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# The Role of Choice in Social Dilemma Experiments

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by

Frank P. Maier-Rigaud† and Jose Apesteguia‡

## Abstract

On the basis of problems related to asymmetric information, self-governance has been proposed and often empirically found to be superior to the external imposition of rules in social dilemma situations. The present paper suggests and experimentally analyses a different line of argument, namely to what extent *behavioral aspects* can explain these findings. We study this hypothesis using the simplest, most general dilemma form: the prisoner's dilemma (PD). We compare behavior when players are given the possibility of choosing between two different representations of the same PD, to behavior when players are externally assigned to play a specific game. We find that cooperation rates are significantly higher in the games that were chosen.

*Keywords:* Freedom of Choice, Self-governance, Social Dilemmas, Framing

*JEL-Classification:* H41, C90, C91

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## 1. Introduction

In many strategic situations players have the possibility of designing the institutional structure under which they will act. Self-governance at the local, national, and international level are good examples of actors actively choosing the games they will play. Collective action and self-governance has often been found to be superior to the external imposition of rules (Ostrom 1990, Ostrom, Gardner, and Walker 1994). A prominent argument that supports this finding was suggested already by Hayek (1945); the immediately concerned may have better information on the strategic properties of the situation and hence may be better equipped to design a working set of institutional arrangements.

In this paper we propose a different line of argument suggesting that the very possibility of choosing the game may in itself have an important intrinsic behavioral effect on outcomes. This is in line with the economic literature on freedom of choice. According to Sen (1988, p. 290), "one reason why freedom [of choice] may be important is that 'choosing' may itself be an important functioning ... if all alternatives except the chosen one were to become unavailable, the chosen alternatives will not, of course, change, but the extent of freedom would be diminished, and if the freedom to choose is of intrinsic importance, then there would be a corresponding reduction of the person's advantage".[1] In our context, this is to say that aside from the particulars of a game, *it matters whether an external actor imposes the game on the players, or if the players are able to choose the game from a set of games.* Whereas the literature on freedom of choice is concerned with an effect of choice on utility, we are interested in a potential behavioral impact of choice. The question whether this choice has an effect on behavior is of particular importance to social dilemma situations, because a positive effect could lead to higher cooperation rates ceteris paribus. A choice of game effect therefore could potentially mitigate the social dilemma.

We experimentally analyze the effect of choosing the game in the simplest most general dilemma form: the prisoner's dilemma (PD). We run five different treatments, divided into two *categories*: the *assignment* treatments and the *choice* treatments. In the three assignment treatments participants play an externally imposed version of a PD game. The three versions of the PD game are different representations of the same game. Therefore, they have the same Nash equilibrium and the same equilibrium payoffs. In the two choice treatments, participants can choose the version of the PD game they want to play from a set of two possibilities.

We are analyzing the behavioral importance of freedom of choice in a scenario where the differences between the alternatives available are kept to a minimum. We conjecture that a behavioral effect when players are given the possibility of choosing between two games that in standard game theoretic terms are equivalent, and differ only in the presentation of the game, will be even more pronounced if differences between games are more substantial.

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1 See also Bossert et al. (1994), Puppe (1996), and Pattanaik, and Xu (2000).

The experimental results clearly indicate that the mere fact that participants can choose the game they want to play has a statistically significant impact on behavior. Cooperation rates are higher when players can choose the game they want to play as compared to when players are externally assigned to a game they have to play. As a result, we argue that – given the current laboratory practice of assigning participants to experimental games - some experimental findings in social dilemma research may be too pessimistic.

The organization of the rest of the paper is as follows. The next section introduces the three versions of the prisoner's dilemma game that are used in this paper, Section 3 contains the experimental procedure, Section 4 reports the experimental results, and Section 5 concludes.

## 2. The Games

### 2.1. The Prisoner's Dilemma Game

Melvin Dresher and Merrill Flood at the RAND CORPORATION devised the prisoner's dilemma in 1950 to illustrate that a non-zero sum game could have an equilibrium outcome that is unique, but fails to be Pareto optimal. Later, at a seminar at Stanford University, Albert W. Tucker told the prisoner's dilemma story to go with the game. Since then the prisoner's dilemma has become the most widely studied and used game in the social sciences (see, e.g., Straffin 1993, p. 73 or Poundstone 1992).

Table 1 presents a typical 2 player matrix game in normal form. This game is a PD if and only if, the following conditions are met: $a > b > c > d$ and $2b > a + d > 2c$ .

**Table 1: General 2×2 prisoner's dilemma game in normal form (PD).**

| | **Cooperate** | **Defect** |
|---|---|---|
| **Cooperate** | (b,b) | (d,a) |
| **Defect** | (a,d) | (c,c) |

Note: The first element of the payoff vectors refer to the row player.
In the experiment a=400, b=300, c=100 and d=0

It is well known that both players playing defection is the unique Nash equilibrium of the one-shot prisoner's dilemma game. Applying the logic of backward induction, Luce and Raiffa (1957) showed that the unique Nash equilibrium outcome in the finitely repeated prisoner's dilemma game under perfect information is again the one in which both players defect in every single period. In fact, the unique subgame-perfect equilibrium is both players defecting in all periods (see, e.g., Binmore 1992).

The experimental analysis of the prisoner's dilemma involves over hundred experiments mainly in Psychology, Economics, Biology and Political Science.[2] It has been shown that behavior is sensitive to subtle changes in the experimental conditions. Factors like repetition, experience, information, relative payoffs, monetary incentives, fixed or random opponents and framing, play an important role in the experimental behavior.[3]

In this paper we will analyze a prisoner's dilemma game repeated over 20 periods with a fixed opponent under perfect information. Earlier studies related to our experimental setting are Dresher and Flood (reported in Flood 1958), Lave (1962), Morehous (1967), Rapoport and Dale (1967), Dolbear et al. (1969), Roth and Murnigham (1978), Selten and Stoecker (1986), and Andreoni and Miller (1993). Basically, the experimental results show that average cooperation levels start relatively high, between 40%-60%, and then gradually decline through time. We will see that our experimental results conform to this general pattern.

