On the Effect of Incentive Schemes on Trust and Trustworthiness

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Dezember 2006

Abstract
We analyze whether being exposed to a certain incentive scheme influences trust and trustworthiness and corresponding expectations among individuals in a subsequent investment game. The results indicate whether trust and trustworthiness can be grown or destructed in an organization via implementing certain incentive schemes. Particularly, we find that trust and the expectation of trust towards the interaction partner are positively affected by experiencing cooperation in a team setting compared to being exposed to a tournament scheme. The expectation of trust is even decreased by the tournament competition.

JEL Classification: C72, D23, J33, L23, M52

Key Words: Trust, Incentive schemes, Team, Relative performance evaluation, Experiments

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I am grateful to René Fahr, Bernd Irlenbusch, Kathrin Pokorny, Dirk Sliwka and the participants of the ESA in Nottingham for valuable comments. All errors are my own. I am also grateful to Evgenij Pechimenko and Andreas Staffeldt who programmed the experimental software and supported the conduction of the experiment. Financial support by the Deutsche Forschungsgemeinschaft through grant HA 4462/1-1 is gratefully acknowledged.
1. Introduction

Some recent studies have impressively shown that being exposed to a certain incentive environment alters behavior in a different subsequent incentive structure which has been labeled “history effect” or “afterglow effect” (e.g. Montmarquette/Rullière/Villeval/Zeiliger 2004, Irlenbusch/Sliwka 2005, Gächter/Kessler/Königstein 2006). We add to this literature by investigating the effect of different incentive structures on social preferences, i.e. trust and trustworthiness and corresponding expectations.\(^1\)

Trust and trustworthiness are increasingly recognized as central to the functioning of relationships in general, especially in organizations. Some evidence has been gathered that trust and trustworthiness – often associated with social capital – have important benefits for organizations. For example, it is argued that trust and trustworthiness enhance cooperation among individuals and are, therefore, essential ingredients for a successful organization. Thus, it is important to gain insight into the emergence of trust and trustworthiness in an organizational setting.\(^2\) We, therefore, ask whether certain incentive environments help to grow or destroy trust and trustworthiness.

Taking a look at the landscape of different organizational cultures it is obvious that a wide variety of environments exist in reality. One dimension of the environment provided by organizations are different forms of incentive structures. In the following, two very different incentive environments will shortly be described. On the one hand, some companies, e.g. large consulting agencies, foster competitive behavior of the employees in order to enhance individual performance. This is reflected by their pay and promotion policies. Usually employees are ranked within their peer group based on their performance review. The ranks are associated with certain consequences, e.g. promotion decisions or pay increases. Often, employees have to make it to a certain rank within a defined period of time or, otherwise, they have to leave the company, which is in its extreme form denoted as “up-or-out” policy.

On the other hand, some organizations invest in fostering cooperative attitudes among their employees. This is done, for example, by creating “corporate values” or “business principles” like “teamwork”, “fairness”, or “integrity” and promoting them within the company.\(^3\) Behavior in accordance with these values often affects the end year’s performance review and

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\(^1\) Bohnet/Huck (2004) explicitly analyze history effects with regard to trust and trustworthiness, too. They focus on the effect of reputation building and not on the effect of different incentive environments on trust and trustworthiness.

\(^2\) There are some studies analyzing various determinants of trust and trustworthiness in experiments, e.g. two recent studies analyze the effect of age (Kocher/Sutter \textit{in press}) and group decision making Bornstein/Kocher/Kugler/Sutter \textit{(in press)} on trust and trustworthiness.

\(^3\) Lauer/Rockenbach/Walgenbach (2006) experimentally analyze the effect of the announcement of normative codes of conduct and find that cooperation may be increased in a public good setting.
has, thus, an influence on pay and promotion decisions. Moreover, the pay structure itself may enhance cooperation among employees by linking pay to the joint performance of a group, which could range from the work group over the business unit or on a higher level to the whole company, e.g. via profit sharing schemes or stock option plans. Relative performance evaluation systems, e.g. forced rankings, that induce competition among employees, are usually avoided in these companies.4

This study analyzes whether experiencing such different incentive cultures may shape the preferences and expectations of individuals. In particular, we ask whether trust and trustworthiness as well as the expectation of both are influenced by being exposed to different reward structures. Can trust be created by cooperative team incentive schemes? Or, is it possible to destroy trust and trustworthiness by inducing competition among subjects? Are the expectations towards others influenced? From the perspective of an organization’s management it is essential to know how the incentive structures implemented affect the employees’ social preferences as these preferences may affect the interaction of employees among each other as well as the efficacy of the whole performance management process (see Harbring 2006b).

We approach this research question by implementing three different incentive schemes in the laboratory. We opt for a laboratory experiment as we are convinced that the question is an empirical one and as conducting an experiment offers the advantage of controlling most parameters which allows us to analyze real ceteris paribus changes.5 Subjects in our study participate in a cooperative setting, i.e., a simple team incentive scheme, and a competitive setting, i.e. a rank-order tournament. Moreover, in a third treatment we analyze a modified team setting. Subjects participate in a team incentive scheme in which they may punish the other participant after each round. This resembles an organizational culture where employees are asked to “blow the whistle” if they observe another employee who has not contributed to the team output, but tends to free-ride on other employees’ efforts or where employees in a team may exert some pressure on others (see Fehr/Gächter 2000, 2002).

In our study, subjects repeatedly interact in one of the three incentive schemes. Afterwards, they play the investment game introduced by Berg/Dickhaut/McCabe (1995). This game provides measures on the degree of trust and trustworthiness towards the other participant. We do not supply feedback and repeat the investment game with participants with whom no interaction has been taken place before and whom we will call “strangers”. In addition to measuring trust and trustworthiness we also elicit expectations regarding the other

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4 For an overview on different incentives in organizations see Gibbons (1998) or Prendergast (1999).
participant’s behavior. To control for initial preferences of participants arriving in the laboratory we conduct the investment game before subjects are exposed to one of the incentive schemes. This design allows us to compare whether trust and trustworthiness and corresponding expectations (i) towards the interaction partner and (ii) towards strangers with whom no interaction has been taken place before are affected by experiencing different incentive environments. If exposing subjects to an incentive scheme alters the behavior not only towards the interaction partner but towards strangers trust and trustworthiness could be influenced not only among colleagues or employees who frequently interact, but also towards every other employee in the organization.

2. Related Literature

From an orthodox theoretical perspective, the behavior of selfish individuals should not be influenced by the experience in a preceding game. If one assumes, however, that participants have social preferences and they may gather information on other subjects’ preferences in a first game this experience might influence behavior in a subsequent setting. There are already several experimental studies on such behavioral effects which are denoted as “history effects” or “afterglow effects”. Some of these studies analyze behavior in an incentive scheme after participants had been exposed to a different incentive scheme in a first phase of the experiment. For example, Nalbantian/Schotter (1997) find that subjects who participate in a revenue-sharing scheme first – with free-riding as a dominant strategy – exert a lower effort in subsequent incentive schemes, e.g. profit sharing schemes, than in the situation where they first enter one of the latter incentive schemes. They explain their result by assuming that participants lack trust after a common history of shirking. Montmarquette/Rullière/Villeval/Zeiliger (2004) disentangle the effect of a change in compensation schemes and the redesigning of teams after a merger by conducting a real-effort experiment with managers from two recently merged companies. They interestingly find that mixing subjects with different incentive backgrounds limits the effect of a newly introduced incentive scheme. Irlenbusch/Sliwka (2005) analyze a principal-agent framework where a principal may repeatedly decide on a contract, followed by the agents’ effort decision. They find that effort is higher in a setting where only fixed wages may be chosen by the principal than in a setting where an additional bonus rate may be selected by the principal. However, switching the incentive structures in a second phase, i.e. playing the setting with bonus rate first, reverses this difference such that effort is significantly higher with bonus rate. They explain their result

5 An overview of the advantages of labor market experiments provide Falk/Fehr (2003).
by conjecturing that the piece-rate alters the decision frame, i.e. being in an incentive scheme where piece-rates are feasible puts participants in an individual maximization frame and not a cooperative frame. Gächter/Kessler/Königstein (2006) whose study is closely related to the one of Irlenbusch/Sliwka find that voluntary cooperation is lower after experiencing incentive pay which is modeled by allowing the principal to exert a fine or pour out a bonus for a certain effort level. The studies mentioned so far also deal with the role of trust and trustworthiness in incentive schemes but do not explicitly measure how different incentive schemes affect trust and trustworthiness. However, these preferences are prevalently discussed in the organizational context. In a related study by Harbring (2006b) the role of trust and trustworthiness as well as corresponding expectations in different incentive environments is analyzed. The results show for example that trust, trustworthiness and the expectations are essential for the stability of cooperation in a team setting.

