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Selfish in the end?

An investigation of consistency and stability of individual behavior

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Abstract:

This paper puts three of the most prominent specifications of 'other-regarding' preferences to the experimental test, namely the theories developed by Charness and Rabin, by Fehr and Schmidt, and by Andreoni and Miller. In a series of experiments based on various dictator and prisoner's dilemma games, we try to uncover which of these concepts, or the classical selfish approach, is able to explain most of our experimental findings. The experiments are special with regard to two aspects: First, we investigate the consistency of *individual* behavior within and across different classes of games. Second, we analyze the stability of individual behavior over time by running the same experiments on the same subjects at several points in time.

Our results demonstrate that in the first wave of experiments, all theories of other-regarding preferences explain a high share of individual decisions. Other-regarding preferences seem to wash out over time, however. In the final wave, it is the classical theory of selfish behavior that delivers the best explanation. Stable behavior over time is observed only for subjects, who behave strictly selfish. Most subjects behave consistently with regard to at least one of the theories within the same class of games, but are much less consistent across games.

Keywords: individual preferences, consistency, stability, experimental economics

JEL classification: C91, C90, C72, C73

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1 Introduction

For a long time, economic science was built on a specification of individual preferences that implies rational and purely self-interested behavior. Over the last two decades, experimental research has produced a number of stylized facts that cast some doubt on the empirical validity of this specification, however. Subjects make voluntary contributions in public good games (see, e.g., Kim and Walker, 1984, Isaac, McCue, and Plott, 1985), they cooperate in the prisoner's dilemma (see, e.g., Flood, 1952, 1958), and they make significant donations to others in dictator games (see, e.g., Kahneman, Knetsch, and Thaler, 1986, Forsythe, Horowitz, Savin, and Sefton, 1994). None of these findings can be fully accounted for by the standard approach of rational and selfish behavior.

One way to tackle this problem is to deviate from the assumption of pure self-interest, while maintaining the rational choice approach. This path has been followed by a number of theorists, who integrate some kind of other-regarding behavior into the individual preference model in order to organize the experimental data. For example, the theories developed by Bolton and Ockenfels (2000) and by Fehr and Schmidt (1999) are based on the supposition that people are not only interested in their own absolute payoff, but also in their own *relative* payoff. Charness and Rabin (2003) propose a theory of social preferences assuming that subjects care about their own payoff, the others' payoff, and about efficiency. Andreoni and Miller (2002) and Andreoni, Castillo, and Petrie (2005) model a concern for altruism and efficiency by defining utility functions over giving to self and to others.[**]

All of these theories assume that individual preferences do not vary across games and over time. Given this assumption it should be possible to rationalize individual behavior observed in various experiments as the result of a particular preference model. In this paper we report the findings of a project in which we directly test this implication. First, we confront subjects in a within-subject design with different variants of modified dictator games and the prisoner's dilemma game in order to check whether they behave *consistently* within and across different classes of games.[††] Second, we repeat this experiment three times with the same

[**] Alternative approaches assume some kind of reciprocity caused by the harming or helping intentions by the fellow players (see, e.g., Geanakoplos, Pearse, and Stacchetti, 1989, Rabin, 1993, Levine, 1998, Dufwenberg and Kirchsteiger, 1998, Falk and Fischbacher, 1998).

[††] Within and across game consistency was also investigated by Blanco, Engelmann, and Normann (2006). In contrast to our paper, they solely focus on the theory proposed by Fehr and Schmidt (1999) and do not aim to analyze the stability of individual preferences over time (see also our discussion in section 6). Fischbacher and Gächter (2006) use a within-subject design to analyze individual preferences in two subsequently played public good games.

subjects within three months. This allows us to investigate whether subjects' behavior is *stable* over time.

Section 2 of our paper describes the modified dictator games and prisoner's dilemma games in more detail. In section 3 we present the notions of consistency, which were tested in the experiments. The notions are based on the standard approach of purely self-interested behavior and on three of the most prominent specifications of other-regarding preferences, namely the theories developed by Charness and Rabin, by Fehr and Schmidt, and by Andreoni and Miller (which allow to make specific predictions in our games). The experimental design is included in section 4 and the findings are discussed in section 5. Section 6 summarizes our results and concludes.

Our observations cast some doubt on the assumption of stable and consistent behavior. In particular, we could not find any other-regarding behavior, which is stable over time. While, in the first wave, there are many subjects, who show some kind of concern for others, this behavior changes over time into more selfishness. Stable behavior is displayed only by those, who behave strictly selfish. This gives rise to some fundamental questions. Given that other-regarding behavior disappears as soon as subjects become familiar with the experimental situation or the behavioral problem in focus, it must be asked how many of the "anomalies" observed in experiments are produced as artifacts of the laboratory situation.

2 Games

In order to investigate individual preferences, we employ two types of games, modified dictator games and prisoner's dilemma (PD) games. The games are described in detail below.

2.1 Modified dictator games

Our dictator games differ from standard dictator games in an important aspect: Dictators do not distribute a fixed amount of money between themselves and the recipients, but the amount to be distributed varies systematically. In each game, the dictator has to choose between eleven different distributions of payoffs to himself, π_A, and to the recipient, π_B. There are two different types of dictator games used in the experiment, 'take' games and 'give' games.

Take games

In each of the four take games, starting from the equal distribution (500, 500), player A (the dictator) can reduce player B's (the recipient) payoff by $\Delta\pi_B$ in order to increase the own payoff by $\Delta\pi_A$ at a constant relative price $m = |\Delta\pi_A / \Delta\pi_B|$, such that $\pi_A = 500 + m\ (500 - \pi_B)$. The four games only differ with respect to the size of m: In the first game, T1, we have $m = m_{T1} = 2$, in remaining games the m-values are $m_{T2} = 3/2$, $m_{T3} = 1$, and $m_{T4} = 1/2$, respectively. Except for the equal payoff distribution, all possible options in the take games are chosen in a way, that they assure a higher payoff to player A than to player B, $\pi_A > \pi_B$. The experimental set-up for the four games is illustrated in Table 1.

Game	π	1	2	3	4	5	6	7	8	9	10	11
T1	π_A π_B	500, 500	600, 450	700, 400	800, 350	900, 300	1000, 250	1100, 200	1200, 150	1300, 100	1400, 50	1500, 0
T2	π_A π_B	500, 500	575, 450	650, 400	725, 350	800, 300	875, 250	950, 200	1025, 150	1100, 100	1175, 50	1250, 0
T3	π_A π_B	500, 500	550, 450	600, 400	650, 350	700, 300	750, 250	800, 200	850, 150	900, 100	950, 50	1000, 0
T4	π_A π_B	500, 500	525, 450	550, 400	575, 350	600, 300	625, 250	650, 200	675, 150	700, 100	725, 50	750, 0

Table 1: Payoffs in the four take games.

Give games

In each of the four give games, starting from the equal distribution (500, 500), player A (the dictator) can increase player B's (the recipient) payoff by $\Delta\pi_B$ at a personal cost of $\Delta\pi_A$ at a constant relative price $m = |\Delta\pi_A / \Delta\pi_B|$, such that $\pi_A = 500 + m\ (500 - \pi_B)$. The four games only differ with respect to the size of m: In the first game, G1, we have $m = m_{G1} = 1/2$, in the remaining games the m-values are $m_{G2} = 2/3$, $m_{G3} = 1$, and $m_{G4} = 2$, respectively. Choices in the give games (except for the equal payoff distribution) grant a higher payoff to player B than to player A, $\pi_A < \pi_B$. The experimental set-up is illustrated in Table 2.

Game	π	1	2	3	4	5	6	7	8	9	10	11
G1	π_A π_B	500, 500	450, 600	400, 700	350, 800	300, 900	250, 1000	200, 1100	150, 1200	100, 1300	50, 1400	0, 1500
G2	π_A π_B	500, 500	450, 575	400, 650	350, 725	300, 800	250, 875	200, 950	150, 1025	100, 1100	50, 1175	0, 1250
G3	π_A π_B	500, 500	450, 550	400, 600	350, 650	300, 700	250, 750	200, 800	150, 850	100, 900	50, 950	0, 1000
G4	π_A π_B	500, 500	450, 525	400, 550	350, 575	300, 600	250, 625	200, 650	150, 675	100, 700	50, 725	0, 750

Table 2: Payoffs in the four give games.

2.1 Sequential prisoner’s dilemma games

The payoffs in the two sequential prisoner’s dilemma games are given in Figure 1. In both games, the decisions of player A (the second mover) are elicited using the strategy method, i.e. player A has to respond to each of the two actions feasible for player B (the first mover).

