j & \text{if} \quad \pi_i \geq \pi_j \end{cases}$$

A.2.1.2.2 Prediction for the Responder's Behavior in G100 and G150

Suppose that the proposer is player *j* and the responder is player *i.* Assume that the proposer has chosen strategy *B*. Strategy *C* induces $\pi_i = 150$ and $\pi_j = 100$ while strategy *D* induces $\pi_i = 150$ and $\pi_j = 150$. Since $\pi_j > \pi_i$ cannot arise the responder's utility function can be reduced to $U_i = (1-\lambda\delta)\pi_i + \lambda\delta\pi_j$. I denote responder's utility for choosing strategy *C* by $U_i(C)$ and for choosing strategy *D* by $U_i(D)$. The responder (weakly) prefers strategy *D* if $U_i(D) \geq U_i(C)$. This condition is fulfilled if: $(1-\lambda\delta)150 + \lambda\delta 150 \geq (1-\lambda\delta)150 + \lambda\delta 100$ which is equivalent to $\lambda\delta \geq 0$.

For $\lambda\delta = 0$ the responder is indifferent between strategy D and C. However, since $\delta \in (0,1)$ the condition $\lambda\delta = 0$ is only fulfilled for $\lambda = 0$. Assume that the players are not selfish – i.e., $\lambda \in (0,1]$ – the condition $\lambda\delta > 0$ is always fulfilled. Thus:

- *strategy D is the dominant strategy for the responder in G100 as well as in G150.*

A.2.1.2.3 Prediction for the Proposer's Behavior in G100

Suppose that the responder is player *j* and the proposer is player *i*. Strategy A induces $\pi_i = 100$ and $\pi_j = 200$ while strategy B induces $\pi_i = 100$ ($\pi_i = 150$) and $\pi_j = 150$ if the responder chooses strategy *C* (*D*). Since $\pi_j < \pi_i$ cannot arise the responder's utility function can be reduced to $U_i = \pi_i + \lambda(1-\delta)\pi_j$. I denote the proposer's utility for choosing strategy A by $U_i(A)$ and choosing strategy B by $U_i(B)$. Furthermore, the proposer's subjective probability that the responder chooses strategy C after observing strategy B is p and the subjective probability that the responder chooses strategy D after observing strategy B is $(1-p)$. The proposer will (weakly) prefer strategy B if $U_i(B) \geq U_i(A)$. This condition is fulfilled if: $(1-p)(150+(\lambda-\lambda\delta)150)+p(100+(\lambda-\lambda\delta)150) \geq 100+(\lambda-\lambda\delta)200$ which is equivalent to $(1-p) \geq \lambda(1-\delta)$.

For the assumption that players are not selfish – i.e., $\lambda \in (0,1]$ – strategy D is strong dominant for the responder. Hence, any rational proposer has to assume $p = 0$. For $p = 0$ the condition $(1-p) \geq \lambda(1-\delta)$ reduces to $1 \geq \lambda(1-\delta)$. Since $\delta \in (0,1)$ the condition $1 > \lambda(1-\delta)$ is always fulfilled. Thus:

- *strategy B is the dominant strategy for the proposer in G100.*

A.2.1.2.4 Prediction for the Proposer's Behavior in G150

Suppose that the responder is player *j* and the proposer is player *i*. Strategy A induces $\pi_i = 100$ and $\pi_j = 200$ while strategy B induces $\pi_i = 100$ ($\pi_i = 150$) and $\pi_j = 150$ if the responder chooses strategy *C* (*D*). Since $\pi_j < \pi_i$ cannot arise the responder's utility function can be reduced to $U_i = \pi_i + \lambda(1-\delta)\pi_j$. I denote the proposer's utility for choosing strategy A by $U_i(A)$ and choosing strategy B by $U_i(B)$. Furthermore, *p* is the proposer's subjective probability that the responder chooses strategy C after observing strategy B and $(1-p)$ is his subjective probability that the responder chooses strategy D after observing strategy B. The proposer will (weakly) prefer strategy A if $U_i(B) \leq U_i(A)$. This condition is fulfilled if: $(1-p)(150+(\lambda-\lambda\delta)150)+p(100+(\lambda-\lambda\delta)150)<150+(\lambda-\lambda\delta)200$ which is equivalent to $(\delta-1)\lambda \leq p$.

For $(\delta-1)\lambda = p$ the proposer is indifferent between strategy A and B. However, since $\delta \in (0,1)$ the condition $(\delta-1)\lambda = p$ is only fulfilled for $\lambda = 0$ and $p = 0$. For the assumption that the players are not selfish – i.e., $\lambda \in (0,1]$ – the condition $(\delta-1)\lambda < p$ is always fulfilled. Thus:

- *strategy A is the dominant strategy for the proposer in G150.*

A.2.1.3 Predictions by a Theory of Reciprocity

A.2.1.3.1 Model of Falk and Fischbacher

While outcome based models only deal with a comparison of outcomes in the end nodes F&F's model also deals with expectations about the opponent's moves, beliefs and intentions. Thus, in each node of the game players form their beliefs about the opponent's behavior. Furthermore, the model records the player's intention by analyzing the expected payoff differences and the opponent`s influence on these payoffs. In doing so, the kindness of the opponent's expected moves are determined and become part of the utility function.

The main points of the model are the kindness term which measures experienced kindness and the reciprocation term which represents the response to the experienced kindness. Before starting to formalize the model I introduce some notification: the nodes of the game are n, $n \in N$. The end node is called *f*. Player *i*'s belief about player *j*'s move is denoted by b_j (first order belief). Player *i*'s belief about what *j* believes about *i*'s move is denoted by c_i (second order belief).

The kindness term measures player *j*'s kindness to player *i*. A positive (negative) sign of the kindness term denotes kindness (unkindness) by player *j* to player *i*. The kindness term will be determined by the opponent's intention and by the expected monetary outcomes. Thus, the kindness term is given in each node n where i has to act for given strategies and beliefs by:

$$\varphi_j(n,b_j,c_i) = \upsilon_j(n,b_j,c_i)\Delta_j(n,b_j,c_i).$$

The first term (second term) on the equation's right-side is the intention factor (outcome term).

The outcome term is given by:

$$\Delta_j(n,b_j,c_i) = \pi_i(n,b_j,c_i) - \pi_j(n,b_j,c_i).$$

It is the difference between the expected payoffs from *i*'s point of view. Thus, $\pi_i(n,b_j,c_i)$ is what *i* expects to get from *j* and $\pi_j(n,b_j,c_i)$ is what *i* believes *j* expects to get.[53]

The intention factor measures the intentionality of the opponent's move. I adopt the notational simplifications of F&F when describing the intention factor. To measure the opponent's intention the expected payoffs $\pi_i(n,b_j,c_i) = \pi_i^0$ and $\pi_j(n,b_j,c_i) = \pi_j^0$ are compared with alternatives. The set of alternatives $\Pi_i(n,b_j)$ are payoff combinations which player *j* may induce through his/her moves. Thus, intention factor is given by:

$$\upsilon_j(n,b_j,c_i) = \begin{cases} 1 & \text{if } \pi_i^0 \geq \pi_j^0 \text{ and } \exists \pi_i^A \in \Pi_i(n,b_j) \text{ with } \pi_i^A < \pi_i^0 \\ \varepsilon_i & \text{if } \pi_i^0 \geq \pi_j^0 \text{ and } \forall \pi_i^A \in \Pi_i(n,b_j),\ \pi_i^A \geq \pi_i^0 \\ 1 & \text{if } \pi_i^0 < \pi_j^0 \text{ and } \exists \pi_i^A \in \Pi_i(n,b_j) \text{ with } \pi_i^A > \pi_i^0 \\ \varepsilon_i & \text{if } \pi_i^0 < \pi_j^0 \text{ and } \forall \pi_i^A \in \Pi_i(n,b_j), \pi_i^A \leq \pi_i^o \end{cases}$$

where ε_i is an individual parameter with $\varepsilon_i \in [0,1]$. Camerer (2003 p.109) summarizes these four cases as follows: "Roughly speaking, intention is equal to 1 when player *j* gives more to *i* than to herself and she could have given *i* less, or when she gives less to *i* and could have given more. Intentions are equal to a value ε_i if *j* gives *i* more then to herself but could have given even more, or if *j* gives *i* less but could have given even less."