## 2.2. The Decomposed Prisoner's Dilemma Game

Evans and Crumbaugh (1966a, 1966b), and Pruitt (1967) independently devised the decomposed prisoner's dilemma game. Consider the game depicted in table 2. The game is played as follows: Both players face the same matrix. Each player must choose between actions *Cooperate* or *Defect*.[4] Each choice provides a payoff to the player in the *self* column, and a payoff to the other player in the *other* column. Hence, if for example player 1 chooses *C* and player 2 chooses *D*, then player 1 gets w + z, while player 2 gets y + x.

The game in table 2 is a decomposed form of the PD game introduced earlier (Table 1) if and only if the following conditions hold: $a = x + y$, $b = w + x$, $c = y + z$ and $d = w + z$. Substituting these into the conditions that define the PD game, the following conditions must be satisfied for the DPD game:

$$y > w$$

$$x > z$$

$$w + x > y + z$$

2 A search of the Social Science Index resulted in 183 papers containing the word "Prisoner's Dilemma" and "Experiment".

3 For an overview of the theoretical literature see e.g, Binmore (1992) and Osborne and Rubinstein (1994). Good overviews of the experimental literature are found in Lave (1965), Rapoport and Chammah (1966), Roth and Murnigham (1978), Roth (1988), and Kagel and Roth (1995).

4 In all the experimental games we used labels A and B, instead.

These inequalities impose constraints on the PD, namely that $b+c=a+d$ . As a result only certain PDs are decomposable.[5]

**Table 2: Schematic representation of a 2×2 PD game in decomposed form (DPD).**

| | Self | Other |
|---|---|---|
| **Cooperate** | (w) | (x) |
| **Defect** | (y) | (z) |

Since the initial research by Evans and Crumbaugh (1966a, 1966b), Crumbaugh and Evans (1967), and Pruitt (1967) there have been a series of studies, mainly conducted in the 1970ies, that analyzed different decompositions of the PD game. In particular, the studies by Pruitt (1970, 1981), Guyer, Fox, and Hamburger (1973), Tognoli (1975), Pincus and Bixenstine (1977), and Komorita (1987) analyzed the effects of different decompositions on cooperation rates in prisoner's dilemma games.[6] With the exception of Pincus and Bixenstine (1977), who did not replicate the earlier findings by Pruitt, these studies largely revealed that framing has a significant impact on cooperation rates. While some decompositions elicited less cooperation than the normal form game, others showed a substantial increase in cooperative behavior. The generally accepted hypothesis for this finding is that different decompositions arouse different motives in the players. Based on the type of decomposition, decomposed games are either referred to as *take-some* or *give-some* games, where take-some games evoke lower and give-some games higher levels of cooperation than the normal form game.[7] Typically, in a give-some decomposition payoffs in the "self" column are lower than payoffs in the "other" column, and vice versa for the take-some decomposition. According to the psychological literature, give-some games evoke a higher level of cooperation because they provide an opportunity to signal a willingness to cooperate at some cost to self, and thus elicit trust and mutual cooperation. Take-some games in contrast are supposed to heighten the competitive motivation of the players due to their punishment aspect inflicted on the other player in case of defection.

Given the findings in the psychological literature on the difference between give-some and take-some games, it seems natural to evaluate the behavioral consequences of a choice of game in both settings. The two decompositions of the standard prisoner's dilemma game presented in table 1 that will be analyzed experimentally are shown in tables 3 and 4. Note that both decompositions add up to the same parent game presented in table 1.

5 Not all PDs are decomposable but a decomposable PD can be decomposed into an infinite number of DPDs. The conditions for decomposing a PD game are also referred to as seperability conditions. See Hamburger (1969) for a theoretical treatment of the issue.

6 Decomposed PD games are also discussed in Selten (1978) and Selten (1998).

7 Recently this terminology has also been used in the public good literature where take-some and give-some refers to whether the public good game is framed as an extraction or contribution game. See for example Andreoni (1995), or Sonnemans, Schram, and Offerman (1998) who explicitly refer to decomposed PD games.

**Table 3: 2×2 prisoner's dilemma game in decomposed form (DPD I: give-some).**

| | **Self** | **Other** |
|---|---|---|
| **Cooperate** | (0) | (300) |
| **Defect** | (100) | (0) |

**Table 4: 2×2 prisoner's dilemma game in decomposed form (DPD II: take-some).**

| | **self** | **Other** |
|---|---|---|
| **Cooperate** | (150) | (150) |
| **Defect** | (250) | (-150) |

Table 3 shows a give-some decomposition of the normal form game, and table 4 a take-some decomposition.

## 3. Experimental Design

The experiments were conducted at the Experimental Economics Laboratory at the University of Bonn using a program based on the z-Tree software developed by Fischbacher (1999). At the beginning of each session participants were randomly assigned to one of the 18 computer terminals. Before the session started, participants first had to read the instructions (see Appendix A), and then had to answer test questions to check if they understood the game they were about to participate in (see Appendix B). The experiment was started only once all participants had correctly answered all test questions. At the end of the experiment participants were asked to fill out a questionnaire where they were asked to give reasons for their decisions (see Appendix C). We run two treatment conditions: *assignment* and *choice*. In the assignment condition participants were told the game they were going to participate in, while in the choice condition participants were informed about the two games they could subsequently chose from. In the assignment condition we conducted three different treatments; one implementing the prisoner's dilemma of table 1 (PD), and the other two implementing the decomposed prisoner's dilemma games of tables 3 and 4 (DPDI and DPDII). In the choice condition, two different treatments were conducted. In the first treatment participants could choose between the prisoner's dilemma (PD) and the first version of the decomposed prisoner's dilemma game (DPDI). In the second treatment participants could choose between the prisoner's dilemma (PD) and the second version of the decomposed prisoner's dilemma game (DPDII).

All treatments where participants were assigned to play a specific game are coded by I, that is Ia for the PD game in normal form, Ib for the first decomposition of the prisoner's dilemma (DPDI) and Ic for the second decomposition of the prisoner's dilemma (DPDII). The treatments where participants had the freedom to choose the game they wanted to play are coded by II, where the following letters indicate the two choice options i.e. treatment IIab gives participants the freedom to choose between the PD game and the DPDI game, and treatment IIac gives participants the freedom to choose between the PD game and the DPDII game. Table 5 summarizes the experimental treatments, and gives information on the number of groups, i.e. the number of independent observations in each treatment.

