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Diplom-Kauffrau Petra Gerlach

aus Köln

Referent: Prof. Dr. Dirk Sliwka
Korreferent: Prof. Dr. Bernd Irlenbusch
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Contents

Chapter 1

Introduction

> *Motivation is the art of getting people to do what you want them to do because they want to do it.*
> (Dwight "Ike" David Eisenhower, 34th President of the United States of America)

This quotation of David Eisenhower gives an idea of the challenge to find the right way to motivate people. Usually, organizations try to motivate their employees by monetary incentives like bonuses or performance-based compensation schemes. Especially in the short run, these kinds of extrinsic motivation can be quite successful (see e.g. Gibbons (1997), Lazear (2000)). However, this positive effect is seen much more controversial by psychologists (and in recent years by economists, too) who claim that contingent rewards can undermine an employee's intrinsic motivation, i.e. the desire to perform a task for his own sake. Hence, motivation can

even be reduced instead of increased by extrinsic incentives (e.g. Deci et al. 1999).

If employees should be motivated intrinsically, one should take into account the social nature of most individuals' behavior. People with social preferences like reciprocity (Trivers 1971), altruism (Andreoni 1988a) or inequity aversion (Fehr/Schmidt 1999) might be motivated by trust or fairness concerns, too. Fair people might perform better if they feel treated fairly themselves or trustful people might appreciate being seen as trustworthy, too. For example, employees who do not only care about their own absolute wage level but also about their own wage compared to their colleagues' wages might be demoralized if they earn less (or even more) as their colleagues (Bewley 2007). When presuming that employees have the aforementioned social preferences, an employer could be better off by not revealing the firm's internal pay structure to the employees. Further, trustful people might appreciate being seen as trustworthy themselves. Hence, they might perform better if the employer trusts in them and deliberately refrains from implementing strict control mechanisms.

Economic models and experimental investigations of the social nature of individual behavior are major subjects of the field of research of behavioral economics. Behavioral economics take into account that many interpersonal relationships in repeated interactions as well as in single encounters are based on trust and social preferences like reciprocity, inequity aversion or fairness. In line with Rousseau et al. (1995: 395), trust is "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another". Thus, trustful individuals are willing to be vulnerable because they anticipate their

counterpart not to exploit them but to react reciprocally. This is in contrast to what is assumed by the standard economic theory where people are acting selfishly and try to maximize their own material payoff. According to this, trust and social preferences do not play any role in individuals' behavior. At most, they are part of a rational decision-making being not distinguishable from other rational profit-maximizing calculations. The emotional side of trust is completely neglected.

Thus, if a firm takes into account the social nature of most individuals' behavior this might lead to more intrinsically motivated employees. In an organizational culture based on principles of trust and reciprocity employees might perform not because they are forced to but because it is their own desire to do a good job. Hence, when employees rely on the employer and on each other, a firm's overall performance might even be increased compared to a company culture that is characterized by control, monitoring or major extrinsic motivators.

There is ample empirical evidence for the existence of social preferences. A lot of studies show that many people do not behave purely selfishly but do care for each other even without maximizing their own profit (see e.g. Kahneman et al. 1986, Fehr et al. 1993, Fehr/Gächter 1998, 2000a, Gächter/Fehr 2002, Fehr/Schmidt 2003). Starting with Akerlof (1982), economists began to increase the explanatory power of economic theory by adding psychological phenomena to standard neoclassical preferences. For example, Geanakoplos et al. (1989) develop a framework that takes into account that players' payoffs do not only depend on what others do but on what others think, too. Rabin (1993) offers an approach to implement reciprocity to standard economic theory. While Rabin

abstracts from the sequential structure of strategic situations, Dufwenberg and Kirchsteiger (2004) offer an extension of Rabin's approach by developing a solution concept for sequential reciprocity equilibria.

Other economic models consider that people are inequity averse and care about their own payoff as well as about their relative payoff compared to other people (see e.g. Fehr/Schmidt 1999 and Bolton/Ockenfels 2000). But until now, not much work has been done to combine the intentional and distributional approach. A notable exception is given by Falk and Fischbacher (2006) who assume that people's behavior is driven by both, the intention as well as the consequences of an action. Thus, this theory can also explain why the same consequences of an action can trigger different reactions.

This thesis aims to highlight the impact and the interaction of trust and other-regarding preferences in organizations. Each chapter analyzes a specific aspect of an experimental labor market and investigates the influence of trust and social preferences on the way to motivate people in organizations.

Chapters 2 and 3 investigate the impact of trust on people's need to reciprocate and by this on the individuals' behavioral pattern. In chapter 2 we replicate a recent contribution of Armin Falk and Michael Kosfeld (2006) who analyze the impact of control on agents' reaction in a dictator game between one principal and one agent. The agent has to decide if he wants to give any points from his initial endowment to the principal. If the principal wants to be sure of receiving at least a certain minimum amount, he has the option to set a requested minimum transfer to the agent. If the principal decides not to restrict the choice set, this decision can be interpreted as a

signal of trust towards the agent. Falk and Kosfeld (henceforth called F/K) show that agents who are not controlled and feel trusted by the principal reciprocate to this kind intention and deliberately offer higher transfers to the principal. F/K run several treatments to check for the robustness of this effect, but they never check for a variation in the wording of the experimental instructions. However, even though the theory of rational choice postulates that the decision between two options should be independent with regard to the context, a lot of studies have shown that the context in which an action takes place is an important determinant of human behavior (see e.g. Tversky/Kahneman 1981, 1986, Brewer/Kramer 1986, Fleishman 1988, Roth 1995, Hertwig/Ortmann 2001, Levitt/List 2006). Hence, in order to control if different contexts might influence agents' reaction to the principal's decision to trust or not, we use three different kinds of instructions with different wordings to explain exactly the same experimental design. Indeed, we find a significant impact of the wording. Instructions can trigger a demand effect that pushes the participants' attention in a certain direction and induces a desired behavioral pattern.

Since many relationships in real labor markets occur between more than two persons, in chapter 3 we investigate whether the positive behavioral consequences of trust as shown by F/K also hold in an extended team situation. As it is a well known issue that findings from individual behavior cannot be appropriately translated into group behavior regularities (see e.g. Kerr et al. 1996, Bornstein/Yaniv 1998, Kocher/Sutter 2005, Kocher et al. 2006, Kocher/Sutter 2007, Kugler et al. (2007)), we extend the experimental design from chapter 2 to a situation between one principal and several agents, running one treatment with three and another treatment with nine agents per group. Neither treatment

allows for any interaction between the agents. As mentioned above, the significant impact of trust is at least partly due to the specific wording used in the instructions of F/K. To control for this effect, we run both team treatments with different instructions in line with those we used in chapter 2. The instructions are just slightly adapted to the team context. Interestingly, we find that the positive impact of trust does not hold in an extended multiple-agents context. Even more, independent of the wording of the instructions we observe benefits of control in teams in all treatments. We show that control is even more effective when the number of agents increases because agents' effort decreases systematically with an increasing group size. This effect might be motivated by a psychological phenomenon called *social loafing*. According to this, agents' motivation might decrease with an increasing number of group members, because participants feel less responsible for the output and thus may feel that they can "hide in the crowd" (Davis 1969).

Chapter 4 still deals with the impact of the restriction of the range of possible contributions, but this time, we investigate this effect in a team situation that allows for an interaction between the agents and therefore offers the opportunity to take advantage of the other team members' contribution while reducing once own contribution. A lot of studies deal with this team specific problem called free-riding (see e.g. Davis/Holt 1993, Fehr/Gächter 2000b, Ledyard 1995). Issues to reduce this major problem are often based on the implementation of extrinsic incentive schemes (Holmström 1982, Nalbantian/Schotter 1997) disregarding that these extrinsic motivators might undermine any intrinsic motivation of the team members (Deci 1971, Fehr/Gächter 2002). Thus, in chapter 4 we investigate the impact of different ranges of contributions on a team's coordination problem. Beside the option to restrict the agents'

choice set to a certain minimum amount (as in chapters 2 and 3) the principal can also decide to set an upper limit instead of setting a lower limit. If the principal limits the agents' contribution to an upper limit, he might signal that he cares about his agents, because the upper limit is slightly above each agent's team best contribution (maximizing the team's output excluding the principal) but clearly below the agents' first best contribution (maximizing the team's output including the principal). Hence, reciprocal agents might perceive the principal's decision to restrict the choice set above as a kind action and respond with a higher contribution. In contrast to this and according to the preceding chapters, if the principal requests a certain minimum amount from each agent, the agents might feel distrusted and might punish this unkind intention by providing lower contributions. The specific borders of the given ranges of contributions have been chosen according to the contribution in the Nash equilibrium, in the team best and the first best situation. Thus, the principal chooses one out of three ranges to offer to his team that consists of three agents. However, due to the problem of free-riding, we expect the agents to perceive the restriction of the choice set in a different manner as in chapters 2 and 3. If the principal sets a lower limit to the agents, he does not only ensure a certain payoff for his own, but he also protects the agents from each other, because the agents, too, can be sure to get a certain minimum amount. Since the risk being exploited by the other team members is limited to the lower limit, the agents might be willing to give a higher contribution as if their range of contribution was not restricted below. Furthermore, to check whether the impact of the restriction of the choice set might change if the agents are able to communicate, we implement a chat-software in a further treatment that allows the agents to chat about their contributions. The results significantly

show that a requested minimum amount can be a helpful support for the agents to reduce their coordination problem. Even more, team performance in a whole can be improved. We also find that communication increases the entire contribution but does not change the agents' attitude towards the different ranges of contributions.

While chapters 2, 3 and 4 concentrate on the impact of trust and reciprocity, chapters 5 and 6 consider the influence of another social preference, namely the impact of inequity aversion when workers are paid unequal wages. In chapter 5 we experimentally investigate the interdependencies between the consequences and the employer's intention of unequally paid wages in teams of one employer and two workers. In line with Mohnen et al. (2007), we use a real effort task to make workers feel a real disutility from providing effort instead of feeling a disutility in terms of monetary costs as in typical abstract effort decisions. We conduct three treatments. In each treatment, workers receive a fixed wage which is independent of their performance. By solving their real effort task they can just increase the employer's payoff. In treatment 1, workers are equally and in treatment 2 they are unequally paid. In both treatments the wages are exogenously given by the experimenters, i.e. the employer himself has nothing to decide. By this we are able to keep the workers from reacting reciprocally with regard to the employer's intention. Hence, any differences in agents' behavior between the first and second treatment should be due to distributional concerns. In treatment 3 the principal can decide whether to pay equal wages or to pay a lower wage to one worker keeping the residual fixed wage for his own. Differences in agents' behavior now might be due either to reciprocity or to inequity aversion. However, comparing treatment 2 and 3, differences might be referred to reciprocal influences. Our

results show that neither pure distributional nor pure intentional concerns can explain agents' reaction to unequal wages. Their behavior seems to be strongly affected by both aspects.

In chapter 6 we investigate again the impact of revealed internal pay structures in organizations on workers' motivation. This time we also try to distinguish between vertical inequity aversion (between two hierarchy levels) and horizontal inequity aversion (within one hierarchy level). Therefore, we study a simple gift-exchange game between one principal and three agents in two different treatments. The principal offers three wages (either equal or individual) to the agents and the agents respond by making an abstract effort decision that is costly to them and that reduces their payoff. In the first treatment, agents are not informed about their co-workers' wages and efforts, but in the second treatment they are. Our results show that agents' behavior is mainly influenced by reciprocity. In contrast, distributional concerns play a minor role: in both treatments, we do not find any impact of vertical inequity aversion, but we observe a slightly significant effect of horizontal inequity aversion between the workers in the treatment with revealed pay structures.

The results of the five experimental studies of this thesis demonstrate that trust and other-regarding preferences can indeed explain many aspects of human behavior. However, ambiguity still remains. Further research is needed in order to understand in depth how social preferences work and interplay and how people can be motivated intrinsically based on the social nature of their behavioral pattern.

Chapter 2

On Trust and Demand Effects [1]

2.1 Introduction

The context in which an action takes place is a fundamental determinant of human behavior. This finding has been shown and analyzed by many researchers in the past (see e.g. Tversky/Kahneman 1981, 1986, Brewer/Kramer 1986, Fleishman 1988, Roth 1995, Hertwig/Ortmann 2001, Levitt/List 2006). Even though the theory of rational choice postulates that the decision between two options should not be reversed due to a change of the context, the heavy influence of a complex set of relational situations, social norms, past experiences or the alternative descriptions of a decision problem cannot be neglected. Several studies concentrate on the impact of different environments or the presentation of a

[1] This chapter is based on Gerlach (2007a).

situation in prisoner dilemma or public goods games. Andreoni (1995) for example shows the negative impact of a negative instead of positive framing in a standard linear public goods setting. This result is supported by Sonnemans et al. (1998) who investigate this issue in a step-level public goods setting where the public good is only provided if the sum of the individual contribution exceeds a given threshold. Cookson (2000) investigates three different kinds of presentation of the same standard repeated public goods game and also find a significant impact of framing.

Burnham et al. (2000) investigate the impact of the wording of instructions in an extensive form two person trust game. The matched person in the trust game is labeled "partner" in one treatment and "opponent" in a second treatment. They show that trustworthiness with "partner" is more than twice as high as with "opponent" which in turn increases trust, too. Connotation seems to play an even more important role in a trust context.

Thus, the replicability of experiments might be influenced by even slightly changed instructions (see e.g. Camerer et al. 1989, Camerer 2003: Chapter 2.5, Hoffmann et al. 2000). Vernon Smith states that "in two-person interactions, instructions often matter so much that they must be considered a (powerful) treatment" (Smith 2002: 101). This effect refers to what psychologists call to be a demand effect. Due to a special (or even missing) context participants might infer that they are demanded by the experimenter to behave in a certain way (Loewenstein 1999).

The aim of this study is to investigate if the wording in the experimental instructions of a dictator game might generate a demand effect that induces a certain behavioral pattern. We follow a recent contribution of Armin Falk and Michael Kosfeld (2006) who investigate the impact of the restriction of the choice set on people's

motivation. They designed an experimental study between one principal and one agent. With an initial endowment of 120 points, the agent has to decide if he wants to give any points to the principal. If the principal wants to be sure of receiving a certain minimum amount, he has the option of setting a minimum transfer of 10 points. Before the agent gets to know if the principal actually decides to control or not, he has to submit a transfer choice for each of the two ranges.

Falk/Kosfeld (henceforth called F/K) show that agents voluntarily choose higher transfers if they are not controlled. Thus, agents are more likely to react kindly when they feel trusted by their principal instead of being forced by control. In order to check for the robustness of this effect, the authors ran several control treatments. They show the same effect when choosing other limits (5 points and 20 points), when playing a gift-exchange game and when omitting the strategy method. However, they never vary the wording of the instructions.