We should note that the kindness is a product of the outcome term and the intention factor. Thus, player *j*'s move is kind (unkind) if the kindness term is positive (negative). The

[53] F&F even can determine with this concept the kindness of a player *j* who never makes any move like in a dictator game. In such a case the outcome term is determined by *i*'s second order belief – i.e., what player *i* does believe about what *j* believes about *i*'s strategy. See more detailed the predictions of an optimal distribution in the dictator game in F&F (p.307-308).

higher the intention factor the higher the kindness or unkindness. For $\varepsilon_i = 0$ the opponent's move is neither kind nor unkind.

Furthermore, a positive (negative) outcome term is a necessary condition to interpret opponent's move as a kind (unkind) action. This is an important implication since the outcome term measures expected inequalities. This implies the following: if player *j* is better off than player *i*, even getting a gift from player *j* is never interpreted as kind by player *i*. On the contrary if player *j* is worse off, even taking money away from player *i* is never interpreted as unkind by player *i*.

The next term of F&F's model is the reciprocation term:

$$\sigma_i(n, f, b_j, c_i) = \pi_j(\upsilon(n, f), b_j, c_i) - \pi_j(n, b_j, c_i).$$

For a brief description of the reciprocation term I cite F&F (p. 301): "The reciprocation term expresses the response to the experienced kindness, i.e., it measures how much *i* alters the payoff of *j* with his move in node *n*. Given *i*'s belief about *j* 's expectations about her payoff in node *n* – i.e., given $\pi_j(n, b_j, c_i)$ – *i* can choose an action in node *n*. The reciprocal impact of this action is represented as the alteration of *j*'s payoff from $\pi_j(n, b_j, c_i)$ to $\pi_j(\upsilon(n, f), b_j, c_i)$ (always from *i*'s perspective). For a given $\pi_j(n, b_j, c_i)$, *i* can thus either choose to reward or to punish *j*. A rewarding action implies a positive, whereas a punishment implies a negative reciprocation term."

The utility function of player *i* is given by:

$$U_i(f, b_j, c_i) = \pi_i(f) + \rho_i \sum_{n \to f} \varphi_j(n, b_j, c_i) \sigma_i(n, f, b_j, c_i)$$

The overall utility is the sum of player *i*'s monetary payoff at the end node *f* and the reciprocity utility. The latter is the product of the kindness term and the reciprocation term where both are summed up over all nodes of the game and weighted by an individual given positive constant parameter, the reciprocity parameter ρ_i.

Reciprocity according to F&F works as follows: if the reciprocity utility is positive, the overall utility increases and reciprocity will be triggered. The reciprocity utility is positive either if the kindness term and the reciprocation term are both positive or if both terms are negative. A positive (negative) sign of the kindness and reciprocation term means positive (negative) reciprocity which implies a reward (punishment) for the opponent.

A.2.1.3.2 Prediction for the Responder's Behavior in G100 and G150

Suppose that the players are not selfish – i.e., $\rho_k > 0$.[54] Furthermore, suppose that the proposer is player *j* while the responder is player *i* and the proposer has chosen strategy *B*. From this node the games G100 and G150 are identical. The proposer's alternative – i.e., strategy, *A* – would imply $\pi_i(f) = 200$ and $\pi_i(f) > \pi_j(f)$ in both games (G100 and G150). Thus, the responder's best reply to strategy *B* is identical for G100 and G150.

The experienced kindness is given by $\varphi_j(n,b_j,c_i) = \upsilon_j(n,b_j,c_i)\Delta_j(n,b_j,c_i)$ where $\Delta_j(n,b_j,c_i) = \pi_i(n,b_j,c_i) - \pi_j(n,b_j,c_i)$. $\pi_i(n,b_j,c_i) = 150$ since the responder's payoff is equal to 150 for strategy *C* as well as for strategy *D*. $\pi_j(n,b_j,c_i)$ depends on c_i – i.e., what player *i* believes about *j* believes about *i*'s strategy. Thus, $\pi_j(n,b_j,c_i) \in [100,150]$ since 100 and 150 are the proposer's feasible payoffs. Hence, the outcome term is $\Delta_j(n,b_j,c_i) = \pi_i(n,b_j,c_i) - \pi_j(n,b_j,c_i) \geq 0$. Furthermore, the intention factor is $\upsilon_j(n,b_j,c_i) = \varepsilon_i$, with $\varepsilon_i \in [0,1]$.[55] Thus, the kindness term is: $\varphi_j(n,b_j,c_i) = \upsilon_j(n,b_j,c_i)\Delta_j(n,b_j,c_i) \geq 0$.

The reciprocation term is given by $\sigma_i(n,f,b_j,c_i) = \pi_j(\upsilon(n,f),b_j,c_i) - \pi_j(n,b_j,c_i)$. $\pi_j(\upsilon(n,f),b_j,c_i)$ represents the proposer's payoff at the end of the game and is equal to 100 for strategy *C* and equal to 150 for strategy *D*. Since $\pi_j(n,b_j,c_i) \in [100,150]$ the reciprocation term is either $\sigma_i(n,f,b_j,c_i) \leq 0$ for strategy *C* or $\sigma_i(n,f,b_j,c_i) \geq 0$ for strategy *D*.

The overall utility is given by $U_i(f,b_j,c_i) = \pi_i(f) + \rho_i \sum_{n \to f} \varphi_j(n,b_j,c_i)\sigma_i(n,f,b_j,c_i)$. For simplicity I denote the overall utility for strategy *C* with $U_i(C)$ and for strategy *D* with $U_i(D)$.

[54] The analysis of the game under $\rho_k = 0$ is identical to the solution of the game by the model of Fehr and Schmidt (1999) for $\alpha_k = \beta_k = 0$.

[55] Out of the four possible cases which determine the intention factor's value the second case arise for the feasible alternative outcomes.

For strategy *C* holds that $\pi_i(f)=150$, $\varphi_j(n,b_j,c_i)\geq 0$ and $\sigma_i(n,f,b_j,c_i)\leq 0$. Thus, the overall utility is $U_i(C)\leq 150$.

For strategy *D* holds that $\pi_i(f)=150$, $\varphi_j(n,b_j,c_i)\geq 0$ and $\sigma_i(n,f,b_j,c_i)\geq 0$. Thus, the overall utility $U_i(D)\geq 150$.

The responder is indifferent between strategy *C* and *D* for $U_i(C)=U_i(D)=150$ otherwise he prefers strategy *D*. $U_i(C)=U_i(D)=150$ is fulfilled if the kindness term is equal to zero. This case arise if $\pi_j(n,b_j,c_i)=150$ and / or if $\upsilon_j(n,b_j,c_i)=\varepsilon_i=0$. For these cases the kindness term is equal to zero and the overall utility reduces to the monetary payoff which is equal to 150. Otherwise $U_i(C)<U_i(D)$ holds and strategy *D* is the dominant strategy. Thus:

- *strategy D is either the dominant strategy for the responder or he may be indifferent between strategy C or D in G100 as well as in G150.*

A.2.1.3.3 Prediction for the Proposer's Behavior in G100

Suppose that the players are not selfish – i.e., $\rho_k>0$.[56] Furthermore, suppose that the proposer is player *j* and the responder is player *i*.

The experienced kindness is given by $\varphi_j(n,b_j,c_i)=\upsilon_j(n,b_j,c_i)\Delta_j(n,b_j,c_i)$, where $\Delta_j(n,b_j,c_i)=\pi_i(n,b_j,c_i)-\pi_j(n,b_j,c_i)$. Note that the outcome term depends on the proposer's belief about the responder's move in the following node of the game and on the proposer's belief about what responder believes about proposer's move. $\pi_i(n,b_j,c_i)\in[100,150]$ because the proposer's feasible payoffs are 100 and 150. $\pi_j(n,b_j,c_i)\in[150,200]$ because the responder's feasible payoffs are 150 and 200. Hence, the outcome term is $\Delta_j(n,b_j,c_i)=\pi_i(n,b_j,c_i)-\pi_j(n,b_j,c_i)\leq 0$. Furthermore, the intention factor is $\upsilon_j(n,b_j,c_i)=1$.[57] Thereby, the kindness term is $\varphi_j(n,b_j,c_i)=\upsilon_j(n,b_j,c_i)\Delta_j(n,b_j,c_i)\leq 0$. More precisely, the kindness term reduces to the outcome term $\varphi_j(n,b_j,c_i)=\Delta_j(n,b_j,c_i)\leq 0$.