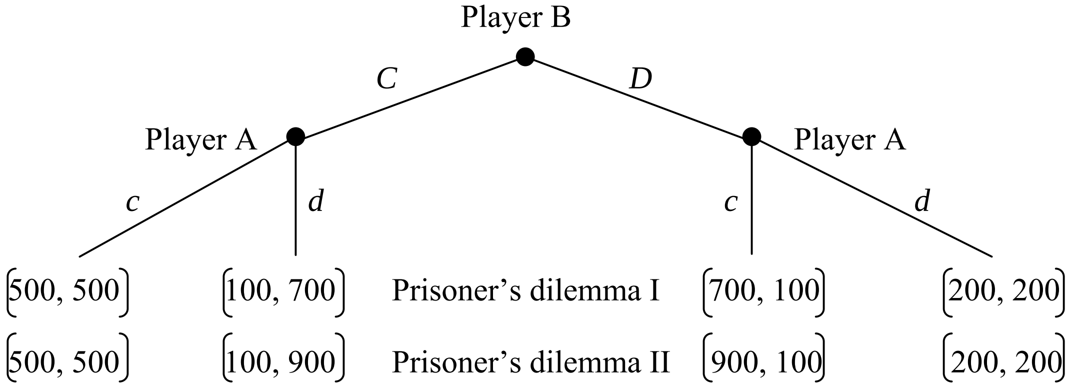

Figure 1: Payoffs in the two prisoner’s dilemma games.

3 Concepts of consistency

In our study, we investigate consistency with regard to the decisions made by players A. The concepts are based on three notions of preferences, selfish preferences (‘S-consistency’), Andreoni/Miller preferences (‘AM-consistency’), and Fehr/Schmidt and Charness/Rabin preferences (‘FS/CR-consistency’).

3.1 Consistency according to selfish preferences

A player A with selfish preferences does solely care for his own payoff π_A. Assuming that player A derives positive utility from π_A, i.e.

$$U_A^S = u(\pi_A) \quad \text{with} \quad \frac{\partial u(\cdot)}{\partial \pi_A} > 0,$$

then a selfish individual will always maximize his own payoff. The implications for the definition of consistency in our games are straightforward. An S-consistent player A will always take the maximum possible amount from player B in the take games (i.e., will always choose option 11), will always transfer the minimum possible amount to player B in the give games (i.e., will always choose option 1), and will always choose *d* in PD games.

All types of other-regarding preferences analyzed in this paper will include selfish preferences as a special case.

3.2 Consistency according to Andreoni/Miller preferences

Our second concept of consistency is in the spirit of the one introduced by Andreoni and Miller (2002). According to this concept, own and other's payoff are considered as 'normal goods'. Assuming that player A derives non-negative utility from her own payoff and from player B's payoff and ruling out the case of simultaneous indifference with regard to both, the utility function can be written as follows:

$$U_A^{AM} = u(\pi_A, \pi_B) \quad \text{with} \quad \frac{\partial u(\cdot)}{\partial \pi_A} \geq 0, \frac{\partial u(\cdot)}{\partial \pi_B} \geq 0 \quad \text{and} \quad \frac{\partial u(\cdot)}{\partial \pi_A} + \frac{\partial u(\cdot)}{\partial \pi_B} \neq 0.$$

Dictator games

Since π_A and π_B are normal goods, optimum demand for π_B, π_B^*, should not increase in the relative price *m*, i.e. $\partial \pi_B^* / \partial m \leq 0$. Consequently, in the take games, the amount taken from player B, $\tau = 500 - \pi_B^*$, should not fall in *m*, i.e. $\partial(500 - \pi_B^*)/\partial m \geq 0$. Given that in the four take games $m_{T1} > m_{T2} > m_{T3} > m_{T4}$, our definition of consistency in these games is:

AM-CONSISTENCY IN TAKE GAMES: An AM-consistent player A in a take game will take no more from player B the lower the relative price *m* of his own payoff is, i.e.

$$\tau_{T1} \geq \tau_{T2} \geq \tau_{T3} \geq \tau_{T4}.$$

Accordingly, in the give games , the amount given to player B, $\gamma = \pi_B^* - 500$, should not rise in *m*, i.e. $\partial(\pi_B^* - 500)/\partial m \leq 0$. Given that in the four give games $m_{G1} < m_{G2} < m_{G3} < m_{G4}$, our definition of consistency in the give games is:

AM-CONSISTENCY IN GIVE GAMES: An AM-consistent player A in a give game will transfer no less to player B the lower the relative price *m* of his own payoff is, i.e.

$$\gamma_{G1} \geq \gamma_{G2} \geq \gamma_{G3} \geq \gamma_{G4}.$$

PD games

For players A with Andreoni/Miller preferences, the definition of consistency in the prisoner's dilemma games is straightforward:

AM-CONSISTENCY IN PD GAMES: For an AM-consistent player A in both PD games, who is following a *C* choice of player B, the following should hold:

1. A player A choosing *d* over *c* in PD I, should choose *d* over *c* in PD II.

2. A player A choosing *c* over *d* in PD II, should choose *c* over *d* in PD I.

For an AM-consistent player A in both PD games, who is following a *D* choice of player B, the following should hold:

1. A player A choosing *c* over *d* in PD I, should choose *c* over *d* in PD II.

2. A player A choosing *d* over *c* in PD II, should choose *d* over *c* in PD I.

3.3 Consistency according to Fehr/Schmidt and Charness/Rabin preferences

Another way of modeling other-regarding preferences takes into account notions of inequality aversion. Preferences of this type have been introduced by Fehr and Schmidt (1999). Charness and Rabin (2002) also consider inequality aversion, but additionally include reciprocity concerns in their preference model. In our experimental set-up, both models have the same implications for the consistency of subjects' behavior.[‡‡]

As long as player B has not 'misbehaved' according to Charness and Rabin, reciprocity does not matter and the two approaches can be represented by using the Fehr/Schmidt utility function[§§]

$$U_A = u(\pi_A, \pi_B) = \begin{cases} \pi_A - \beta(\pi_A - \pi_B) & \text{for } \pi_A \geq \pi_B \\ \pi_A - \alpha(\pi_B - \pi_A) & \text{for } \pi_A < \pi_B \end{cases},$$

where it is assumed that $\alpha \geq \beta$ and $0 \leq \beta < 1$. In case of 'misbehavior', the Charness/Rabin utility function changes to:

$$U_A = u(\pi_A, \pi_B) = \begin{cases} \pi_A - \beta(\pi_A - \pi_B) + \psi(\pi_A - \pi_B) & \text{for } \pi_A \geq \pi_B \\ \pi_A - \alpha(\pi_B - \pi_A) + \psi(\pi_B - \pi_A) & \text{for } \pi_A < \pi_B \end{cases},$$

where it is additionally assumed that $\psi > 0$. With preferences including inequity aversion, a player gains utility from his own payoff and loses utility from a difference between his own and the other's payoff. Considering reciprocity in the case of 'misbehavior', the utility loss from a difference between the own and the other's payoff is even larger.

‡‡ Note that qualitatively similar results can be obtained when applying the relative-payoff approach by Bolton and Ockenfels (2000). The precise definitions of consistency resulting from this approach depend on the specific parameterization of their 'motivation function', however.

§§ For details refer to Appendix A.

Dictator games

In specifications of other–regarding preference incorporating notions of inequity–aversion, payoffs to others do not generally increase every players' utility. If player A has a lower payoff than player B ($\pi_A \leq \pi_B$), which is the case in our give games, FS/CR-consistency coincides with S-consistency. A decrease in π_A has a two-fold negative effect on player A's utility. On the one hand, utility falls because of the direct effect of the decrease in π_A. On the other hand, utility falls because a decrease in π_A will increase inequality $\pi_B - \pi_A$. Consequently, in the give games, an FS/CR-consistent player A should keep everything to himself:

FS/CR-CONSISTENCY IN GIVE GAMES: An FS/CR-consistent player A in a give game will transfer no money to player B, i.e. $\gamma_{G1} = \gamma_{G2} = \gamma_{G3} = \gamma_{G4} = 0$.

Things are slightly more complicated if player A has a higher payoff than player B ($\pi_A \geq \pi_B$) as it is the case in our take games. Changes in π_A will have two opposite effects: On the one hand, a rise in π_A increases utility. On the other hand, this also increases the inequality between π_A and π_B, which, in turn, decreases utility. This tradeoff needs to be examined in greater detail. Each of our take games can be characterized by a parameter β^c, which is the value of β that leaves an individual indifferent between all choices available in that take game. A player *i* with a degree of difference aversion higher than β^c, $\beta_i > \beta^c$, suffers comparably strong from the difference in payoffs and will thus aim to keep the difference as low as possible, i.e. takes nothing from B. A player *i* with $\beta_i < \beta^c$ will aim to enlarge the difference, i.e. takes everything from B. It can be found that in our take games, the relative price of π_A, *m*, and the critical value β^c are alternative measures. One can be computed from the other as $\beta^c = m/(m+1)$.