To control for the different contexts in which the participants have to make their decision we use three kinds of instructions with different wordings to explain exactly the same dictator game. First, we replicate the experiment with the original instructions of F/K. Using the phrase “participant B can decide to force participant A to give at least 10 points or to leave him completely free to decide” we find that these instructions strongly accentuate the negative meaning if the principal decides to control the agent and therefore might influence the agents’ transfer decision. Thus, we use a second kind of instructions differing from the originals in just one expression. Avoiding the wording “to force” and “to leave him completely free to decide”, now the principal has the possibility “to constrain or not to

constrain the agent". But as these second instructions still point out the negative denotation of the decision to control due to the word "to constrain", we also design a third kind of instructions that are as neutral as possible. We avoid any emphasis on the intent of the principal's decision by letting the principal just "offer one out of two kinds of contract that allow the agent to choose his transfer from different ranges".

Our results show that the framing of the decision context significantly influences agents' reaction. Using the original F/K-instructions, we are able to replicate the effect that agents voluntarily give higher transfers if they are not controlled. But this phenomenon disappears using the slightly changed instructions and is even reversed in the neutral instructions where standard economic theory can be confirmed.

This chapter is organized as follows. In section 2.2 we present the experimental design and procedure. Section 2.3 derives our behavioral predictions. Section 2.4 presents the experimental results which are discussed in section 2.5. The paper concludes in section 2.6.

2.2 Experimental Design and Procedure

The experiment was conducted at the Cologne Laboratory of Experimental Economics at the University of Cologne. 180 participants (60 per treatment) were recruited via the online recruitment system ORSEE (Greiner 2004), all of them students from

different faculties of the University of Cologne. We conducted two sessions with 30 participants per treatment. None of the students took part in more than one session. The experiment was programmed and conducted with the software z-tree (Fischbacher 1999). All sessions were played one-shot using the strategy method and lasted about thirty minutes. Students left the laboratory with an average payoff of 11 €.

In the beginning of the experiment, each participant threw a number between 1 and 30 that indicated his place in the laboratory and the role he was assigned to in the experiment. The instructions were distributed and questions were answered. After this, the participants were randomly assigned to groups consisting of one agent (called player A) and one principal (called player B) and the experiment started.

With an initial endowment of 120 points, the agent had to decide if he wanted to give any points to the principal. The agent's payoff was $\pi_A = 120 - x$. The principal received twice the amount the agent offered, so his profit function was $\pi_P = 2x$. However, if the principal wanted to be sure of receiving a certain minimum amount, he had the option of setting a minimum transfer of 10 points. Thus, the principal had to decide whether he wanted to control the agent and therefore offered a range of [10; 120] or whether he refrained from controlling by offering a range of [0; 120] to the agent. Before the agent got to know if the principal actually decided to control or not, he had to submit a transfer choice for each of the two ranges.

The three treatments differ in the wording we use in the instructions. In the first treatment, we use the original instructions of F/K. These instructions strongly highlight the intention of the

principal's decision when he decides to restrict or not the agent's choice set by using the following expression: "*Participant B is able to force participant A to give him at least 10 points. But he can also decide not to constrain participant A and to leave him completely free to decide*".[2] Henceforth, this treatment will be called T[force].

In the second treatment, we slightly modify these instructions. Instead of the expression mentioned above we use the following wording: *"Participant B is able to constrain participant A in order to get at least 10 points. But he can also decide not to constrain participant A"*. Following, we call this treatment T[constrain].

Since both instructions obviously point out the principal's intention of the restriction, we design our third instructions as neutral as possible. We avoid any special emphasis on the meaning of the restriction using the following formulation: *"Player A offers a contract to player B. He can choose between two different types of contract. Contract 1: Player B has to offer a transfer from the range of [0; 120]. Contract 2: Player B has to offer a transfer from the range of [10; 120]."* This treatment is now called T[neutral]. Table 2.1 opposes the main message of each treatment.

[2] The original instructions of F/K are in German, too.

Table 2.1: Comparison of instructions

T[force]	**T[constrain]**	**T[neutral]**
Before participant A decides how many points he wants to give to B, B can set a minimum transfer. Concretely, **participant B is able to force participant A to give him at least 10 points**. But he can also decide not to constrain participant A and **to leave him completely free to decide**. So there are two cases:	Before participant A decides how many points he wants to give to B, B can set a minimum transfer. Concretely, **participant B is able to constrain participant A, in order to get at least 10 points**. But he can also decide **not to constrain** participant A. So there are two cases:	Player A **offers a contract** to player B. He can choose between two different types of contract.
Case 1: Participant B **forces** participant A to transfer at least 10 points. In this case, participant A can transfer any amount between 10 and 120 to B.	Case 1: Participant B **constrains** participant A to transfer at least 10 points. In this case, participant A can transfer any amount between 10 and 120 to B.	Contract 1: Player B has to submit a transfer from the range of [0; 120].
Case 2: Participant B leaves participant A **free to decide** and **does not force him** to transfer at least 10 points. In this case, participant A can transfer any amount between 0 and 120 to B.	Case 2: Participant B **does not constrain** participant A. In this case, participant A can transfer any amount between 0 and 120 to B.	Contract 2: Player B has to submit a transfer from the range of [10; 120].

[Note: Original instructions are all in German, translation by the author].

2.3 Behavioral Predictions

In this section we derive the behavioral predictions we expect to observe. First, we concentrate on differences between the control and

no-control condition within each treatment and analyze the differences between the treatments afterwards.

There are a lot of theoretical approaches (e.g. Rabin 1993, Fehr/Schmidt 1999, Bolton/Ockenfels 2000, Dufwenberg/Kirchsteiger 2004, Falk/Fischbacher 2006) as well as experimental studies (e.g. Fehr/Gächter 1998, 2000a, Gächter/Fehr 2002) that give sufficient evidence for the existence of social preferences in most people's behavior. Thus, people are not completely selfish as predicted by standard economic theory but do take into account other people's utility or intention, too.

If agents were completely selfish, they would give the minimum available amount, i.e. 10 points in the control condition and 0 points in the no-control condition. However, if agents' behavior is at least partly driven by fairness concerns, they would take into account either the principal's payoff and/or the principal's intention when deciding to control the agent or not. As shown by F/K, the principal's decision to control has a strongly negative impact on the agents' willingness to provide any points. It seems that most agents negatively reciprocate by punishing the principal's unkind decision if he sets a requested minimum amount. Thus, as we use the same instructions as F/K in T[force], we expect to replicate the negative impact of control. Most of the agents should feel distrusted by the principal's decision to control if he decides to set a requested minimum transfer and in consequence might reduce their transfer in the control condition.

Presumption 2.1:

In T[force], we expect to observe a negative impact of control. The average transfer should be higher in the no-control than in the control condition.

In T[constrain], the instructions are changed in a very slightly way. The verb "to force" as used in the instructions of T[force] gives a negative connotation to the principal's decision in the control condition. This negative connotation might even be boosted by the extremely positive description of the no-control condition, when the principal leaves the agent "completely free to decide". Hence, the extreme confrontation of the two opposite cases might make the agents susceptive to the underlying intention when the principal decides to control or not. Therefore, we change the instructions in T[constrain] in that way, that the confrontation of both conditions is less strong, i.e. that the decision to control appears to be less unkind and the decision to refrain from using control appears to be less nice. However, the instructions that we use in T[constrain] still highlight the principal's underlying intention when he decides to control. There should still be enough participants who do not want to be constrained by someone and who want to punish the principal if he sets the requested minimum transfer, but we expect that there should be fewer agents than in T[force] who negatively reciprocate to the principal's decision to control. We derive our second presumption:

Presumption 2.2:
In T[constrain], we still expect to observe a negative but more moderate impact of the restriction of the choice set on agents' transfer decision than in T[force]. The average transfer should be slightly higher in the no-control than in the control condition.

In order to eliminate as much as possible any emphasis on the principal's decision, we design the third kind of instructions. Instead of verbs like "to force" or "to constrain" that automatically give a certain connotation to the principal's decision, we use the expression

that the principal "has to offer a contract to the agent". However, as the decision to control or not is still made by the principal and not by an exogenous instance, the intention itself does not disappear, it is just less explicitly pronounced. Now we expect most of the agents to make their transfer decision in a more rational way, detached from the need to react reciprocally to the principal's intention.

Presumption 2.3:
In T[neutral], we expect the influence of the restriction of the choice set to change. We suppose most of the agents to give a higher transfer in the control than in the no-control condition.

In the next step, we compare each of the conditions between the three treatments. First, we concentrate on the control condition. As mentioned above, we expect agents' reaction to control to differ with regard to the wording of the instructions. As the negative meaning of the principal's decision to control is strongly emphasized if the principal forces the agent to give at least 10 points, we expect the agents to punish the decision to control most heavily in T[force]. In contrast to this, the wording in T[neutral] does not point out the intention of the decision to control. That's why we suppose the average transfer in T[neutral] to exceed the two other contracts.

In line with this argumentation, we expect to observe the opposite behavioral pattern in agents' behavior in the no-control condition in the three treatments:

Presumption 2.4.1:

In the control condition, we expect the average transfer to be lowest in T[force] and to be highest in T[neutral]. The average transfer in T[constrain] ranges between the two other treatments.

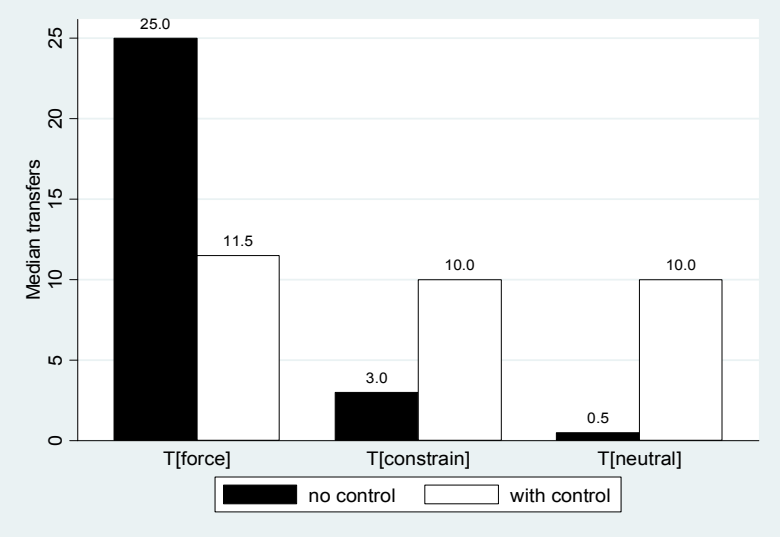
Presumption 2.4.2:

In the no-control condition, the average transfer should be highest in T[force] and lowest in T[neutral]. Again, we suppose the average transfer in T[constrain] to range between the two other treatments.

2.4 Experimental Results

First, we analyze descriptively the impact of the restriction of the choice set on agents' behavior within each treatment. Since we do not want to make our results sensitive to some extreme outliers, we base our analysis on the median rather than on the mean transfers. Figure 2.1 shows the median transfers per treatment:

Figure 2.1: Median transfers per treatment



[Note: N = 30 observations with and without control per treatment]

In T[force], the median transfer in the no-control condition obviously exceeds the median transfer in the control condition. However, this difference is statistically not significant (Wilcoxon signed-rank test, p=0.54), because only 40% of the agents give a higher transfer without control compared to 37% of the agents who give a higher transfer in the control condition.[3] Hence, the part of agents reacting positively or negatively to the principal's decision to control is almost the same. The remaining 23% of the agents do not react to control and choose equal transfers in both conditions.

However, the comparison of the median transfers between both conditions might be biased because the range of possible transfers is not the same with and without control. From a technical point of view, transfers have to be higher in the control condition because the lowest possible transfer cannot be smaller than 10. In order to control

[3] Tables 2.2 - 2.4 in appendix 2.B report in detail agents' reaction to the principal's decision to control in each treatment.

for the constrained nature of the restricted choice set, we follow F/K and truncate all transfers that are smaller than 10 equal to 10 in the no-control condition and compare again the differences between both conditions. In T[force], 33.33% of the agents give a transfer smaller than 10 if they are allowed to. If we set those transfers equal to 10, the difference between the two conditions now becomes highly statistically significant (Wilcoxon signed-rank test, p=0.008). Thus, we can conclude that the decision to control indeed has a negative motivational impact on the agent's transfer submission.

Result 2.1:
We observe a negative impact of control in T[force].

In T[constrain], the median transfer in the control condition is more than three times as high as the median transfer in the no-control condition. 30% of the agents give a higher transfer in the no-control condition and 53% give more if they are controlled. However, the difference is statistically not significant (Wilcoxon signed-rank test, p=0.42). This might be explained by the fact that those (few) people who react negatively to control most often are willing to provide a much higher transfer if the principal does not control. In T[constrain], those who dislike being controlled give in average 35 points without control and 13 points with control. Since these high differences are partly due to some extreme outliers[4], we prefer analyzing the median transfers as shown in figure 2.1. However, if we look at the mean instead of median transfer, the difference between both conditions is quite small. The mean transfer without

[4] For example, in T[constrain] there is one outlier giving 100 points in the no-control condition and 20 points in the control condition.

control is even slightly higher than with control.[5] To investigate if there is any motivational impact of control as it is shown in T[force], we control again for the constrained nature of the restricted choice set in the control condition by setting all transfers smaller than 10 equal to 10. The truncation has to be made for 53.33% of the agents. Even though this modification still does not lead to a statistically significant difference between both conditions, we carefully argue to observe the tendency of a motivational effect of the restriction of the choice set in T[constrain], which is weakly indicated by a p-value of 0.124. Thus, we derive our second result:

Result 2.2:
In T[constrain], the negative impact of control disappears.

Now we come to the third treatment. As mentioned in presumption 2.3, in T[neutral] we suppose most of the agents to give a higher transfer with control than without control. Indeed, only 13% of the agents react negatively to the principal's decision to restrict their choice set. The majority of agents (73%) give a higher transfer in the control condition. The difference between the median transfers is now statistically highly significant (Wilcoxon signed-rank test, $p<0.001$).

There are 60% of the agents who give a transfer below 10 in the no-control condition. Thus, we check again if the difference between the two conditions might be due to the restricted nature of the choice set. We modify again the data by raising transfers that are smaller than 10 equal to 10 in the no-control condition. Interestingly, the difference between control and no control that was highly significant

[5] Figure 2.2 in appendix 2.A shows the mean transfers in all treatments.

before the truncation totally disappears (p=0.605). Indeed, the difference seems to be due to technical reasons. It seems that agents practice the option of giving less than 10 in the no-control condition, because they do not feel the need to react reciprocally with regard to the principal's decision not to restrict them. Thus, the decision to set a requested minimum amount to the agent apparently has no influence on the agent's motivation in T[neutral].

Result 2.3:
In T[neutral], we observe a positive instead of negative impact of control. The median transfer is significantly higher in the control condition than in the no-control condition.

The first three results already show that the wording of the instructions clearly influences the behavioral pattern of the participants. Hence, in the next step we look for differences between the treatments.

First, we analyze the control condition. As one can see in figure 2.1, median transfers in the control condition are 11.5 in T[force] and 10.0 in T[constrain] and T[neutral]. It seems that the principal's decision to restrict the choice set has no different influences between the three treatments (Jonckheere-test). On average, agents give what they have to give, but their transfer decision in the control condition does not depend on the wording of the instructions.