[56] The analysis of the game under $\rho_k=0$ is identical to the solution of the game by the model of Fehr and Schmidt (1999) for $\alpha_k=\beta_k=0$.

[57] Out of the four possible cases which determine intention factor's value the first or third case may arise for the feasible alternative outcomes.

The reciprocation term is given by $\sigma_i(n,f,b_j,c_i) = \pi_j(\upsilon(n,f),b_j,c_i) - \pi_j(n,b_j,c_i)$. $\pi_j(\upsilon(n,f),b_j,c_i)$ represents the responder's payoff at the end of the game and is equal to 200 for strategy *A* and equal to 150 for strategy *B*. Thus, the reciprocation term is either $\sigma_i(n,f,b_j,c_i) \geq 0$ for strategy *A* or $\sigma_i(n,f,b_j,c_i) \leq 0$ for strategy *B*.

The overall utility is given by $U_i(f,b_j,c_i) = \pi_i(f) + \rho_i \sum_{n \to f} \varphi_j(n,b_j,c_i)\sigma_i(n,f,b_j,c_i)$. For simplicity I denote the utility for strategy *A* by $U_i(A)$ and for strategy *B* by $U_i(B)$. Note that for strategy *B* the payoff $\pi_i(f)$ is equal to 100 (150) if the responder chooses strategy *C* (*D*).

When choosing strategy *A* holds: $\pi_i(f) = 100$, $\varphi_j(n,b_j,c_i) \leq 0$ and $\sigma_i(n,f,b_j,c_i) \geq 0$. Thus, the overall utility is $U_i(A) \leq 100$.

When choosing strategy *B* holds: $\pi_i(f) \in [100,150]$, $\varphi_j(n,b_j,c_i) \leq 0$ and $\sigma_i(n,f,b_j,c_i) \leq 0$. Thus, the overall utility is $U_i(B) \geq 100$.

The proposer is indifferent between strategy *A* and *B* if $U_i(A) = U_i(B) = 100$ otherwise he prefers strategy *B* since $U_i(A) < U_i(B)$ holds. However, $U_i(A) = 100$ might arise only in a very strange case. A necessary condition for $U_i(A) = 100$ is a non-negative kindness term – i. e., $\varphi_j(n,b_j,c_i) = \Delta_j(n,b_j,c_i) = 0$. If the proposer believes that the responder could choose strategy *C* –i.e. the responder could punish him for choosing strategy *B* – the proposer's utility would be $U_i(A) < 100$. Thus, a non-negative kindness term only arises if the proposer believes that the responder will choose strategy *D* after observing strategy *B*. However, if the responder chooses strategy *D* after observing strategy *B* all payoffs are equal to 150 which implies a higher overall utility for the proposer than when choosing strategy *A*. Thus, the proposer has no incentive to choose strategy *A* if he believes that the responder will choose strategy *D* after observing strategy *B*. Hence, it is implausible to assume that a responder can be indifferent between strategy *A* and strategy *B* although $U_i(A) = U_i(B) = 100$ is mathematically feasible. Since $U_i(A) = U_i(B) = 100$ is implausible the condition $U_i(A) < U_i(B)$ is always fulfilled. Thus:

- *strategy B is the dominant strategy for the proposer in G100.*

A.2.1.3.4 Prediction for the Proposer's Behavior in G150

Suppose that is the players are not selfish – i.e., $\rho_k > 0$.[58] Furthermore, suppose that the proposer is player *j* and the responder is player *i*.

The analyses of the kindness term and the reciprocation term are the same as in G100.

The overall utility is given by $U_i(f,b_j,c_i) = \pi_i(f) + \rho_i \sum_{n \to f} \varphi_j(n,b_j,c_i)\sigma_i(n,f,b_j,c_i)$. For simplicity I denote the utility for strategy *A* by $U_i(A)$ and for strategy *B* by $U_i(B)$. Note that for choosing strategy B the payoff $\pi_i(f)$ is equal to 100 (150) if the responder chooses strategy *C* (*D*).

When choosing strategy *A* holds: $\pi_i(f) = 150$, $\varphi_j(n,b_j,c_i) \leq 0$ and $\sigma_i(n,f,b_j,c_i) \geq 0$. Thus, the overall utility is $U_i(A) \leq 150$.

When choosing strategy *B* holds: $\pi_i(f) \in [100,150]$, $\varphi_j(n,b_j,c_i) \leq 0$ and $\sigma_i(n,f,b_j,c_i) \leq 0$. Thus, the overall utility is $U_i(B) \geq 100$.

Thus, depending on the proposer's beliefs and on his/her reciprocation parameter ρ_i he/she may prefer strategy *A* as well as strategy *B* or he/she might be indifferent. The closer ρ_i, kindness term and reciprocation term to zero the more likely is $U_i(A) > U_i(B)$.

In summary:

- *both strategies may be dominant for the proposer in G150.*

A.2.1.4 Predictions for the Responder's Behavior with Inequality Aversion in Game 1 and Game 2

A.2.1.4.1 Prediction for the Responder's Behavior in Game 1

I use the utility function and notification introduced in A.2.1.1.1.

[58]The analysis of the game under $\rho_k = 0$ is identical to the solution of the game by the model of Fehr and Schmidt (1999) for $\alpha_k = \beta_k = 0$.

Suppose that the proposer is player *j* while the responder is player *i.* Assume that the proposer has chosen strategy *B*. Strategy *C* induces $\pi_i = 125$ and $\pi_j = 75$ while strategy *D* induces $\pi_i = 125$ and $\pi_j = 125$. Since $\pi_j > \pi_i$ cannot arise the responder's utility function can be reduced to $U_i = \pi_i - \beta_i(\pi_i - \pi_j)$. I denote the responder's utility for choosing strategy *C* by $U_i(C)$ and for choosing strategy *D* by $U_i(D)$. The responder (weakly) prefers strategy *D* if $U_i(D) \geq U_i(C)$. This condition is fulfilled if: $125 - \beta_i(125 - 125) \geq 125 - \beta_i(125 - 75)$ which is equivalent to $\beta_i \geq 0$.

It is easy to see that the responder is indifferent between strategies *C* and *D* if $\beta_i = 0$. For $\beta_i > 0$ he/she prefers strategy *D* since $U_i(D) > U_i(C)$. Assume that the players dislike favorable and unfavorable inequality – i.e., $\alpha_k \geq \beta_k \neq 0$ – so that the condition $\beta_i > 0$ is always fulfilled. Thus:

- *strategy D is a dominant strategy for the responder in Game 1.*

A.2.1.4.2 Prediction for the Responder's Behavior in Game 2

I use the utility function and notification introduced in A.2.1.1.1.

Suppose that the proposer is player *j* while the responder is player *i.* Assume that the proposer has chosen strategy *B*. Strategy *C* induces $\pi_i = 400$ and $\pi_j = 200$ while strategy *D* induces $\pi_i = 400$ and $\pi_j = 400$. Since $\pi_j > \pi_i$ cannot arise the responder's utility function can be reduced to $U_i = \pi_i - \beta_i(\pi_i - \pi_j)$. I denote the responder's utility for choosing strategy *C* by $U_i(C)$ and for choosing strategy *D* by $U_i(D)$. Responder (weakly) prefers strategy *D* if $U_i(D) \geq U_i(C)$. This condition is fulfilled if: $400 - \beta_i(400 - 400) \geq 400 - \beta_i(400 - 200)$ which is equivalent to $\beta_i \geq 0$.

It is easy to see that the responder is indifferent between strategies *C* and *D* if $\beta_i = 0$. For $\beta_i > 0$ he/she prefers strategy *D* since $U_i(D) > U_i(C)$. Assume that the players dislike favorable and unfavorable inequality – i.e., $\alpha_k \geq \beta_k \neq 0$ – so that the condition $\beta_i > 0$ is always fulfilled. Thus:

- *strategy D is a dominant strategy for the responder in Game 2.*

A.2.1.5 Predictions for the Responder's Behavior with Quasi-Maximin Preferences in Game 1 and Game 2

A.2.1.5.1 Prediction for the Responder's Behavior in Game 1

I use the utility function and notification introduced in A.2.1.2.1.