Bohnet/Huck (2004) investigate history effects in trust games. They directly measure trust and trustworthiness by using the trust game, but vary the matching procedure of participants and not the game structure. Ferrin/Dirks (2003) whose research question is close to ours experimentally analyze whether different reward structures, i.e. competitive, cooperative and mixed structures, affect interpersonal trust. They measure trust by answers to a questionnaire that is distributed after the experiment while we opt for measuring trust and trustworthiness by behavior in the investment game. Their results indicate that competitive reward structures negatively influence trust while cooperative structures have a positive effect. Brandts/Schwieren/Weichselbaumer (in progress) conducted an experiment independently from us which follows a similar research agenda. They experimentally investigate the effect of different incentive schemes on behavior in a trust game. Participants have to fulfill a real-effort task and are rewarded according to a competitive scheme, a cooperative scheme and a piece-rate. They find that there is significantly less trustworthiness in the competitive condition than in the cooperative condition. This is roughly in line with our results where trustworthiness is decreased after being exposed to the tournament scheme. Note that we deliberately opt for abstractly modeling effort as the decision on a number associated with certain costs of effort. Our approach has the advantage that we can control for the theoretical predictions in the different incentive environments.

Finally, there are some recent papers discussing the negative effects of competition. Direct negative effects of competition have been addressed in the framework of tournament theory: Relative performance evaluation decreases cooperation among agents and may even increase destructive sabotage activities (Lazear 1989, Drago/Garvey 1998, Garicano/Palacios-Huerta
This well-known downside of competition is predicted by tournament theory and does not refer to a behavioral change induced by competition that carries over to subsequent situations. Recent studies analyze the history effect of competition on subsequent behavior which can usually not be explained by standard theory. For example, Carpenter/Seki (2005) conduct a field experiment with workers in a fishing community in Japan, Toyoma Bay. They find that those individuals being exposed to a higher degree of competition at work tend to cooperate less in a standard public good game. Brandts/Riedl/van Winden (2006) find that competition negatively affects the disposition towards others. Moreover, the well-being of those participants being on the long side of competition is negatively influenced by competition and competition reduces the willingness to help others.

We contribute to the literature by analyzing whether trust and trustworthiness and corresponding expectations – measured by actual behavior in an investment game based on Berg/Dickhaut/McCabe (1995) – are influenced by the experience under different incentive schemes towards the interaction partner as well as strangers. Most studies mentioned so far only analyze behavioral changes towards the interaction partner. We also elicit subjects’ expectations of other participants’ behavior which helps to gain insight into participants’ motives. As we conduct an investment game after participants’ arrival in the laboratory we control for initial preferences when analyzing the history effects. We deliberately opt for abstractly modeling effort as choice of a number associated with certain monetary costs. This procedure helps us to control the setting, e.g. we may implement the same theoretic prediction in all three incentive schemes and we do not need to check for the different abilities of the participants.

3. The Experiment

The computerized experiment was conducted at the Cologne Laboratory for Economic Research in 2005 and 2006 using the experimental software z-tree (Fischbacher 1999). Subjects were recruited with the online recruiting system ORSEE (Greiner 2004) and were mainly students of Economics and Business Administration. While some had already participated in experiments it was ensured that no one had been involved in an investment game before. In sum 180 students participated in the experiment. The experiment consisted of six sessions with two sessions per treatment condition. All payoffs and costs were given in the

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6 For a comprehensive study disentangling the different motives in trust games see Ashraf/Bohnet/Piankov (2006). They do not only elicit expectations but also conduct two dictator games before subjects make their decision in the trust game which allows them to separate unconditional kindness from reciprocity.
fictitious currency “Taler” and the sum of Taler earned was exchanged in Euro at an exchange rate of €5 per 100 Taler at the end of the experiment. Each session lasted about 1.5 – 2 hours, and participants earned € 18.23 on average. Subjects were not allowed to speak to each other during the whole experiment.

3.1 Sequence of Play

The experiment was based on four phases (see Table 1) with the three treatments varying only in the incentive structure in phase II. After entering the laboratory and before instructions were distributed participants were asked to provide random numbers. These numbers served as sample decisions and were used to explain participants the two game structures. First, instructions regarding phase I were read to the participants. During the whole experiment the language was kept neutral. Subjects were informed about the “10-Taler-Game” (investment game) they would play in phase I and that they would play a different game, the “2-Number-Game” (incentive scheme), in phase II. At that point of time the incentive scheme of phase II was not yet explained to them. Though, they were informed about the matching procedure, the number of rounds as well as the feedback that would be given after each round in phase I and II. It was explained that in phase I they would play the “10-Taler-Game” for 10 rounds, with a new randomly selected subject in each round and roles would be alternating over rounds, i.e. they would be trustor (“player A”) in one round and trustee (“player B”) in the next round etc. The investment game is repeated to allow for a variation of participants’ behavior. This variation could be due to the expectation of a subject that there are proportions of different types of individuals in the population, e.g. selfish and altruistic subjects. Participants were told that a detailed overview of all of their group’s decisions and payoffs of phase I would be provided at the end of the experiment.

After being seated in their cubicles the roles and the matching to groups were determined randomly by the software and the participants typed in their decisions. After phase I had been finished participants were asked to leave their cubicles again and the game (incentive scheme) of phase II was explained to them in detail. Depending on the treatment condition either the team scheme (team), the tournament (tourn) or the team with punishment (teampun) opportunity was implemented. In phase II, participants played with one randomly selected

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7 Examples regarding the payoffs were calculated on the basis of these random numbers. This procedure was applied to keep possible suggestive influences as small as possible.

8 Sample instructions are provided in the appendix. Original instructions in German are available from the author upon request.
other participant for 15 rounds and they learned the decision of the other participant and both players’ payoffs after each round.

**Table 1**: Sequence of Play

<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Phase IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control of initial T/TW</td>
<td>Incentive Scheme (treatment variation)</td>
<td>T/TW towards partner</td>
<td>T/TW towards stranger</td>
</tr>
<tr>
<td>Team (team)</td>
<td>Tournament (tourn)</td>
<td>Team with punishment (teampun)</td>
<td>Team (team)</td>
</tr>
<tr>
<td>game</td>
<td>Investment Game</td>
<td>Investment Game</td>
<td>Investment Game</td>
</tr>
<tr>
<td>matching</td>
<td>random</td>
<td>fixed</td>
<td>fixed</td>
</tr>
<tr>
<td>rounds</td>
<td>10</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>roles</td>
<td>alternating</td>
<td>-</td>
<td>alternating</td>
</tr>
<tr>
<td>feedback</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>

T = Trust; TW = Trustworthiness

After participants had played all 15 rounds of phase II they were distributed an additional instructions sheet providing information on phase III and IV of the experiment. They learned that they would play the “10-Taler-Game” they knew from phase I again. The additional sheet (as well as the text on the computer screens) informed participants also about the matching procedure, number of rounds and that – as in phase I – no feedback would be given after each round in the last two phases of the experiment. Again, participants were told that they would be provided with a detailed overview of their group’s decisions and payoffs of phase III and phase IV at the end of the experiment. In phase III, participants played two rounds with the “partner” they had interacted with in phase II, again with alternating roles. In phase IV, participants played with a new randomly selected participant – a “stranger” – in each of the 10 rounds. Roles were again alternating over rounds. Thus, phase IV is exactly the same like phase I. After phase IV participants were asked to fill in a questionnaire. Finally, they were shown the detailed decisions and payoffs of their group in the “10-Taler-Game” (investment game) regarding each round in phase I, phase III and phase IV.9

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9 The correlation of behavior and expectations in phase I and behavior in phase II is analyzed in detail in Harbring (2006b).
3.2 Games

(i) Investment Game

The investment game we implemented is based on the investment game of Berg/Dickhaut/McCabe (1995). In our game only the first mover who will be called “trustor” in the following received an endowment of 10 Euro. The trustor could transfer any positive amount \( x \in \{0, 1, 2, \ldots, 10\} \) to the second mover who will be referred to as “trustee”. The transfer was tripled, i.e., the trustee received an amount of \( 3x \). The trustee subsequently decided on an amount \( y \in \{0, \ldots, 3x\} \) he wanted to send back to the trustor. The final payoffs were given by \((10 - x + y)\) for the sender and \((3x - y)\) for the trustee. The only subgame perfect equilibrium of the game is constituted by an amount sent of 0 and a return amount of 0 for each possible transfer.