Result 2.4.1:
In the control condition, agents' transfer decision is not influenced by the wording of the instructions.

I the no-control condition this effect changes. Now median transfers are 25.0 in T[force], 3.0 in T[constrain] and 0.5 in T[neutral]. These differences are significant between T[force] and T[constrain] (Mann-Whitney U-Test, $p=0.066$) and between T[force] and T[neutral] ($p=0.013$), but not between T[constrain] and T[neutral]. However, the transfers are significantly highest in T[force] and lowest in T[neutral] (Jonckheere-test, two-tailed, $p<0.01$). Hence, in contrast to the condition with control, the effect of the decision not to control strongly depends on the wording or the presentation of this decision. If agents perceive the decision not to control as a kind action, many of them react reciprocally by giving deliberately higher transfers in the no-control condition.

Result 2.4.2:
In the no-control condition, agents' transfer decision is strongly influenced by the wording in the instructions. The median transfer is significantly highest in T[force] and lowest in T[neutral].

2.5 Demand Effect

Concluding from the presented results in section 2.4, the wording "to force or to leave him completely free to decide" obviously induces a demand effect. This demand effect results in a certain behavioral pattern differing significantly from the two other instructions and therefore seems to be induced by the specific wording of the instructions in T[force]. Thus, one can conclude that

the wording influences the perception of the principal's decision. But as the medians in the control-condition do not differ from each other, it seems that it is not the decision to restrict the choice set that strongly influences agents' reaction, it is moreover the decision not to restrict but to trust.

In T[force], the principal's underlying intention when deciding to control or not is much more striking than in the other treatments. According to a German synonym dictionary (Duden 2004), "to force"[6] has the same meaning as "to press", "to threaten" or even "to terrorize". Most people do not want to be forced to do something, because being forced also implies a dominance relation. Hence, if a principal is willing to do without the power to force the agent, this decision has to be perceived as an extraordinary kind action to which a great fraction of agents answers reciprocally by giving generous transfers in the no-control condition.

Compared to this, the decision not to constrain the agent in T[constrain] appears less strong. Synonym expressions for "to constrain"[7] are for example "to limit", "to restrict" or "to confine" which are all less aggressive than the synonyms mentioned above. Furthermore, the decision not to control is less highlighted, because in T[constrain] it is said that the principal chooses "not to constrain" the agent instead of "to leave him completely free to decide". Of course, there are still agents who perceive the principal's decision to refrain from controlling as a kind action, but the part of those agents is smaller than in T[force].[8]

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[6] Translation of the German word "zwingen" as used in the F/K instructions.

[7] Translation of the German word "einschränken".

[8] However, the difference in the part of agents reacting reciprocally if they are not controlled (40% in T[force] and 30% in T[constrain]) is statistically not significant (Fisher's exact test, two-sided, p=0.294).

In T[neutral], the principal's underlying intention is accentuated least of all treatments. The wording "to offer a contract" is an unemotional expression that appeals very low to the agents' need of reacting reciprocally. Even though in this study it is obvious that the consequences of the principal's decision is the same in all treatments because of course player B is still able to force player A to give a certain minimum transfer by offering a contract with a range of transfer of [10; 120] instead of [0; 120], the notation in T[force] suggests a certain valuation of the situation. While the offer of a contract is a neutral action being part of each individual's every-day life, the decision to force someone implies a dominance relation that should be seen as something negative by most people. The one who forces may be seen as an opponent respectively the one who does not force as a friend, while someone who offers a contract might rather be seen as a (business) partner. Furthermore, in T[neutral] the difference between both conditions is hardly highlighted by the wording. Even more, the principal's decision to offer the contract with the restricted range might be perceived as more legitimate because it is more obvious that the principal's intention is just to protect his own payoff and not to exert his position of power.[9] Consequently, this time the part of agents reacting negatively reciprocally[10] in T[neutral] (13%) is significantly lower than in T[force] (40%) (Fisher's exact test, two-sided, p=0.020).

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[9] See Schnedler/Vadovic (2007) for the impact of legitimacy of control.

[10] Negatively reciprocating agents are those who give a smaller transfer with than without control.

2.6 Discussion

In this study we investigate if and to which extent the behavioral pattern in a laboratory experiment might be influenced by the connotation of the wording in the instructions. We conducted three treatments in analogy to Falk/Kosfeld (2006) who analyze the impact of control in terms of setting a requested minimum amount in a dictator game between one principal and one agent. With an initial endowment of 120 points, the agent has to decide how many points he wants to give to the principal. If the principal wants to be sure of receiving a certain minimum amount, he has the option of setting a minimum transfer of 10 points. The three treatments just differ in the instructions we use to explain the experiment.

In the first treatment, T[force], we adopt the original instructions that have been used by Falk and Kosfeld. Using the wording "to force or to leave completely free to decide", these instructions strongly highlight the negative or positive effect if the principal decides to set the restriction or to refrain from it. In the second treatment, called T[constrain], we slightly alter these instructions by substituting the verb "to force" by "to constrain" and by eliminating the expression "to leave completely free to decide". Finally, in the third treatment what we call T[neutral], we use totally different instructions that reduces the accentuation on the principal's underlying intention as much as possible, because the principal just can decide "to offer one out of two different kinds of contracts".

According to what we have expected, we find a significant impact of the wording in the instructions. While in T[force], agents strongly positively reciprocate if the principal does not set a

requested minimum amount, this positive effect is clearly diminished in T[constrain] and is even eliminated in T[neutral]. Thus, we find support for the existence of a demand effect where the wording of the instructions induces a certain behavior.

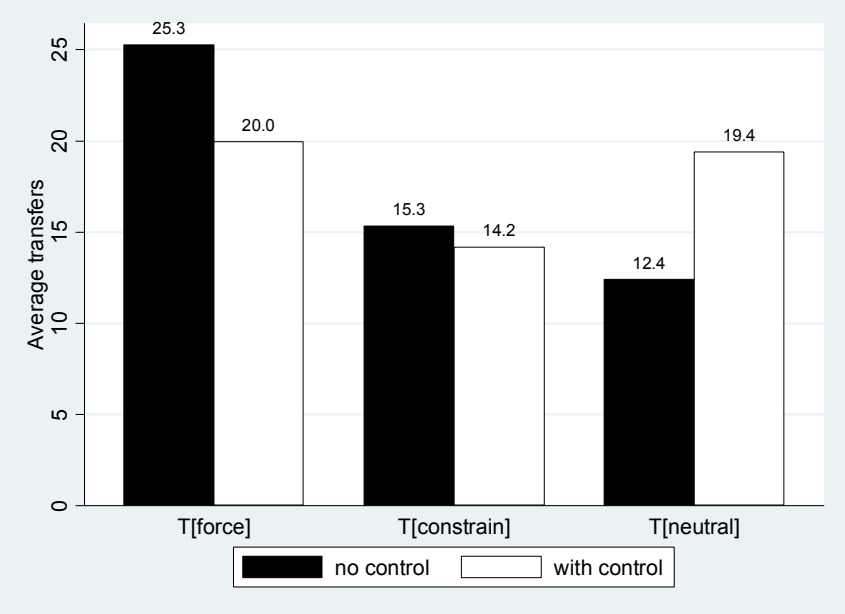
Interestingly, we do not find any differences between the treatments in the control condition, but only in the no-control condition. Hence, it seems that agents' behavior should not be interpreted as a negative reaction to control, but moreover as a positive reaction to the decision to trust instead to control that strongly depends on the connotation by which the decision to control is presented.

Our analysis aims to highlight the importance of the wording in experimental instructions. Instructions can trigger a demand effect that pushes the participants' attention in a certain direction. This is clearly underlined by our results that show that experimental results are very sensitive with regard to the wording and should always be interpreted against the given background.

2.7 Appendix to Chapter 2

2.A: Mean transfers

Figure 2.2: Mean transfers per treatment



[Note: N = 30 observations with and without control per treatment]

2.B: Agents' reaction to control

Table 2.2: T[force]

	Positive	**Neutral**	**Negative**
Number of agents	11	7	12
Relative share	0.37	0.23	0.40
Average x if controlled	12.91	36.43	16.83
Average x if not controlled	4.18	36.43	38.08

Table 2.3: T[constrain]

	Positive	**Neutral**	**Negative**
Number of agents	16	5	9
Relative share	0.53	0.17	0.30
Average x if controlled	10.81	27	13
Average x if not controlled	0.63	27	35

Table 2.4: T[neutral]

	Positive	**Neutral**	**Negative**
Number of agents	22	4	4
Relative share	0.73	0.13	0.13
Average x if controlled	18.73	23.75	18.75
Average x if not controlled	7.59	23.75	27.5

2.C: Experimental Instructions used in T[force]

(Note: Original instructions are in German. Changes made in T[constrain] are in bold italics.)

You are about to take part in an economic experiment, which is financed by the Deutsche Forschungsgemeinschaft.

Please read the instructions carefully. Everything you need to know for this experiment will be explained to you. In case you have any questions, please notify so. Your questions will be answered at your desk. All other communication is strictly forbidden throughout the whole experiment.

At the beginning of the experiment, every participant will receive a show up fee of 2.50 €. You will be able to earn additional points during the experiment. All points earned during the experiment will be converted into Euros at the end of the experiment. The exchange rate is the following:

1 point = 10 Cent

At the end of the experiment you will receive your income, which you have earned during the experiment, plus the 2.50 € show up fee in cash.

The Experiment

In this experiment one player A and one player B will form a group of two. No participant will know the other member of his group, so all decisions will be made anonymously.

You are player A (B).

At the beginning of the experiment every participant A will receive 120 points. Participant B will not receive any points.

Decision of player A:

Player A can choose how many points he wants to transfer to player B. Every point transferred from A to B will be doubled by the experimenters. Every point transferred from A to B therefore decreases A's income by one point and increases B's income by two points.

The formula for the earnings looks like this:

Earning of player A: 120 – transfer

Earnings of player B: 0 + 2*transfer

The following examples will clarify the formulas for the earnings:

Example 1: A transfers 0 points to B. The earnings will be 120 for A and 0 for B.

Example 2: A transfers 20 points to B. The earnings will be 100 for A and 40 for B.

Example 3: A transfers 80 points to B. The earnings will be 40 for A and 160 for B.

Decision of player B:

B can determine a minimum transfer, before player A has chosen how many points he wants to transfer to player B. In particular, player B can force ***(constrain)*** player A to transfer at least 10 points to B. But player B can also choose not to force ***(to constrain)*** player A to any minimum transfer (and thus to leave the decision completely free to player A.)

There are two possible cases:

Case 1: Participant B forces ***(constrains)*** player A to transfer at least 10 points to B. In this case player A may transfer any whole numbered amount between 10 and 120 to B.

Case 2: Participant B (leaves the decision free to player A and) does not force ***(does not constrain)*** him to transfer at least 10 points to B. In this case, player A may transfer any amount between 0 and 120 to B.

The experiment therefore consists of two steps:

Step 1:

In the first step, player B decides either to force ***(to constrain)*** player A to a minimum transfer of 10 points or (to leave free the decision on the amount to be transferred) ***(not)***.

Step 2:

In the second step, A decides on the amount, which he wants to transfer to B. This may be an amount between

- 10 and 120, in case B has forced ***(constrained)*** player A to transfer at least 10 points to B.

or

- 0 and 120, in case B has not forced ***(not constrained)*** player A to transfer at least 10 points to B.

After player A has decided on how many points he wants to transfer to B the experiment is over.

(Note: the following part is only contained in the instructions for player A. Player B received the instructions, “The decisions of A and B will be entered on the monitors at the computers.”)

Please take notice: As player A you have to decide on the amount to be transferred to B before you know, whether B does force ***(constrain)*** you to transfer at least 10 points or whether he does not. This means, you have to make two decisions. You will submit your decision through the following screen:

You are player A. You have 120 points. Player B has 0 points. You may transfer points to player B. Every single point you transfer will be doubled by the experimenters. Case 1: In case, player B forces ***(constrains)*** you to a minimum transfer of 10 points: How many points do you transfer in this case? x points Case 2: In case, player B (leaves the decision completely free to you) ***(does not constrain you)***: How many points do you transfer in this case? x points

So you will specify how many points you will transfer to B, in case B forces ***(constrains)*** you to transfer a at least 10 points (case 1) and in case B (leaves you completely free to decide) ***(does not constrain you)*** (case 2).

Which of the two decisions is relevant for the payout, will be determined by B's decision. In case B forces ***(constrains)*** you to transfer him at least 10 points, your decision specified for case 1 will count. In case B (leaves you completely free to decide) ***(does not constrain you)*** the amount of points specified for case 2 will count.

(Note: From here on, there are again identical instructions for both participants.)

A screen at the end of the experiment will inform you about the decisions made and the earnings resulting from these decisions.
Your earned points will be exchanged into Euros and paid out to you in cash, together with the show up fee.

2.D: Experimental Instructions used in T[neutral]

(Note: Original instructions are in German.)

Periods and Parts

- The experiment takes one period.
- You will form a group with another player, so that every group consists of two players. However you will not know the identity of the other group member.
- The members of one group will adopt different parts: There is one player A and one player B. These parts will be randomly assigned to each participant at the beginning of the experiment.

Course of Period

Decision of player A

- Player A offers a contract to player B. He can choose between two different types of contracts:
    - Contract type I: Player B has to offer a transfer from the range of [0;120]
    - Contract type II: Player B has to offer a transfer from the range of [10;120]

Decision of player B

- At the same time, player B will specify his transfer for each type of contract depending on player A's decision of choosing contract type I or II. So player B will specify his possible transfers within the given interval of each type of contract, before he will be informed about player A's decision on contract type I or II.

  Transfers may only be specified in form of whole numbers.

- The pay-outs will only be determined by player B's transfer for the type of contract, which is actually chosen by player A.

Realization of Profits

- Only after player B has specified his individual transfers for each type of contract, player A's actual decision on the type of contract will be announced.
- Player B's profit will consist of his starting capital of 120 Taler minus his transfer for the type of contract previously chosen by player A.
    - Profit for player B = 120-transfer
- Player A will receive the double amount of player B's transfer for the type of contract previously chosen by player A.
    - Profit for player A = 2 x transfer

Starting Capital and Final Pay-out

- At the beginning of this experiment every player B will be provided with a starting capital in form of the experimental currency of 120 Taler. Player A will not receive any starting capital. At the end of this experiment every participant will receive his achieved profit converted into Euros with an exchange rate of 0,10 € for one Taler. Additionally, every participant will receive a show up fee of 2,50 €.

Important Instructions:

- No communications will be allowed except via the experimental software.
- All decisions will be anonymous, so that no other participant will be able to link a decision to any other participant.
- The pay-out will also be anonymous, so that no participant will find out the pay-out of any other participant.