Suppose that the proposer is player *j* and the responder is player *i.* Assume that the proposer has chosen strategy *B*. Strategy *C* induces $\pi_i = 125$ and $\pi_j = 75$ while strategy *D* induces $\pi_i = 125$ and $\pi_j = 125$. Since $\pi_j > \pi_i$ cannot arise the responder's utility function can be reduced to $U_i = (1-\lambda\delta)\pi_i + \lambda\delta\pi_j$. I denote the responder's utility for choosing strategy *C* by $U_i(C)$ and for choosing strategy *D* by $U_i(D)$. The responder (weakly) prefers strategy *D* if $U_i(D) \geq U_i(C)$. This condition is fulfilled if: $(1-\lambda\delta)125 + \lambda\delta 125 \geq (1-\lambda\delta)125 + \lambda\delta 75$ which is equivalent to $\lambda\delta \geq 0$.

For $\lambda\delta = 0$ the responder is indifferent between strategies *D* or *C*. However, since $\delta \in (0,1)$ the condition $\lambda\delta = 0$ is only fulfilled for $\lambda = 0$. Assumed that players are not selfish – i.e., $\lambda \in (0,1]$ – the condition $\lambda\delta > 0$ is always fulfilled. Thus:

- *strategy D is a dominant strategy for the responder in Game 1.*

A.2.1.5.2 Prediction for the Responder's Behavior in Game 2

I use the utility function and notification introduced in A.2.1.2.1.

Suppose that the proposer is player *j* and responder is player *i.* Assume that the proposer has chosen strategy *B*. Strategy *C* induces $\pi_i = 400$ and $\pi_j = 200$ while strategy *D* induces $\pi_i = 400$ and $\pi_j = 400$. Since $\pi_j > \pi_i$ cannot arise the responder's utility function can be reduced to $U_i = (1-\lambda\delta)\pi_i + \lambda\delta\pi_j$. I denote the responder's utility for choosing strategy *C* by $U_i(C)$ and for choosing strategy *D* by $U_i(D)$. The responder (weakly) prefers strategy *D* if $U_i(D) \geq U_i(C)$. This condition is fulfilled if: $(1-\lambda\delta)400 + \lambda\delta 400 \geq (1-\lambda\delta)400 + \lambda\delta 200$ which is equivalent to $\lambda\delta \geq 0$.

For $\lambda\delta = 0$ the responder is indifferent between strategies *D* or *C*. However, since $\delta \in (0,1)$ the condition $\lambda\delta = 0$ is only fulfilled for $\lambda = 0$. Assumed that players are not selfish – i.e., $\lambda \in (0,1]$ – the condition $\lambda\delta > 0$ is always fulfilled. Thus:

- *strategy D is the dominant strategy for the responder in Game 2.*

A.2.1.6 Predictions for the Responder's Behavior with the Model of Falk and Fischbacher in Game 1 and Game 2

A.2.1.6.1 Prediction for the Responder's Behavior in Game 1

I use the utility function and notification introduced in A.2.1.3.1.

Assume that none of the players is selfish – i.e., $\rho_k > 0$.[59] Suppose the proposer has chosen strategy *B*. The responder's payoff is equal to 125 in any case and the proposer's payoff is equal to 125 (75) if the responder chooses strategy *D* (*C*).

The outcome term is $\Delta_j(n,b_j,c_i) = \pi_i(n,b_j,c_i) - \pi_j(n,b_j,c_i) \geq 0$ because $\pi_i(n,b_j,c_i) = 125$ and $\pi_j(n,b_j,c_i) \in [75,125]$. Due to the feasible alternative payoffs for the intention factor holds: $\upsilon_j(n,b_j,c_i) = \varepsilon_i$.[60] Note that ε_i is an individual parameter with $\varepsilon_i \in [0,1]$. Thereby, the kindness term is $\varphi_j(n,b_j,c_i) = \upsilon_j(n,b_j,c_i)\Delta_j(n,b_j,c_i) \geq 0$.

Next I analyze the reciprocation term $\sigma_i(n,f,b_j,c_i) = \pi_j(\upsilon(n,f),b_j,c_i) - \pi_j(n,b_j,c_i)$. $\pi_j(\upsilon(n,f),b_j,c_i)$ represents the proposer's payoff at the end of the game which is equal to 75 for choosing strategy *C* and equal to 125 for choosing strategy *D*. $\pi_j(n,b_j,c_i) \in [75,125]$ because the reciprocation term is either $\sigma_i(n,f,b_j,c_i) \leq 0$ if the responder chooses strategy *C* or $\sigma_i(n,f,b_j,c_i) \geq 0$ if the responder chooses strategy *D*.

Now I turn to the overall utility $U_i(f,b_j,c_i) = \pi_i(f) + \rho_i \sum_{n \to f} \varphi_j(n,b_j,c_i)\sigma_i(n,f,b_j,c_i)$. For simplicity I denote the overall utility for choosing strategy *C* by $U_i(C)$ and for choosing strategy *D* by $U_i(D)$.

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[59] The analysis of the game under $\rho_k = 0$ is identical to the solution of the game by the model of Fehr and Schmidt (1999) for $\alpha_k = \beta_k = 0$.

[60] Out of the four possible cases that determine the value of the intention factor the second case arise for the feasible alternative outcomes.

When choosing strategy *C* holds: $\pi_i(f)=125$, $\varphi_j(n,b_j,c_i)\geq 0$ and $\sigma_i(n,f,b_j,c_i)\leq 0$. Thus, the overall utility is $U_i(C)\leq 125$.

When choosing strategy *D* holds: $\pi_i(f)=125$, $\varphi_j(n,b_j,c_i)\geq 0$ and $\sigma_i(n,f,b_j,c_i)\geq 0$. Thus, the overall utility is $U_i(D)\geq 125$.

The responder is indifferent between strategy *C* and *D* if $U_i(C)=U_i(D)=125$ otherwise he/she prefers strategy *D*. $U_i(C)=U_i(D)=125$ is fulfilled if the kindness term is equal to zero. This case arise if $\pi_j(n,b_j,c_i)=125$ and / or $\upsilon_j(n,b_j,c_i)=\varepsilon_i=0$. For these cases the kindness term is equal to zero and the overall utility reduces to the monetary payoff which is equal to 125. Otherwise $U_i(C)<U_i(D)$ is fulfilled and strategy *D* is the dominant strategy.

A.2.1.6.2 Prediction for the Responder's Behavior in Game 2

The proof for Game 2 is identical to the proof of Game 1 shown in A.2.1.6.1. Only the payoffs are different.

Assume that none of the players is selfish – i.e., $\rho_k>0$.[61] Suppose the proposer has chosen strategy *B*. The responder's payoff is equal to 400 in any case and the proposer's payoff is equal to 400 (200) if the responder chooses strategy *D* (*C*).

The outcome term is $\Delta_j(n,b_j,c_i)=\pi_i(n,b_j,c_i)-\pi_j(n,b_j,c_i)\geq 0$ because $\pi_i(n,b_j,c_i)=400$ and $\pi_j(n,b_j,c_i)\in[200,400]$. Due to the feasible alternative payoffs for the intention factor holds: $\upsilon_j(n,b_j,c_i)=\varepsilon_i$.[62] Note that ε_i is an individual parameter with $\varepsilon_i\in[0,1]$. Thereby, the kindness term is $\varphi_j(n,b_j,c_i)=\upsilon_j(n,b_j,c_i)\Delta_j(n,b_j,c_i)\geq 0$.

Next I analyze the reciprocation term $\sigma_i(n,f,b_j,c_i)=\pi_j(\upsilon(n,f),b_j,c_i)-\pi_j(n,b_j,c_i)$. $\pi_j(\upsilon(n,f),b_j,c_i)$ represents the proposer's payoff at the end of the game which is equal to 200 for choosing strategy *C* and equal to 400 for choosing strategy *D*. Since

[61] The analysis of the game under $\rho_k=0$ is identical to the solution of the game by the model of Fehr and Schmidt (1999) for $\alpha_k=\beta_k=0$.

[62] Out of the four possible cases that determine intention factor`s value the second case arise for the feasible alternative outcomes.

$\pi_j(n,b_j,c_i) \in [200,400]$ the reciprocation term is either $\sigma_i(n,f,b_j,c_i) \leq 0$ if the responder chooses strategy *C* or $\sigma_i(n,f,b_j,c_i) \geq 0$ if the responder chooses strategy *D*.

Now I turn to the overall utility $U_i(f,b_j,c_i) = \pi_i(f) + \rho_i \sum_{n \to f} \varphi_j(n,b_j,c_i)\sigma_i(n,f,b_j,c_i)$. For simplicity I denote the overall utility for choosing strategy *C* by $U_i(C)$ and for choosing strategy *D* by $U_i(D)$.