**Table 5: Experimental treatments and number of groups conducted in each treatment.**

| Treatment | Game | Number of groups |
|---|---|---|
| Ia | PD | 9 |
| Ib | DPDI | 9 |
| Ic | DPDII | 9 |
| Iiab | Choice between PD and DPD I | 17* |
| Iiac | Choice between PD and DPD II | 18 |

* In the choice treatments players were grouped randomly after they had chosen the game they wanted to play. In this particular case the amount of players who chose a particular game was not even, so that one player from each group was randomly drawn to be excluded.

In all treatments participants played against the same opponent for 20 periods. In the choice treatments participants played against a player who chose the same game. All this information was common knowledge.

A total of 126 students, mainly law or economics students, took part in the experiment. The experiment took 45 minutes on average. Taler (the experimental currency) were transformed into Euro at the exchange rate of 1000 Taler = 2€.[8] Average payoffs were 9.92€.

# 4. Results

## 4.1. Freedom of Choice

In this section we analyze the central hypothesis of this paper. That is, if giving players the possibility of choosing the game they want to play from a set of games with identical game theoretic properties, has a behavioral impact.

We compare behavior exhibited in the assigned prisoner's dilemma game (treatment Ia) with the behavior of those players that chose the prisoner's dilemma game in the choice treatments (IIab:PD and IIac:PD). Analogously we will contrast behavior in the two versions of the assigned decomposed prisoner's dilemma games (treatments Ib and Ic) against the behavior of those players that chose the corresponding decomposed prisoner's dilemma game in the choice treatments (IIab:DPDI and IIac:DPDII).

Table 6 gives information on the games chosen by players in the choice treatments. Participants generally preferred the prisoner's dilemma as opposed to the decomposed prisoner's dilemma. From an evaluation of the questionnaire given to participants at the end of the experiment this appears to be due to the fact that decomposed games are cognitively more challenging than normal form games.

8 At the time the experiments were run €1 roughly corresponded with $1.

**Table 6: Number of groups choosing the PD and the DPD in the choice treatments.**

| Treatment | Groups choosing the PD | Groups choosing the DPD |
|---|---|---|
| IIab | 14 | 3 (DPDI) |
| IIac | 13 | 5 (DPDII) |

Figures 1, 2, 3, and 4 plot the time series of the average cooperation rates in treatments Ia and IIab:PD, Ia and IIac:PD, Ib and IIab:DPDI, and finally Ic and IIac:DPDII. Table 7 reports the average cooperation rates.