Chapter 3

The Role of Trust in Teams [11]

3.1 Introduction

The conflicting interests between principal and agent are the most frequently mentioned reason why a typical principal-agent relationship fails to reach an efficient solution. Looking for example at employer-employee relations, the employer wants the employee to work as much and as hard as possible for a moderate wage, while the employee expects a high wage without exerting too much effort. These discrepancies have been investigated in lots of studies from different disciplines of research. Based on the neoclassical theory, economists recommend to motivate agents extrinsically by rewards or close monitoring (e.g. piece rates (Lazear 2000, Paarsch/Shearer

[11] This chapter is based on Gerlach (2007b)

2000), tournaments (Lazear/Rosen 1981, Bull/Schotter/Weigelt 1987) or efficiency wages (Shapiro/Stiglitz 1984, Acemoglu/Newman 2002))[12]. Agents do what they are supposed to because of an expected reward. In contrast to this kind of motivation that is based on regulations, psychologists moreover focus on intrinsic motivation. An agent who is intrinsically motivated spends time on an action because of the action itself and not because he is forced to. Psychologists often claim the negative effects (e.g. Deci 1971) of extrinsic motivation because extrinsic motivation critically depends on the existence and the choice of the right incentive scheme. Moreover, extrinsic and intrinsic motivation are mostly seen as combined components where the intrinsic motivation might be undermined by extrinsic incentives. The so called crowding-out effect or corruption effect of intrinsic motivation (e.g. Deci 1975, Lepper/Greene 1978a, Frey 1997a) has been shown in a couple of studies (e.g. Frey/Jegen 2001, Fehr/Gächter 2002, Kunz/Pfaff 2002, Fehr/Rockenbach 2003, Irlenbusch/Sliwka 2005a). All of these studies have in common that they concentrate on the relationship between individuals. Yet, many important relations occur between groups of people. Decisions in firms are most often made by groups instead of individuals and team work is usually claimed as an important factor of success. However, there are also some team-specific problems such as free-riding. Hence it is a well known issue in psychological and economic literature that findings from individual behavior cannot be appropriately translated into group behavior regularities (e.g. Davis 1969, Kerr et al. 1996, Bornstein/Yaniv 1998, Kugler et al. 2007, Kocher et al. 2006, Kocher/Sutter 2005, Kocher/Sutter 2007).

[12] A review of the provision of incentives is given by Prendergast (1999).

Inspired by the results of the contribution of Armin Falk and Michael Kosfeld (2006) on which chapter 2 is based, too, the aim of this study is to check whether the impact of control is the same when the principal restricts the choice set not only for a single agent but for a group of agents. We predict agents to perceive the principal's decision to control differently if it is directed towards a team of agents and not exclusively towards one agent.

Using a variant of F/K's base treatment, in this chapter we look at one principal and several agents, running one treatment with three and another treatment with nine agents per group. In order to avoid any typical free-riding problem, neither treatment allows for any interaction between the agents. The principal has to offer the same type of contract to all of his three (nine) agents. Hence, he has no choice to differentiate between the agents. In the end, the principal's payoff depends on the given amount of one randomly selected agent of his group. As shown in chapter 2, the significant impact of control is partly due to the specific wording used in the instructions by F/K. Therefore we run our team treatments with the instructions used in T[neutral] of chapter 2 as well as with the original FK-instructions as used in T[force], which are just slightly adapted to the group context.

In the team treatments, we expect to observe the phenomenon of *social loafing* between the agents. Average transfers should decrease with an increasing number of group members, because participants may feel that they can "hide in the crowd" (Davis 1969). Furthermore, as we think that the principal's decision to control is no longer be seen as a signal of distrust if it is directed towards a whole team and not exclusively to one agent, the observed transfers should be higher when the principal controls as if he does not. Hence, control should become more important in bigger groups. The results

support our hypotheses: We observe benefits of control in teams. In the team treatments, we find a positive instead of negative impact of control. Control can no longer be interpreted as a signal of distrust towards an individual agent. Furthermore, average transfers decrease in the number of team members. These findings are also robust with respect to the wording used in the instructions.

The remainder of this chapter is organized as follows. In section 3.2 we generally discuss the theoretical background. In section 3.3 we derive our hypotheses. We describe the details of the experimental design and procedure in section 3.4. The experimental results are shown in section 3.5. Section 3.6 controls for the impact of the instructions. The chapter concludes with section 3.7.

3.2 Theoretical Background

3.2.1 Motivation Crowding-Out

Economic Theory

Two kinds of behavioral predictions on agents' behavior in an experimental set-up discussed above are in line with economic theory. First, pure neoclassical theory assumes that agents are selfish and try to maximize their own payoff. Therefore they try to maximize their own payoff giving the lowest possible transfer. Second, economic models incorporating the impact of social preferences in agents' behavior (e.g. Fehr/Schmidt 1999, Bolton/Ockenfels 2000, Fehr/Gächter 2000a, Charness 2004,

Falk/Fischbacher 2006) predict that agents are not completely selfish but do care for other people's utility. According to these assumptions the agents' behavior should not be affected by the principal's decision to control or not. A completely inequity averse agent should give the same transfer in both cases, with and without control in order to equalize the principal's and his own payoff, irrespective of the number of agents per group. As there is no change in profit and cost functions there should also be no change in agents' behavior between the treatments.

But the question is how to explain agents' behavior if they give different transfers in both conditions that exceed the lowest possible transfer, a reaction which might be due to a change in agents' motivation. Even though there are some approaches to implement the differentiation between intrinsic and extrinsic motivation in economic theory, the effect of motivation crowding-out cannot be economically explained. In particular, Frey (1997b: Chapter 4) incorporates this effect in a simple economic model, where the agent's utility depends on his own effort as well as on an intervention (reward or sanction) by the principal. The agent maximizes his utility for a given intervention. If the effort's marginal utility decreases with an increasing value of the intervention, Frey calls this the effect of motivation crowding-out. However, the model cannot endogenously explain the reasons for this effect, it just shows the consequences of the crowding-out effect.

Bénabou and Tirole (2003) explicitly describe the process of motivation crowding-out in a signaling model. Their central assumption is that the agent's effort costs for a certain task are only imperfectly known by the agent but that the principal has additional information on these costs. The principal can offer a reward to motivate the agent. By choosing the appropriate level of reward

(which should be higher the higher the agent's costs of effort) to motivate the agent he automatically sends a signal concerning the difficulty of the task. Hence, the agent gets some information about his own preferences. Even though higher incentives might cause higher efforts, they also might diminish future motivation because of the revealed unattractiveness of the task. Nevertheless, the effect of motivation crowding-out is not set off via a direct causality between incentive and effort. It is caused due to the simultaneous influence of the difficulty of the task on both, reward and effort.

Another approach is offered by Sliwka (2007). Based again on a simple principal-agent model, Sliwka assumes that there is at least a substantial part of agents always behaving fair, i.e. committing oneself to an agreement, even if this agreement is not verifiable. Furthermore, Sliwka assumes that this willingness to be fair is influenced by a social norm or by other individuals' behavior. Apart from agents who are always fair or unfair, there are also some agents who are fair if and only if they think that the part of fair agents is sufficiently large. These agents are called the conformists. By setting high incentives, the principal gives a signal that there are apparently lots of agents who are not fair, because if not the principal could save costs by offering a fixed wage contract. This signal, however, can influence the conformists' behavior. Hence, the motivation crowding-out effect arises if agents think that unfairness is a common way to behave. But still, it is not the agents' intrinsic motivation to engage in a task that is undermined by extrinsic motivators, but the agents' willingness to behave fairly.

Cognitive Evaluation Theory

Psychologists already have started analyzing the effect of the "hidden costs of reward" in the 1970s (Deci 1976, Lepper/Greene 1978b). One of the possible explanations derives from the "Cognitive Evaluation Theory" (CET). The CET assumes that people need to feel autonomous and competent. External factors that seem to constrain these needs tend to undermine intrinsic motivation (e.g. Amabile et al. 1976, Lepper/Greene 1975, Deci/Porac 1978). Therefore, external factors enhancing the feelings of autonomy might even help to increase intrinsic motivation (Zuckerman et al. 1978). A review with 128 laboratory experiments that try to confirm the CET is given by Deci (Deci et al. 1999). However, CET performs poorly in explaining work motivation. Maybe the most important problem is that the CET implies that managers have to select between intrinsic and extrinsic motivation. They have to decide whether they want to use external motivators neglecting intrinsic motivation or whether they try to maximize the intrinsic motivation forgoing the use of external rewards (Gagné/Deci 2005). Even though in the experiment of this study the CET might help to explain why agents voluntarily give a higher transfer if they are not controlled, it can not serve as an explanation why transfers with control could exceed transfers without control. Furthermore, as the experimental design implies an abstract instead of a real effort, the assumption that intrinsic motivation could be a driving factor of subjects' behavior is critical in the context of our experiment. Maybe one could argue that agents are intrinsically motivated to participate in the experimental game or to react reciprocally to their partner, but the definition of intrinsic motivation as an interest and enjoyment of a task does not fit in an experiment including an abstract effort decision.

Self-Determination Theory

In 1985 Edward L. Deci and Richard M. Ryan presented a concept of internalization of extrinsic motivators. The theory describes how extrinsically motivated behavior can become intrinsically motivated. This approach was the beginning of the "Self-Determination Theory" (SDT) (Deci/Ryan 1985, 2000, Ryan/Deci 2000, Gagné/Deci 2005). The SDT is a meta-theory constituted by four theories: the "cognitive evaluation theory", "organismic integration theory", "causality orientations theory" and the "basic needs theory". SDT concerns the development and functioning of personalities in social contexts and focuses on the degree to which human behavior is volitional and self-determined. First, the SDT differentiates between *amotivation* and *motivation*. *Amotivation* means a lack of motivation or no intention to work at all. In our experiment, an amotivated agent should give a transfer of 0 if he is not controlled and a transfer of 10 if he is controlled.

A central point of the SDT is the classification of motivation in *controlled* and *autonomous motivation*. Whereas the CET just differentiates between extrinsic and intrinsic motivation, the SDT assumes an *autonomy continuum* with several stages between fully extrinsic and fully intrinsic motivation. *Controlled motivation* can be divided into *external and introjected regulation*. The *external regulation* corresponds to the typical extrinsic motivation depending on reward and punishment of an action. *Introjected regulation* means that a rule has been taken in but not accepted, so the individual is controlled via the regulation. Translated in the context of the experiment of this chapter agents who are controlled motivated dishonor the given constraint of 10 points. In the control-case, they just give the minimum transfer of 10 because they are forced to.

Autonomous motivation can be divided into *identified regulation*, *integrated extrinsic motivation and intrinsic motivation*, where intrinsic motivation represents the highest level of autonomous motivation. As mentioned above, this kind of motivation as an interest and enjoyment of the task hardly can exist in an experiment with an abstract effort decision. Identified and integrated regulation both mean that a rule has been accepted and taken in and therefore it is not seen as an exogenously set constraint. The identification with a regulation is reached if individuals identify with the value of a certain behavior for their own self-selected goals, whereas the integration of a regulation means that the behavior is an integral part of the individual itself and therefore self-determined. Again, translated in our experimental context, agents who are autonomous motivated have taken in the regulation. Probably an autonomous motivated agent himself would have decided to control if he had been in the principal's position. So, in contrast to a controlled motivated agent who feels being forced by the principal's decision to control, an autonomous motivated agent who can identify with the given regulation should not have the negative feeling of being restricted in his transfer choice.

Whether an individual is controlled or autonomous motivated first depends on aspects of the social environment like job or work climate and second on individual differences in *causality orientation* which can be more *autonomous, controlled* or *impersonal oriented*. Furthermore, there are three basic psychological needs that are important for the internalization of extrinsic motivation, namely the *need for autonomy*, the *need for competence* and the *need for relatedness*. People need to feel self-determined and to be effective, and they also need to feel connected to others in their social environment. These needs "provide the basis for predicting which

aspects of a social context will support intrinsic motivation and facilitate internalization of extrinsic motivation" (Gagné/Deci 2005: 338). The higher a person's entitlements to satisfy his basic psychological needs the more *autonomous oriented* the person. In contrast, a *controlled oriented* person's needs will be more quickly satisfied whereas an *impersonal oriented* individual tends to be amotivated.

As mentioned in the introduction, we used two different kinds of instructions in our experiment, the original instructions used by FK and our own instructions. While in the FK-instructions the principal "is able to force[13] the agent to give him at least 10 points or to decide not to limit the agent and to leave him completely free to decide" in our own instructions "the principal has to offer a contract to the agent and can choose between two different types of contract. The agent has to offer a transfer from the range [0; 120] or a transfer from the range [10; 120]". Obviously the two instructions promote two different social contexts. However, as the instructions exactly describe the same rules of game, the needs for competence and relatedness should be quite equally satisfied by both instructions. But the need for autonomy which is the most crucial need in the general causality orientation might be differently touched by both instructions. Using the FK-instructions, the wording "not to limit the agent and to leave him completely free to decide" implies an accentuation on choice and freedom rather than on control and therefore clearly addresses an individual's need for autonomy.[14] So the agents' need for autonomy seems to be more satisfied if the

[13] Original instructions are in German, translation by the author. The expression used in the German version is "zwingen".

[14] The "emphasis on choice rather than control" has been detected as one of three specific factors leading to greater internalization of extrinsic motivation (Deci et al. 1994).

principal does not ask for a transfer of at least 10 points. As the wording in our own instructions is more unemotional, the need for autonomy is not activated in the same way. Hence, the principal's decision to control appears in a more neutral and rational manner.

The SDT can help to explain why agents voluntarily give a higher transfer if they are not controlled. These agents are controlled motivated having not taken in the regulation. But even more, the SDT can help to explain why agents give a higher transfer in the control-case and why this transfer is higher than the minimum transfer of 10 points. Those agents are autonomous motivated who have identified with the regulation.

3.2.2 Social Loafing

The approaches mentioned above might help to explain the impact of control on agents' behavior, but they do not serve as theoretical background to explain agents' motivation in the team treatments. Therefore we have to extend our theoretical framework. Due to the experimental design that eliminates any interaction between the agents, we have to distinguish groups who work collectively from those who work coactively. Working coactively also means working in the presence of others, but in contrast to collectively working agents whose inputs are connected within their group, coactively working agents' inputs are not combined with the inputs of the other agents of their group (Karau/Williams 1993). For this reason we do not expect free riding as mentioned in the introduction, because it presumes the existence of collectively

working groups.[15] To analyze the impact of increasing groups on agents' behavioral reaction to the restriction of the choice set, we therefore focus on the psychological phenomenon called *social loafing*. "Formally, social loafing is the reduction in motivation and effort when individuals work collectively compared with when they work individually or coactively" (Karau/Williams 1993: 681). There are several theoretical accounts for social loafing. In the following, we concentrate on three main causes that seem to be the most appropriate for our design.

First, one reason for the effect of social loafing is the *lack of identifiability* of people's performance (Latané et al. 1979, Jackson/Harkins 1985, Williams et al. 1981). People feel that they can "hide in the crowd" (Davis 1969) and therefore do not risk to be blamed when being detected withholding effort. In the context of our experiment, agents should feel less motivated in the team treatments. They know that their transfer cannot be assigned to them by the principal because first, the agent whose transfer decision will be responsible for the principal's payoff is randomly chosen and therefore the probability to be chosen decreases to one out of three respectively one out of nine in the team treatments. And second, even if an agent is the selected one in the end of the experiment, due to the anonymity of the lab experiment the principal will never get to know him face-to-face.