When choosing strategy *C* holds: $\pi_i(f) = 400$, $\varphi_j(n,b_j,c_i) \geq 0$ and $\sigma_i(n,f,b_j,c_i) \leq 0$. Thus, the overall utility is $U_i(C) \leq 400$.

When choosing strategy *D* holds: $\pi_i(f) = 400$, $\varphi_j(n,b_j,c_i) \geq 0$ and $\sigma_i(n,f,b_j,c_i) \geq 0$. Thus, the overall utility is $U_i(D) \geq 400$.

The responder is indifferent between strategy *C* and *D* for $U_i(C) = U_i(D) = 400$ otherwise he/she prefers strategy *D*. $U_i(C) = U_i(D) = 400$ holds if the kindness term is equal to zero. This case arise if $\pi_j(n,b_j,c_i) = 400$ and/or $\upsilon_j(n,b_j,c_i) = \varepsilon_i = 0$. For these cases the kindness term is equal to zero and the overall utility reduces to the monetary payoff which is equal to 400. Otherwise $U_i(C) < U_i(D)$ is fulfilled and strategy *D* is the dominant strategy.

A.2.2 Instructions

Instructions for the Experiment of Chapter 2 (translated from German)

(Instruction of G100. The instructions for G100 and G150 are analogue so that I waive the instruction of G150)

Depending on your decisions you can earn money within the experiments. Earnings will be added to your account while loses will be subtracted. In the end of the experiment your earnings will be paid cash. Earnings are denoted by points.

Points are converted into euros according to the following rule:

20 points = 1 euro

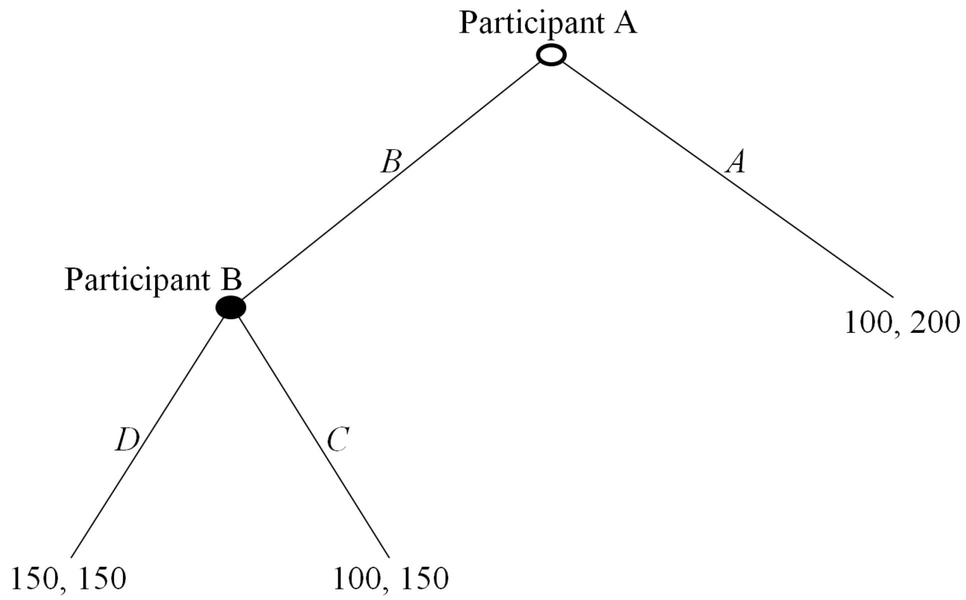
Please note that during the experiment communication is not allowed. If you have any question, please raise your hand out of the cubicle. All decisions are made anonymously. No other participant will experience your name and your monetary payoff.

Schedule of the experiment:

You will be randomly divided into groups with two members. Each group consists of a participant A and participant B. Participants` types will not change during the experiment. Your type is show on the instruction.

You are participant A

You can choose between the actions *A* and *B*. If you choose action *A* you receive 100 points and participant B receives 200. If you choose action *B*, participant B's choice determines final outcome. If you choose action *B* and participant B choose action *C*, you receive 100 points and participant B receives 150 points. If you choose action *B* and participant B choose action *D,* you receive 100 points and participant B receives 150 points. Participant B makes his choice without knowing your decision. However, participant B knows that his/her decision is only of relevance if you choose action *B*. Thus, participant B makes his/her decision on the assumption that you have chosen action *B*. The sequence of the experiment is shawn in the following figure:

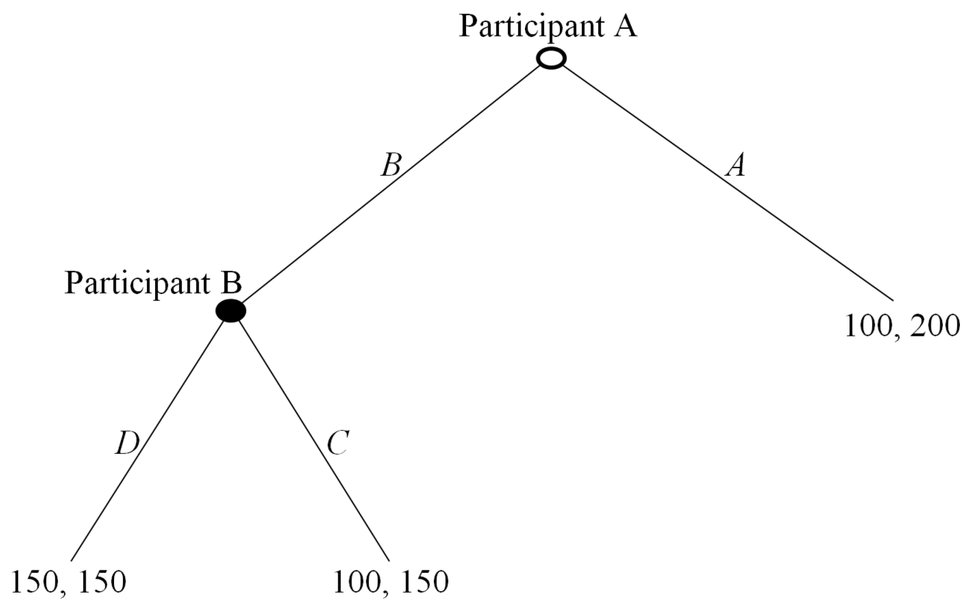


You can choose between action *A* and action *B*. Please write your choice in the appropriate field.

I choose action: _______.

You are participant B

You can choose between the actions *C* and *D*. At first participant A decides between action *A* and action *B*. If participant A chooses action *A*, you receive 200 and participant A receives 100 points. If participant A chooses action *B*, your choice determines the payoffs. If participant A chooses action *B* and you choose action *C*, you receive 150 points and participant A receives 150 points. If participant A chooses action *B* and you choose action *D*, you receive 150 points and participant A receives 100 points. Your choice is only of relevance if participant A chooses action *B*. Thus, make your decision on the assumption that participant A has chosen action *B*. The sequence of the experiment is show in following figure:



You can choose between action *C* and action *D*. Please write your choice in the appropriate field.

I choose action: _______.

Appendix A.3

A.3.1 Proof of Proposition

In order to keep the analysis simple we assume that preferences and productivities are common knowledge, that agents compare their payoff within the work group but not with the agents outside the work group and not with the principal, and, finally, that the principal only cares for monetary payoff.

Proposition 1: *Given that all group members are sufficiently inequality averse, the dominant strategy for all j = 1,2,3,4 within a group is to provide* $e_j^* = 10$ *if* $\beta_j \geq 1 - \frac{q_j}{8} s^{GT}$*. The principal can induce these choices by* $s^{GT} \geq \frac{8(1-\beta_j)}{q_j}$.