In the take games, we have $\beta^c_{T1} = 2/3$, $\beta^c_{T2} = 3/5$, $\beta^c_{T3} = 1/2$, and $\beta^c_{T4} = 1/3$. Consequently, only a player A with a low β_i will take anything from player B. As an example, take a player *i* with $\beta^c_{T3} > \beta_i > \beta^c_{T4}$. This player will take nothing in game T4, but will take everything in games T1 to T3, i.e. $\tau_{T1} = \tau_{T2} = \tau_{T3} \geq \tau_{T4} = 0$. Extending this exemplary notion to every possible value of β_i, we define FS/CR-consistency in the take games as follows:

FS/CR-CONSISTENCY IN TAKE GAMES: An FS/CR-consistent player A in a take game will take no more from player B the lower the relative price *m* of his own payoff is, i.e.

$$\tau_{T1} \geq \tau_{T2} \geq \tau_{T3} \geq \tau_{T4}.$$

PD games

Since sequential prisoner's dilemma games represent strategic interactions, reciprocity might play a role. According to Charness and Rabin reciprocity only matters, however, if player B 'misbehaves'. Consequently, we have to condition the definitions of consistency on the actions chosen by player B. If player B chooses *C*, i.e. if he does not 'misbehave', the definitions of FS-consistency and CR-consistency coincide. If player B chooses *D*, i.e. if he 'misbehaves', the reciprocity term of the Charness/Rabin utility function matter.

Following a *D*–move by player B, a player A can achieve both, a higher π_A and a lower difference between π_A and π_B by choosing *D*. This increases utility when applying the Fehr/Schmidt utility function and, because of the reciprocity term, does even more so when applying the Charness/Rabin utility function. Thus, in the case of a *D*-move, both approaches lead to the same definition of consistency.

FS/CR-CONSISTENCY IN PD GAMES FOLLOWING A *D*-MOVE: An FS/CR-consistent player A in both PD games, who is following a *D* choice of player B, will choose *d*.

If player B chooses *C*, things are slightly more complicated. Again, each subgame following a *C*-move can be characterized by a critical value of β^c, which leaves player *i* with $\beta_i = \beta^c$ indifferent between choosing *c* and *d*. The critical values for the two PD games are $\beta^c_{\mathrm{PDI}} = 1/3$ and $\beta^c_{\mathrm{PDII}} = 1/2$. Players A with a relatively low β_i will opt for the more unequal payoff distribution, i.e. will choose *d*, and players A with a relatively high β_i will opt for the more equal payoff distribution, i.e. will choose *c*.

FS/CR-CONSISTENCY IN PD I GAMES FOLLOWING A *C*-MOVE: An FS/CR-consistent player A in PD I games, who is following a *C* choice of player B, will choose *d*, if $\beta_i < 1/3$, and will choose *c*, if $\beta_i > 1/3$. Otherwise she will be indifferent.

FS/CR-CONSISTENCY IN PD II GAMES FOLLOWING A *C*-MOVE: An FS/CR-consistent player A in PD II games, who is following a *C* choice of player B, will choose *d*, if $\beta_i < 1/2$, and will choose *c*, if $\beta_i > 1/2$. Otherwise she will be indifferent.

Our definitions of consistency obtained by applying selfish preferences, Andreoni/Miller preferences and Fehr/Schmidt and Charness/Rabin preferences are summarized in Table 3.

<table>
<tr><th></th><th>Give games</th><th>Take games</th><th>PD I</th><th>PD II</th></tr>
<tr><td rowspan="2">S-consistency</td><td rowspan="2">$\gamma_{G1} = \gamma_{G2} = \gamma_{G3} = \gamma_{G4} = 0$</td><td rowspan="2">$\tau_{T1} = \tau_{T2} = \tau_{T3} = \tau_{T4} = 500$</td><td colspan="2">always d/D</td></tr>
<tr><td colspan="2">always d/C</td></tr>
<tr><td rowspan="2">AM-consistency</td><td rowspan="2">$\gamma_{G1} \geq \gamma_{G2} \geq \gamma_{G3} \geq \gamma_{G4}$</td><td rowspan="2">$\tau_{T1} \geq \tau_{T2} \geq \tau_{T3} \geq \tau_{T4}$</td><td colspan="2">$c/D$ in PD I $\Rightarrow$ c/D in PD II,
d/D in PD II $\Rightarrow$ d/D in PD I</td></tr>
<tr><td colspan="2">c/C in PD II $\Rightarrow$ c/C in PD I,
d/C in PD I $\Rightarrow$ d/C in PD II</td></tr>
<tr><td rowspan="2">FS/CR-consistency</td><td rowspan="2">$\gamma_{G1} = \gamma_{G2} = \gamma_{G3} = \gamma_{G4} = 0$</td><td rowspan="2">$\tau_{T1} \geq \tau_{T2} \geq \tau_{T3} \geq \tau_{T4}$</td><td colspan="2">always d/D</td></tr>
<tr><td>d/C if $\beta_i < 1/3$,
c/C, if $\beta_i > 1/3$,
indifference otherwise</td><td>d/C if $\beta_i < 1/2$,
c/C, if $\beta_i > 1/2$,
indifference otherwise</td></tr>
</table>

Table 3: Definitions of consistency.

3.4 Consistency across games

S-consistency (AM-consistency) in each of the 10 games implies S-consistency (AM-consistency) across games. A more complex definition of consistency across games can be obtained when applying Fehr/Schmidt and Charness/Rabin preferences. Given that players are FS/CR-consistent in each of the four give games and in each of the two PD games after a *D*-move and given their specific β_i obtained in the take games, consistency across games requires the following PD choices after a *C*-move:

$\tau = 0$ in	Choice in PD I ($\beta^c_{PDI} = 1/3$)	Choice in PD II ($\beta^c_{PDII} = 1/2$)
T1	*c*	*c*
T2	*c*	*c*
T3	*c*	indifference
T4	indifference	?

Table 4: Consistent PD choices after a *C*-move by player B.

Thus, across games, things depend on β_is, which are 'revealed' in the take games. For example, a player A consistently choosing to take nothing in T1 reveals to have a $\beta_i > \beta^c_{T1} = 2/3$. A player A with $\beta_i > 2/3$ should choose *c* in both PD games following a *C*-move by player B. For a player A taking nothing in T2, we know that $\beta_i > 3/5$, which implies that he should choose *c* after a *C*–move of player B in both PD–games.

4 Experimental design

The ten games were played over two sessions, which were conducted within one week in April 2006. Each of the two sessions was run with four groups of subjects consisting of 10 players A and 10 players B. In session 1 subjects participated in the four take games and in prisoner's dilemma I. In session 2 subjects participated in the four give games and in prisoner's dilemma II. The sequence of play is illustrated in Table 5. The two sessions were repeated twice, once in June 2006 (wave 2) and once in July 2006 (wave 3). In order to investigate the stability and consistency of preferences, the 2 x 3 sessions were conducted using a within-subject design for players A. Players B were newly recruited for each session and players A were informed about this.

	1st game	2nd game	3rd game	4th game	5th game
Session 1	T2	T4	PD I	T1	T3
Session 2	G3	G1	PD II	G4	G2

Table 5: Sequence of play.

At the beginning of each session in waves 1 and 2, subjects were told that they have to make decisions, but were left ignorant about the structure and number of games to be played. Wave 3 differed from the previous two waves in that subjects were informed about the five games right at the beginning of each session.[***] In all sessions, we employed a perfect random matching design, i.e. players A were matched with different players B, and subjects were informed accordingly. In addition, subjects were told that they will receive no feedback about their partner's and others' decisions during the experiment. At the end of each sessions subjects were paid off their total profit made in the five games at an exchange rate of 150 LabCents = 100 Eurocents. The payment was conducted anonymously employing a double-blind procedure.

The computerized experiment was run with a total of 270[†††] students at the Magdeburg Laboratory for Experimental Economics (MaXLab) using Fischbacher's (1999) z-tree software tool. Average payoffs were about €15.03, with a minimum of €0.67 and a maximum of €34.67. No experiment lasted longer than 30 minutes.

[***] This was done in order to amplify subjects' experience in a way that mimics the influence of repetitions of the experiment. Possible effects on subjects' behavior are discussed in section 5.1.

[†††] In wave 1, there were 40 (40) players A (B) in both sessions. Due to no-shows, in wave 2 there were 39 (39) players A (B) in both sessions, and in wave 3 there were 37 (37) players A (B) in session 1 and 35 (35) players A (B) in session 2.

5 Results

In order to report on our large set of data (decisions made by players A in three different classes of games – take games, give games, and PD games – which are played in different variants in three waves over time), the results section is structured in the following way. We first look at the aggregate data level, which is the focus of most experimental studies. After that, we take a closer inspection of *individual* behavior. This essentially means two things: First, we analyze the *consistency* of individual behavior, trying to find out to what extend the concepts of consistency introduced earlier in this paper can account for individual's behavior observed within and across the three classes of games in each of the three waves. Second, we investigate each individual's *stability* of behavior, describing whether, and if so, how, individual behavior changes over time.

Looking at aggregate behavior, we find that, in the first wave, the three models assuming some form of other-regarding behavior outperform the standard theory of pure-self-interest. Similar is true for individual behavior. There are more subjects, who behave consistently other-regarding (particularly AM-consistent), than subjects, who behave consistently selfish within and across the different classes of games. Over time, the frequency of consistent behavior increases. The proportion of consistent purely other-regarding behavior declines from wave to wave, however, while the proportion of consistent self-interested behavior increases. In the third wave nearly all consistent decisions can be rationalized by pure self-interest. This last observation also dominates our findings concerning the stability of behavior. Only a few subjects behave stable over time, all of them making selfish decisions. The following subsections present our findings in more detail.