In order to fully analyze the inclination of trustees to return money we implement the strategy method, i.e., we ask each trustee to state the return amount for every possible transfer without actually knowing the concrete transfer from the trustor. Moreover, we ask players to state their expectations regarding the other participant’s decision after they have submitted their decision. Therefore, we ask trustees to state their conjecture about the amount sent by the trustor. And, we ask the trustors for the expected return amount regarding each possible amount sent. Of course, the trustor knows which amount she has sent. However, to get more information on the trustor’s expectations and to be able to compare it with all of the trustee’s decisions she has to state the expected return amount for each possible transfer. The expectations are incentivized, i.e. participants receive a bonus of 1 Taler if their expectation turns out to be true.\(^{10}\)

(ii) Incentive Schemes

In each of the incentive schemes the payoff of an agent \( i \) \((i = 1, 2)\) depends on her own effort decision \( e_i \) and the effort decision of the other agent. Efforts are abstractly modeled, i.e., agents simultaneously choose integers with \( e_i \in \{0, 1, 2, \ldots, 10\} \). Each effort level is associated with certain costs given by \( c(e_i) = \frac{e_i^2}{10} \). The instructions sheet included a table with a full overview of costs regarding the decisions. We implement the same production function in each treatment: \( f(e_i, e_j) = e_i + e_j \), i.e. output is determined by effort and a random

\(^{10}\) While the trustee’s bonus can either amount to 1 Taler (correct expectation) or 0 Taler (false expectation) the trustor’s bonus can also be between 0 and 1 Taler as each of the 10 expected numbers is compared to the decisions. Note that Gächter/Renner (2006) conducted a study on incentivized beliefs in public good games.
component. The integer random variable is uniformly distributed over the interval \( e_i \in [-4,4] \) and assumed to be i.i.d. for all agents. For deriving the theoretical benchmark we assume risk-neutrality of agents. Parameters have been chosen such that the same theoretic prediction is implemented in the different incentive environments. This design enables us to compare the different incentive environments without distortion of behavior due to the equilibrium predictions. Moreover, the expected payoff in equilibrium as well as in a full cooperation/collusion is equal in all settings.

After participants have entered their decision the random number was drawn by the computer and the payoffs were calculated. Both subjects were then informed about the other player’s decision as well as both round payoffs.

**Team**

In the team setting each participant’s expected payoff is dependent on the sum of both agents’ outputs and own effort costs. In the following, we derive the analysis for agent \( i (i = 1, 2) \):

\[
E \Pi_i(f_i, f_j) = f_i(e_i, e_j) + f_j(e_j, e_j) - c(e_i) = e_i + e_j + e_j - \frac{e_i^2}{10}.
\]

The first-order condition for maximizing the individual payoff\(^{11}\) is given by:

\[
\frac{\partial E \Pi_i(f_i, f_j)}{\partial e_i} = 1 - \frac{2e_i}{10} = 0 \Leftrightarrow e_i^* = 5.
\]

This gives the subgame perfect equilibrium of the finitely repeated game in dominant strategies at (5, 5).

However, participants may also aim at pareto-efficiency by choosing strategies which maximize the sum of expected payoffs:

\[
E \Pi_i(f_i, f_j) + E \Pi_j(f_i, f_j) - c(e_i) - c(e_j) = 2(e_i + e_j + e_j) - \frac{e_i^2}{10} - \frac{e_j^2}{10}.
\]

The pareto-efficient outcome is achieved if both players choose the maximal amount of effort:

\[
\frac{\partial (E \Pi_i(f_i, f_j) + E \Pi_j(f_i, f_j))}{\partial e_i} = 2 - \frac{2e_i}{10} = 0 \Leftrightarrow e_i^\diamond = 10.
\]

However, participants have an incentive to act as a free-rider in each round and deviate from this cooperative effort level by choosing the dominant strategy.

\(^{11}\) Checking the first-order condition suffices here as the payoff function is concave.
**Tournament**

In the rank-order tournament the subject with the higher output receives a winner prize $M$ of 14 Taler while the other agent receives a lower loser prize $m$ of 6 Taler. If payoffs are equal the winner is randomly determined by the computer. Thus, the expected payoff of an agent is given by: $E \Pi_i(f_i, f_j) = P(f_i, f_j)M + [1 - P(f_i, f_j)]m - c(e_i)$ with $P(.)$ being the probability of agent 1 to receive the winner prize. In the symmetric equilibrium both agents choose the same effort level resulting in equal marginal winning probabilities dependent only on the size of the interval of $\varepsilon = 4$ from which the random component is drawn: 

$$\frac{\partial P(f_i, f_j)}{\partial e_i} = \frac{1}{2\varepsilon}.$$

The equilibrium in pure strategies can now be characterized by:

$$\frac{\partial E \Pi_i(f_i, f_j)}{\partial e_i} = \frac{1}{2\varepsilon}(M - m) - \frac{\partial c(e_i)}{\partial e_i} = 0.$$

Plugging in the parameters we receive a subgame perfect equilibrium effort level of $e_i^* = 5$ for the finitely repeated game. Again, participants may also decide to choose pareto-efficient strategies and maximize joint payoff. The resulting efficient effort level is straightforward: Winner and loser prizes are allocated independently of the absolute effort levels. Thus, it is pareto-efficient to minimize cost of effort and exert an effort level of $e_i^0 = 0$. The winner is then only determined by the realization of the random component. Each agent has an incentive to deviate from this collusion by exerting a higher effort level and receiving the winner prize with a higher probability than the other agent.

**Team with Punishment**

The team with punishment opportunity is exactly the same like the team incentive scheme described above with the only exception that there is a second stage at which participants may reduce the other subject’s payoff for some extra costs. After subjects have been shown their payoffs and the other agent’s effort level both agents can determine the number of punishment points $p_{ij}$ (punishment points of player $i$ towards player $j$) which were called “reduction points” in the instructions. The punishment points $p_{ij} \in \{0, 1, 2, \ldots, 10\}$ were associated with certain costs given by the following cost table which was also included in the instruction:

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12 In our setting here no asymmetric equilibrium in pure strategies exists.

13 For the derivation of the marginal winning probability see Orrison/Schotter/Weigelt (2004) or Harbring/Irlenbusch (2005).
Table 2: Costs of punishment points in Taler

<table>
<thead>
<tr>
<th>Punishment points $p_{ij}$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs $k(p_{ij})$</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>1.6</td>
<td>2.3</td>
<td>3.1</td>
<td>4</td>
<td>5</td>
<td>6.1</td>
<td>7.3</td>
<td>8.6</td>
</tr>
</tbody>
</table>

Each punishment point reduces the other participant’s payoff by 10%, i.e., the maximal amount of punishment points completely destroys the other subject’s payoff. If the payoff resulting from the effort choices is given by $\Pi_i(f_i, f_j)$ as described above each subject’s final round payoff after the punishment stage is calculated as follows

$$\Pi_i^{pu}(f_i, f_j) = f_i(e_i, \epsilon_j) + f_j(e_j, \epsilon_j) - c(e_i) - k(p_{ij}) - 0.1 p_{ij} \Pi_i(f_i, f_j),$$

with $p_{ij}$ being the punishment points received by player $j$ from player $i$. In the subgame perfect equilibrium no purely selfish individually rational agent would choose a positive amount of punishment points because he would not be willing to bear the extra cost. Setting $p_{ij}$ equal to zero means that the analysis is equal to the one above without punishment opportunity. Thus, when agents are purely selfish the equilibrium and efficient effort levels are equal to the predicted levels in the team incentive scheme without punishment opportunity.

The parameters and behavioral benchmarks are summarized by Table 3.

Table 3: Parameters and behavioral benchmarks

<table>
<thead>
<tr>
<th></th>
<th>team</th>
<th>tourn</th>
<th>teampun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effort range</td>
<td>$e_i \in {0, 1, 2, \ldots, 10}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of effort</td>
<td>$c(e_i) = \frac{e_i^2}{10}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Random component</td>
<td>$\epsilon_i \in [-4.4]$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Punishment stage</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Equilibrium effort</td>
<td>$e^* = 5$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected payoff in equilibrium</td>
<td>$\Pi^<em>(e_i^</em>, e_j^*, \epsilon_i, \epsilon_j) = 7.5$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooperative/collusive effort</td>
<td>$e^0 = 10$</td>
<td>$e^0 = 0$</td>
<td>$e^0 = 10$</td>
</tr>
<tr>
<td>Payoff in cooperation/collusion</td>
<td>$\Pi^0(e_i^0, e_j^0, \epsilon_i, \epsilon_j) = 10$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Hypotheses

We compare whether trust and trustworthiness and corresponding expectations are influenced by the experience made in different incentive schemes. Additionally, our experimental design allows us to disentangle the effect towards the interaction partner from phase II from a behavioral change towards another participant – a stranger\(^\text{14}\) – with whom no interaction has been taken place before. Why should observing certain decisions of the interaction partner in the incentive scheme change trust behavior in the future?