Proof:

Assume that $j = 4$ and $i = 1,2,3$ so that $k = 1,2,3,4$ with $j \in k$, $i \in k$ and $i \neq j$. Since the utility function is linear the agents maximize their utility at a corner solution. Thus agents either contribute no effort or eliminate inequalities by contributing equally positive efforts. Given the latter case and maximal contributions – i.e., $e_k = 10$ – there is no inequality so that *j*'s utility U_j is:

$$U_j = \left(s^{GT} \frac{1}{4} \sum_{k=1}^{4} e_k q_k \right) - 2e_j + f^{GT}.$$

Next we determine the deviation utility – i.e., agent *j*'s utility if he/she contributes $e_j = 0$ while the other agents contribute $e_i = 10$ so that *j*'s utility U_j is:

$$U_j = \left(s^{GT} \frac{1}{4} \sum_{i=1}^{3} e_i q_i \right) - \frac{1}{n-1} \beta_j \left(2 \sum_{i=1}^{3} e_i \right) + f^{GT}.$$

A sufficiently inequality averse agent *j* will contribute $e_j^* = 10$ if his/her utility is higher than for free-riding. This holds if:

$$\left(s^{GT} \frac{1}{4} \sum_{k=1}^{4} e_k q_k \right) - 2e_j + f^{GT} \geq \left(s^{GT} \frac{1}{4} \sum_{i=1}^{3} e_i q_i \right) - \frac{1}{n-1} \beta_j \left(2 \sum_{i=1}^{3} e_i \right) + f^{GT}.$$

This inequality can be simplified to:

$$\frac{1}{n-1}\beta_j\left(2\sum_{i=1}^{3}e_i\right) \geq 2e_j - \left(\frac{s^{GT}e_jq_j}{4}\right).$$

Since in equilibrium all agents contribute the same effort we can simplify this expression to:

$$2\beta_j e_j \geq 2e_j - \left(\frac{s^{GT}e_jq_j}{4}\right) \qquad \Leftrightarrow \qquad \beta_j \geq 1-\frac{1}{8}q_j s^{GT}.$$

A.3.2 Variable List and Regression Tables of Chapter 3

Table A.3.1: Variable List of Chapter 3

Variable	Scale	Description
Effort in GT	0, 1,2, …, 10	amount contributed to the group task
Effort in IT	0, 1,2, …, 10	amount contributed to the individual task
Share GT	0%, 10%,…, 100%	return share kept by agent in group task
Fix GT	-15, -14, …, 15	fixed wage in group task
Share IT	0%, 10%,…, 100%	return share kept by agent in individual task
Fix IT	-15, -14, …, 15	fixed wage in individual task
HT	0-1 coded	subject has productivity 7.5 in group task
LT	0-1 coded	subject has productivity 2.5 in group task
Period	1, 2, …, 10	period of the game
Low Team Productivity	0-1 coded	all players in team have productivity 2.5
Asym. Team	0-1 coded	players have different productivities
Sym. Team	0-1 coded	players have all equal productivities
Average Team Productivity	2.5, 3.75, 5.00, 6.25, 7.50	mean of team members productivity
Alpha	0-1 coded	high unfavored inequality aversion
Alpha missing	0-1 coded	unfavored inequality aversion is missing value
Beta	0-1 coded	high favored inequality aversion
Beta missing	0-1 coded	favored inequality aversion is missing value
Risk aversion	0-1 coded	Risk aversion according to Holt and Laury (2002)
Risk loving	0-1 coded	
Risk missing	0-1 coded	
Male	0-1 coded	person is male
WV survey trust	0-1 coded	person trusts the most people
Self control	(1,2, …,10)	16 PA personality factors according to Brandstätter (1988)
Emotional Stability	(1,2, …,10)	
Independence	(1,2, …,10)	
Tough-mindness	(1,2, …,10)	
Extraversion	(1,2, …,10)	

Table A.3.2: Regression Results of Regression on Effort in *GT*

Variable	*Coefficient*	*Robust Std. Error*	*P-Value*
Asymmetric Team * Fix-GT	0.323	0.141	0.023
Asymmetric Team * Share GT	0.050	0.008	0.000
Asymmetric Team *Average Team Productivity	0.071	0.028	0.012
Asymmetric Team	-7.779	1.167	0.000
Low Team Productivity	-3.555	1.210	0.012
Period	-0.262	0.057	0.000
Constant	8.530	0.659	0.000
Model Statistics:	N = 800 P-Value: 0.000 Pseudo R2: 0.032		
Dependent Variable:	Effort in *GT*		
Method:	Tobit Regression		

Notes: Base category is symmetric team with productivity 7.5.

Table A.3.3: Regression Results of Regression on Tasks Selection

Choice of Tasks, multinomial logistic regression			
GT versus IT			
Variable	*Coefficient*	*Robust Std. Error*	*P-Value*
Share in GT	0.030	0.005	0.000
Fix in GT	0.112	0.019	0.000
Share in IT	-0.025	0.006	0.000
Fix in IT	-0.148	0.022	0.000
Share in GT * HT	0.014	0.008	0.073
Fix in GT * HT	0.051	0.032	0.119
Share in IT * HT	-0.018	0.009	0.046
Fix in IT * HT	-0.070	0.039	0.077
HT	0.804	0.785	0.306
Alpha-high	0.504	0.193	0.009
Alpha-missing	0.269	0.233	0.247
Beta-high	0.287	0.176	0.102
Beta-missing	-0.364	0.284	0.200
Period	0.237	0.097	0.014
$Period^2$	-0.016	0.008	0.052
Constant	-0.630	0.647	0.330
Exit Option versus IT			
Variable	*Coefficient*	*Std. Error*	*P-Value*
Share in GT	0.005	0.008	0.547
Fix in GT	-0.085	0.027	0.002
Share in IT	-0.024	0.011	0.028
Fix in IT	-0.245	0.040	0.000
Share in GT * HT	-0.014	0.011	0.175
Fix in GT * HT	-0.022	0.040	0.587
Share in IT * HT	0.004	0.016	0.790
Fix in IT * HT	-0.042	0.061	0.494
HT	0.662	1.137	0.561
Alpha-high	0.856	0.400	0.032
Alpha-missing	-0.132	0.590	0.824
Beta-high	0.386	0.350	0.270
Beta-missing	-1.376	0.599	0.022
Period	0.380	0.231	0.100
$Period^2$	-0.018	0.017	0.284
Constant	-3.119	1.099	0.005
Model Statistics:	N = 1440		
	P-Value: 0.000		
	Pseudo R^2: 0.2523		

A.3.3 Instructions

Instructions for the Experiment of Chapter 3 (translated from German)

You are participating in two decision experiments. At the end you will be paid according to your performance. Therefore it is important, that you understand the following instructions.

Instructions for Experiment 1

- *Roll Assignment*

17 participants are taking part in the decision experiment 1. Each participant has one of three roles. One participant is of the type A (**player A**), eight participants are of the type B (**player B**) and eight participants are of the type C (**player C**). Your type is randomly determined at the beginning of the experiment and is displayed to you on your screen. Your type remains constant throughout the experiment and is shown on the top of the screen to remind you of your role assignment.

- *Payoff*

The experiment consists of several periods. During the experiment payoffs are measured in points and displayed on your account. At the beginning each participant's account has an amount of 50 points. Profits are added to your account and losses are subtracted from your account. In the case of a negative account balance you continue to participate in the experiment. Due to profits you can again obtain a positive account balance. At the end your payoffs are converted into Euro and paid to you in cash. If your account balance is negative at the end, you receive a payoff of 0 euro for experiment 1. The following rules apply to the conversion of points into euros:

- For player B and C: 10 points = 1 euro
- For player A: 100 points = 1 euro

- *Other Details*

Please note that during the experiment **communication is not allowed**. If you have any questions, please raise your hand out of the cubicle. All decisions are made anonymously. No other participant will experience your name and your monetary payoff.

Best of luck!

Experiment 1 consists of **10 periods** and **17 players**: one player of type A, eight players of type B and eight players of type C.

<u>Procedures for each period:</u>

1. Player A proposes a payment scheme for an individual project (**Project I**) and a payment scheme for a group project (**Project II**) which are announced to all players B and C. Payment scheme I determines the payoff for project I and consists of a *return share I* (percentage of the individual return) and a *fixed wage I*. Payment scheme II determines the payoff for project II and consists of a *return share II* (percentage of the group return) and a *fixed wage II*.

2. Each player B or C decides whether he or she accepts payment scheme I, payment scheme II or neither of them.

3.a. **<u>Participation in Project I</u>**

Given a player B or C accepts the payment scheme I, he or she participates in project I (**individual project**) and chooses an investment level (0, 1, …, 10) with the corresponding investment costs (investment cost = 2* investment level). The chosen investment level determines the individual return (individual return = 3* investment level).

Thus the following payoffs results:

period payoff player B (C) =	**individual return** * ***return share I*** + ***fixed wage I*** − **investment costs**

period payoff player A =	**individual return * (100% −** ***return share I*****) −** ***fixed wage I***

This means: Player B (C) receives the agreed *return share I* of the individual return plus the *fixed wage I* minus the own investment costs. Player A receives the remaining return share of the individual return minus the *fixed wage I*.