5.1 Aggregate behavior

In order to get a first impression of what happens in the course of the experiments, we look at the aggregate data obtained for each class of games in each of the three waves.[‡‡‡]

[‡‡‡] Analyzing wave 3, we have to take into account that the experimental design slightly changed from wave 2 to wave 3. In the last wave subjects were informed about the sequence of games, while in the first two waves they were not. Changing the informational design in this direction, we believe we can generate a 'time-lapse' effect, mimicking the experience-enhancing effect of repeating the experiment. Potentially this change is in favor of non-selfish behavior. Given a subject plans to 'give' some money to one of his opponents, he can choose the one single game within the experiment that suits him most to do this (maybe because giving to others is particularly 'cheap' in that game, maybe because the game allows the subjects to give away a certain amount of money, or because of other reasons). Calculating the total amount of money players A allocate to themselves or the total amount of money players A allocate to their opponents for all three waves separately, we do not observe such an increase of other-regarding behavior, however (see Figures B1 and B2 in Appendix B).

In the take games of the first wave we observe that the average amounts taken away from players B are lower than 500. Moreover, the average taken amount, if at all, significantly decreases with a lower relative price for player's A payoff (significance levels for all game comparisons are displayed in Table 6). That is, on the aggregate level the observed behavior is in line with all three theories of other-regarding behavior (FS, CR, and AM).

	T1 vs. T2	T1 vs. T3	T1 vs. T4	T2 vs. T3	T2 vs. T4	T3 vs. T4
Wave 1	p = 0.288	p =0.132	p =0.071	p =0.036	p = 0.023	p =0.266
Wave 2	0.438	0.367	0.008	0.041	0.000	0.039

Table 6: Significance levels for take games (two-tailed exact Wilcoxon test).

Similar is true for the second wave, though the average amounts taken away by players A are significantly higher than in wave 1 ($p < 0.003$, two-tailed exact Wilcoxon test). In the third wave, players A take almost all money from players B in all four games. There are no longer any significant differences regarding player As' behavior between four games. These observations indicate that selfish behavior, which is not dominant in wave 1, takes over by the last wave and already plays a major role in wave 2. The aggregate results from the dictator games are displayed in Figure 2.

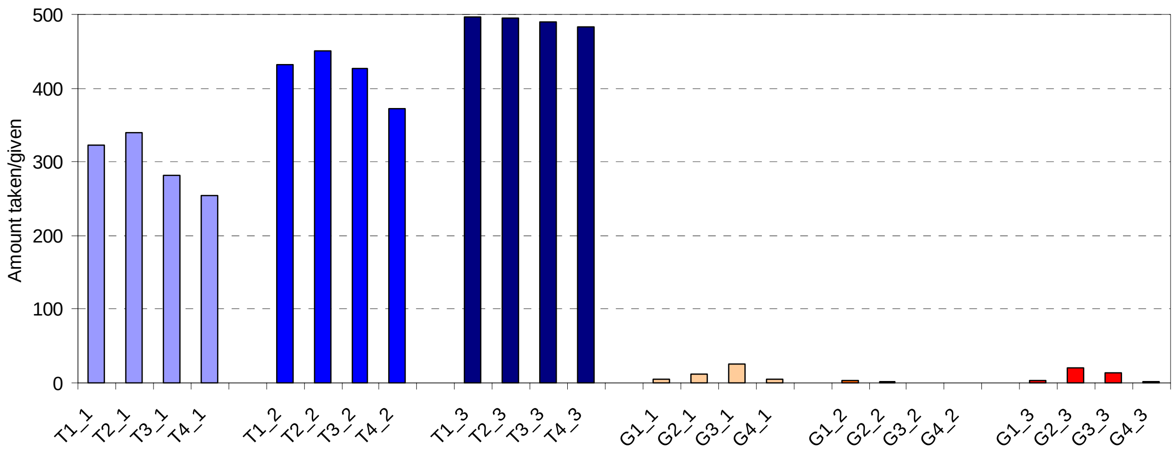

Figure 2: Average amount taken/given in the take games/give games in the three waves.

In the give games, things are quite different. On average, players A do not give significant amounts in all three waves. There are neither significant differences between games nor between waves. The fact that giving creates an efficiency gain does not seem to be a driving force for average decisions. The aggregate data obtained in giving games can be fully accounted for by the standard model of purely selfish behavior (though, it is not in contrast to the predictions made by the other three models).

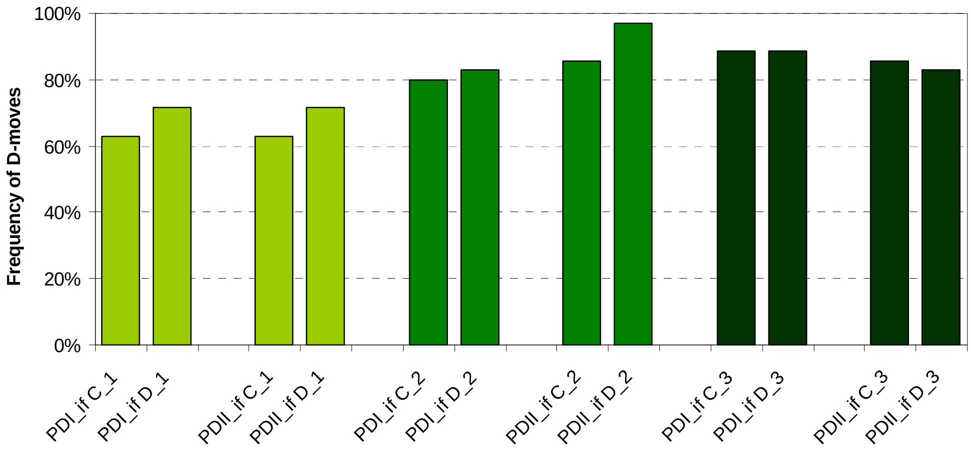

Figure 3: Average frequency of *d*-moves in the two PD-games in the three waves.

Comparing the average frequencies of *d*-moves between PD I and PD II, we find no significant differences within any one wave (see Figure 3). Similarly, there are no significant differences between players As' average response to a *C*-move and their average response to a *D*-move in either of the two games and the three waves, respectively.[§§§] That is, the average player A does not condition his move on the behavior of his opponent. These findings are in line with the models by Fehr and Schmidt, Charness and Rabin, and Andreoni and Miller.

The average frequency of purely self-interested behavior is always higher than 60 percent in wave 1, and increases in nearly all repetitions (except for PD II where we observe a weakly significant decrease of *d*-moves from wave 2 to wave 3). From wave 2 on the average frequency of defection in no case drops below the 80 percent level – also in response to a cooperative move made by player B. On average, we once again observe that subjects behave rather selfish when playing the game a second and a third time. Our results are summarized in observation 1:

Observation 1 (aggregate behavior)

In two of the three classes of games (take games and PD games) we observe that in the first wave subjects, on average, do not show strictly selfish behavior. Over the two repetitions the fraction of purely self-interested decisions increases and in the last wave no more than 15 percent of average behavior deviates from strict selfishness. In the give games we observe selfish behavior right from the beginning.

[§§§] If not indicated otherwise, two-tailed exact McNemar tests are used. Differences are labeled as significant if $p < 0.050$ and are labeled as weakly significant if $0.050 \leq p < 0.100$.

5.2 Consistency of individual behavior

5.2.1 Consistency within games

In order to investigate whether subjects behave consistently within any one of the three classes of games, we use the three concepts of consistency introduced in section 3. Note that, as already mentioned, these concepts are no independent measures. Since selfishness (S-consistency) is a special case of AM- and FS/CR-consistency, the additional explanatory power of the latter concepts is limited to the cases where behavior is non-selfish, but AM- or FS/CR-consistent. Furthermore, the AM-concept is by far the most general of the three. In particular, any FS/CR-consistent behavior in the take and give games is also AM-consistent, but this is not true *vice versa*. Only in the PD games, *some* FS/CR-consistent behavior is *not* AM-consistent (e.g., certain changes of behavior between PD I and PD II). On the other hand, there are strategies in the PD-games that are AM-consistent, but can never be FS/CR-consistent (e.g., 'always cooperate' or 'inverse tit-for-tat'). Therefore, we should expect that most of the decisions are AM-consistent and fewest are S-consistent. Figure 4 displays the results for all three waves:

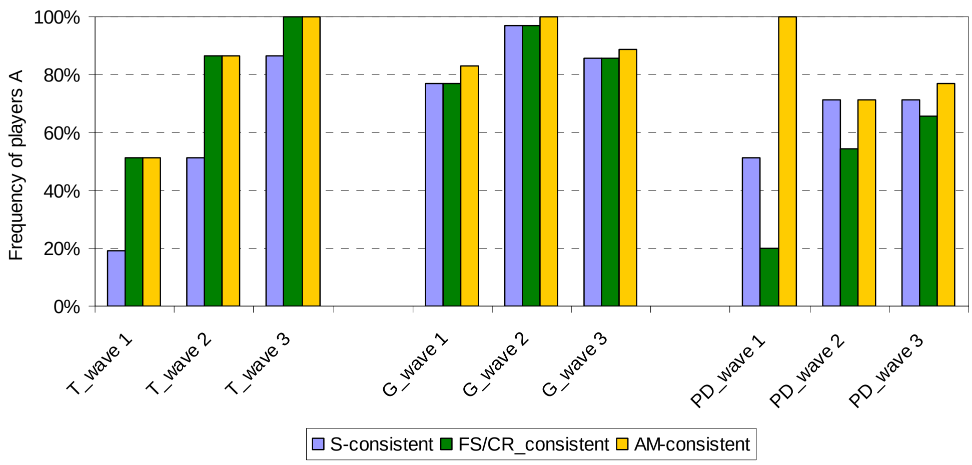

Figure 4: Frequency of consistent behavior in all games in the three waves.