A second reason could be the so called "effort matching" (Latané et al. 1979, Kerr 1983, Jackson/Harkins 1985). According to this, people match their effort for equity or fairness reasons. When one's partner is hardly working, one would be a "sucker" to work hard himself reducing one's own payoff (Kerr 1983). Thus, in our

[15] A differentiation between *shirking*, *social loafing* and *free riding* from psychological and economic points of view is given by Kidwell/Bennett (1993).

experiment, if agents believe that the other agents will loaf and only give small transfers to the principal, they give small transfers themselves. In comparison to the other agents none of the agents might want to be the only one giving a lot of points to the principal which immediately reduces the agent's own payoff. Again, this effect might be intensified by the anonymity and the stranger matching in the experimental procedure, because "there is no reason for them to have faith in the group" (Jackson/Harkins 1985: 1200).

A third reason for the social loafing could be the "dispensability of effort" (Karau/Williams 1993, Kerr/Bruun 1983, Kerr 1983). People's motivation might be reduced if they feel that their effort is not essential for the whole group product. Even though there is no group product in our experiment, agents might feel that their transfer is of little value (i.e. dispensable) because, once again, the probability to be the selected agent whose transfer decision applies for the principal's payoff decreases in the team treatments. Even more, agents could feel that giving a high transfer is like wasting money, because the probability that no one will benefit from a generous transfer is quite high.

3.3 Hypotheses

In line with the theoretical background of the Self-Determination Theory we derive our first presumption. Apart from amotivated agents who only give the minimum amount of 0 without control and 10 with control, there should be a substantial amount of

motivated agents. Controlled motivated agents have not taken in the given constraint. They dishonor the distrust implied by the restriction of the choice set and therefore would give a higher transfer if they are not controlled. Corresponding to this, agents who are autonomous motivated have identified with the given regulation. They would give a higher transfer if the principal decides to control.

Presumption 3.1:
In all treatments, there should be a substantial amount of agents who voluntarily give a transfer superior to the minimum amount of 0 respectively 10.

Regarding the differences between the single-agent and the team treatments, we refer to the phenomenon of social loafing. We expect the agents to feel less responsible for the principal's payoff in the team treatments which might reduce their motivation to give high transfers. Adapted from the theoretical considerations from section 3.2, we derive our next presumption:

Presumption 3.2:
We expect lower average transfers in the team treatments as in the single-agent treatment. Transfers decrease with an increasing size of group.

Presumption 3.2 just concerns the differences between the single-agent and team treatments. In the next step we focus on differences within the team treatments, because the main issue of our study affects agents' behavioral reaction to the restriction of the choice set in the team treatments. Therefore we have to combine the self-determination theory with the phenomenon of social loafing. As

already mentioned, the effect of social loafing is a well-known issue which might occur due to a change in the context between the treatments. Hence, the principal might expect the agents to loaf in the team treatments and decides to control them in order to get at least 10 points. On the other side, the agents might expect the principal to anticipate the social loafing in teams because they know that they will loaf themselves. Presumably, most of the agents would have decided to control, too, if they had been assigned to the role of a principal. Thus, they understand the principal's decision. The restriction of the choice set appears in a different light to the agents if it is directed towards a team of agents and not to a single agent. In line with the self-determination theory, one could argue, that agents who would be controlled motivated in the single-agent treatment might become autonomous motivated in the team treatments. In other words, agents who might perceive the restriction of the choice set as a kind of distrust in the single-agent treatment and therefore decide to give a lower transfer in the case with control might change their point of view in the team treatments giving a higher transfer in the case when the principal controls.

Presumption 3.3:

In both team treatments, we expect the agents' average transfer to be higher if the principal decides to impose a lower bound to the transfer actions of the agent.

3.4 Experimental Procedure

The experiment was conducted at the Cologne Laboratory of Experimental Economics at the University of Cologne in May and December 2006 and January 2007. 176 participants had been recruited via the online recruitment system ORSEE (Greiner 2004), all of them students of different faculties of the University of Cologne. 60 participants took part in the base treatment with one principal and one agent, 56 participants in the team treatment consisting of one principal and three agents and 60 participants in the team treatment with one principal and nine agents per group. None of the students took part in more than one session. The experiment was programmed and conducted with the software z-tree (Fischbacher 1999). All sessions were played one-shot and lasted about thirty minutes. Students left the laboratory with an average payoff of 11€.

Our control treatment which is exactly the same as the base treatment of Falk/Kosfeld is a two-stage game with one principal and one agent. While the principal has no endowment, the agent starts with an endowment of 120 in the experimental currency "Taler" which is converted into Euro at the end of the game with an exchange rate of 0.1 €/Taler.

In the beginning the participants are randomly assigned to the role of a principal or an agent or – according to the neutral formulation in the experimental design – player A or player B. The principal has to decide which type of contract he wants to offer to the agent. In the first contract the agent has to choose a transfer x between [0, 1, …, 120] while in the second contract he has to give a transfer x between [10, 11, …, 120]. Thereby, with the choice of contract 2 the principal can minimize his risk by forcing the agent to

give at least a transfer of $x = 10$. The principal's payoff-function is given by $\pi_P = 2x$ and the agent's by $\pi_A = 120 - x$. As we used the strategy method, the agent chooses simultaneously to the principal's decision making the amount of x he wants to give for each contract type. When all participants have made their choices, the principal's decision is announced and the game is finished. After this, the students have to answer some questions concerning their age, gender or field and state of study.

In two further treatments we look at one principal and several agents, running one treatment with three and another treatment with nine agents per group. Now the principal has to decide for the whole group whether he wants to control or not. Neither treatment allows for any interaction between the agents. Every agent makes his own transfer decisions for both cases, being controlled or not. In the end of the experiment, one agent per group is randomly chosen to realize the principal's payoff. The principal gets twice the amount the randomly chosen agent decided to offer while the agents' payoffs depend on each agent's individual transfer decisions.

As mentioned above, the negative effect of control as shown by Falk/Kosfeld is at least partly due to the framing in the instructions. In order to control for the impact of the framing we therefore repeated the team treatments with both instructions.[16]

[16] A comparison of the major differences between the instructions is shown in table 3.1 in appendix 3.A.

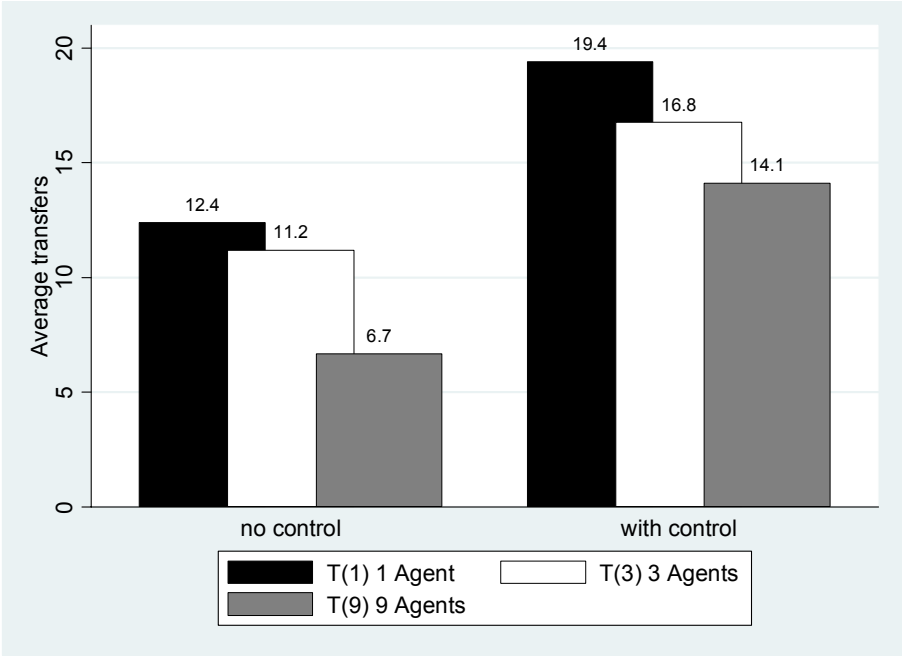
3.5 Experimental Evidence

In the following section we focus on the results obtained by using our own instructions. Therefore we start our investigations by regarding the average transfers. As shown in figure 3.1, obviously in all treatments and in both conditions the transfers exceed the required minimum level of 0 respectively 10 Taler.

Result 3.1:
In all treatments, there is a substantial number of motivated agents who voluntarily offer a higher transfer as the required minimum.

In the next step we concentrate on differences between the single-agent and the multiple-agents settings. Therefore we call the single-agent treatment T(1), the team treatment with three agents T(3) and the team treatment with nine agents T(9).

Figure 3.1: Average transfers per treatment



[Note: N = 30 observations in T(1) and T(9), 28 observations in T(3)]

Average transfers decrease with an increasing number of team members in both conditions, with and without control. In the no-control case this is significant between T(1) and T(9) and between T(3) and T(9) (Mann-Whitney U-test, one-tailed, exact, both p=0.037) while in the control case the difference is only significant between T(1) and T(9) (Mann-Whitney U-test, one-tailed, exact, p=0.019). While in T(1) and T(3) in both conditions agents give in average a transfer above the threshold of 10 Taler, in T(9) average transfer in the no-control condition even falls down to 6.67 Taler. Hence, the impact of the size of group is essentially seen by comparing T(1) and T(9) where the number of agents per group arises from one to nine agents. Furthermore, we find a significant order in the medians between the three treatments (Jonckheere-Test,

two-tailed, exact, p=0.039 without control and p=0.033 with control). Median transfers are highest in T(1) and lowest in T(9).

Result 3.2:
Average transfers are lower in the team treatments as in the single-agent treatment. The bigger the group, the lower are the given transfers.

To analyze the impact of control within treatments we compare the averages between the control and no-control conditions. Figure 3.1 shows that in each treatment the average transfers with control exceed average transfers without control. These differences are highly significant in all treatments (Wilcoxon signed rank test, two-tailed, exact, $p<0.001$ in all treatments).

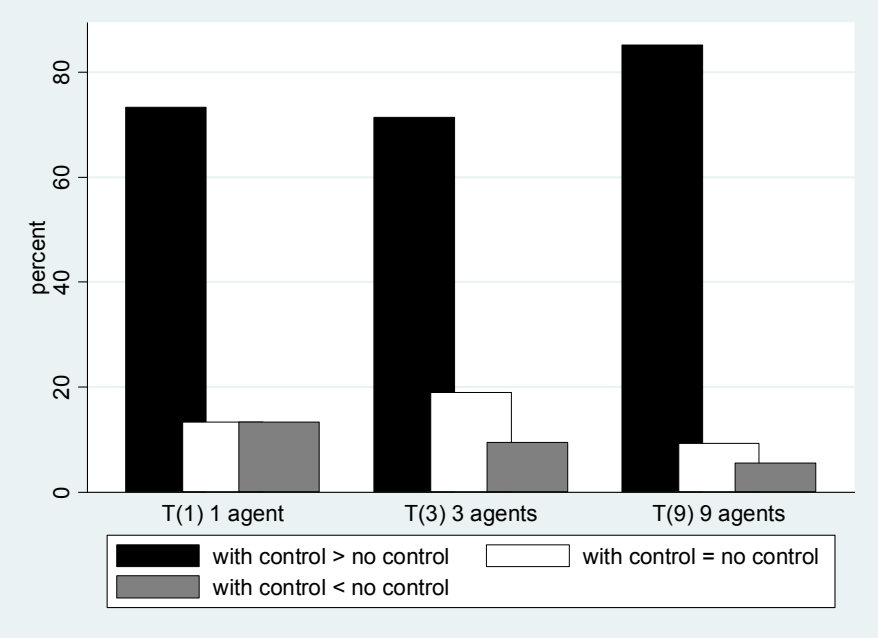
However, it might be necessary to control for the constrained nature of the choice set. In the constrained choice set, agents have to give at least 10 Taler, but in the unconstrained choice set they are allowed to give less than 10 Taler. It might be interesting to check whether the differences between the two conditions just appear for mathematical reasons. Therefore, we truncate the unconstrained choices to 10 by setting all transfers smaller than 10 equal to 10. If agents only give higher transfers in the control condition because they are forced to, there should be no difference in the distribution between the truncated unconstrained choices and the constrained choices. In fact, we cannot reject the null hypothesis of no difference between both conditions in all treatments (Wilcoxon signed-rank test). This leads to our third result:

Result 3.3:

We observe benefits of control in each treatment. Average transfers with control exceed average transfers without control.

Next, we want to investigate whether the influence of the restriction of the choice set on agents' behavior changes between the treatments. We examine the differences in transfers between the control and no-control condition by subtracting the transfer without control from the transfer with control per subject. The resulting variable should be negative if the agent's reaction to control is negative, i.e. the agent would be willing to offer a higher transfer if he was not controlled. According to this, if an agent gives a higher transfer with as without control, the resulting variable is positive. Figure 3.2 shows that in each treatment most of the agents give a higher transfer in the control condition.

Figure 3.2: Agents' reaction to the restriction of the choice set



[Note: N = 30 observations in T(1) and T(9), 28 observations in T(3)]

The fraction of agents who are willing to give voluntarily more if they are not controlled is quite small and decreases from 13.33% in T(1) up to 5.56% in T(9). In contrast, the fraction of agents who offer higher transfers in the control condition increases from 73.33% in T(1) up to 85.19% in T(9). In each treatment, there are highly significant more agents giving higher transfers in the control condition compared to those who give less or equal transfers without control. (Binomialtest, two-tailed, p=0.016 in T(1), p=0.008 in T(3) and p=0.000 in T(9)). However, the distribution of agents' reaction does not significantly differ between the treatments (Fisher's test, exact).[17]

Result 3.4:
We observe no change in the influence of control on agents' behavior in bigger groups.