Displayed information to the players: Player B (C) is informed about individual return and own payoff for the particular period. Player A is informed about the number of players in individual projects. Additionally, he or she is informed about the sum of all individual returns and the sum of the payoffs from individual projects.

3.b. **Participation in Project II**

Given that several players B or C accepted the payment scheme II, groups of 4 members are formed out of the players who want to participate in project II (**group project**). Group members can be of different types. The group composition is random. Redundant participants can't participate in a group project. They are informed and can decide, whether to alternatively accept payment scheme I or not. If so, see point 3.a. If not, see point 3.c.

Each of the four members of a group choose an investment level (0, 1, …, 10) with the corresponding investment costs (investment cost = 2 x investment level) without the knowledge of the other group members decisions. You will be informed about types of your group members (type B or type C) before choosing investment level. The chosen individual investment level determines the individual return contribution for each group member.

Individual return contribution of participant is B = 2.5 * investment level
Individual return contribution of participant is C = 7.5 * investment level
The sum of the four individual return contributions is the group return.
Thus the following payoff results:

period payoff player B (C) =	**group return * (*return share II*)/4** **+ *fixed wage II*** **− investment costs**

period payoff player A =	**group return * (100% − *return share II*) – 4 * *fixed wage II***

This means: Each group member receives one fourth of the agreed share of the group return (*return share II*) plus the *fixed wage II* minus the own investment costs. Participant A receives the remaining share of the group return minus the four fixed wages.

Displayed information to the players: Player B (C) is informed about the group return and own period payoff. Participant A is informed about the number of participants in group projects, the sum of all group returns and the sum of payoffs from group projects.

3.c. **No participation in any project**

Given a player B (C) has neither accepted payment scheme I nor payment scheme II, he or she participates in no investment project in this period and receives the payoff 0.

Rules for the payment scheme:

- The return share can equal 0%, 10%, …, or 100%. Return shares I and II can be different.
- The fixed wage can equal -15, -14, …, 0, 1, … or 15. Fixed wages I and II can also be different.

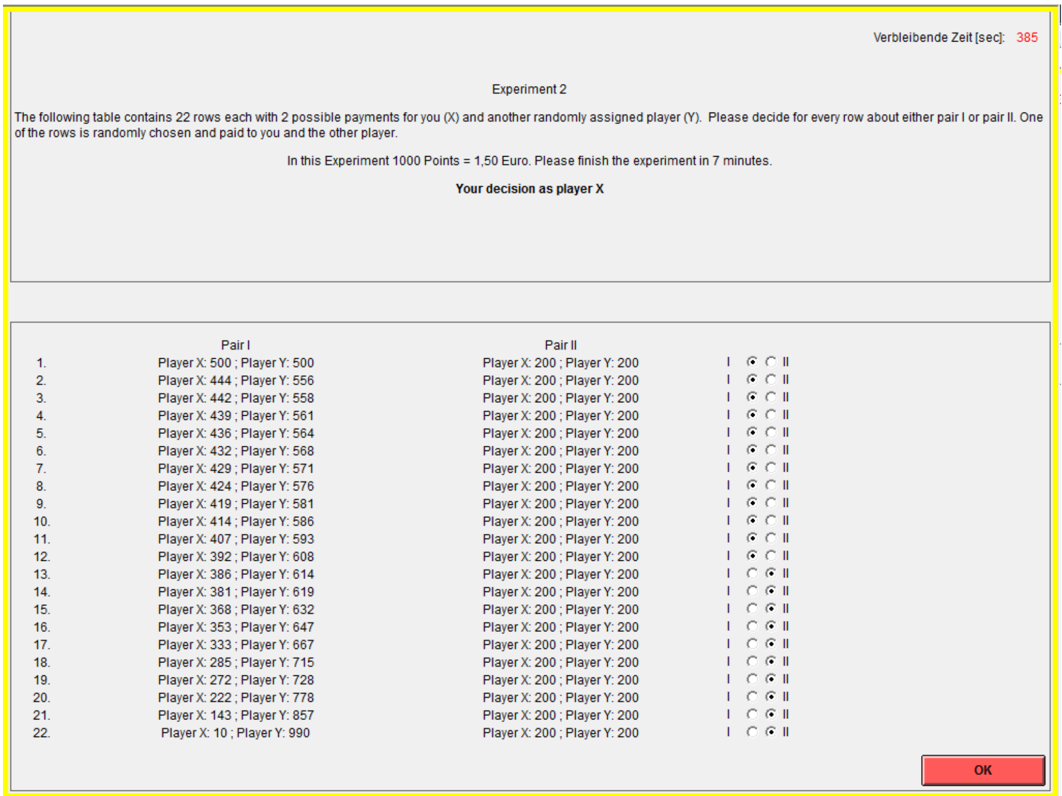
Within the given limitations return share and fixed wages can be arbitrary chosen. A positive fixed wage means a payment of player A to the respective player B (C). A negative fixed wage means a payment of a player B (C) to player A.

End of a period and further periods

After the investment decisions payoffs are calculated. The period ends. Your period payoff and your account balance are displayed to you. The next period starts according to the same rules.

<u>Experiment 2</u>

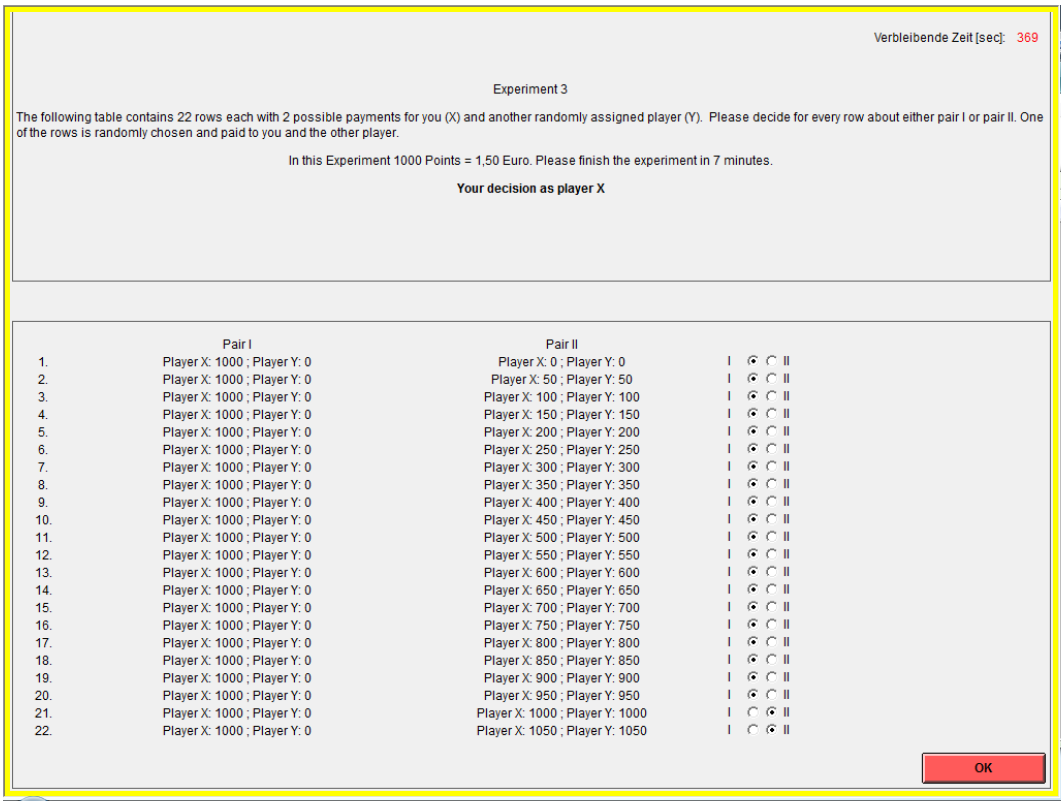
Figure A.3.1: Z-tree screenshot of Elicitation of unfavored inequality aversion



Notes: Players have to decide upon one of each column in every row. The procedure is as proposed by Danneberg et al. 2007.