For the take games, the concepts of AM- and FS/CR-consistency are identical and explain about 51 percent of all individual moves in the first wave, while 19 percent of subjects behave consistently selfish. That is, roughly a little more than 30 percent of the observed behavior in the first wave becomes consistent if we take into account that subjects may harbor preferences as used in the AM- and the FS/CR-concepts. In the second wave, we observe a highly significant increase in consistent behavior. Now more than 80 percent of decisions are AM- and FS/CR-consistent and this frequency is still significantly higher than the 52 percent of S-consistent decisions. The observation that the difference between both frequencies remains the same implies that the increase in consistency is mainly due to more consistent selfishness. In the third wave, the share of selfish behavior again increases significantly to 86 percent. Only the decisions made by those 14 percent of subjects, who do not take all the money from players B, can be accounted for by AM and FS/CR-consistency only. Remarkably, we do not observe any individual move in wave 3, which can not be characterized as consistent in the sense of one of the three concepts.

In the give games subjects behave selfish right from the start and do not significantly change their behavior over time. All three measures of consistency explain about 80 percent of observed individual behavior; there are no significant differences within and between the three waves. Since those, who decide to give something to player B, choose only very small amounts, it seems to be adequate to characterize the overall behavior in the give games as "consistently selfish".

In the PD games we find different patterns of behavior. In the first wave all subjects behaved in an AM-consistent manner, while FS/CR-consistent behavior could be observed in only 20 percent of all cases. The reason for the good performance of AM-consistency is the fact that all players A follow one of the four AM-consistent patterns: they always defect, or always cooperate, or always play tit-for-tat, or always play 'inverted tit-for-tat', i.e. play d/C and c/D. About 50 percent of the subjects behave strictly S-consistent and decide to always defect. The observation that not all of these subjects are FS/CR-consistent is due to the fact that they reveal β-values in the take games, which are not compatible with their d-moves in the PD-games.[****] The behavioral patterns observed in wave 1 are summarized in Table 7.

	always d		always c		tit-for-tat		inverted tit-for-tat	
PD I	55.0%	(22/40)	15.0%	(6/40)	17.5%	(7/40)	12.5%	(5/40)
PD II	52.5%	(21/40)	15.0%	(6/40)	17.5%	(7/40)	15.0%	(6/40)
PD	**52.5%**	**(21/40)**	**15.0%**	**(6/40)**	**17.5%**	**(7/40)**	**12.5%**	**(5/40)**

Table 7: Behavior in the PD-games of wave 1.

[****] In this respect, our notion of FS/CR-consistency in PD games already assumes some across-game consistency. If we focus on PD games only without further knowledge of the value of β, FS/CR preferences necessarily imply that players A following a D move will choose d, but have no implications regarding the response to a C move. Accordingly, FS/CR preferences are in line with 'always d' and 'tit-for-tat', respectively.

In waves 2 and 3, the share of S-consistency increases to 71.8 percent and 71.4 percent, respectively. These shares are nearly identical to the share of AM-consistency. The reason is that AM-consistent strategies that are not S-consistent (tit-for-tat, inverted tit-for-tat, and always c) are hardly ever used any more. The increase of FS/CR-consistent behavior in waves 2 and 3 can be attributed to the strong increase of selfish behavior in the take games in these waves. Subjects, who take away all the money from player B, exhibit low values of β and, consequently, their strategy to always defect is both, S-consistent and FS/CR-consistent. In particular, we find no single subject, whose behavior is AM-inconsistent and FS/CR-consistent at the same time. Given this behavior, more than one fourth of all subjects make *inconsistent* decisions in the last two waves. We summarize in observation 2:

Observation 2 (consistency within games):

Consistency of behavior within the three classes of games increases during the course of the experiment. This increase is almost always due to the fact that, over time, more and more subjects make consistently selfish decisions. In the PD games we observe that, even in the last wave, about 25 percent of subjects display a behavior, which can not be characterized as consistent by one of the three concepts under consideration.

5.2.2 Consistency across games

The strongest test for the consistency of individual behavior is the comparison of decisions made by a particular subject in different strategic situations. Figure 5 summarizes our findings regarding the consistency over all three classes of games. In all cases we employ the across-game consistency measures introduced in section 3.4.

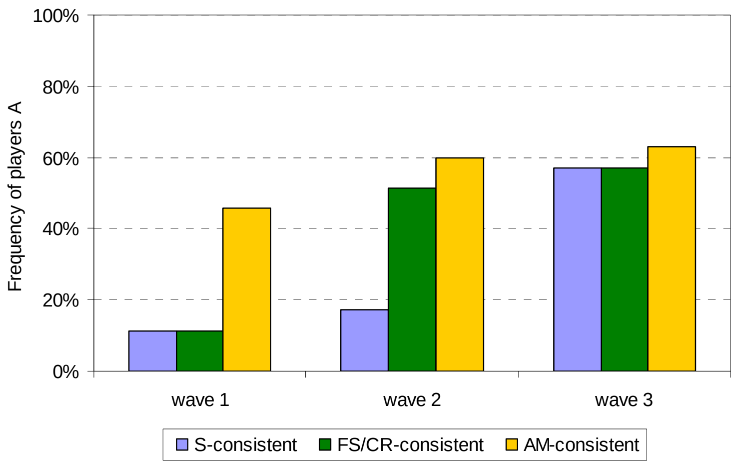

Figure 5: Consistency across games.

In the first wave, only about 10 percent of all subjects behave consistently selfish in all ten games. The same is true for FS/CR-consistency. AM-consistency, the most general concept of consistency, can account for the decisions made by 45 percent of subjects, and the differences to the other two measures are significant. The observations imply that more than 50 percent of all subjects behave *in*consistently over the three classes of games. In wave 2, only the number of FS/CR-consistent subjects significantly increases. As a result, both concepts of consistency assuming non-selfish behavior perform equally well (no significant differences) and outperform S-consistency. In wave 3, overall inconsistency decreases to about 40 percent. Moreover, we observe a significant increase in the frequency of S-consistent behavior from wave 2 to wave 3. Now nearly all of the FS/CR-consistent decisions and most of the AM-consistent decisions are a result of pure self-interest. The rather low proportion of S-consistent behavior observed in the first two waves is due to the fact that subjects tend to make 'exceptions' from their otherwise selfish behavior while, in the third wave, they consistently stick to their selfishness in all ten games. We summarize in observation 3:

Observation 3 (consistency across games):

Compared to the proportion of within-game consistency the proportion of consistent behavior across games is rather low. While in the first two waves selfishness is rarely observed across games, it clearly dominates behavior in the third wave. In this wave about 60 percent of all decisions can be characterized as consistent across games.

5.3 Stability of individual behavior

Our concept of stability is rather simple. We denote individual behavior as *stable*, if the subject always makes the same decision in the same game. As the question of stability is one of our major concerns, the results are presented in more detail by looking at the stability of individual behavior over waves 1 and 2, over waves 2 and 3, and over all three waves, separately. Figure 6 illustrates the stability of behavior observed in all games over the first two waves.

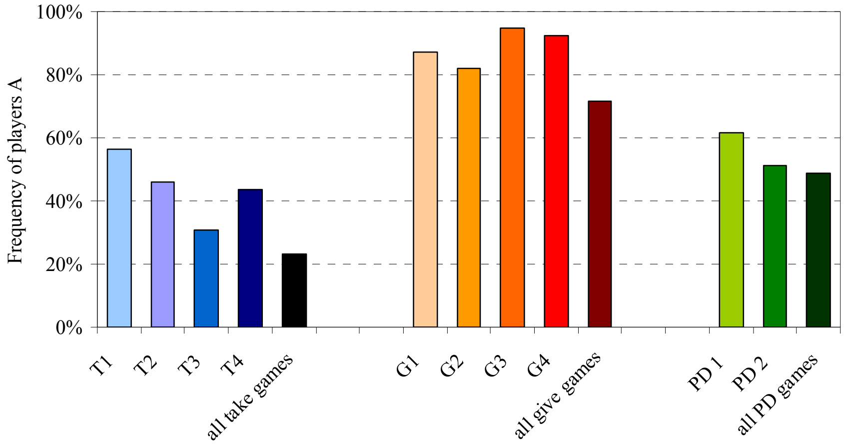

Figure 6: Frequency of stable behavior in the three game types – from wave 1 to wave 2.