Observing the partner’s behavior in the incentive scheme could reveal some information about her preferences, e.g., that she has some other-regarding preferences. This information could modify the expectation towards the partner in a subsequent investment game and, thus, influence behavior. Observing a certain behavior in the incentive scheme could also be interpreted as behavior which is in line with some general social norm. Learning about this social norm might influence expectations in a subsequent investment game also towards strangers with whom no interaction has been taken place before. Another explanation for a behavioral change towards strangers could be that a participant gathers information on the distribution of different types of players, e.g. selfish and non-selfish types, in the population. Especially reciprocal subjects should adjust their behavior to this information. Note that most studies on history effects have analyzed behavioral effects towards the interaction partner and not towards strangers (e.g. Nalbantian/Schotter 1997, Irlenbusch/Sliwka 2005). However, it has been confirmed in other studies that a history effect towards strangers may arise (e.g. Bohnet/Huck 2004).

To derive our hypotheses regarding the history effect of the incentive schemes it is important to conjecture first how participants will behave in the different incentive schemes. The team incentive scheme serves as our baseline treatment and we compare the team scheme to the tournament setting as well as to the team scheme with punishment opportunity. The team incentive scheme modeled in this study resembles the structure of a public good game. As we know from many experiments on public goods there usually is some degree of cooperation which is declining over rounds and which is dependent on certain design features like group size, the opportunity to communicate etc. (for an overview on public good games see e.g. Ledyard 1995, and Camerer 2003). In tournaments cooperation among agents is labeled as “collusion” and one of the major drawbacks of incentive schemes based on relative

\(^{14}\) We refer to this subject as “stranger”. However, it is important to note that the stranger is not introduced to the game from another environment but has been exposed to the same game structure throughout the experiment. Introducing strangers from a completely different environment would be an interesting extension of the design.
performance evaluation. The competitors may save on effort costs by reducing their effort. Some experimental studies already compare team and tournament settings. They differ from our study as they do not implement the same theoretical prediction in both incentive structures or analyze real efforts (Nalbantian/Schotter 1997, van Dijk/Sonnemans/van Winden 2001, Harbring 2006a). These studies as well as other experimental studies on tournaments show only little evidence of collusion (e.g. Bull/Schotter/Weigelt 1987, Harbring/Irlenbusch in press). It seems, therefore, plausible to expect more cooperation in the team scheme than in the tournament scheme.

It has recently been impressively demonstrated that cooperation in public good games can be enhanced by introducing a punishment opportunity (e.g. Fehr/Gächter 2000, 2002, Masclet/Noussair/Tucker/Villeval. 2003, Masclet/Villeval 2006). Thus, we conclude that the punishment opportunity increases the tendency to cooperate in the team setting.

**Hypothesis 1 - Behavior in Incentive Schemes**

**Hypothesis 1a team vs. tourn:** More cooperation can be observed in the team incentive scheme than in the tournament incentive scheme.

**Hypothesis 1b team vs. teampun:** More cooperation can be observed in the team scheme with punishment opportunity than in the team incentive scheme.

What can I learn from observing my partner cooperating in the different incentive environments? It is typically argued that part of the observed cooperation in social dilemma games is not only due to participants with unconditional other-regarding preferences like altruism but to conditional cooperators who cooperate as long as sufficiently others cooperate, i.e. behave reciprocally. The decision of reciprocal subjects should be influenced by the other participant’s behavior in previous rounds as well as the expectation regarding the other participant’s behavior in the current round. In the following, we differentiate between selfish individuals and non-selfish individuals with other-regarding preferences while we still divide the latter group into subjects with unconditional other-regarding preferences like altruism and other-regarding preferences conditioned on the other participant’s behavior like reciprocity.

Selfish individuals solely aim at maximizing their own income. From a theoretical perspective a selfish subject in the classical sense of an individually rational *homo oeconomicus* would never cooperate in one of our settings. Some studies, however, show that selfish participants

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15 In Harbring (2006a) participants are able to achieve a stable collusion in an experiment on rank-order tournaments if certain conditions are met, i.e. participants communicate to each other, effort is observable etc.
might cooperate during social dilemma games for a variety of reasons.\(^{17}\) Though, one could conclude that a non-selfish individual is more likely to cooperate in a team or tournament setting than a selfish subject. Thus, observing cooperation could induce a subject to consider the interaction partner as non-selfish or to consider non-selfish behavior as a general social norm. Based on Hypothesis 1a one could conclude that observing the partner’s behavior in the team scheme rather induces subjects to expect others to be non-selfish than in a tournament.

However, in the team with punishment opportunity observing the partner’s cooperation probably does not reveal the same information as in the team scheme. A participant might be only interested in maximizing his own income but might expect other participants to be non-selfish.\(^{18}\) Non-selfish participants could be willing to bear some costs and punish others for not adhering to a social norm or for reciprocating for previous behavior (Fehr/Gächter 2000, 2002, Falk/Fehr/Fischbacher 2005). Thus, cooperation could be due to fear of punishment and might not necessarily be interpreted as non-selfish behavior. Together with Hypothesis 1b we may conclude that observing the partner’s cooperation in team rather induces participants to consider the interaction partner as non-selfish than in teampun.

How does this translate to the behavior in the investment game? A selfish individual should never return a positive amount being in the role of the trustee; moreover, a selfish individual in the classical sense should never send a positive amount being in the role of the trustor. Observing the partner cooperating in the incentive scheme results in expecting non-selfish behavior which means that a certain degree of trustworthiness as well as a certain degree of trust can be expected in the subsequent investment game. Both – trust and trustworthiness – can be due to unconditional kindness or reciprocity (see also Holm/Danielson 2005 and Ashraf/Bohnet/Piankov 2006). Expecting others to be trustworthy should increase trust of reciprocal subjects. And even selfish individuals could tend to increase their trust if they assume others to be trustworthy and the investment to pay off. Trustworthiness might be due to unconditional kindness which is probably not affected by the expectation towards others or to conditional kindness like reciprocity. We measure the degree of reciprocity by the trustee’s preferences revealed via the contingent response method. The degree of reciprocity, i.e. how much is returned for each possible amount sent by the trustor, should not be influenced by the

\(^{16}\) For recent studies on cooperation in social dilemma games see e.g. Houser/Kurzban (2002); Gunnthorsdottir/Houser/McCabe (2005) or Fischbacher/Gächter (2006).

\(^{17}\) See for example Fischbacher/Gächter (2006) who control for social preferences before participants enter a repeated public good game. They find that free-riders, i.e. selfish individuals, tend to contribute to the public good in the first half of the experiment.

\(^{18}\) Note that a selfish individually rational individual in the classical sense does not believe other participants to deviate from selfish behavior.
expectations towards others. However, experiencing cooperation of the interaction partner in the incentive scheme could induce reciprocal subjects to render this “kind” behavior by increasing trustworthiness, i.e. increasing the amount returned for each amount sent by the trustor. Also trust might be increased due to reciprocity which is in line with our above argumentation. While our logic explained above is based on the assumption that participants gather information about the partner’s preferences which influences the expectations regarding the partner’s behavior, this second explanation refers to a direct reaction towards behavior in the incentive scheme which is expressed by a change in trust and trustworthiness and not expectations. To conclude neither the expectations should be affected by the intention to retaliate nor the behavior towards the stranger in phase IV.

Based on Hypothesis 1 and the logic listed above we may derive the following Hypothesis 2:

**Hypothesis 2 - Behavior in Investment Game**

**Hypothesis 2a team vs. tourn (partner):** Being exposed to a team incentive scheme increases trust and trustworthiness as well as the expectation of trust and trustworthiness towards the interaction partner more than being exposed to a tournament incentive scheme.

**Hypothesis 2b team vs. tourn (stranger):** Being exposed to a team incentive scheme increases trust as well as the expectation of trust and trustworthiness towards a stranger more than being exposed to a tournament incentive scheme.

Analogically, Hypothesis 3 is derived based on the arguments on the team scheme and the team with punishment opportunity:

**Hypothesis 3 - Behavior in Investment Game:**

**Hypothesis 3a team vs. teampun (partner):** Being exposed to a team incentive scheme increases trust, trustworthiness as well as the expectation of trust and trustworthiness towards the interaction partner more than being exposed to a team incentive scheme with punishment opportunity.

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19 If the whole range of the trustee’s decisions is to be taken into account either the average relative return amount can be calculated or the slope of return amounts over the possible amounts sent by the trustor (see subsection 5.2). Both measures should not be altered by the expectation regarding the amount sent by the trustor as the strategy method already makes the trustee’s behavior contingent on the trustor’s decisions.
Hypothesis 3b team vs. teampun (stranger): Being exposed to a team incentive scheme increases trust as well as the expectation of trust and trustworthiness towards a stranger more than being exposed to a team incentive scheme with punishment opportunity.

One might assume that reciprocal participants render a high level of cooperation in teampun with a high level of trust and trustworthiness as a direct response to behavior in phase II. However, according to our above logic cooperation might not be interpreted as kind behavior like in team as it could be due to fear of punishment.