Figure 1: Time series of average cooperation rates in Ia and IIab:PD

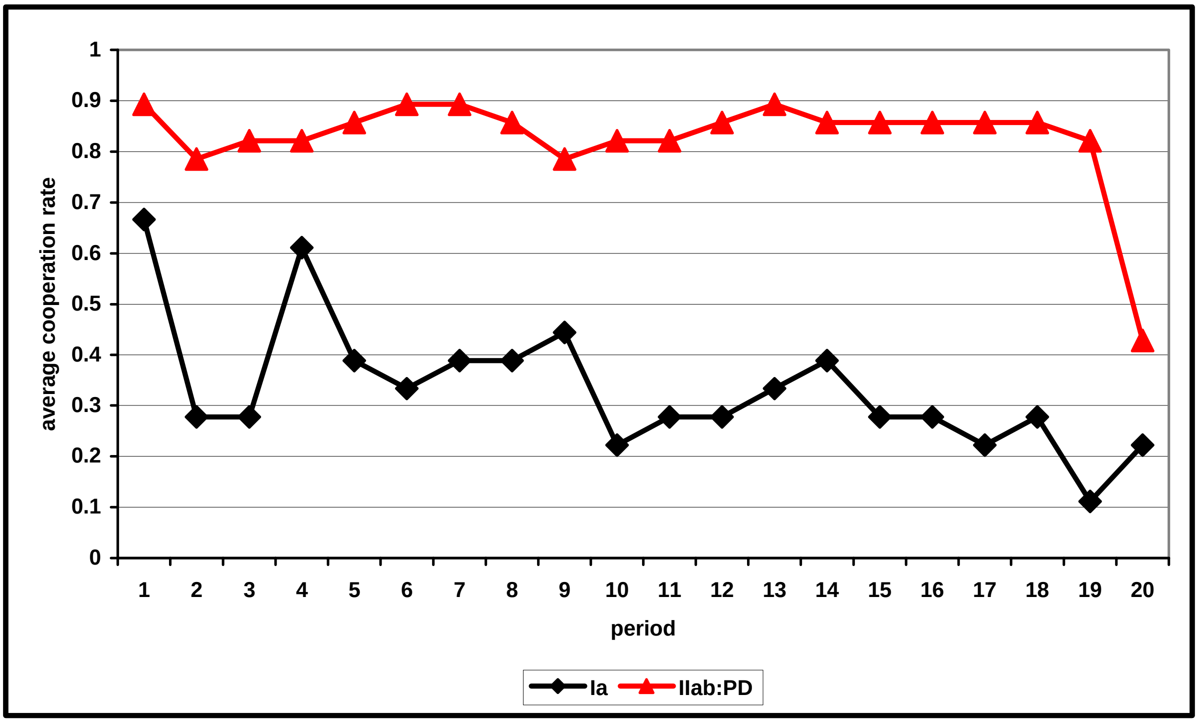



Figure 2: Time series of average cooperation rates in Ia and IIac:PD

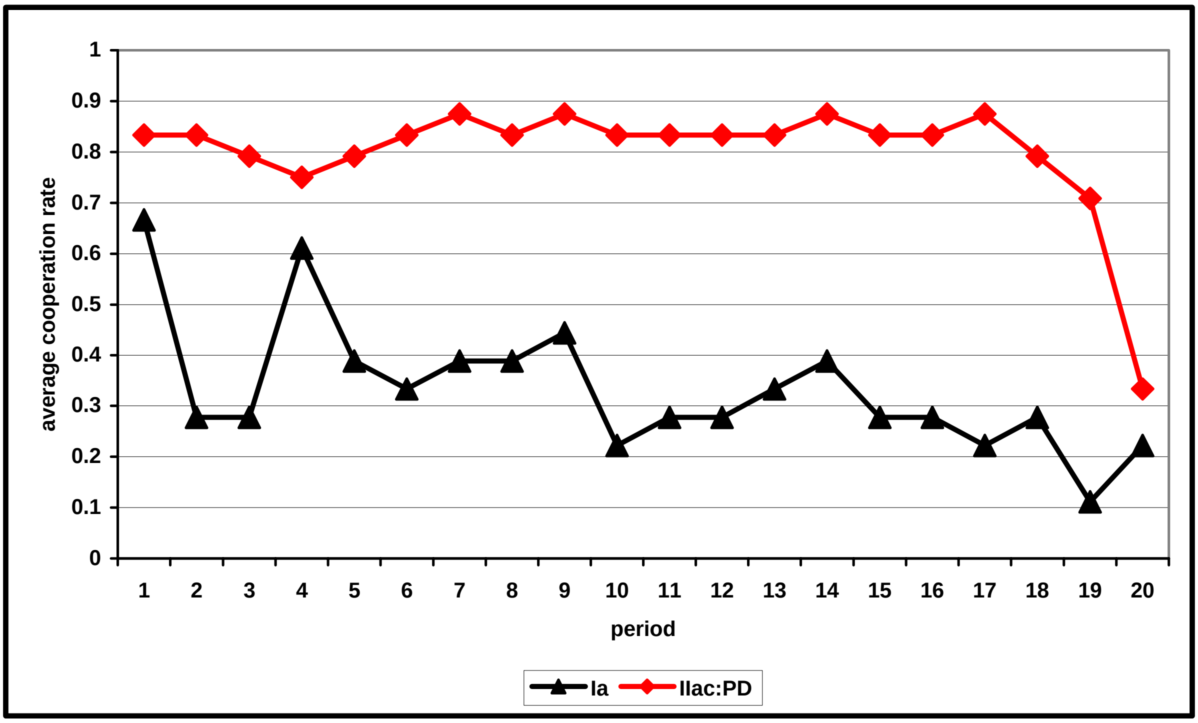


Figure 3: Time series of average cooperation rates in Ib and IIab:DPDI

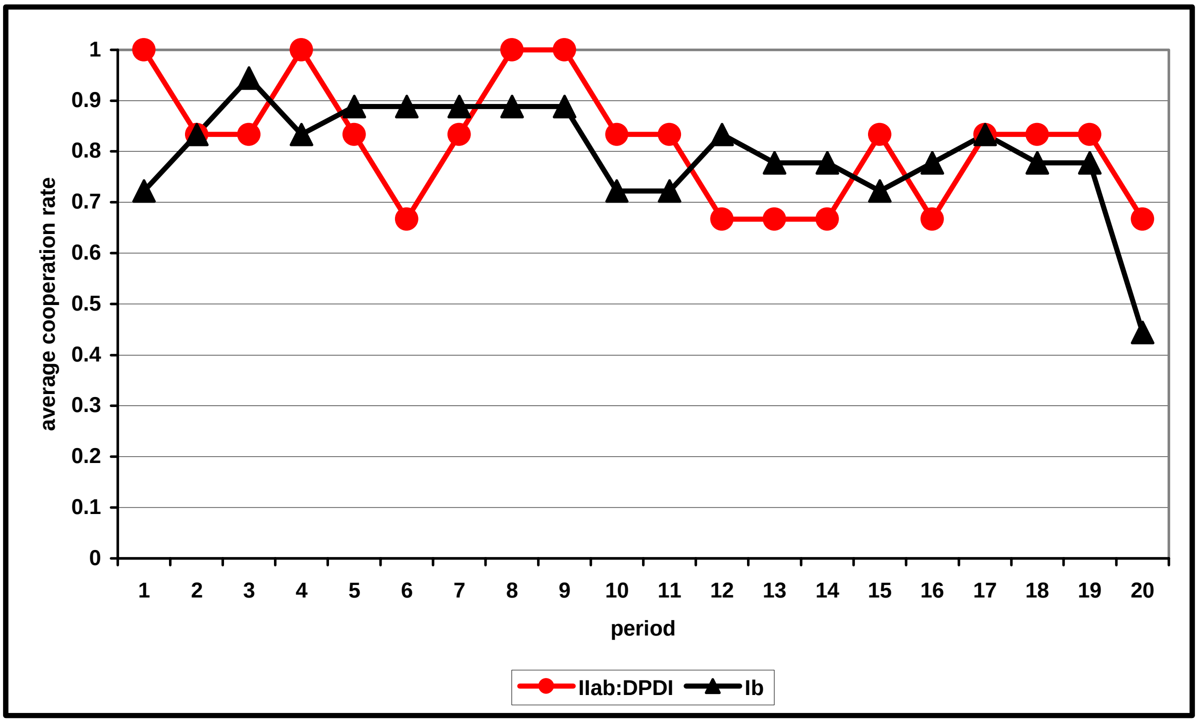
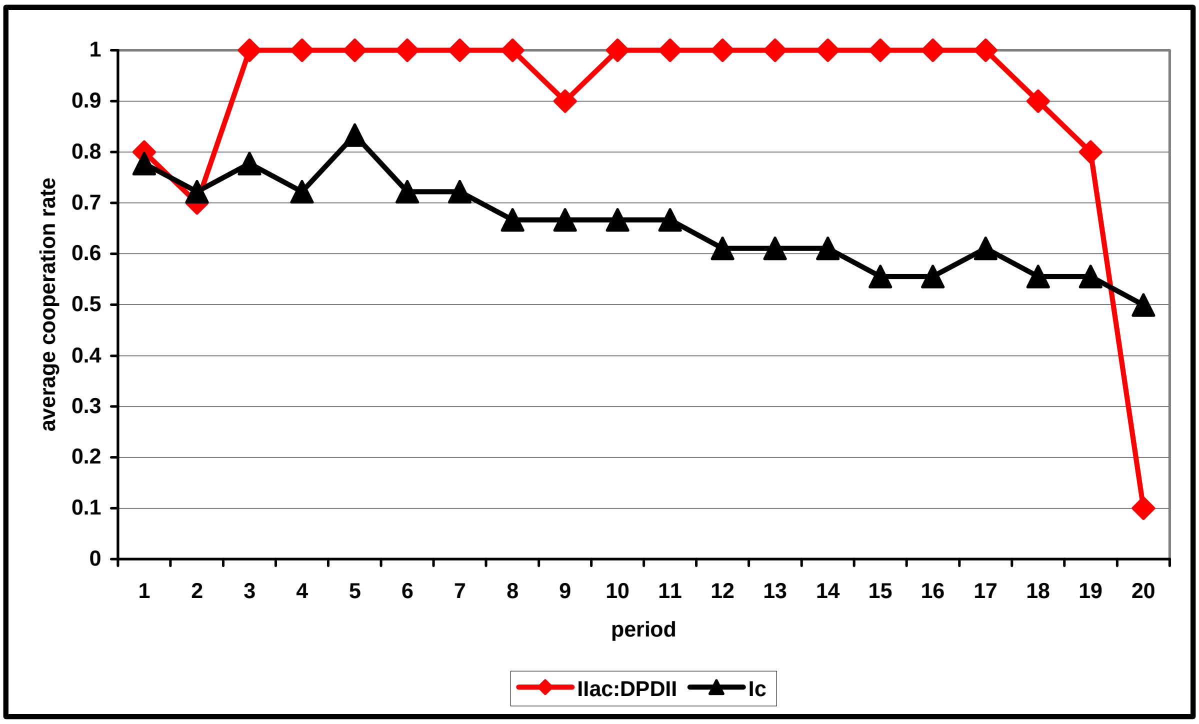