In the four take games, there are 9 subjects (23 percent), who do not change their behavior over the first two waves. Out of these 9 subjects, the behavior of 7 subjects is in line with S-consistency, and the behavior of all 9 subjects is in line with both, AM- and FS/CR-consistency. In the four give games we observe 28 subjects (72 percent), who behave in a stable manner over waves 1 and 2. The behavior of all 28 subjects is in line with S-consistency. In the two PD games there are 19 subjects (49 percent), who do not change their behavior over the first two waves. The behavior of all 19 subjects (who always choose *d*) is in line with S-consistency, AM-, and FS/CR-consistency.

These results imply that particularly those subjects, who behave (consistently) selfish, make stable decisions over time. Consequently, we observe a high frequency of stable behavior in those classes of games, which reveal a high number of S-consistent decisions, i.e., the frequency of individual stability is significantly higher in give games than in PD games and in take games and weakly significantly higher in PD games than in take games.

This supposition is further supported when investigating the stability of individual behavior over waves 2 and 3, and over all three waves. In the four take games, the significant increase of S-consistent behavior over time is accompanied by a significant increase of stable behavior from the first two waves to the last two waves. In particular, in wave 3 we observe 18 subjects (51 percent), who make the same decisions as in wave 2. All of the 18 subjects' decisions are S-consistent. Calculating the total number of subjects, who behave stable in the take games over all three waves, we find that all of these 7 subjects behave in line with S-consistency. Figures 7-9 summarize the relative frequencies of stable behavior observed in wave 3 (compared to wave 2) and over all waves.

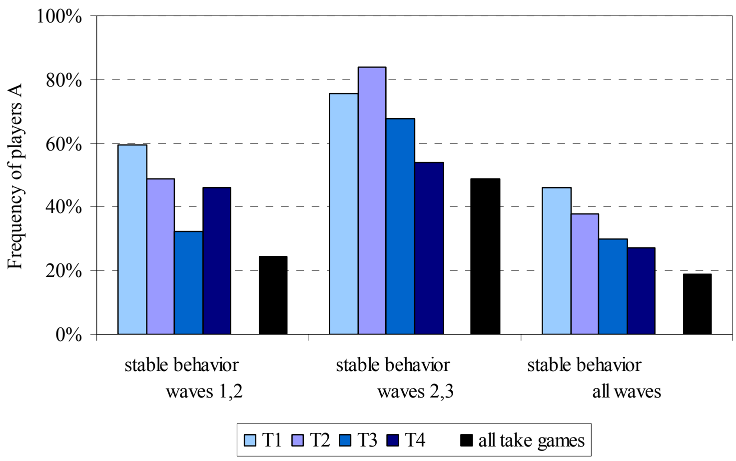

Figure 7: Frequency of stable behavior in the take games – wave 2 to 3 and over all waves.

In the give games, we do not find a significant change regarding S-consistent behavior over time and also do not find a significant difference between waves 2 and 3 regarding the number of subjects displaying a stable behavior. There are 29 subjects (83 percent), who make the same decisions over the last two waves, and again all of these subjects' decisions are S-consistent. Over all three waves the frequency of stable behavior in give games (which is also S-consistent) is 66 percent.

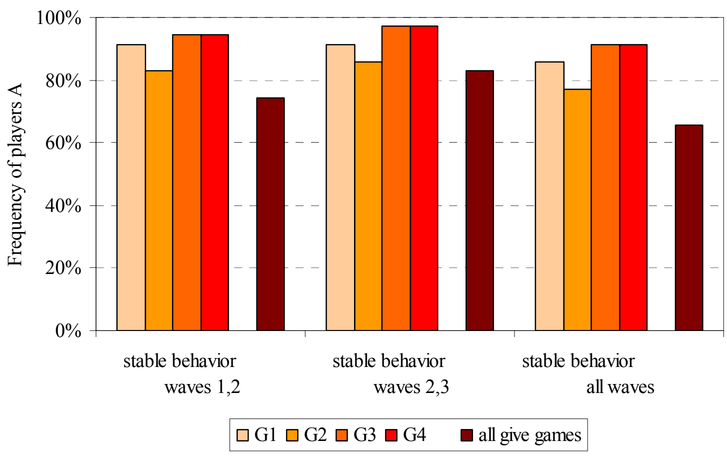

Figure 8: Frequency of stable behavior in the give games – wave 2 to 3 and over all waves.

In the PD games there is a significant increase of S-consistent behavior from wave 1 to wave 2. Accordingly, the frequency of stable behavior in these games significantly increases from the first two waves to the last two waves. In wave 3 we observe 25 subjects (71 percent), who do not change their behavior compared to wave 2. 23 of the 25 subjects can be classified as S-consistent. In total, 43 percent of subjects do not change their behavior over all three waves in the PD games. All of them make decisions, which are in line with S-consistency but are not consistent with any of the other concepts.

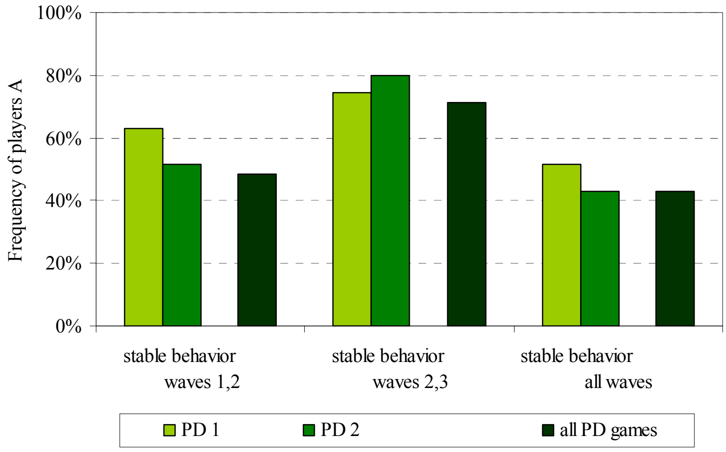

Figure 9: Frequency of stable behavior in the PD games – wave 2 to 3 and over all waves.

While over the first two waves, PD games and give games significantly differ regarding the frequency of stable behavior, we find no such difference over waves 2 and 3. Both classes of games still significantly differ regarding this frequency from the take games, however. Comparing the three classes of games regarding the frequency of stable behavior observed over all three waves reveals a (weakly) significantly higher stability in give games than in PD games and in take games and a significantly higher stability in PD games than in take games. Our findings are summarized in observation 4:

Observation 4 (stability):

Over all three waves, the frequency of stable behavior in the take games is rather low (less than 20 percent), in the PD games it is about 40 percent, and in the give games it is more than 60 percent. All subjects, who behave stable over waves 1, 2, and 3, make strictly selfish decisions. Also between two adjacent waves we find only a few subjects displaying stable but not selfish behavior. The increase of stability observed from wave 2 to wave 3 is largely due to an increase of S-consistent behavior.

6 Discussion and conclusion

During the last decade a lot of experimental evidence in favor of the existence of some kind of other-regarding preferences has been produced. In the first wave of our three-wave-design, we add some more findings to this evidence, as most of the observed behavior cannot be explained by the assumption that subjects behave like rational egoistic payoff maximizers. Particularly the observations made on aggregate and on individual behavior in wave 1 leave room for explanations along the lines of theories assuming some kind of other-regarding preferences. For example some of the results on our give games and on our take games in the first wave seem to confirm the assumptions made by Fehr and Schmidt, namely that subjects are rather willing to accept inequality when they are better off than their opponents, than in the case in which they are behind. The theory by Fehr and Schmidt accounts for a rather low share of decisions, however, when investigating individual consistency across games. Our observations are, thus, similar to those reported by Blanko, Engelmann, and Normann (2006), who test Fehr and Schmidt's theory with regard to individual consistency across four games. In particular, Blanco et al. also find that the theory by Fehr and Schmidt is capable of explaining only a very small fraction of individual behavior, while the aggregate data is generally compatible with this theory.

The major result of our investigations is that, over the three repetitions of our experiment, subjects change their behavior tremendously. These changes have one unique direction, which is common to all subjects: They behave more and more purely self-interested. In particular, stable behavior over time is observed only for those subjects, who make strictly selfish decisions.

Given these findings, several more or less fundamental questions inevitably arise. The first line of questions seems to be quite obvious: Why is the observed behavior that instable and why do subjects, who start with other than self-interested behavior, turn out to be *homines oeconomici* in the end? Two plausible (though speculative) explanations are at hand. First, it might be that subjects learn to be selfish in the sense that they find out that it does not hurt not to care for others. Therefore, in the third wave, they know that there is no internal punishment mechanism (bad feelings, bad conscience) at work when they take all the money, give nothing, and defect in the PD games. The second possible explanation is that subjects feel obliged to care for others, but that this obligation is finally fulfilled by forgoing to behave strictly selfishly just once (independent of the fact that they are matched with new opponents in each of the three waves). Consequently, subjects in later waves might have the impression that they have done their duty and are in a position in which it is justified to care only about the own payoff.