5. Results

5.1 Behavior in Incentive Schemes

As we want to compare the degree of cooperation in % in the different incentive schemes we recode effort as the tendency to cooperate by multiplying effort in the team settings by 10. In the tournament, the tendency to cooperate is given by \((10 - e)\)10. Note that 50% cooperation means exerting the equilibrium effort in both schemes and 100% cooperation corresponds to the minimal effort of zero in tourn and the maximal effort of 100 in team and teampun (see Table 3).\(^{20}\) Figure 1 supplies an overview of the average tendency to cooperate in each of the incentive schemes. Non-parametric testing yields our first result:

Observation on Hypothesis 1a team vs. tourn:

Cooperation is significantly higher in team than in tourn \((team \ vs. \ tourn: p = 0.0001,\) Mann-Whitney U test, two-tailed).

The average effort of 5.1 in tournaments is quite close to the equilibrium prediction while average effort amounts to 6.7 in team and 6.5 in teampun.\(^{21}\) This is in line with other experimental studies on tournaments where average behavior is also close to the equilibrium prediction (Bull/Schotter/Weigelt 1987, Orrison/Schotter/Weigelt 2004, Harbring/Irlenbusch in press).

\(^{20}\) If one deducts the equilibrium amount of 50% from this calculation, one obtains the amount of effort above the equilibrium effort in % in the team settings and below the equilibrium effort in the tournament.

\(^{21}\) Average effort is significantly higher in team than in tourn \((team \ vs. \ tourn: p = 0.0017,\) Mann-Whitney U test, two-tailed).
Also our results regarding the team setting are in line with standard results on public goods game. As indicated by Figure 1 in the first round average cooperation is highest in the team setting (team vs. tourn: \( p = 0.0013 \) and team vs. teampun: \( p = 0.0082 \), Mann-Whitney U test, two-tailed). Cooperation only decreases significantly over rounds in the team incentive scheme.\(^{22}\) In the last round average cooperation does not differ between team and one of the other two treatments. In team as well as teampun participants seem to decrease cooperation in the last round which indicates an end game effect. Average cooperation in the last round is significantly lower than average cooperation over all previous rounds (team: \( p = 0.0002 \) and teampun: \( p = 0.0006 \), Wilcoxon Signed Rank test, two-tailed).

However, as Figure 1 already indicates we cannot support Hypothesis 1b as there is no significant difference between team and teampun regarding average effort and cooperation over all rounds:

**Observation on Hypothesis 1b team vs. teampun:**

Cooperation is not significantly higher in teampun than in team.

In teampun participants may also decide on the number of punishment points after being informed about the effort chosen by the other participant. In 18 out of 30 groups the punishment opportunity is used at least once. Average punishment points chosen per round amount to 0.37 and are significantly decreasing over rounds.\(^{23}\) Results indicate that less punishment points are chosen in the last round compared to all rounds before (\( p = 0.0499 \), Wilcoxon Signed Rank test, two-tailed). Interestingly, the average effort of those groups using

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\(^{22}\) The Spearman rank correlation coefficients per group are significantly more often negative than positive (Binomial test; \( p = 0.0052 \)).
the punishment opportunity is significantly lower than effort of the other groups \( (p = 0.038, \) Mann-Whitney U test, two-tailed). When do subjects make use of the punishment opportunity? The average effort of the partner in the round in which the punishment is chosen is significantly lower than the average effort over all rounds in the same groups \( (p = 0.055, \) Wilcoxon Signed Rank test, two-tailed). However, exerting punishment points does not increase effort significantly in the following round.

5.2 Behavior in Investment Game – Main Results

Figure 2a and 2b supply an overview of behavior in the investment game in each phase and each treatment. Overall, behavior in the investment game in phase I is in line with other results on the investment game (for details see Harbring 2006b). To capture the degree of reciprocal behavior of each subject we calculate the return sensitivity for each responder by running simple OLS regressions with the amount returned as dependent variable and the amount sent as independent variable forcing the slope through the origin.\(^{24}\) We find no significant difference between the treatments regarding the decisions of phase I. Interestingly, the expectation of trustworthiness is significantly higher than the actual trustworthiness in phase I as well as in all later phases (for similar results see Ashraf/Bohnet/Piankov 2006).\(^{25}\)

![Figure 2a](image)

**Figure 2a:** Average trust and expectation of trust (exp_trust) per phase in each treatment

\(^{23}\) Spearman rank correlation coefficients per group are significantly more often negative than positive (Binomial test; \( p = 0.0052 \)).

\(^{24}\) We only include the return transfers for received amounts of at least 3 as participants cannot implement equal payoffs for smaller amounts received by the sender (for this procedure see also Dohmen/Falk 2006, Fahr/Irlenbusch 2006).

\(^{25}\) A comparison of each participant’s trustworthiness and corresponding expectation in phase I resp. of each group’s average decision and expectation in phase III and IV yields a level of significance of at least 1% except for phase III in *teampun* when applying the Wilcoxon Signed rank test for dependent pairs.
Figure 2b: Average trustworthiness (tw) and expectation of trustworthiness (exp_tw) per phase in each treatment.

The statistical comparison of decisions and corresponding expectations for each treatment in the initial phase I and after being exposed to the incentive scheme in phase III/IV is depicted by Table 4. The direction of changes between both phases is always the same in the two team incentive schemes. However, comparing phase I with phase III only the expectation of trust increases significantly after the incentive scheme in *team*. In *tourn* trustworthiness as well as the expectations regarding trust and trustworthiness are significantly lower in phase III than in the initial phase I. Comparing behavior in phase III across treatments we find only one significant difference between the treatments, i.e. the expectation of trust is lower in *tourn* than in *team* ($p = 0.0397$, Mann-Whitney U test, two-tailed).

Interestingly, all decisions and expectations are significantly lower in phase IV than in phase I in each treatment. We find no differences between the treatments regarding phase IV.

Table 4: Comparison of behavior in Investment Game across the different phases

<table>
<thead>
<tr>
<th></th>
<th>team</th>
<th><em>tourn</em></th>
<th><em>teampun</em></th>
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<tbody>
<tr>
<td></td>
<td>PI vs. PI</td>
<td>PI vs. PIV</td>
<td>PI vs. PI</td>
</tr>
<tr>
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<td>&lt;</td>
<td>&gt;***</td>
<td>&gt;</td>
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<tr>
<td>exp_trust</td>
<td>**</td>
<td>&gt;**</td>
<td>&gt;***</td>
</tr>
<tr>
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<td>&lt;</td>
<td>&gt;***</td>
<td>&gt;***</td>
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<tr>
<td>exp_tw</td>
<td>&gt;</td>
<td>&gt;***</td>
<td>&gt;***</td>
</tr>
</tbody>
</table>

By using the Wilcoxon Signed Rank Test (two-tailed) we state the level of significance at which the null hypothesis can be rejected in favor of the alternative hypothesis that average values are differ between the phases.

* weakly significant: $0.05 < p \leq 0.10$

** significant: $0.01 < p \leq 0.05$

*** highly significant: $p \leq 0.01$

To control for the decisions and expectations in phase I we also compare the differences between behavior in phase III/IV and phase I between the treatments. Average differences are depicted by Figure 3.
Figure 3: Average difference between phase I and phase III (partner) or phase IV (stranger)

This is a very meaningful and comprehensive test for history effects here as we include initial preferences measured in phase I as well as behavior in phase III/IV while we may directly compare the differences between the treatments. Note that negative differences denote a decrease from phase I to phase III/IV while positive differences result from an increase from phase I to phase III/IV.

We find that the difference between trust in phase I and trust in phase III is significantly higher in team than in tourn ($p = 0.0836$, Mann-Whitney U test, two-tailed). Together with the above results and Figure 2a and 2b this indicates that trust towards the interaction partner is increased in team to a higher extent than in tourn. Moreover, the difference between the expectation of trust towards the interaction partner in phase I and phase III is also significantly higher in team than in tourn ($p = 0.0020$, Mann-Whitney U test, two-tailed). This effect is strongly confirmed by the above results. We can even conclude that the expectation of trust is increased after being exposed to the team scheme while it is decreased after being exposed to the competition in a tournament setting. Therefore, we can partly confirm Hypothesis 2a:

**Observation on Hypothesis 2a team vs. tourn (partner):**

Being exposed to a team incentive scheme increases trust as well as the expectation of trust towards the interaction partner more than being exposed to a tournament incentive scheme.
We cannot confirm any behavioral change from phase I to phase IV induced by the incentive environment, as we find no significant difference between the treatments. Thus, we cannot confirm Hypothesis 2b on history effects towards strangers:

**Observation on Hypothesis 2b team vs. tourn (stranger):**

Being exposed to a team incentive scheme does not increase trust as well as the expectation of trust and trustworthiness towards a stranger more than being exposed to a tournament incentive scheme.