Figure 4: Time series of average cooperation rates in Ic and IIac:DPDII



Figures 1, 2, and 4, and table 7 clearly show the strong behavioral effect on the relative levels of cooperation when players are given the possibility of choosing the game they want to play, as opposed to when the game is externally imposed on them.

**Table 7: Average cooperation rates by treatment**

| | Ia | Ib | Ic | IIab:PD | IIab:DPDI | IIac:PD | IIac:DPDII |
|---|---|---|---|---|---|---|---|
| Average Cooperation Rates | .33 | .80 | .66 | .83 | .82 | .88 | .91 |

In the cases where the prisoner's dilemma game was chosen (treatments IIab:PD and IIac:PD), the increase in cooperation rates compared with the assigned prisoner's dilemma (treatment Ia) is dramatic. In both cases there is an increase of about 60% in the rate of cooperation. The permutation test (Siegel and Castellan, 1988) yields significance levels at .1% and .5% respectively.

When analyzing the differences in behavior between the decomposed prisoner's dilemma in the assigned condition (treatments Ib and Ic) and the decomposed prisoner's dilemma in the choice condition (treatments IIab:DPDI and IIac:DPDII), the effect is not as strong. Clearly, behavior in the decomposed prisoner's dilemma games in the assignment conditions (treatments Ib and Ic) is highly cooperative, which makes it difficult to reach even higher cooperation levels in the choice treatments. Furthermore, the statistical tests suffer from the relatively small number of decomposed prisoner's dilemma games chosen by players (see table 6). Nevertheless, cooperation rates in the DPDII groups where participants freely choose the game (treatment IIac:DPDII) are close to 30% higher than in the assigned decomposed prisoner's dilemma (treatment Ic). This is a remarkable increase in the cooperation rate, (the permutation test yields a .1258 significance level, one sided). In the case of the first version of the decomposed prisoner's dilemma (treatment Ib vs. treatment IIab:DPDI) the increase is just 2.2%, clearly not significant.

From a policy perspective, the efficiency that a particular treatment variable generates in a social dilemma is of particular interest. Based on high cooperation rates in the choice treatments, efficiency[9] is astonishingly high as well. In particular, for the normal form PD game, choice increases efficiency by 100%.[10]

**Table 9: Gains from Cooperation.**

| Treatment | Aggregate efficiency |
|---|---|
| Ia | 40,84 |
| Ib | 80,00 |
| Ic | 65,56 |
| IIab:DPDI | 81,67 |
| IIab:PD | 82,68 |
| IIac:DPDII | 91,00 |
| IIac:PD | 81,35 |

9 Efficiency is defined as (π - min π) / (max π - min π), where min π and max π stand for the minimal and maximal payoffs respectively.

10 Related findings have been obtained by Ostrom, Walker and Gardner (1992), in other social dilemma types. In their experimental study of different sanctioning and communication mechanisms in a common-pool resource game, they find a higher efficiency in the treatment with endogenous sanctioning.

## 4.2. Framing

In this section we discuss the effect of different frames on behavior in the prisoner's dilemma game. Framing effects in social dilemma games have recently received substantial attention in the economic literature.[11] Since Selten (1978) and Kahnemann and Tversky (1979), it is generally recognized that different presentations of game theoretically identical situations may trigger different behavior. The following section compares our findings with previous psychological studies.

The dominating conjecture in the psychological literature is that participants in a "give-some" (DPDI) decomposition will see the game as one in which players have less influence upon their respective payoffs and are less independent than in a "take-some" (DPDII) decomposition. This perception of the game highlights the exchange potential of the situation in DPDI and enhances cooperation. In the "take-some" framing of the game, payoffs appear to be predominantly determined by own choices suggesting independence and therefore no desire for cooperation is induced.[12] Komorita (1987, p.55), summarizing the literature, remarks: The "give-some" decomposition "evokes a high level of cooperation because it provides an opportunity to help the other at some cost to self and thus elicits trust and the motive of mutual assistance."