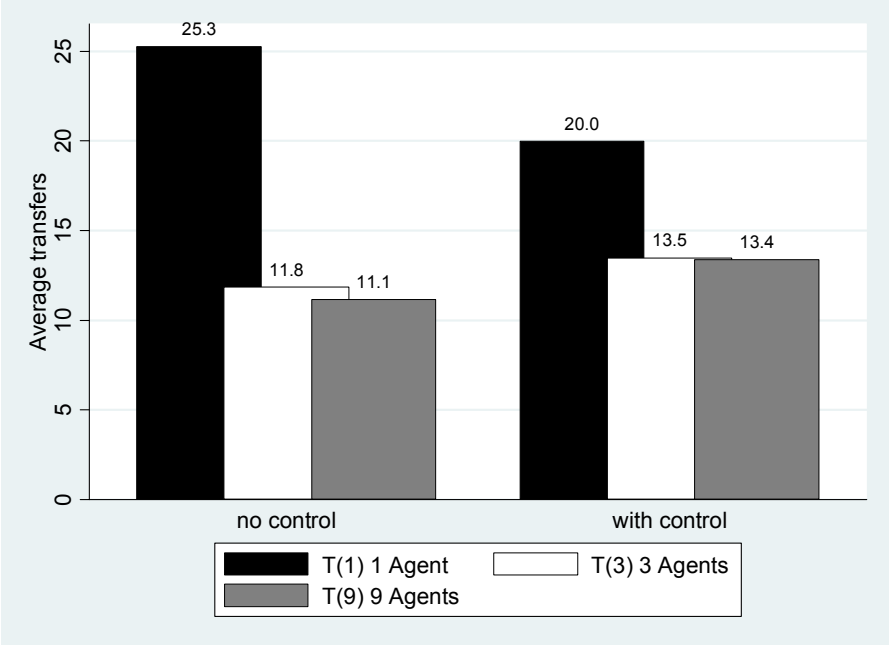
3.6 Robustness of Results

As mentioned in the introduction the results of the single-agent treatment using our own instructions contradict those of FK's base treatment. We were not able to replicate the negative effect of the principal's decision to restrict the agent's choice set on agents' motivation. As we have shown in chapter 2, this effect is at least partly due to the specific wording used in the instructions. Hence, we also run both team treatments with the original FK-instructions

[17] A detailed overview of agents' reaction to control is given in table 3.2 in appendix 3.B.

which were slightly adapted to the team context. In the previous section we presented our experimental results disregarding the impact of the instructions. Now we analyze the results from the team treatments obtained by using the FK-instructions. Figure 3.3 gives an overview of the average transfers.

Figure 3.3: Average transfers per treatment using FK-instructions



[Note: N = 30 observations in T(1) and T(9), 28 observations in T(3)]

Again, average transfers decrease with an increasing number of team members in both conditions. This time, with and without control these differences are significant between T(1) and T(3) (Mann-Whitney U-Test, one-tailed, exact, $p<0.01$ with and without control) and between T(1) and T(9) (Mann-Whitney U-Test, one-tailed, exact, $p<0.01$ with and without control), but there are no significant differences between the two team treatments. We find the same order in the medians between the three treatments as by using

our own instructions. Median transfers are highest in T(1) and lowest in T(9) with as well as without control (Jonckheere-test, two-tailed, exact[18], p=0.006 without control and p=0.015 with control).

Result 5:
Even with the FK-instructions, we observe social loafing in the team treatments.

Next, we analyze within treatment differences between the control and no-control condition. In contrast to the single-agent treatment, in both team treatments, the constrained choices exceed the unconstrained choices (T(3): 13.5>11.8, T(9): 13.4>11.1). But the only difference which is weakly significant is seen in T(9) (Wilcoxon signed-rank test, two-tailed, exact, p=0.059). Controlling for the constrained nature of the choice set, again we set all transfers smaller than 10 equal to 10 in the no-control condition which addresses 33.33% of the agents in T(1), 50.00% in T(3) and 53.70% in T(9). Interestingly, checking the differences with the truncated dates in the no-control condition, the differences between the two conditions are highly significant in all treatments (Wilcoxon signed-rank test, two-tailed, exact, p<0.01 in all treatments). Furthermore, there is a change in the relation of the transfers between the two conditions. In all treatments, average transfers are now significantly higher in the truncated no-control condition than in the control condition, as shown in table 3.3:

[18] In the no-control condition, we were just able to compute an asymptotic Jonckheere-test.

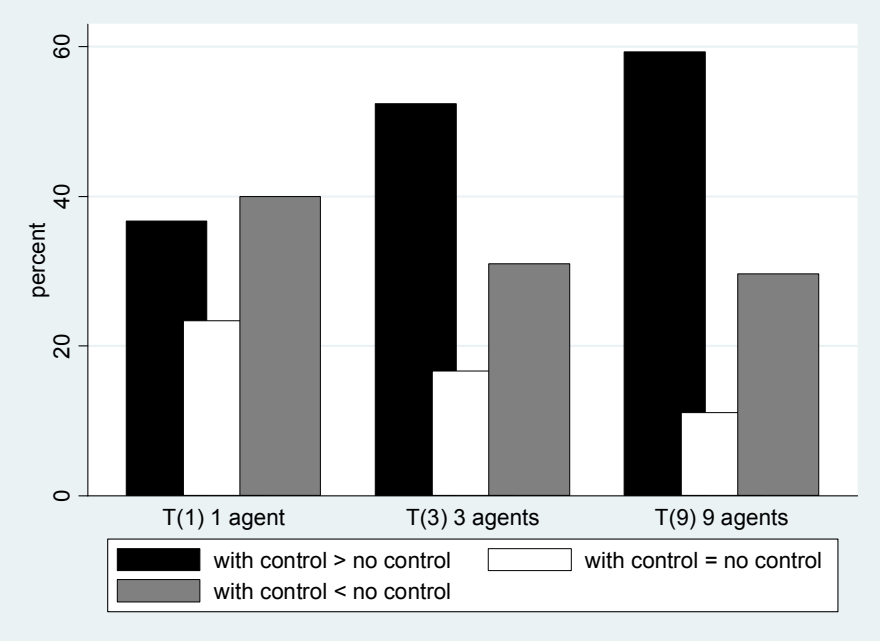
Table 3.3: Average transfers per treatment with truncated transfers using FK-instructions

	no control [*10*, 1,..., 120]	**with control [10, 11,...,120]**
1 agent	**28.23**	**19.97**
3 agents	**16.02**	**13.48**
9 agents	**16.00**	**13.39**

To learn more about the relevance of this effect it might be helpful to regard agents' reaction to control by subtracting transfers without control from transfers with control per subject which is shown in figure 3.4: [19]

[19] A detailed overview of agents' reaction to control using the FK-instructions is given in table 3.4 in appendix 3.C.

Figure 3.4: Agents' reaction to the restriction of the choice set using FK-instructions



[Note: N = 30 observations in T(1) and T(9), 28 observations in T(3)]

This time, the fraction of agents who give higher transfers without control decreases from 40.00% in T(1) up to 29.63% in T(9), while the fraction of those agents willing to give a higher transfer in the control condition increases from 36.67% in T(1) to 59.26% in T(9). But in none of the treatments the part of agents giving a higher transfer with control significantly exceeds the part of agents giving more or equal in the no-control condition (Binomial-test). However, using the same test while dropping those agents who react indifferently in both conditions leads to a significant difference in T(9) (Binomial-test, two-tailed, p=0.029). Furthermore, we only observe one significant difference between the treatments, namely the part of agents giving higher transfers with control between T(1) and T(9) (Fisher's test, one-tailed, exact, p=0.039). But despite of the weak significances, in T(1) the share of agents with a negative

behavioral pattern with respect to control exceeds the share of agents with a positive behavioral pattern, while this relation changes in the team treatments. Now there are more agents who are willing to give higher transfers in the control condition as in the no-control condition, which is comparable to result 3.2 from section 3.5.

However, in all treatments, more than 90% of those agents who give higher transfers with control also give a transfer that is lower than 10 in the no-control condition. Hence, the part of positively reacting agents to control is drastically reduced by truncating the distribution.[20] Now there are more agents who give higher transfers without control compared to those who give higher transfers with control which leads to higher average transfers in the no-control condition. These differences are highly significant in all treatments (Binomial-test, two-tailed, $p<0.01$ in all treatments). Dropping again those agents who react equally in both conditions after the truncation still leads to significant differences (Binomial-test, two-tailed, $p=0.035$ in T(1), $p=0.021$ in T(3) and $p=0.027$ in T(9)).

Result 3.6:

Using the FK-instructions, we observe a tendency of hidden costs of control in the single-agent treatment, because agents dishonor the principal's decision to restrict their choice set. However, this motivational effect disappears with an increasing group size. We observe benefits of control in teams.

[20] Most of those agents who give a transfer below 10 in the no-control condition choose a transfer equal to 10 in the control condition. In particular, there are 93.44% in T(1), 95.24% in T(3) and 96.30% in T(9). Hence, most of the agents who react positively to control (giving 10 points in the control condition and lower than 10 in the no-control condition) give 10 points in both conditions after the truncation.

3.7 Discussion

In this study we analyze the influence of control on agents' motivation in a team situation. Therefore we designed a simple experimental game following Falk/Kosfeld (2006) where the treatments differ in the size of the group of agents. We conducted one treatment with one agent (which is a replication of FK's base treatment), one with three agents per group and one with nine agents. As we did not implement a team-based compensation we avoided any free-riding problem. While the principal's profit was realized by selecting the decision of one randomly chosen agent per group, each agent's payoff just depended on his own decision-making.

The major objective of our study was to test whether the relevance of control defined as the principal's decision to set a minimum required transfer to the agents also holds in a team situation. The results show that agents in a team do not reduce their transfers as an effect of a loss in motivation which might be due to the principal's decision to control. Furthermore, we show that control is even more effective in larger groups because agents' transfer decreases systematically with an increasing group size.

As described in section 3.2, we try to explain agents' behavioral reaction in the team treatments with the phenomenon of *social loafing*. Thus, drawing on the psychological literature a loss in motivation and effort might occur because of a *lack of identifiability* of agents' performance, *dispensability of their effort* or because of the so called *effort matching* where agents reduce their effort for equity or fairness reasons. While the differences between the treatment with one agent and the team treatment with three agents are not statistically significant, differences are significant between

the extreme treatments with one and nine agents. Using the FK-instructions, we even find significant differences between one and three agents as well as between one and nine agents. This shows that indeed the size of group significantly influences agents' motivation. Even more, there seems to be no influence of the kind of instructions on agents' behavioral reaction in the multiple-agents treatments.

The findings in the present paper offer a rationale for the presence of control by supervisors. Even if there are approximately as many agents giving higher transfers with control as those giving higher transfers without control, the majority of agents in our experimental study just give the minimum required transfers. Nearly 45% of all agents give a transfer of 0 in the no-control condition and a transfer of 10 in the control condition. Even more, a loss in effort as a consequence of a loss in agents' motivation in teams seems to be avoidable by setting extrinsic motivators. Control as a mechanism to make team performance more efficient seems to be indispensable.

3.8 Appendix to Chapter 3

3.A: Comparison of instructions

Table 3.1: Comparison of instructions

Instructions used by Falk/Kosfeld	**Own instructions**
Before participant A decides how many points he wants to give to B, B can set a minimum transfer. Concretely, participant B is able to force participant A to give him at least 10 points. But he can also decide not to limit participant A and to leave him completely free to decide. So there are two cases:	Player A offers a contract to player B. He can choose between two different types of contract.
Case 1: Participant B forces participant A to transfer at least 10 points. In this case, participant A can transfer any amount between 10 and 120 to B.	Contract 1: Player B has to offer a transfer from the range of [0; 120].
Case 2: Participant B leaves participant A free to decide and does not force him to transfer at least 10 points. In this case, participant A can transfer any amount between 0 and 120 to B.	Contract 2: Player B has to offer a transfer from the range of [10; 120].

[Note: Original instructions are both in German, translation by the author].

3.B: Agents' reaction to control using own instructions

Table 3.2: Agents' reaction to control using own instructions

	1 Agent			3 Agents			9 Agents		
	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative
Number of agents	**22**	**4**	**4**	**30**	**8**	**4**	**46**	**5**	**3**
Relative share	**0.73**	**0.13**	**0.13**	**0.71**	**0.19**	**0.10**	**0.85**	**0.09**	**0.06**
Average x if controlled	**18.73**	**23.75**	**18.75**	**14.30**	**21.25**	**26.25**	**10.80**	**30.00**	**38.33**
Average x if not controlled	**7.59**	**23.75**	**27.50**	**4.50**	**21.25**	**41.25**	**1.20**	**30.00**	**51.67**

3.C: Agents' reaction to control using FK-instructions

Table 3.4: Agents' reaction to control using FK-instructions

	1 Agent			3 Agents			9 Agents		
	Positive	Neutral	Negative	Positive	Neutral	Negative	Positive	Neutral	Negative
Number of agents	**11**	**7**	**12**	**22**	**7**	**13**	**32**	**6**	**16**
Relative share	**0.37**	**0.23**	**0.40**	**0.52**	**0.17**	**0.31**	**0.59**	**0.11**	**0.30**
Average x if controlled	**12.91**	**36.43**	**16.83**	**11.95**	**21.43**	**11.77**	**11.28**	**22.50**	**14.19**
Average x if not controlled	**4.18**	**36.43**	**38.08**	**3.14**	**21.43**	**21.38**	**2.34**	**22.50**	**24.50**

3.D: Experimental Instructions (own version)

(Note: Original instructions are in German. Expressions in brackets are just shown in the team treatments.)

Periods and Parts

- The experiment takes one period.
- You will form a group with another player [with three (nine) other players], so that every group consists of two [four (ten)] players. However you will not know the identity of the other group member[s].
- The members of one group will adopt different parts: There is one Player A and one [three (nine)] Player[s] B. These parts will be randomly assigned to each participant at the beginning of the experiment.

Course of Period

Decision of Player A

- Player A offers a contract to [each] Player B. He can choose between two different types of contracts:
    - Contract type I: [Each] Player B has to offer a transfer from the range of [0;120]
    - Contract type II: [Each] Player B has to offer a transfer from the range of [10;120]

Decision of Player B

- At the same time, [each] Player B will specify his transfer for each type of contract depending on Player A's decision of choosing contract type I or II. So [every] Player B will specify his possible transfers within the given interval of each type of

contract, before he will be informed about Player A's decision on contract type I or II.

Transfers may only be specified in form of whole numbers.

- The pay-outs will only be determined by Player B's transfer for the type of contract, which is actually chosen by Player A.

Realization of Profits

- Only after [all] Player[s] B has [have] specified his [their] individual transfers for each type of contract, Player A's actual decision on the type of contract will be announced.
- [Each] Player B's profit will consist of his starting capital of 120 Taler minus his transfer for the type of contract previously chosen by Player A.
    - Profit for [each] Player B= 120-transfer
- [Player A's profit will be determined by the decision of one randomly chosen Player B of the same group]. Player A will receive the double amount of [this randomly chosen] Player B's transfer for the type of contract previously chosen by Player A.
    - Profit for Player A = 2 x transfer of [one random] Player B [of the same group]

Starting Capital and Final Pay-out

- At the beginning of this experiment every Player B will be provided with a starting capital in form of the experimental currency of 120 Taler. Players A will not receive any starting capital. At the end of this experiment every participant will receive his achieved profit converted into Euros with an exchange rate of 0,10 € for one Taler. Additionally, every participant will receive a show up fee of 2,50 €.

Important Instructions:

- No communications will be allowed except via the experimental software.
- All decisions will be anonymous, so that no other participant will be able to link a decision to any other participant.
- The pay-out will also be anonymous, so that no participant will find out the pay-out of any other participant.
- The instructions will be collected after the experiment is finished.

Good luck.

3.E: Experimental Instructions (Falk/Kosfeld version)

(Note: Original instructions are in German. Expressions in brackets are just shown in the team treatments.)

You are about to take part in an economic experiment, which is financed by the Deutsche Forschungsgemeinschaft.

Please read the instructions carefully. Everything you need to know for this experiment will be explained to you. In case you have any questions, please notify so. Your questions will be answered at your desk. All other communication is strictly forbidden throughout the whole experiment.