Finally, we find no results indicating a behavioral change induced by the team with punishment opportunity and no difference of behavior between *team* and *teampun*:

**Observation on Hypothesis 3a and 3b team vs. teampun (partner and stranger):**

Being exposed to a team incentive scheme does not increase trust, trustworthiness as well as the expectation of trust and trustworthiness – neither towards the interaction partner nor towards a stranger – more than being exposed to a team incentive scheme with punishment opportunity.

### 5.3 Behavior in Investment Game - Details and Discussion

The following subsection provides further details on our main results. So far our analysis confirms that behavior partly changes after being exposed to the incentive environments. To investigate the determinants of the decisions and corresponding expectations towards the partner in phase III and the stranger in phase IV we run regressions including the decisions and expectations of the initial phase I as control variables. To capture the experience in each of the incentive schemes we analyze whether the other partner’s tendency to cooperate in phase II influences behavior in phase III and IV. Observing cooperation in phase II might influence subsequent expectations and decisions even if the effects are too weak to induce significant differences between the treatments. Moreover, we provide a discussion of our results.

#### 5.3.1 Behavior in Investment Game towards Partner: *team* vs. *tourn*

**Detailed Results**

Table 5 summarizes the results for *team*. We run simple OLS regressions with robust clusters over statistically dependent observations, i.e. observations of each group from phase II. We
use the decisions/expectations of phase III as dependent variables ("trustp3", "exp_trustp3", "twp3", and "exp_twp3") and the decisions/expectations of phase I as independent control variables ("trustp1", "exp_trustp1", "twp1", and "exp_twp1"). We check whether the average cooperation of the partner in phase II ("coopp2") has an effect on behavior towards the partner in phase III (regressions (1) – (4)). We also include a dummy variable for being female ("female").

First of all, the results confirm what can be expected for all treatments, i.e. that the decisions and corresponding expectations in phase I have a strong positive effect on decisions and expectations in phase III. It is intuitive that a participant sending a high amount in phase I tends to send a high amount in phase III as well.

Moreover, we find that the partner’s average tendency to cooperate in phase II has a positive significant effect on trust, the expectation of trust as well as of trustworthiness. This is in line with our intuition on Hypothesis 2a from above. To shed some additional light on the determinants of behavior in phase III we ran regressions including the partner’s cooperation in the last round ("coopp15") and previous rounds ("coopp1_r14") as separate variables (see regressions (5) – (8)).

The analysis of behavior in the last round is important as behavior in the last round should definitely differentiate selfish from non-selfish behavior. Selfish individuals might cooperate in rounds 1 to 14 for a variety of reasons. For example, they could be confused in the beginning, but as the game continues they learn what is best for them and approach equilibrium play (Houser/Kurzban 2002). Participants may also assume that the other participant is not selfish. This could induce a subject to cooperate for strategic reasons in order to build up reputation as a cooperator (see Kreps/Milgrom/Roberts/Wilson 1982). Moreover, it is also possible that participants perceive the game as an infinitely repeated game (e.g. Selten/Stoecker 1996) which could make cooperation in a prisoner’s dilemma rational.26

As all of these reasons do not apply to the calculus in the last round, behavior in the last round should differentiate selfish individuals from participants with unconditional other-regarding preferences. Whether conditional cooperators cooperate in the last round or not depends on their expectation regarding the other participant’s tendency to cooperate. Taking the above into account the probability to observe cooperation in the last round should be smaller than in previous rounds and thus, conditional cooperators should also cooperate less. To conclude

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26 Cooperation in a repeated prisoner’s dilemma is rational if the probability that the game continues is large enough and both players play a trigger strategy, i.e. they cooperate as long as the other cooperates and otherwise defect for all subsequent rounds.
observing the partner’s cooperation during rounds 1 to 14 could induce participants to regard the partner rather as non-selfish than as selfish. Observing cooperation in the last round should obviously indicate that the partner is non-selfish. Interestingly, we indeed find that the partner’s cooperation in the last round has a positive effect on the expectation of trustworthiness.

Table 5: Effect of cooperation in team on investment game with partner in phase III

<table>
<thead>
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<th>(4)</th>
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<td>0.37</td>
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</tr>
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</table>

Note: Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

We run the same regressions for tourn but find only weak effects. The partner’s average cooperation weakly significantly increases trustworthiness indicating positive reciprocity. Separating cooperation in the last round from previous rounds shows that the partner’s average cooperation over rounds 1 to 14 has a positive impact on trustworthiness. To shed some additional light on the different effects of team and tourn we run further regressions depicted by Table 6. For these regressions we are pooling the data from team and tourn adding a treatment dummy “tourn” which equals to 1 for the tournament treatment and 0 for the team setting.

We find that the treatment dummy ceteris paribus has a strong negative effect on the expectation of trust in phase III. Simply being in a tournament reduces the expectation of trust ceteris paribus by at least 1.18 compared to being in the team incentive scheme.
Table 6: Treatment effect (team vs. tourn) on investment game with partner in phase III

<table>
<thead>
<tr>
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>trustp3</td>
<td>0.865***</td>
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<td>exp_trustp3</td>
<td></td>
<td>0.895***</td>
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<tr>
<td>twp3</td>
<td>0.843***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>exp_twp3</td>
<td></td>
<td></td>
<td>0.823***</td>
<td></td>
</tr>
<tr>
<td>coop</td>
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<td>0.034**</td>
<td>0.004*</td>
<td>0.003</td>
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<td>-0.054</td>
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<td>Constant</td>
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<td>120</td>
<td>120</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.43</td>
<td>0.51</td>
<td>0.51</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Thus, being exposed to competition – independently of the partner’s behavior – decreases the expectation that others exhibit trust. Moreover, the pooled data reveal a positive impact of the partner’s cooperation on trust and expectation of trust as well as a weakly significant positive effect on trustworthiness which is in line with the results on team and tourn reported above.27

Discussion

What is the difference between both incentive schemes that makes participants alter their expectation of trust? In a team incentive scheme both participants may receive the same (high) payoff at the same time. If effort is increased in our setting both participants’ payoffs are increased. In a tournament there is always one winner and one loser. A subject ceteris paribus always decreases the competitor’s expected payoff by increasing one’s own effort as the own winning chances are increased and, thus, the other one’s decreased. Although, cooperation resp. collusion is also feasible in tournaments the situation resembles a “You or

---

27 To check whether observing cooperation influences behavior differently in team and tourn we also reran regressions from Table 6 including an interaction term based on the independent variables tourn and coop. However, the interaction term is not significant in each regression.
me”-situation. Also in a perfect collusion one is the winner and one the loser in each round.\textsuperscript{28} Participants being exposed to a tournament scheme might falsely assume that it is not the strategic situation that induces competition between them but competition is due to the other person’s preferences, i.e. that the other person is of a competitive type. The effect that the causes of behavior are rather attributed to personal traits than to the characteristics of a situation is called “fundamental attribution error” (see e.g. Ross/Nisbett 1991) and has been confirmed by several experiments (see e.g. Weber/Camerer/Rottenstreich/Knez 2001)\textsuperscript{29}. Being competitive could range from having the strong desire to win over others also at the expense of others to having the desire to win but not at the expense of others and enjoying competition (Houston/McIntire/Kinnie/Terry 2002). Particularly, the first type of competitive attitude should be associated with purely selfish behavior and one could assume that this reduces trust. Both attitudes imply that the aim is to perform better than others. If a positive amount is sent by the trustor it is unlikely that the trustee sends back enough such that the trustor has a higher payoff than the trustee. It is, thus, unlikely to perform better than the trustee for a positive amount sent. However, sending nothing implies having a higher payoff than the trustee for sure in this round. This logic of relative comparison might induce participants to expect that others whom they regard as competitive decrease trust. Interestingly, the number of trustors sending nothing increases in \textit{tourn} by the factor 3.25 from phase I to phase III (from 4 subjects to 13) and in \textit{team} only by factor 1.43 (from 7 subjects to 10). On the other hand, the team incentive scheme where one’s own payoff is increasing in the other participant’s effort might induce subjects to assume that the other participant has some other-regarding preferences and they, therefore, expect him to trust more.

Remember that also trust towards the partner increases to a larger extent after \textit{team} than after \textit{tourn}. As we find no significant effect of the treatment dummy \textit{tourn} here we may conclude that this difference is mainly caused by observing the partner cooperating. The higher degree of the partner’s cooperation in \textit{team} induces participants to trust their partner more than in \textit{tourn} which is in line with our intuition. One could argue that the behavior is close to equilibrium in \textit{tourn} as described above. And if no cooperation evolves over rounds it is

\textsuperscript{28} Participants might alternate in winning the tournament if it is repeated over rounds. For experimental evidence see Harbring (2006a) who shows that such a coordinated collusion is facilitated by the introduction of communication. Without communication there are hardly any groups who make it to coordinate on this type of collusion.