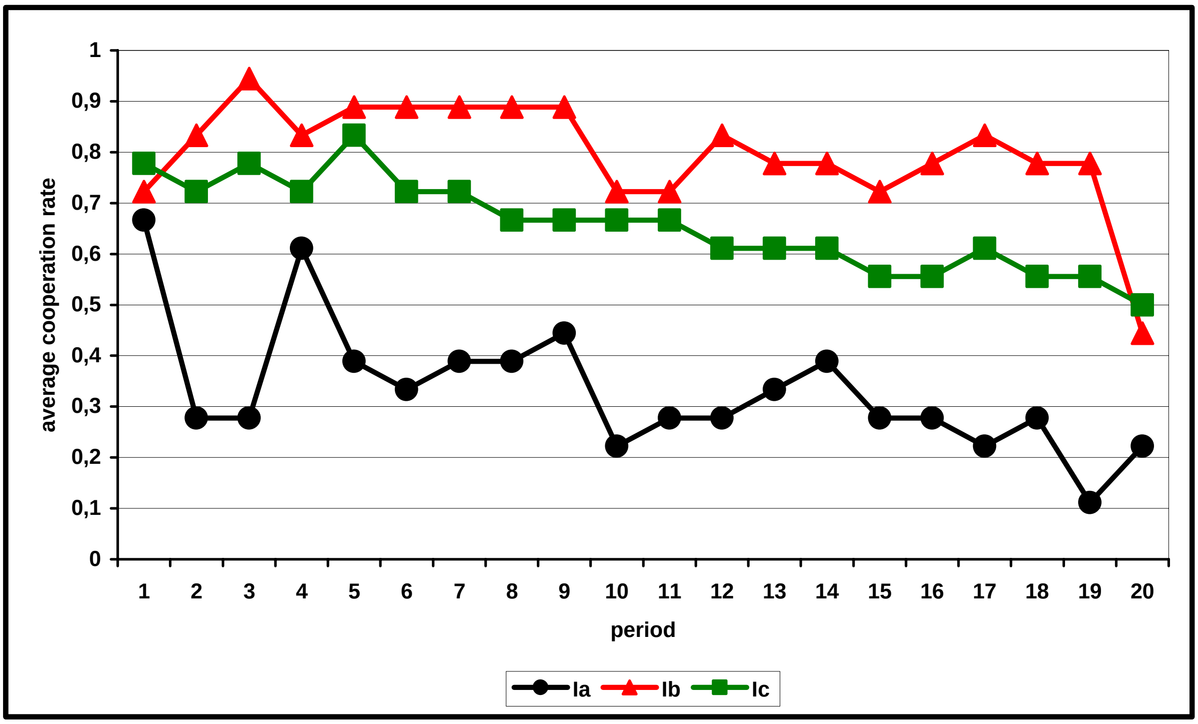
Figure 5 shows the time series of the average cooperation rates in the three assigned games (PD, DPDI, and DPDII) with 9 independent observations each. Cooperation rates in the PD are in line with previous studies. Average cooperation rates start relatively high, at a level between 60 and 70%, and then gradually decline through time. As expected, cooperation rates in DPDI are substantially higher than in the PD, and hence our results clearly replicate the original findings by Evans and Crumbaugh (1966a, 1966b), Crumbaugh and Evans (1967) and Pruitt (1967).[13]. Another remarkable aspect of these frames is that in all three treatments cooperation starts at a similar level in the first period.

11 See for example Cookson (2000), Druckman (2001) and Sonnemans, Schram, and Offerman (1998).

12 Komorita and Barth (1985) also provide evidence to support the hypothesis that rewards for cooperative choices are more effective in inducing cooperation than punishment for competitive choices.

13 See also Pruitt (1970), Guyer, Fox and Hamburger (1973), Tognoli (1975), Pruitt and Kimmel (1977), Pruitt (1981) and Komorita (1987).

**Figure 5: Time series of average cooperative rates in "assignment" treatments Ia, Ib and Ic**




Our findings in DPDII, however, only partially replicate previous studies. Treatment Ic is a "take-some" decomposition and, according to the psychological literature, should induce less cooperation than the normal form game (Treatment Ia). Following Komorita (1987, p.55) a similar but not identical decomposition evoked low levels "of cooperation because the D choice, once it is chosen by one or both players, punishes the other and thus heightens the competitive motivation of the players". Since the decomposition used in Ic is not completely identical to the decompositions previously analyzed in the literature, evidence in favor of the take-some hypothesis appears to be inconclusive even though the differences between Ib and Ic, that is the differences between give- and take-some decompositions are in the same direction as previously found.

We consider our results as further evidence that even small changes in the framing may have a substantial impact on behavior and cooperation rates. As Pruitt (1967, p.26) points out: ".. although the DPD reduces algebraically to the standard PD, it does not necessarily reduce behaviorally to that game. Clearly, psychologists should not follow the lead of mathematicians and lump together all situations that reduce algebraically to a single PD."

In summary Figure 5 clearly shows that framing or presentation effects significantly impact behavior. Based on the standard results replicated in treatment Ia, both decompositions of the prisoner's dilemma have a significant positive impact on cooperation rates (with significance levels of .5% each). In the decomposed game treatment Ib participants achieve cooperation rates that result in roughly 80% of possible profits being extracted – a 100% increase compared to the normal form treatment.

## 5. Conclusion

Self-governance has been proposed, and empirically found to be capable of mitigating or even solving the problems associated with social dilemma situations. The foundation for such arguments lies in the role of information. Those who are directly involved in the strategic situation may have more accurate information on the cultural background, the natural environment and the specificities of the problem, and hence may be better equipped to solve the social dilemma.

From a game theoretic perspective self-governance means to have the possibility of choosing the game one wants to play. In this paper we hypothesize, and experimentally show, that when players are given the possibility of choosing the game from a set of given games, such a choice has a significant impact on behavior. In our experiments participants playing a strategically equivalent version of the PD game cooperate significantly more, even 60% more on average, when they are given the possibility of choosing the game they will play out of two different representations of the same game, than when they are assigned to play a specific game.

The set of games from which participants could choose contained two different representations of a strategically identical game. Our data shows that despite this narrow difference the change in individual and aggregate behavior may be dramatic. It can be hypothesized that if the set of games to be chosen from not only consist of games differing with respect to frames, but also with respect to their strategic character, resulting differences in behavior may even be more substantial.

Drawing conclusions and extrapolating from laboratory findings is always difficult and needs to be done with the required caution. Nevertheless, we claim that the results of this paper may have important consequences for research on social dilemma problems and policy. The results presented here have a bearing on two levels.

First, and most importantly, we believe that findings in social dilemma experiments may systematically underestimate cooperation levels in the field due to the fact that they neglect the apparently important behavioral aspect of choice endogenous to a wide class of voluntary and self-governing social dilemma situations. Our results show that besides the informational aspects, motivational aspects inherent in the design and choice of institutions may be an important factor in the successful management of social dilemmas. An immediate consequence of the later is that decentralized processes actively involving the concerned actors may be preferable to externally imposed solutions.

Second, we provide further evidence that suggests that the way social dilemmas are perceived by the concerned actors is of high importance. Framing a social dilemma in a way that emphasizes interdependence and the mutual need for cooperation clearly has an effect on cooperation rates. The framing effect we find is particularly strong and suggests that decomposition of a strategic situation is particularly powerful in affecting players perception of a situation and subsequent behavior.