The second line of questions concerns a more general, methodological point. Given our results, the question is what is the relevant experimental evidence? Do we learn from our experiment that people behave selfishly or that they are not selfish in general? The answer to this questions depends on the specific wave we look at and this leads to the general question of what “true” experimental evidence is. Is it the behavior we observe when we invite subjects to the laboratory for the first time (which is the case in most of the experimental studies), or do we have to give subjects the chance to become familiar with the experimental situation? What is of greater importance, the behavior of the ‘inexperienced’ subjects in the first wave or the behavior by ‘mature’ subjects in the final wave? These methodological questions seem to be of fundamental relevance for experimental research.

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Appendix A: Equivalence of F/S and C/R Preferences

For a two-person-game with players A and B, Fehr and Schmidt (1999) specify individual A's preferences concerning his own payoff π_A and his opponent's payoff π_B:

$$U_A = u(\pi_A, \pi_B) = \begin{cases} \pi_A - \beta(\pi_A - \pi_B) & \text{for} \quad \pi_A \geq \pi_B \\ \pi_A - \alpha(\pi_B - \pi_A) & \text{for} \quad \pi_A < \pi_B \end{cases}$$

The respective specification by Charness and Rabin (2002, p.822) reads

$$U_A = u(\pi_A, \pi_B) = \begin{cases} (\rho + \theta q)\pi_B + (1 - \rho - \theta q)\pi_A & \text{for} \quad \pi_A \geq \pi_B \\ (\sigma + \theta q)\pi_B + (1 - \sigma - \theta q)\pi_A & \text{for} \quad \pi_A < \pi_B \end{cases}$$

where q is an indicator variable signaling the presence of reciprocity. As we designed our experiments in a way that avoids reciprocity, we can, for our paper, set $q := 0$, which leads to the simple specification

$$U_A = u(\pi_A, \pi_B) = \begin{cases} \rho\pi_B + (1 - \rho)\pi_A & \text{for} \quad \pi_A \geq \pi_B \\ \sigma\pi_B + (1 - \sigma)\pi_A & \text{for} \quad \pi_A < \pi_B \end{cases}.$$

This can be re-written as

$$U_A = u(\pi_A, \pi_B) = \begin{cases} \pi_A - \rho(\pi_A - \pi_B) & \text{for} \quad \pi_A \geq \pi_B \\ \pi_A + \sigma(\pi_B - \pi_A) & \text{for} \quad \pi_A < \pi_B \end{cases}.$$

This form shows that, for the purpose of our paper, the specification by Fehr and Schmidt and the one by Charness and Rabin are equivalent for $\rho = \beta$ and $\sigma = -\alpha$.

Appendix B: Figures

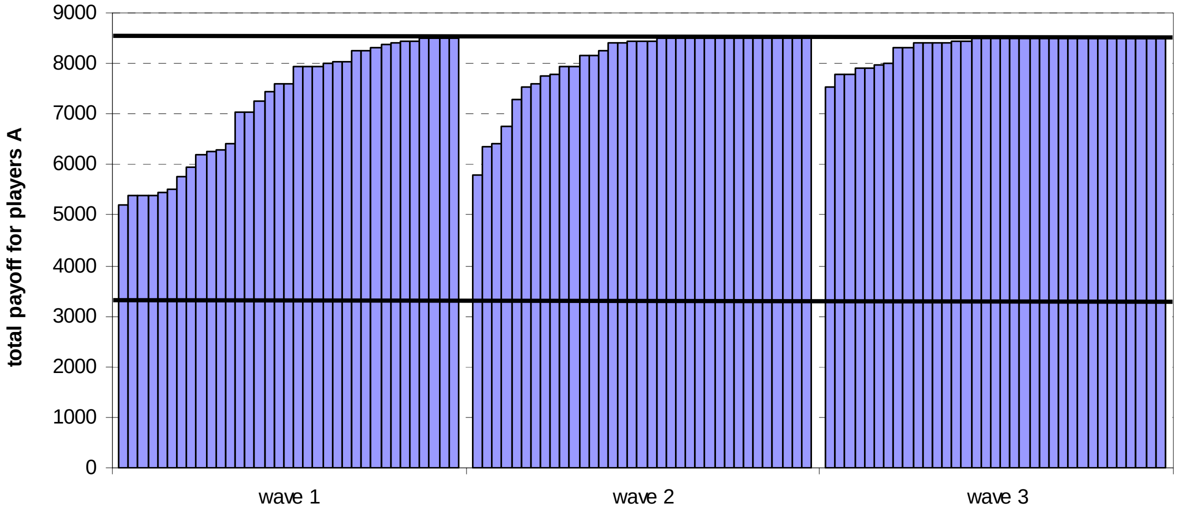

Figure B1: Total amount allocated by players A to themselves (black lines indicate the maximum and minimum amounts).

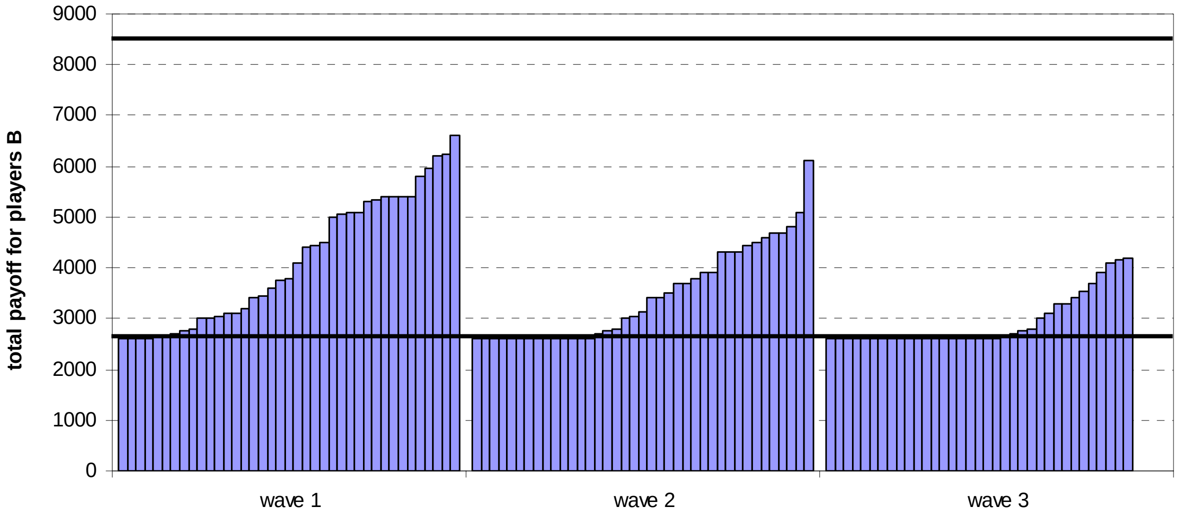

Figure B2: Total amount allocated by players A to player B (black lines indicate the maximum and minimum amounts).

Appendix C: Data

Table C.1: Individual τ in Take Games

wave	1				2				3			
game	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4
subject												
1	350	450	350	450	500	500	500	500	500	500	500	500
2	500	500	500	500	500	500	500	500	500	500	500	500
3	500	500	50	0	200	0	500	0	500	500	500	500
4	0	0	0	0	500	500	400	500				
5	0	0	0	400	500	500	500	500	500	500	500	500
6	0	400	50	0	500	500	500	0	500	500	500	500
7	0	0	50	0	0	500	0	0	500	500	500	500
8	450	400	350	200	500	500	500	500	500	500	500	500
9	0	200	50	500	500	500	500	0	500	500	500	500
10	200	250	200	200								
11	500	500	500	500	500	500	500	500	500	500	500	500
12	450	500	500	500	500	500	500	500	500	500	500	500
13	0	0	500	0	0	0	0	0				
14	450	450	450	450	450	450	450	450	500	500	450	450
15	100	150	100	50	400	400	400	400	500	500	500	500
16	100	50	100	150	200	500	200	500	500	500	500	500
17	500	500	500	500	500	500	500	500	500	500	500	500
18	0	200	0	0	500	500	500	500	500	500	500	500
19	500	500	450	450	500	500	500	500	500	500	500	500
20	0	0	0	0	0	0	0	0	500	500	500	500
21	250	200	400	500	500	500	450	450	500	500	500	500
22	500	500	500	500	500	500	500	500	500	500	500	500
23	500	450	500	500	500	500	250	300	500	500	500	500
24	500	450	400	350	500	500	500	400	500	500	500	500
25	500	500	500	500	500	500	500	500	500	500	500	500
26	0	0	0	0	500	500	450	400	500	500	500	500
27	500	500	250	400	500	500	500	500	500	500	500	500
28	500	500	200	0	500	500	500	500	500	500	500	500
29	500	300	300	500	500	500	500	500	500	500	500	500
30	500	500	500	500	500	500	500	500	500	500	500	500
31	200	250	0	0	300	250	150	0	350	350	300	200
32	500	500	500	0	500	500	500	400	500	500	500	500
33	0	100	50	50	0	150	100	50	500	500	500	500
34	0	0	0	0	500	500	450	200	500	500	500	500
35	200	300	300	0	450	450	400	350	500	450	450	400
36	500	500	500	500	500	500	500	500	500	500	500	500
37	500	500	400	450	500	500	500	350	500	500	500	400
38	500	500	500	0	500	500	500	500	500	500	500	500
39	400	400	200	0	500	500	500	500	500	500	500	500
40	500	300	400	0	500	500	500	500	500	500	450	450