At the beginning of the experiment, every participant will receive a show up fee of 2.50 €. You will be able to earn additional points during the experiment. All points earned during the experiment will be converted into Euros at the end of the experiment. The exchange rate is the following:

1 point = 10 Cent

At the end of the experiment you will receive your income, which you have earned during the experiment, plus the 2.50 € show up fee in cash.

The Experiment

In this experiment one [three (nine)] participant[s] A and one participant B will form a group of two [four (ten)]. No participant

will know the other member[s] of his group, so all decisions will be made anonymously.

You are participant A (B).

At the beginning of the experiment every participant A will receive 120 points. Participant B will not receive any points.

Decision of participant A:

[Every] participant A can choose, how many points he wants to transfer to participant B. Every point transferred from A to B will be doubled by the experimenters. Every point transferred from A to B therefore decreases A's income by one point and increases B's income by two points. [To determine participant B's earnings the decision from one participant A out of the group of four (ten) will be randomly picked.]

The formula for the earnings look like this:

Earning of participant[s] A: 120 – transfer

Earnings of participant B: 0 + 2*transfer [of one randomly picked participant A of the same group]

The following examples will clarify the formulas for the earnings:
Example 1: [The randomly picked] A transfers 0 points to B. The earnings will be 120 for A and 0 for B.

Example 2: [The randomly picked] A transfers 20 points to B. The earnings will be 100 for A and 40 for B.
Example 3: [The randomly picked] A transfers 80 points to B. The earnings will be 40 for A and 160 for B.

Decision of participant B:

B can determine a minimum transfer, before [every] participant A has chosen, how many points he wants to transfer to participant B. In particular, participant B could force [all of his] participant[s] A to transfer at least 10 points to B. But participant B can also choose not to force [his] participant[s] A to any minimum transfer and thus to leave the decision completely free to participant[s] A.

There are two possible cases:
Case 1: Participant B forces participant[s] A to transfer at least 10 points to B. In this case [each] participant A may transfer any whole numbered amount **between 10 and 120** to B.
Case 2: Participant B leaves the decision free to participant[s] A and does not force him [them] to transfer at least 10 points to B. In this case, participant[s] A may transfer any amount **between 0 and 120** to B.

The experiment therefore consists of two steps:

Step 1:

In the first step, participant B decides, either to force participant[s] A to a minimum transfer of 10 points or to leave free the decision on the amount to be transferred. [B has to make the same decision for all three (nine) participants A of his group. So he either forces all three (nine) participants A or he lets all three (nine) A's decide freely.]

Step 2:

In the second step [every] A decides on the amount which he wants to transfer to B. This may be an amount between

- 10 and 120, in case B has forced participant[s] A to transfer at least 10 points to B.

or

- 0 and 120, in case B has not forced participant[s] A to transfer at least 10 points to B.

After [every] participant A has decided on how many points he wants to transfer to B [one participant A out of the group of four (ten) will be randomly picked. This participant A's decision on the amount transferred to B determines participant's B earnings] the experiment is over.

(Note: the following part is only contained in the instructions for participant A. Participant B received the instructions, "The decisions of A and B will be entered on the monitors at the computers.")

Please take notice: As participant A you have to decide on the amount to be transferred to B **before you know, whether B does force you to transfer at least 10 points** or whether he does not [and before you know, whether your decision will be chosen to determine B's earnings]. This means, you have to make two decisions. You will submit your decision through the following screen:

You are participant A.

You have 120 points. Participant B has 0 points.
You may transfer points to participant B.
Every single point you transfer, will be doubled by the experimenters.

Case 1: In case, Participant B forces you to a minimum transfer of 10 points:
How many points do you transfer in this case? x points

Case 2: In case, Participant B leaves the decision completely to you:
How many points do you transfer in this case? x points

So you will specify how many points you will transfer to B, in case B forces you to transfer a at least 10 points (case 1) and in case B leaves the decision to your free choice (case 2).

Which of the two decisions is relevant for the payout, will be determined by B's decision. In case B forces you to transfer him at least 10 points, your decision specified for case 1 will count. In case B leaves the decision to your free choice the amount of points specified for case 2 will count.

(Note: From here on, there are again identical instructions for both participants.)

A screen at the end of the experiment will inform you about the decisions made and the earnings resulting from these decisions.

Your earned points will be exchanged into Euros and paid out to you in cash, together with the show up fee.

Do you have any questions?
Please solve the following control questions. The answers have no consequences on your earnings. Their only purpose is to check that every participant has understood the rules of the experiment.

Question 1: Assumed participant B leaves the decision to participant A. A transfers 22 points to participant B. What are their earnings?

Question 2: Assumed participant B forces participant A to transfer at least 10 points to B. A transfers 12 points to participant B. What are their earnings?

Question 3: Assumed participant B leaves the decision to participant A. A transfers 6 points to participant B. What are their earnings?

[Question 1: Assumed participant B leaves the decision to participants A. The first A transfers 22 points, the second A 30 points and the third A 10 points to participant B. The first A's decision is randomly picked to determine participant B's earning. What are their earnings?]

[Question 2: Assumed participant B forces participants A to transfer at least 10 points to B. The first A transfers 20 points, the second A 12 points and the third A 30 points to participant B. The second A's decision is randomly picked to determine participant B's earning. What are their earnings?]

[Question 3: Assumed participant B leaves the decision to participants A. The first A transfers 15 points, the second A 25 points and the third A 6 points to participant B. The third A's decision is randomly picked to determine participant B's earning. What are their earnings?]

Chapter 4

The Impact of Coordination Devices on Team Performance [21]

4.1 Introduction

The productivity of teams is an interesting issue in research that has been investigated many times before. A lot of laboratory experiments have been conducted in order to analyze how teams react and how they can be motivated (see e.g. Colman 1995, Davis/Holt 1993, Fehr/Gächter 2000b, Ledyard 1995, Nalbantian/Schotter 1997, Sally 1995). With this study we want to contribute to this field of research by investigating the impact of different types of coordination devices on agents' behavioral pattern in a team situation.

[21] This chapter is based on Gerlach/Gerlach (2007).

The crucial point of many studies is the possibility of free-riding and shirking which is immanent to a typical team or public goods situation. Most often it is only the collective team performance that can be observed and not each member's individual performance. Therefore, one could benefit from the other team members' contribution without being detected while shirking. Even if people start by voluntarily giving more than the minimum input, once they have been exploited by their team they start shirking themselves. John O. Ledyard (1995) for example shows that in a typical public goods situation which is often compared to a team situation, in the beginning people give approximately 50% of the pareto optimal contribution. In a repeated experiment this contribution decreases to 11% in the end. Thus, a major problem in team situations is a coordination dilemma between the team members. Even though everyone could be better off by cooperating, no one wants to risk being exploited by potential free-riders and therefore gives less than the team best contribution himself.

Issues to reduce free-riding in teams often focus on the implementation of different incentive schemes (Holmström 1982), such as target based schemes, tournament based schemes or several forms of gain- or profit-sharing (Nalbantian/Schotter 1997). The problem is that extrinsically motivated people reduce shirking because of the expected incentive. If the incentive does not hold any longer – for example after a tournament is finished – people tend to start shirking again. Furthermore, external factors such as tangible rewards, deadlines or monitoring might undermine intrinsic motivation and reduce the motivation to contribute in a whole (Deci 1975, Fehr/Gächter 2002).

In this study we conduct a principal-agent lab experiment with teams consisting of one principal and three agents. The agents have to provide a contribution to a team product. The principal has to offer to his team one out of three types of contracts. These three contracts differ in the range from which the agents have to choose their contribution. The limitations of the ranges in the three contracts are chosen according to the Nash equilibrium contribution, the team best contribution and the first best contribution.

Contract 1 offers the highest liberty of action to the agents, but it does not give any support to reduce the team's coordination problem.

Contract 2 offers a range of contribution that is limited above compared to contract 1. The idea of this contract is to take into account that in addition to the issue of their coordination problem agents might also pay attention to the principal's intention when offering a contract. By choosing contract 2, the principal can signalize that he is willing to refrain from very high contributions that would be beneficial for the principal but not for the agents themselves. Thus, this decision might be perceived as a kind action that could be rewarded by reciprocal agents. However, this contract does not limit the opportunity to free-ride. Even though the principal offers some support to the agents to find their optimal contribution, this device does not reduce the coordination dilemma between the agents.

In contrast to the first two contracts, contract 3 offers a range of contribution that is limited below. Choosing this contract, the principal gives assistance to the agents to reduce their coordination problem. Since agents are forced to give at least a certain minimum contribution, they are protected from each other. If an agent wants to exploit the others by providing a very low contribution, this

willingness to free-ride is restricted to the lower limit of contract 3. Agents do not risk that the other team members give nothing at all, they can be sure to get a certain minimum output. For this reason agents might risk to give a higher contribution as in the two other contracts. Hence, offering contract 3 could be interpreted as a supporting coordination device given by the principal. However, in line with our argumentation from contract 2, it might be that agents do not appreciate being forced to provide a requested minimum contribution and therefore might perceive the principal's decision as an unkind action that should be punished by providing less.[22]

Hence, there are two oppositional effects that might influence agents' contribution. However, as the agents' payoff is mainly determined by the coordination dilemma, we expect the agents to pay low attention to the principal's underlying intention by offering contract 2 or 3.

While in the first treatment the agents do not have the opportunity to communicate with each other, we implement a chat-software in a second treatment to allow for a discussion between the agents in a team. As the communication is not binding in our experiment and as there is no change in the parameters of the experiment, the agents' contribution decisions should not be influenced by the communication. However, several studies show that the contribution rate in a team situation is strongly and positively influenced by the opportunity to communicate (e.g. Brosig 2002, Brosig et al. 2003, Brosig et al. 2004, Harbring 2006, Hoffmann et al. 1996, Isaac/Walker 1988).

[22] See also Falk/Kosfeld (2006) who find a significant negative impact of setting a minimum restriction in a situation with one principal and one agent.

Our results show that giving a supporting coordination device to a team by limiting the opportunity to free-ride increases the average team performance. Agents' average contribution in contract 3 significantly outperforms the average contributions given in the other contracts and is also significantly higher than the requested minimum contribution. In contrast, the impact of the principal's underlying intention by choosing a certain contract seems to be negligible in this context. Apart from that, we show that communication does not change the impact of the coordination device on agents' behavioral patterns. Even though the average contribution rate with communication is higher in all contracts, agents still spend the highest contribution if their range of contribution is limited below.

The paper is organized as follows: In section 4.2 and 4.3 we present the experimental design and theoretical predictions. After this we report our empirical results in section 4.4. Section 4.5 deals with the impact of communication and section 4.6 with the influence of good and bad experiences on agents' behavior. The paper concludes in section 4.7.

4.2 Experimental Design

The experiment was conducted at the Cologne Laboratory for Experimental Economics at the University of Cologne. The participants were recruited with the online recruiting system ORSEE (Greiner 2004). 112 students of all branches of study were spread over four sessions: two sessions for the treatment with chat and two sessions for the treatment without chat. Each candidate was only

allowed to participate in one session, which consisted of seven periods and lasted about one hour and a half. In the end, one randomly chosen payoff of one of the seven periods was relevant for the payment. The average payoff was 14.20 €. During the experiment, the payoffs were given in the experimental currency Taler. At the end of the experiment, one Taler was converted into Euro by an exchange rate of 0.23 € per Taler[23] that was announced in advance.

The participants were randomly assigned as principal or as agent or - according to the neutral formulation of the experimental instructions - as player A and player B and did not change their role during the whole experiment. They were also randomly assigned to groups consisting of one principal and three agents. After each period the composition of each group was changed so that none of the participants met twice. Each agent started with an endowment of 35 Taler and each principal with an endowment of 20 Taler.

Before starting the experiment, the instructions and cost tables were distributed and read to all participants and question were answered. Via the experimental software the principal then chooses one of three different types of contract to offer to the agents. The principal has to offer the same contract to all of the three agents. Choosing the first contract, each agent has to provide a contribution from range [0; 80], choosing the second contract from range [0; 60] and choosing the third contract from [20; 80]. As it will be shown in the next section, these frameworks are chosen according to the agents' contribution in the Nash equilibrium, the team best contribution and the first best contribution of each agent.

[23] This exchange-rate was chosen in order to reach approximately the general average earning of 12.50 € per hour in the laboratory.

Before the agents get to know which type of contract the principal actually decides on, they have to make a contribution decision for each of the three contracts, so each agent has to make three separated contribution decisions. Agents are rewarded on the basis of their collective output. The contribution is costly to the agents with a cost function of $c(e_i) = \frac{e_i^2}{100}$. While in the treatment without chat, the agents just have to make their decisions without talking to their team members, in the treatment with chat, they are allowed to discuss via a chat-software about their contributions. This communication cannot be observed by the principal. Once an agent sends his decisions, he has no longer the possibility to take part in the chat but can observe the communication between the remaining two agents. The agents can give any contribution within the given range of each contract, regardless of what they announce in the chat. Because the agents only meet once during the experiment a great possibility of free-riding is given.

After the agents have made their decisions, the principal's decision and the team's output for the selected contract are revealed. In order to take into account the interaction of the agents, we assume the following production function: $f(e_i) = Y = 1.5\sum_{i=1}^{3} e_i$. The principal's payoff function is given by $\pi_P = 0.25 \cdot 1.5\sum_{i=1}^{3} e_i$, so the principal gets a quarter of his team's output. The agents' payoff function is given by $\pi_{Ai} = 0.25 \cdot 1.5\sum_{i=1}^{3} e_i - c(e_i)$. After this, the groups are rematched and the next period starts.

4.3 Theoretical Predictions

In the following section we present our theoretical predictions. Because we firstly concentrate on the differences between the three kinds of contracts, we disregard the impact of the communication in the chat-treatment in this section. The chat will be discussed separately in section 4.5.

The behavioral predictions of our study depend on the assumptions concerning players' preferences. According to the economic standard theory, agents are supposed to be selfish and to maximize their own material payoff. In this study each agent's payoff depends on his own contribution as well as on the other team members' contributions. Because agents cannot be obliged to what they have announced they would give, there should not be any cooperation between the agents. As shown below the result is the Nash equilibrium, because agents maximize their own profit:

$$\max_{e_i} \pi_{Ai} = 0.25 \cdot 1.5 \sum_{i=1}^{3} e_i - 0.01 \cdot e_i^2$$

$$\Rightarrow 0.375 - 0.02 e_i \overset{!}{=} 0$$

$$\Leftrightarrow e_i = 18.75$$

In the Nash equilibrium, agents would give a contribution of $e_i = 18.75$. The principal's and each agent's payoff would be:

$$\pi_P = 0.25 \cdot 1.5 \cdot 3 \cdot 18.75 = 21.09$$

$$\pi_{Ai} = 0.25 \cdot 1.5 \cdot 3 \cdot 18.75 - 0.01 \cdot (18.75)^2 = 17.58$$

Hence, we derive our first presumption:

Presumption 4.1:

If agents are selfish, in the first and second contract their contribution will be e=18.75. In the third contract where the decision is limited below to 20, the contribution will be e=20.