# Appendix A: The Written Instructions

**[[In All Treatments]]**

**<u>Note:</u>**

- You have 5 minutes to read the instructions. If after reading the instructions you have any questions, please contact one of the experimenters. Communication with other participants is not allowed during the experiment.
- After the 5 minutes you will be asked to fill out a test questionnaire about the experiment you will be part in. Once all participants have correctly answered all questions, the experiment will start.
- After completion of the experiment you will be asked to fill out a computerized questionnaire
- Please do not leave your seat before you have filled out the questionnaire and your terminal number has been announced

**[[In Treatments Ia, Ib and Ic]]**

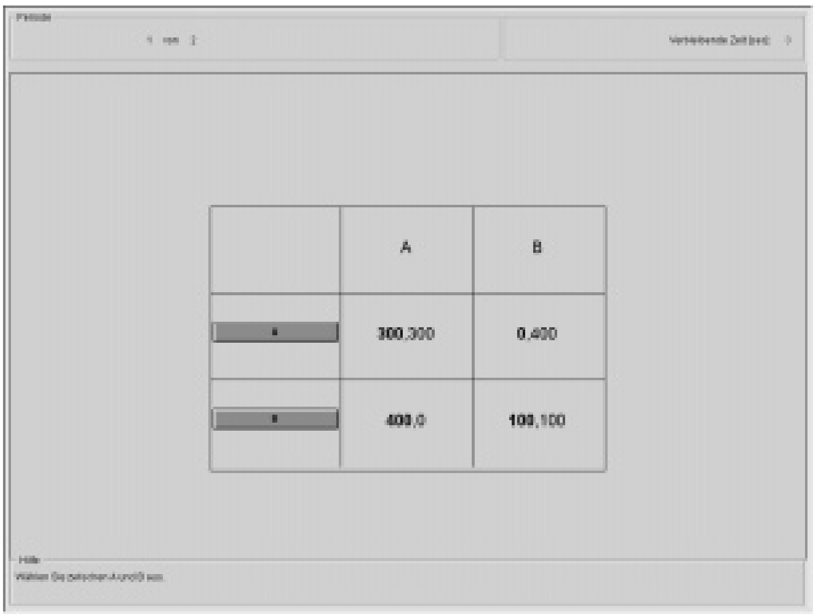
In the following experiment:

- You play with another person. The decision situation, as well as the other person are identical in each period.
- You have to choose between A and B in each one of the 20 periods.
- In each period, you will not know the choice of the other person before you have made your own choice.
- The amount of Talers you earn in each period depends on your and the other persons decision.
- After each period you will be given information on: your last decision, the last decision of the other person, the number of Talers you earned in the last period, and the total number of Talers you have earned so far.

**[[In Treatments Ia, IIab and IIac]]**

**<u>The experiment:</u>**

The experiment consists of a decision situation in which you and another person will choose between A and B for 20 periods. The decision situation, as well as the person you interact with is identical in each period.



The amount of Talers you earn in each period depends on your and the other person´s decision:

- If you choose A and the other person as well, you both get 300.
- If you choose B and the other person as well, you both get 100.
- If you choose A and the other person chooses B, you will get 0 and the other person will get 400.
- If you choose B and the other person chooses A you will get 400 and the other person will get 0.

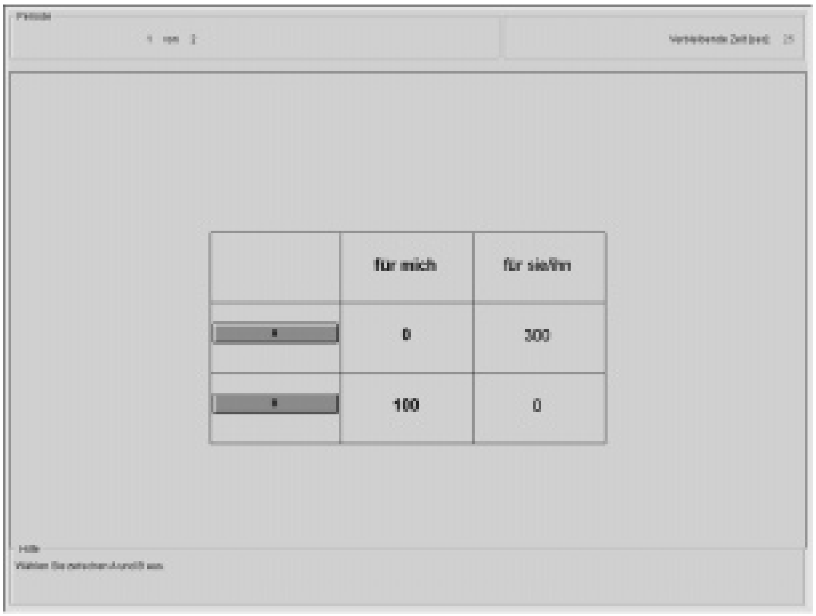
After each period you will be given information on: your last decision, the last decision of the other person, the number of Talers you earned in the last period, and the total number of Talers you have earned so far.

**[[In Treatments Ib and IIab]]**

**<u>The experiment:</u>**

The experiment consists of a decision situation in which you and another person will choose between A and B for 20 periods. The decision situation, as well as the person you interact with is identical in each period.

Every period you will have the opportunity to decide how many Talers you give to yourself and how many Talers you give to the other person by choosing between A and B. The other person faces exactly the same decision situation. The Talers you earn in one period is determined by the amount of Talers you give to yourself plus the amount of Talers the other person gives to you:




The amount of Talers you earn in each period depends on your and the other person´s decision:

- if you choose A you give 0 to yourself and 300 to the other person.
- if you choose B you give 100 to yourself and 0 to the other person.
- if the other person chooses A, he/she gives you 300 and 0 to him/herself.
- if the other person chooses B, he/she gives you 0 and 100 to him/herself.