\textsuperscript{29} Weber/Camerer/Rottenstreich/Knez (2001) find that subjects underestimate the situational effect, i.e. group size in a weak-link game, but rather attribute failure of coordination to the personal traits of a leader who speaks to the group before decisions are taken in order to induce an efficient outcome.
difficult for participants to learn anything about the other participant’s preferences. However, there is a high variation of efforts over rounds which is typical for tournaments in experiments (e.g. Bull/Schotter/Weigelt 1987, van Dijk/Sonnemans/van Winden 2001, Harbring 2006a) and there are some repeated tendencies to choose very low efforts. Yet, it is true that there are almost no groups who make it to maintain a stable cooperation over rounds like in team or teampun.30

Additional evidence is provided by a questionnaire which we distributed at the end of the experiment and in which we asked subjects about their trust and risk attitudes (see Harbring 2006c). One of the questions referred to the attitude towards the partner in phase II and phase III. We asked them – before providing information on behavior in the investment game – whether they could trust the other participant. Interestingly, participants who were exposed to the tournament incentive scheme trusted the partner significantly less than in both other schemes (tourn vs. team: p = 0.0009 and tourn vs. teampun: p = 0.0000, Mann-Whitney U test, two-tailed).

5.3.2 Behavior in Investment Game towards Partner: team vs. teampun

Detailed Results

In teampun observing the partner cooperating does not necessarily reveal the other participant’s preferences as selfish participants might cooperate because they fear being punished by non-selfish subjects. This logic even applies to the last round such that the partner’s cooperation in the last round could not be interpreted as evidence for non-selfish behavior. Can participants learn anything from the exertion of punishment points? We may assume that subjects with conditional other-regarding preferences are most likely to punish others, e.g. because they want to reciprocate for last round’s behavior (see Falk/Fehr/Fischbacher 2005). Selfish participants should not be willing to sacrifice money for the punishment; participants with unconditional other-regarding preferences like altruism should not want to reduce the other participant’s payoff.

Running the regressions for teampun (see Table 7) shows that the partner’s tendency to cooperate has a significantly positive impact on all decisions and corresponding expectations in phase III. We also added the partner’s average number of punishment points as independent variable and find that it has a negative significant effect in each regression, though it is only

30 Interestingly, there is one group who actually makes it to alternate between 0 and 1 like in the coordinated
weakly significant regarding the effect on trustworthiness. Including the effect of the partner’s cooperation in the last round and in previous rounds shows that last round behavior itself does not have an effect on behavior in phase III.\textsuperscript{31}

**Table 7**: Effect of cooperation in *teampun* on investment game with partner in phase III

<table>
<thead>
<tr>
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<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
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<td>0.641***</td>
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</tr>
<tr>
<td>twp3</td>
<td>0.987***</td>
<td></td>
<td></td>
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<td>exp_twp3</td>
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</tr>
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<td>trustp1</td>
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<tr>
<td>exp_twp1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>coopp</td>
<td>0.0913***</td>
<td>0.089***</td>
<td>0.008**</td>
<td>0.009**</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.024)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>pupointp</td>
<td>-1.015**</td>
<td>-1.149**</td>
<td>-0.104*</td>
<td>-0.161**</td>
</tr>
<tr>
<td></td>
<td>(0.434)</td>
<td>(0.538)</td>
<td>(0.053)</td>
<td>(0.068)</td>
</tr>
<tr>
<td>female</td>
<td>1.267</td>
<td>0.697</td>
<td>0.153</td>
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</tr>
<tr>
<td></td>
<td>(0.818)</td>
<td>(0.657)</td>
<td>(0.110)</td>
<td>(0.109)</td>
</tr>
<tr>
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<td>-4.191**</td>
<td>-0.498**</td>
<td>-0.449</td>
</tr>
<tr>
<td></td>
<td>(1.619)</td>
<td>(1.689)</td>
<td>(0.231)</td>
<td>(0.296)</td>
</tr>
<tr>
<td>Obs.</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.46</td>
<td>0.34</td>
<td>0.51</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

We also ran regressions pooling the treatments *team* and *teampun* to check whether there is a treatment effect on behavior in phase III which is independent of the partner’s cooperation and punishment. However, we find no effect of the treatment dummy we added to the regressions. The positive effects of the partner’s cooperation as shown in Table 7 prevail also for the pooled data.

**Discussion**

To gain insight into the effect of the punishment activity as well as the partner’s cooperation we have to understand why the introduction of the punishment opportunity does not increase cooperation as shown by Fehr/Gächter (2000, 2002), Masclet/Noussair/Tucker/Villeval (2003), Masclet/Villeval (2006). The design of these studies differs from ours in various collusion in Harbring (2006a).

\textsuperscript{31} Note that we cannot include the punishment points exerted in the last round as they are rarely chosen as mentioned above.
aspects. They analyze groups of four subjects in a public good setting. They do neither reveal the identity of the punisher nor allow to trace other participants’ contributions over rounds. Both kind of information are, of course, revealed in a two-person setting. Interestingly, Fehr/Rockenbach (2003) find that imposing a fine in a trust game for a lower than desired return amount lowers altruistic cooperation. They experimentally investigate a trust game where the trustor may impose a fine on the trustee for a lower than desired return amount. They find that refraining from imposing the fine results in a higher amount sent and induces a higher return amount than in the case where the trustor decides to impose a fine and also than in the setting where no fine is feasible at all. They explain their results by assuming that refraining from fining could be perceived as fair while threatening to use the fine could be interpreted as some selfish and even “hostile” act.³² Fehr/Rockenbach conclude that only if punishing others is motivated by altruism and perceived as morally legitimate it increases cooperation among subjects. In their setting, however, imposing a fine is rather motivated by the self-interest of the trustor and, therefore, decreases altruism.

We can only speculate that using the punishment opportunity, i.e. destroying the other participant’s payoff, is perceived as selfish behavior in our setting.³³ This perception of the punishment induces subjects to decrease their expectations of trustworthiness and also of trust. Lowering the expectations might result in lower trust levels especially for reciprocal subjects. This is somewhat puzzling as it seems intuitive that subjects with conditional other-regarding preferences tend to punish others and bear some extra costs. Thus, exerting punishment points should actually induce participants to believe that their partner is non-selfish and following the logic from above could also have positive effects on decisions and expectations. Interestingly, Harbring (2006b) finds that the exertion of punishment points is positively influenced by trust, trustworthiness and corresponding expectations in phase I indicating that rather non-selfish subjects punish than selfish ones. To conclude punishments may not be perceived as some non-selfish action although non-selfish preferences enhance punishments.

Remember that the degree of cooperation of the groups who make no use of the punishment opportunity is higher than in the punishing groups. If the punishment activity is perceived as

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³² This seems also in line with the results of Masclet/Villeval (2006) who find that punishing others in a public good setting is rather motivated by negative emotions than by inequality aversion.

³³ Interestingly, Hopfensitz/Reuben (2005) find in a two-person situation where mutual punishment and retaliation is possible that cooperation can be enhanced by the punishment opportunity and that feeling shameful after being punished increases the cooperation afterwards while feeling anger triggers punishment. Our results might indicate that participants did not feel particularly shameful which also emphasizes that punishing is not perceived as morally legitimate or an altruistic act.
some selfish act observing the partner’s cooperation without using the punishment activity might foster the assumption that the partner’s cooperation is due to non-selfish preferences. This could increase the expectations of trust, trustworthiness and trust.

Table 7 reveals that also trustworthiness is decreased by the partner’s exertion of punishment points and increased by observing the partner cooperating. Both could be a direct response of reciprocal subjects to the partner’s behavior in phase II. The destruction of the own payoff in phase II is rendered with a lower trustworthiness and cooperation without punishment is rendered with a higher amount sent back. The effect on trust could also be explained as a reaction to the partner’s behavior in phase II. However, the effect on the expectations is rather in line with the logic from above that participants gather information on the partner’s type than with this interpretation of direct reciprocity.

5.3.3 Behavior in Investment Game towards Stranger

Non-parametric testing showed that all decisions and corresponding expectations are decreasing significantly from phase I to phase IV in all three treatments (see Table 4). We found no differences between the treatments and could, therefore, not confirm our Hypotheses 2b and 3b. We may conclude that the difference between phase I and phase IV is not due to the different incentive environments.