Experiment 3

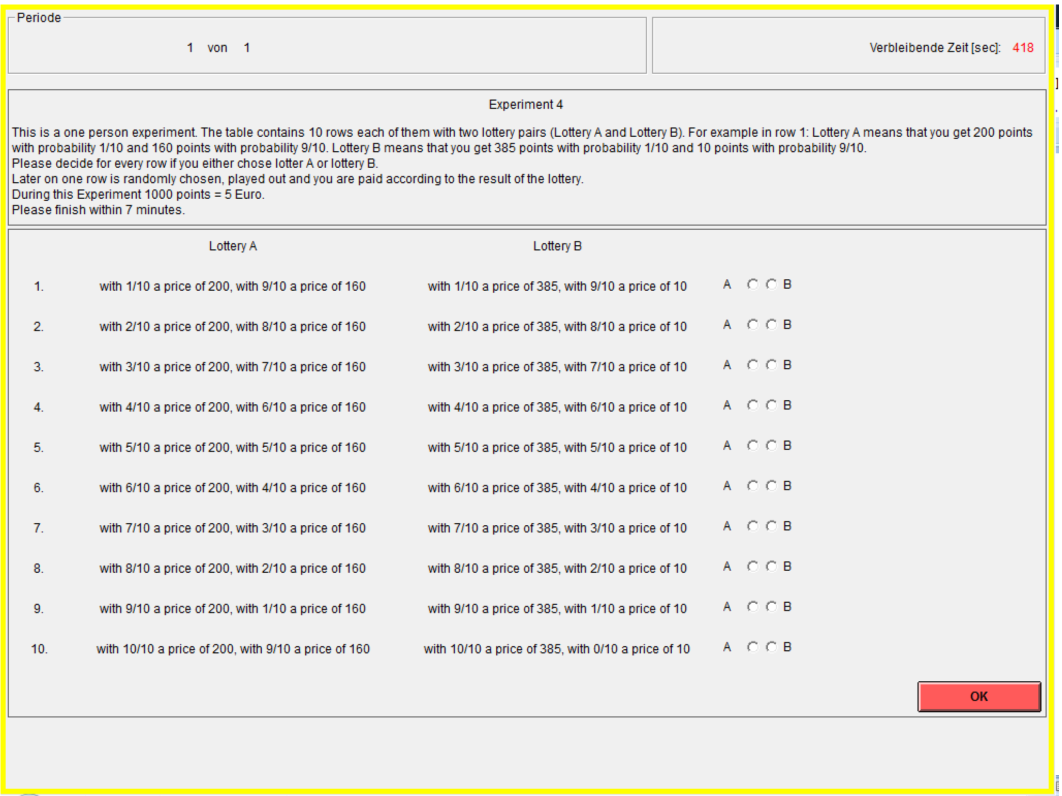
Figure A.3.2: Z-tree screenshot of Elicitation of favored inequality aversion



Notes: Players have to decide upon one of each column in every row. The procedure is as proposed by Danneberg et al. 2007.

Experiment 4

Figure A.3.3: Z-tree screenshot of Elicitation of Risk Preferences



Notes: Players have to decide upon one of two lotteries in every row. The procedure is as proposed by Holt and Laury (2002).

Appendix A.4

A.4.1 Predictions of Behavior

A.4.1.1 Prediction with Inequality Aversion

Suppose that players are inequality averse and their utility function is well described by the utility function introduced by Fehr and Schmidt (1999) which is already detailed described in A.2.1.1.1. If the dictator is subject A and his/her opponent is subject B, the dictator's utility function is as follows:

$$U_A = \pi_A - \alpha_A \max\{\pi_B - \pi_A, 0\} - \beta_A \max\{\pi_A - \pi_B, 0\}$$

Since $\pi_{B2} > \pi_{B1} = \pi_{A1} = \pi_{A2}$ the dictator's utility can be reduced to $U_A = \pi_A - \alpha_A(\pi_B - \pi_A)$. I denote the utility of the dictator for choosing column 1 by $U_A(C1)$ and for choosing column 2 by $U_A(C2)$. The dictator (weakly) prefers column 1 if $U_A(C1) \geq U_A(C2)$. This condition is fulfilled if: $\pi_{A1} - \alpha_A(\pi_{B1} - \pi_{A1}) \geq \pi_{A2} - \alpha_A(\pi_{B2} - \pi_{A2})$ which is equivalent to $\pi_{A1} \geq \pi_{A2} - \alpha_A(\pi_{B2} - \pi_{A2})$ and to $\alpha_A \geq 0$. It is easy to see that only a selfish dictator – i.e., if $\alpha_A = 0$ – is indifferent between column 1 and column 2. He/she strictly prefers column 1 if $\alpha_A > 0$.

A.4.1.2 Prediction with Quasi-Maximin Preferences

Suppose that the utility function of the players is well described by quasi-maximin preferences introduced by Charness and Rabin (2002) which is already detailed described in A.2.1.2.1. If the dictator is subject A and his/her opponent is subject B, the dictator's utility function is as follows:

$$U_A = (\pi_A, \pi_B) = \begin{cases} \pi_A + \lambda(1-\delta)\pi_B & \text{if} \quad \pi_A \leq \pi_B \\ (1 - \lambda\delta)\pi_{\text{A}} + \lambda\delta\pi_B & \text{if} \quad \pi_A \geq \pi_B \end{cases}$$

Since $\pi_{B2} > \pi_{B1} = \pi_{A1} = \pi_{A2}$ the dictator's utility can be reduced to $U_A = (\pi_A, \pi_B) = \pi_A + \lambda(1-\delta)\pi_B$. I denote the utility of the dictator for choosing column 1 by $U_A(C1)$ and for choosing column 2 by $U_A(C2)$. The dictator (weakly) prefers column 2 if $U_A(C1) \leq U_A(C2)$. This condition is fulfilled if: $\pi_{A1} + \lambda(1-\delta)\pi_{B1} \leq \pi_{A2} + \lambda(1-\delta)\pi_{B2}$ which is equivalent to $\lambda\pi_{B1} \leq \lambda\pi_{B2}$. It is easy to see that only a selfish dictator – i.e., if $\lambda = 0$ – is indifferent between column 1 and column 2. He/she strictly prefers column 2 if $\lambda \in (0,1]$.

A.4.2 Instructions

Instructions for the Experiment of Chapter 3 (translated from German)

Depending on your decisions you can earn money within the experiments. Earnings will be added to your account while loses will be subtracted. In the end of the experiment your earnings will be paid cash. Earnings are denoted by points.

Please note that during the experiment communication is not allowed. If you have any question, please raise your hand out of the cubicle. All decisions are made anonymously. No other participant will experience your name and your monetary payoff.

Schedule of the experiment:

You will be randomly divided into groups with two members. Each group consists of a participant A and a participant B. You will learn your type later. Participants' types will not change during the experiment.

Decision for Participant A:

Participant A decides on the division of points between himself/herself and participant B.

Decision for Participant B:

Participant B has no influence on the division of points.

The "Table" shows 11 rows with two payoff pairs (column 1 and column 2). Participant A chooses in each row one payoff pair (either column 1 or column 2).

Please make your choice in the experiment in the role of participant A. If you are actually in the role of participant A or in the role of participant B, will be told you after all decisions are made.

Please complete this "Table" on your screen by ticking column 1 or column 2 in each of the 11 rows. You may switch between column 1 and column 2 once.

Table

#	Column 1	Column 2
1	Participant A: 10; Participant B: 10	Participant A: 10; Participant B: 10
2	Participant A: 9; Participant B: 9	Participant A: 9; Participant B: 10
3	Participant A: 8; Participant B: 8	Participant A: 8; Participant B: 10
4	Participant A: 7; Participant B: 7	Participant A: 7; Participant B: 10
5	Participant A: 6; Participant B: 6	Participant A: 6; Participant B: 10
6	Participant A: 5; Participant B: 5	Participant A: 5; Participant B: 10
7	Participant A: 4; Participant B: 4	Participant A: 4; Participant B: 10
8	Participant A: 3; Participant B: 3	Participant A: 3; Participant B: 10
9	Participant A: 2; Participant B: 2	Participant A: 2; Participant B: 10
10	Participant A: 1; Participant B: 1	Participant A: 1; Participant B: 10
11	Participant A: 0; Participant B: 0	Participant A: 0; Participant B: 10

After completing the "Table" one of the 11 rows will be randomly chosen that determinates participants points. You will be paid according to the chosen column by participant A of the relevant row.

Furthermore, you will receive 8 points for participating on the experiment.

Points are converted into euros according to the following rule:

1 point = 0.5 euro

Best of luck!