Table C.2: Individual γ in Give Games

wave	1				2				3			
game	**G1**	**G2**	**G3**	**G4**	**G1**	**G2**	**G3**	**G4**	**G1**	**G2**	**G3**	**G4**
subject												
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	50	0	0	0	0	0	0	0	0	0	0
3	0	50	0	100	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0				
5	0	0	0	0	0	0	0	0	0	0	0	0
6	100	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0								
11	0	0	500	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	500	0	0	500	0	0	0	0				
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	200	0	0	0	0	0	0	0	500	450	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	400	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	50
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0				
30	0	0	0	0	0	0	0	0	0	0	0	0
31	200	100	0	0	0	0	0	0				
32	0	0	0	0	0	0	0	0	0	0	0	0
33	50	50	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	100	50	0	0	0	0	0	0
35	0	50	0	100	0	0	0	0	50	100	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	50	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	50	50	0	0

Table C.3: Individual Action Choices in PD games

wave	1				2				3			
Game	**PD I**		**PD II**		**PD I**		**PD II**		**PD I**		**PD II**	
	if *C*	**if *D***	**if *C***	**if *D***	**if *C***	**if *D***	**if *C***	**if *D***	**if *C***	**if *D***	**if *C***	**if *D***
subject												
1	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*c*	*c*
2	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
3	*c*	*d*	*c*	*d*	*d*	*d*	*c*	*c*	*d*	*c*	*c*	*c*
4	*d*	*c*	*d*	*c*	*d*	*d*	*d*	*d*				
5	*c*	*c*	*c*	*c*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
6	*c*	*c*	*c*	*c*	*c*	*c*	*c*	*d*	*c*	*d*	*c*	*c*
7	*c*	*d*	*c*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
8	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
9	*d*	*c*	*d*	*c*	*d*	*c*	*d*	*d*	*d*	*d*	*d*	*c*
10	*d*	*d*	*d*	*c*								
11	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
12	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
13	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*				
14	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
15	*c*	*d*	*c*	*d*	*c*	*c*	*c*	*d*	*d*	*d*	*d*	*c*
16	*d*	*c*	*d*	*c*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
17	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
18	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
19	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
20	*c*	*c*	*c*	*c*	*c*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
21	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
22	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
23	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*c*	*c*	*c*	*d*
24	*d*	*c*	*d*	*c*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
25	*d*	*c*	*d*	*c*	*d*	*c*	*d*	*d*	*d*	*c*	*d*	*d*
26	*c*	*d*	*c*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
27	*c*	*d*	*c*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
28	*d*	*d*	*d*	*d*	*c*	*c*	*c*	*d*	*d*	*d*	*d*	*d*
29	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*		
30	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
31	*d*	*d*	*d*	*d*	*c*	*c*	*d*	*c*	*c*	*c*		
32	*c*	*c*	*c*	*c*	*c*	*c*	*c*	*d*	*c*	*d*	*c*	*d*
33	*c*	*d*	*c*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
34	*c*	*d*	*c*	*d*	*c*	*d*	*d*	*d*	*c*	*d*	*d*	*d*
35	*c*	*c*	*c*	*c*	*c*	*d*	*d*	*d*	*d*	*c*	*d*	*c*
36	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
37	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
38	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
39	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*
40	*c*	*c*	*c*	*c*	*d*	*d*	*d*	*d*	*d*	*d*	*d*	*d*

Appendix D: Instructions (*for players A; similar instructions were handed out to players B*)

Note

You are participating in an investigation of individual decision behavior. If you have any questions, which are not answered by these instructions, please let us know. We will come to you and answer your questions.

During this experiment you will earn money. It depends on your decisions during the experiment how much money this will be. At the end of the experiment the money will be paid to you in the office of the chair "VWL III" (room C-214) if you display your ID card there.

Decision

During the experiment, you will have to make decisions at the computer. Before every decision, you will be given detailed instructions on the computer screen.

There is one other participant involved in each of your decision situations. This other participant will be will newly allocated to you in each of your decision situations. We made sure that you will interact with one and the same participant only once. No participant learns the identity of his allocated partners neither during nor after the experiment. Your decisions remain **anonymous**.

Please keep in mind that your decision situations are independent of one another, which means that none of your decisions has an influence on the other decisions.

[*Wave 3 only:*

In the appendix, you will find a list of the decision situations you will be confronted with during this experiment.]

Payoff

At the end of the experiment we will compute your payoff in the laboratory. The exchange rate of laboratory cents to EURO cents is 150 laboratory Cents = 100 EURO cent. The payoff to each of the participants will be put into an envelope, the envelope will be closed and labeled with the respective ID number. The enveloped will then be brought to the office of the chair "VLW III", where a member of the staff, who was not involved into the computation of the payoffs and who is sitting behind a blind, will hand out your payoff if you display your ID card. This procedure makes sure that your decisions remain anonymous vis-a-vis the other participants and vis-a-vis the experimenter.

Please do not communicate with the other participant during the experiment. Moreover, we would like to ask you not to talk about the experiment to others in order to avoid influencing the behavior of potential future participants.

We thank you for your participation.

Appendix [*Wave 3, session 2 only*]

decision situation 1:

Here you can determine the payoff to yourself and the payoff to your partner. Please choose one of the following combinations of payoffs:

choice:	○	You:	500	Partner:	500
	○	You:	450	Partner:	550
	○	You:	400	Partner:	600
	○	You:	350	Partner:	650
	○	You:	300	Partner:	700
	○	You:	250	Partner:	750
	○	You:	200	Partner:	800
	○	You:	150	Partner:	850
	○	You:	100	Partner:	900
	○	You:	50	Partner:	950
	○	You:	0	Partner:	1000

decision situation 2:

Here you can determine the payoff to yourself and the payoff to your partner. Please choose one of the following combinations of payoffs:

choice:	○	You:	500	Partner:	500
	○	You:	450	Partner:	600
	○	You:	400	Partner:	700
	○	You:	350	Partner:	800
	○	You:	300	Partner:	900
	○	You:	250	Partner:	1000
	○	You:	200	Partner:	1100
	○	You:	150	Partner:	1200
	○	You:	100	Partner:	1300
	○	You:	50	Partner:	1400
	○	You:	0	Partner:	1500

decision situation 3:

Please choose one of the "strategies" A or B for every possible choice of your partner. Your payoff depends on what you choose and what your partner chooses.

The following table displays your payoffs. If your partner chooses "A" and you choose "A if partner chooses A", your payoff is 500 (Your payoff is given by the second entry of the respective cell in the table given below.) If your partner chooses "A" and you choose "B if partner chooses A", your payoff is 900, the one of your partner is 100. If your partner chooses "B" and your chose ""A if partner chooses B", your payoff is 100, the payoff of your partner is 900. In the case that your partner chooses "B" and you choose "B if partner chooses B", your payoff is 200 and the payoff of your partner is also 200.

	you choose A	you choose B
Your partner chooses A	500 , 500	100 , 900
Your partner chooses B	900 , 100	200 , 200

Your choice, if partner chooses "A" ○ A
○ B

Your choice, if partner chooses "B" ○ A
○ B

decision situation 4:

Here you can determine the payoff to yourself and the payoff to your partner. Please choose one of the following combinations of payoffs:

choice:					
	○	You:	500	Partner:	500
	○	You:	450	Partner:	525
	○	You:	400	Partner:	550
	○	You:	350	Partner:	575
	○	You:	300	Partner:	600
	○	You:	250	Partner:	625
	○	You:	200	Partner:	650
	○	You:	150	Partner:	675
	○	You:	100	Partner:	700
	○	You:	50	Partner:	725
	○	You:	0	Partner:	750

decision situation 5:

Here you can determine the payoff to yourself and the payoff to your partner. Please choose one of the following combinations of payoffs:

choice:	○	You:	500	Partner:	500
	○	You:	450	Partner:	575
	○	You:	400	Partner:	850
	○	You:	350	Partner:	925
	○	You:	300	Partner:	1000
	○	You:	250	Partner:	1025
	○	You:	200	Partner:	1050
	○	You:	150	Partner:	1125
	○	You:	100	Partner:	1200
	○	You:	50	Partner:	1225
	○	You:	0	Partner:	1250