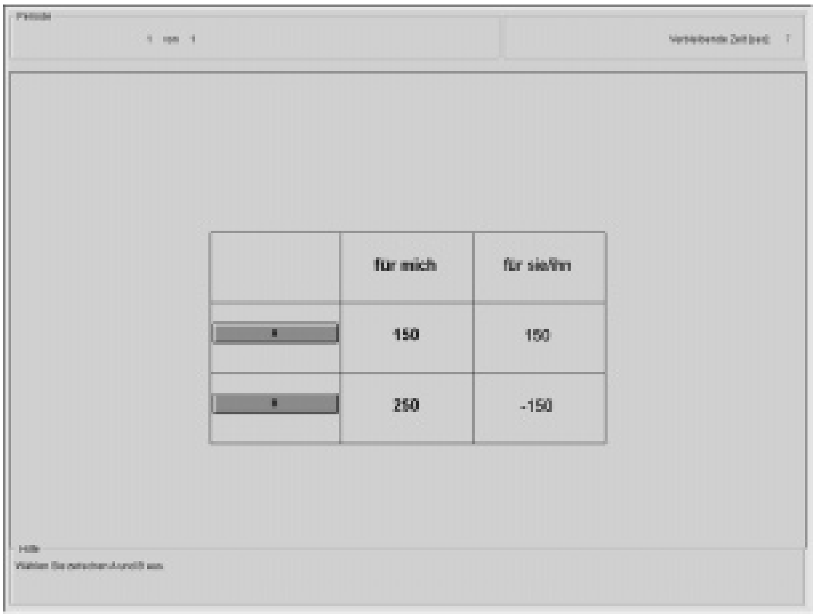
After each period you will be given information on: your last decision, the last decision of the other person, the number of Talers you earned in the last period, and the total number of Talers you have earned so far.

**[[In Treatments Ic and IIac]]**

**<u>The experiment:</u>**

The experiment consists of a decision situation in which you and another person will choose between A and B for 20 periods. The decision situation, as well as the person you interact with is identical in each period.

Every period you will have the opportunity to decide how many Talers you give to yourself and how many Talers you give to the other person by choosing between A and B. The other person faces exactly the same decision situation. The Talers you earn in one period is determined by the amount of Talers you give to yourself plus the amount of Talers the other person gives to you:




The amount of Talers you earn in each period depends on your and the other person´s decision:

- if you choose A you give 150 to yourself and 150 to the other person.
- if you choose B you give 250 to yourself and -150 to the other person.
- if the other person chooses A, he/she gives you 150 and 150 to him/herself.
- if the other person chooses B, he/she gives you -150 and 250 to him/herself.

After each period you will be given information on: your last decision, the last decision of the other person, the number of Talers you earned in the last period, and the total number of Talers you have earned so far.

**[[In Treatments IIab and IIac]]**

**<u>The experiment:</u>**

The experiment is composed of two phases

**<u>Phase I:</u>**

In phase I you have the choice between two experimental situations.


Both experimental situations have the following in common:

- You play with another person. The decision situation, as well as the other person are identical in each period.
- You have to choose between A and B in each one of the 20 periods.
- In each period, you will not know the choice of the other person before you have made your own choice.
- The amount of Talers you earn in each period depends on your and the other persons decision.
- After each period you will be given information on: your last decision, the last decision of the other person, the number of Talers you earned in the last period, and the total number of Talers you have earned so far.

**Particular to Decision <u>Situation I</u>:**

See Ib or Ic

**Particular to Decision <u>Situation II</u>:**

See Ia

**[[In All Treatments]]**

<u>Payment:</u>

You will be privately paid on the basis of the total Talers accumulated in all the experiment. 1000 Taler equal 2 Euro.

**Thank you very much for your participation!**

# Appendix B: The Multiple Choice Test Questions

## Test Questions

**[[In Treatment Ia]]**
- How high is the profit for person 1, if she chooses B and person 2 A? {0,100,300,400}
- How high is the profit for person 1, if she chooses A and person 2 as well? {0,100,300,400}
- How high is the profit for person 1, if she chooses B and person 2 as well? {0,100,300,400}
- How high is the profit for person 1, if she chooses A and person 2 B? {0,100,300,400}

**[[In Treatment Ib]]**
- How high is the profit for person 1, if she chooses B and person 2 A? {0,100,300,400}
- How high is the profit for person 1, if she chooses A and person 2 as well? {0,100,300,400}
- How high is the profit for person 1, if she chooses B and person 2 as well? {0,100,200,300}
- How high is the profit for person 1, if she chooses A and person 2 B? {0,100,200,300}

**[[In Treatment Ic]]**
- How high is the profit for person 1, if she chooses B and person 2 A? {0,150,250,400}
- How high is the profit for person 1, if she chooses A and person 2 as well? {-150,250,300,400}
- How high is the profit for person 1, if she chooses B and person 2 as well? {-150,100,250,300}
- How high is the profit for person 1, if she chooses A and person 2 B? {0,150,250,300}

**[[In Treatments IIab]]**

- In experimental situation **I**, how high is the profit for person 1, if she chooses B and person 2 A? {0,100,300,400}
- In experimental situation **II**, how high is the profit for person 1, if she chooses A and person 2 as well? {0,100,300,400}
- In experimental situation **I**, how high is the profit for person 1, if she chooses B and person 2 as well? {0,10,200,300}
- In experimental situation **II**, how high is the profit for person 1, if she chooses A and person 2 B? {0,100,300,400}

**[[In Treatments IIac]]**

- In experimental situation **I**, how high is the profit for person 1, if she chooses B and person 2 A? {0,150,250,400}
- In experimental situation **II**, how high is the profit for person 1, if she chooses A and person 2 as well? {0,100,300,400}
- In experimental situation **I**, how high is the profit for person 1, if she chooses B and person 2 as well? {-150,100,250,300}
- In experimental situation **II**, how high is the profit for person 1, if she chooses A and person 2 B? {0,100,300,400}

# Appendix C: The Computerized Questionaire

## Questionaire

**[[In All Treatments]]**

Question 1: Terminal number?
Question 2: Major?
Question 3: Job?
Question 4: Semester?
Question 5: Age?
Question 6: Sex?
Question 7: Did you ever take a microeconomics course?
Question 8: Do you know what game theory is?

**[[In Treatment Ia]]**

Question 9: Do you know what a prisoner's dilemma is?
Question 10: Additional comments?

**[In treatment Ib and Ic]]**

Question 9: Do you know what a decomposed prisoner's dilemma is?
Question 10: Additional comments?

**[[In Treatment IIab and IIac]]**

Question 9: What experimental situation did you pick at the beginning of the experiment?
Question 10: According to what criteria did you choose between experimental situation I and II?
Question 11: Do you know what a prisoner's dilemma is?
Question 12: Do you know what a decomposed prisoner's dilemma is?
Question 13: Are the possible profits in both experimental situations the same?
Question 14: Additional comments?

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