However, it seems interesting to check whether behavior in phase II influences subsequent decisions and expectations even if effects are too weak to induce significant differences between the treatments. Interestingly, we find some intuitive results for team while no such effects can be confirmed for tourn and teampun. Table 8 depicts the results regarding the team setting. We find a positive weakly significant effect of the partner’s cooperation in phase II on the expectation of trust in phase IV. Thus, the effect on the expectation of trust of phase III weakly prevails also in phase IV. Disentangling cooperation in the last round from previous behavior by regressions (5) to (8) shows that cooperation in the last round has a significant positive effect on trustworthiness as well as the expectation of trustworthiness in phase IV. As described above we find that cooperation in the last round as well as overall cooperation increases the expectation of trustworthiness towards the partner in phase III. Thus, the effect on the expectation of trustworthiness also prevails in phase IV. The overall effect of cooperation on the expectation of trustworthiness cannot be confirmed in phase IV as the partner’s cooperation in rounds 1 to 14 has an insignificant negative effect on the expectation of trustworthiness (and trustworthiness).
Interestingly, unlike in phase III and contrary to our hypothesis also trustworthiness is increased by the partner’s cooperation in the last round. Finally, we find a gender effect: Women have a higher trustworthiness and a higher expectations of trust and trustworthiness in phase IV than men.

### 6. Conclusion

We compare how trust and trustworthiness as well as corresponding expectations are affected by the experience in three different incentive environments. Our results confirm that history matters for subsequent behavior towards the interaction partner. Particularly, we find that trust and the expectation of trust towards the interaction partner are positively affected by experiencing a team setting compared to a tournament scheme, while the expectation of trust is even decreased by being exposed to a tournament. Regression analysis reveals that obviously simply being in the tournament competition – independently of the partner’s behavior – decreases the expectation of trust. Interestingly, we find in a related study Harbring (2006b) that trust, trustworthiness as well as corresponding expectations

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Table 8: Effect of cooperation in team on Investment Game with stranger in phase IV

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
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<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
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<td>trustp1</td>
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<td>exp_trustp1</td>
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</tr>
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</tr>
<tr>
<td>coopp_p2</td>
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<td>0.005</td>
<td>0.005**</td>
<td>0.003**</td>
</tr>
<tr>
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<td>-0.004</td>
<td>0.019</td>
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<td>-0.002</td>
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<tr>
<td>female</td>
<td>0.400</td>
<td>1.442***</td>
<td>0.218*</td>
<td>0.192**</td>
<td>0.344</td>
<td>1.428***</td>
<td>0.204*</td>
<td>0.183**</td>
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<td>-0.683</td>
<td>-2.199**</td>
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<td>-0.149</td>
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<td>60</td>
<td>60</td>
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</tr>
<tr>
<td>R-squared</td>
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<td>0.65</td>
<td>0.59</td>
<td>0.70</td>
<td>0.53</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1
significantly increase the tendency to cooperate in the last round in the team setting. This demonstrates that being exposed to competition may endanger the stability of cooperation in a team setting. Finally, we find that cooperation in our team setting with punishment opportunity is not higher than in the simple team setting, and there are no significant differences between both treatments regarding subsequent behavior although being punished has a negative on trust, trustworthiness and corresponding expectations towards the partner.

We provide some intuition for our results, but further research is necessary to gain a deeper understanding of the effect of different game structures on subsequent behavior. It seems important to confront individuals with different experiences in a variety of strategic situations. For example, how does a subject having experienced competition (or a team with punishment opportunity) behave in a team with other subjects who only experienced a cooperative setting so far? A first illuminating step in this direction has been done by Montmarquette/Rullière/Villeval/Zeiliger (2004) who exposed individuals to different incentive environments and found interesting effects regarding their behavior in a subsequent setting. In real organizations, employees frequently interact with employees whose experience differs from the own history, e.g. in case of a merger of different companies, a restructuring of the organization or when being confronted with a new hire from the external labor market. It is, therefore, particularly important to investigate how experience affects preferences and also expectations towards others and how this may carry over to subsequent situations.

Finally, the negative effects of competition should be further investigated. We find a strong decrease of the expectation of trust after being exposed to the tournament setting in our study. However, competition is prevalent and often serves as a solution in situations where only inefficient outcomes are achievable. It is, therefore, essential to understand how and why the experience of competition affects social preferences.

References
Bornstein, G., Kocher, M., Kugler, T. and M. Sutter (in press): Trust between individuals and groups: Groups are less trusting than individuals but just as trustworthy. Journal of Economic Psychology.


Prergerast, Cane (1999): The Provision of Incentives in Firms. Journal of Economic Literature 37, 7-63.


Appendix (Sample Instructions for *tourn*)

*(Distributed before phase I:)*

- During the experiment you will participate in two games.
- Each amount will be given in the fictitious currency „Taler“.

**10-Taler-Game**

**Decisions**

- There are players of type A and players of type B.
- The player A receives 10 Taler at the beginning of each round and has to decide how much Taler \(x\) (integers from \(0, 1, \ldots, 10\)) he would like to transfer to player B. Player A keeps the remaining amount of \((10 - x)\) for himself.
- After the transfer of \(x\) Taler player B receives a credit of \(3x\) Taler. Thereof she may transfer an amount of \(y\) (integers from \(0, 1, \ldots, 3x\)) to player A. She keeps the remaining amount of \((3x - y)\) for herself. Player A receives amount \(y\) as a credit.
- The following round payoffs can be derived:

| Player A: \(10 - x + y\) | Player B: \(3x - y\) |

**Expectations**

- After making his decision player A makes his expectation regarding the amount \(y\) transferred by player B for each possible amount \(x\) received.
- After making her decision player B makes her expectation regarding the amount transferred by A.
- The expectations are compared to the actual decisions of the assigned player. The closer the expectation to the actual decisions the larger is the amount of an additional bonus in this round. The bonus may range from 0 to 1 Taler.

**Structure of Experiment**

The experiment consists of 2 phases first. You participate in phase 1 before participating in phase 2. The “2-Numbers-Game” in which you will participate in phase 2 will be explained to you after phase 1.

| Overview of phase 1 and phase of the experiment |
|---|---|
| **Phase 1** | **Phase 2** |
| **What do I play?** | **10-Taler-Game** | **2-Numbers-Game** |
| **How often do I make decisions?** | **10 rounds** | **15 rounds** |
| Types will be alternating over rounds. | | |
| **With whom do I play in each round?** | You are randomly assigned a new player in each round. | You are randomly assigned one player with whom you will be playing for all 15 rounds. |
| **Which information do I receive after each round?** | None | Your own round payoff, the decision and round payoff of the other player |
| Your round payoff as well as the decisions of the other player are revealed to you at the end of the whole experiment. | |

**Payoff**

You receive a lump sum of 50 Taler in the beginning of the experiment. Your final payoff will be exchanged at a rate of 20 Taler for 1 Euro at the end of the experiment.
Questionnaire
At the end of the experiment we still ask you to fill in a questionnaire. Please note that the questionnaire will be anonymously analyzed, i.e. your answer will be related to you behavior in the experiment but not to you as a person.

Please note:
During the whole experiment communication is not allowed. If you have a question, please raise your hand out of the cabin. All decisions are made anonymously, i.e. no other participant will get to know which decision had been made by whom. Also the payment is anonymous such that no participant gets to know the payments of other participants.

(Distributed before phase II:)

2-Numbers-Game (Phase 2)

Decisions
• Another player is randomly assigned to you at the beginning of the 2-Numbers-Games.
• Each of both participants chooses an integer number from \(\{0, 1, ..., 10\}\). Each number is associated with a certain amount of costs. Costs are increasing with the number:

<table>
<thead>
<tr>
<th>Number</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
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<td>1.6</td>
<td>2.5</td>
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<td>4.9</td>
<td>6.4</td>
<td>8.1</td>
<td>10</td>
</tr>
</tbody>
</table>

• The computer draws an integer random number for each participant in each round from \{-4, ..., 0, ..., 4\}. Each random number is equally probable.
• The numbers chosen by both participants as well as the random numbers determine your round payoff as follows:
  o The participant with the higher result receives a high payment of 14 Taler, the participant with the lower result receives a low payment of 6 Taler. (If equal results are achieved a fair random draw decides on who is going to receive the high and the low payment.) The costs for the number chosen are deducted from your own number. This gives the round payoff.
  o Your result and your round payoff are determined as follows:

\[
\text{Result} = \text{Own number} + \text{Own random number} \\
\text{Round payoff} = \text{High (low) payment} - \text{Costs for own number}
\]

(Distributed before phase III:)

Additional information
You are now participating in two last phases of the experiment, during which you will play the 10-Taler-Game again.

Overview of phase 3 and 4 of the experiment

<table>
<thead>
<tr>
<th></th>
<th>Phase 3</th>
<th>Phase 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do I play?</td>
<td>10-Taler-Game</td>
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</tr>
<tr>
<td>How often do I make decisions?</td>
<td>2 rounds</td>
<td>10 rounds</td>
</tr>
<tr>
<td></td>
<td>Types will be alternating over rounds.</td>
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</tr>
<tr>
<td>With whom do I play in each round?</td>
<td>You are playing with the same participant as in phase 2.</td>
<td>You are randomly assigned a new player in each round</td>
</tr>
<tr>
<td>Which information do I receive after each round?</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Your round payoff as well as the decisions of the other player are revealed to you at the end of the whole experiment.</td>
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