Yet, many empirical studies show that people's behavior is dominated by social preferences instead of being completely selfish. By maximizing their own utility they take into account other people's utility as well (see e.g. Andreoni/Miller 1993, Bolton/Ockenfels 2000, Fehr/Fischbacher 2002, Fehr/Schmidt 1999, Rabin 1993). Therefore, agents might consider that the team is rewarded on the collective output. Because the principal just benefits from the agents' contribution and does not have any costs at all, the agents' optimal decision would be the team best contribution, which means to maximize the agents' collective payoff excluding the principal's payoff. In this case, agents' utility function is:

$$\max_{e_i} \pi_A = 0.75 \cdot 1.5 \sum_{i=1}^{3} e_i - 0.01 \cdot e_i^2$$

$$\Rightarrow 1.125 - 0.02 e_i \overset{!}{=} 0$$

$$\Leftrightarrow e_i = 56.25$$

With a team best contribution of $e_i = 56.25$, the payoffs are:

$$\pi_P = 0.25 \cdot 1.5 \cdot 3 \cdot 56.25 = 63.28$$

$$\pi_{Ai} = 0.25 \cdot 1.5 \cdot 3 \cdot 56.25 - 0.01 \cdot (56.25)^2 = 31.64$$

However, due to the given free-riding problem we expect the agents to give less than the team best contribution of 56.25. As shown in many other empirical studies, the majority of individuals

are “weak free-riders” in teams. Even if their contribution to the group exceeds the Nash-prediction they provide less than the team best amount (e.g. Andreoni 1988b, Ledyard 1995, Weimann 1994). We derive our second presumption:

Presumption 4.2:
There is a substantial amount of agents who is not completely selfish and also cares about their team partners' utility. Thus, their contribution exceeds the Nash equilibrium.

In the next step, we come to the most interesting point of our study by analyzing the impact of the different ranges of contribution on agents' behavioral pattern. While in the first and second presumptions we just concentrate on agents' behavior in a general team situation, we now take a look at the influence of the principal's contract decision. If the principal chooses contract 1 with a range of [0; 80], he offers the full range of decision to his team. Hence, this contract will serve as the base contract to be compared with the effect of the two other contracts.

By choosing the second contract the principal sets an upper limit to the agents' decisions (range of [0; 60]). On the one hand, by choosing this contract the principal has the possibility to protect his agents from harming themselves by giving a contribution that exceeds the team best contribution. Note that the maximum contribution of $e_i = 60$ is just slightly above the team best contribution of $e_i = 56.25$ but clearly below the first best contribution of $e_i = 75$. By providing the first best contribution the collective team's payoff including the principal's payoff will reach its maximum:

$$\max_{e_i} \pi = 1.5\sum_{i=1}^{3} e_i - 0.01 \cdot e_i^2$$
$$\Rightarrow 1.5 - 0.02e_i \overset{!}{=} 0$$
$$\Leftrightarrow e_i = 75$$

In this case, principal and agents will get the following payoffs:

$$\pi_P = 0.25 \cdot 1.5 \cdot 3 \cdot 75 = 84.375$$
$$\pi_{Ai} = 0.25 \cdot 1.5 \cdot 3 \cdot 75 - 0.01 \cdot (75)^2 = 28.125$$

While the principal's payoff in the first best situation exceeds his payoff in the team best situation, the opposite holds for the agents. By giving an upper limit of $e_i = 60$, the principal can point out that he cares about his agents' payoffs. In the agents' interest he is willing to refrain from his maximum payoff in the first best case. If agents pay attention to this kind action, they might reciprocate by giving a higher contribution as in the other contracts. However, this is only one point of view. On the other hand – which to our mind should be more important - the second contract does not give any support to the agents to reduce their coordination problem, because it does not limit the opportunity to free-ride. Even more it reduces the chance to get very high contributions (>60) and payoffs. Therefore we derive our third presumption:

Presumption 4.3:
Compared to contract 1, the average contribution will be lower if the principal sets an upper limit to the agents in contract 2.

Choosing the third contract, the principal restricts the agents' choice by setting a requested minimum contribution. Note that the lower limit of $e_i = 20$ is chosen in our experimental design because it is just slightly above the Nash equilibrium of $e_i = 18.75$. If the principal supposes the agents to be selfish he can ensure a payoff of at least 22.5 Taler to himself by preventing the agents from giving less than 20. However, if the agents perceive the decision to offer contract 3 as an unkind action the principal risks being punished by lower contributions compared to the other contracts. But furthermore and probably even more important with regard to the agents' coordination dilemma, the principal offers a supporting coordination device to his team. By setting the lower limit, even potential free-riders have to give at least a contribution of 20. The team members are protected from each other, because the danger being exploited by the others is limited to the given minimum amount. Agents might risk providing a higher contribution.

Presumption 4.4:
Compared to contract 1, the average contribution will be higher if the principal offers a supporting coordination device to the agents in contract 3 by requesting a minimum contribution of at least 20 Taler.

4.4 Empirical Results

In this section we present our main empirical findings. According to presumption 4.1, agents are supposed to be selfish. As

shown in the previous section, the predicted contribution would be 18.75 in the first and second contract and 20 in the third contract. Table 4.1 shows the average and median contributions for the three contracts.

Table 4.1: Average and median contributions

	averages	medians
contract 1 [0;80]	**34.14**	**35**
contract 2 [0;60]	**31.94**	**30**
contract 3 [20;80]	**38.49**	**39**

The average contribution is clearly higher than the Nash equilibrium (Wilcoxon signed-rank test, $p<0.01$ for all contracts)[24]. Looking at the percentiles we find supporting evidence for this result. For all contracts, 75% of the agents spend more than the Nash-prediction.

Result 4.1:
There is a substantial amount of agents who are not completely selfish and who do take into account their team partners' payoffs.

In presumption 4.2, we consider that agents' behavior might be influenced by social preferences. Agents know that their team is rewarded on the collective output and therefore spend more than predicted by standard economic theory. If they try to maximize the team's payoff excluding the principal, every agent should give a contribution of $e_i = 56.25$. However, table 4.1 reports other results. Even if many agents are not completely selfish, most of them are

[24] We report all Wilcoxon signed rank tests as two-sided tests.

weak free-riders who provide less than the team best contribution. For each kind of contract the average contribution is quite in the middle between the selfish and the team best amount. Less than 25% of all agents give a contribution higher than 50. These dates are consistent with other team or public goods experiments showing that in a typical public goods situation in the beginning agents spend approximately 50% of the pareto optimal effort (Nalbantian/Schotter 1997, Ledyard 1995).

Of course, the reported results might be explained by the issue of free-riding. Agents cannot be committed to any contribution and they only meet once during the whole experiment, so the incentive to shirk is quite high. Even if each agent can be better off by cooperating, there should be few cooperation because the agents hesitate to trust each other. Since contribution is costly, the agents try to avoid loosing money. They anticipate that the others will not give the team best contribution and therefore spend less than the team optimum themselves. As despite of the coordination dilemma the average contribution is higher than the Nash equilibrium, we find support for the assumption of the influence of social preferences.

Result 4.2:
Even if most of the agents are not completely selfish, the average contribution does not reach the team optimum.

Next we analyze the impact of the different ranges of contribution on agents' behavior. Therefore we compare the average contributions between the three types of contracts. Table 4.1 shows that the average contribution is highest if agents are bounded below (contract 3) and lowest if agents are bounded above (contract 2). These differences are highly significant (Wilcoxon signed rank test,

p<0.001 between all contracts). However, these results might be due to the initial range of possible contributions. Because in contract 2 the given contribution cannot be higher than 60 and in contract 3 there are no possible contributions below 20, the averages technically might be highest in the third contract. To make these averages more comparable, we set all contributions smaller than 20 equal to 20 and all contributions higher than 60 equal to 60. Hence, in all of the three contracts the minimum and maximum possible contributions are the same in the modified data. With these modified data we get the following results:

Table 4.2: Average contributions with modified data

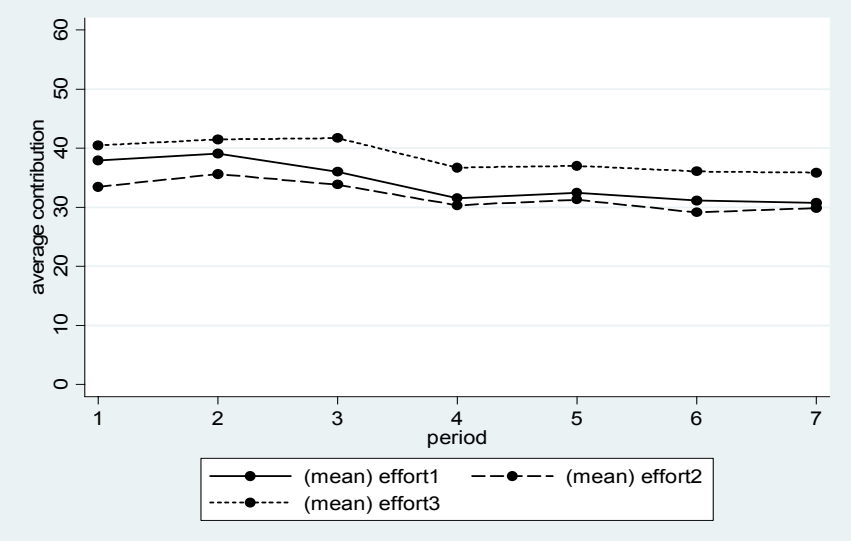
	Averages with modified data
contract 1 [0;80]	**35.58**
contract 2 [0;60]	**34.38**
contract 3 [20;80]	**37.30**

Although averages are now naturally smaller in contracts 1 and 3 and higher in contract 2 than in the original data, there seems to be no change in the rank. Averages are still highest in contract 3 and lowest in contract 2 (Wilcoxon signed-rank test, p<0.001 between all contracts).

Result 4.3:
Average contribution is highest if agents are bounded below (contract 3) and average contribution is lowest if agents are bounded above (contract 2).

Apparently, by offering the upper limit in contract 2 the principal's intention to protect the agents from providing too high contributions does not matter at all. A reason could be that in all periods (see figure 4.1), agents are far away from giving a contribution higher than 60, hence the upper limit is not binding and does not have any impact. By offering contract 3, however, agents seem to agree to the coordination device given by the principal. Their motivation to provide is not reduced due to the feeling being forced to give at least a certain minimum amount, but they recognize that the danger being totally exploited by the other team members is reduced. Furthermore, as the requested contribution of 20 is very close to the Nash equilibrium of 18.75, from the agents' point of view this might be seen as no drastic limitation.

Figure 4.1: Average contributions per period

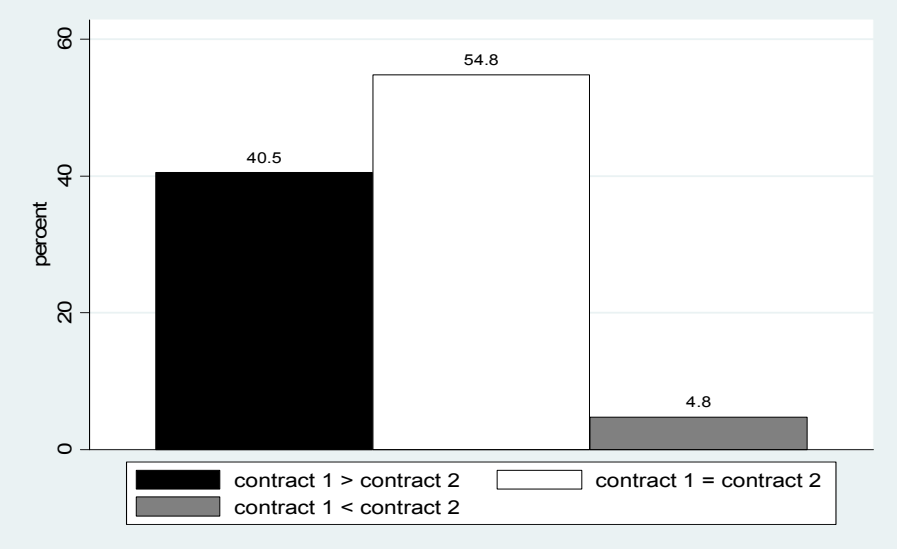


[N = 42 observations per period]

In the next step we look at agents' individual reactions to the three contracts. As in none of the contracts the average contribution

reaches the team optimum, we define the coordination dilemma and free-riding to be higher the lower the average contribution per agent. We call an agent to favor a certain contract if his contribution in this contract exceeds his contributions in the other contracts. Independent of the amount of the contribution we check in which contract an agent's average contribution is highest. First, we concentrate on contract 1 and contract 2. Figure 4.2 shows that more than half of the participants (54.8%) do not differentiate between their contribution in contract 1 and contract 2. The part of agents favoring contract 1 (40.5%) is nearly ten times as high as the part of agents favoring contract 2 (4.8%). However, this difference is statistically not significant (Binomial-test, two-tailed, p=0.109).

Figure 4.2: Agents' individual reaction to contract 1 and contract 2

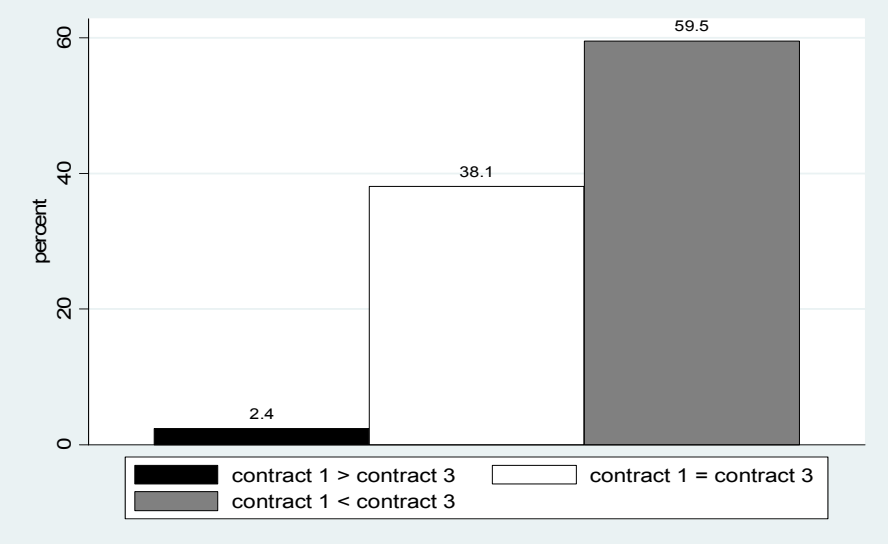


[N = 42 observations]

Looking at the differences between contract 1 and contract 3, the majority of agents favors contract 3 (59.5%). 38.1% give the same contribution in both contracts and only 2.4% of the agents

favor contract 1. The fraction of agents favoring contract 3 is significantly higher than those favoring contract 1 (Binomial-Test, two-tailed, p=0.021).

Figure 4.3: Agents' individual reaction to contract 1 and contract 3



[N = 42 observations]

Result 4.4:

The coordination dilemma is highest in contract 2 and lowest in contract 3. Giving a supporting coordination device to the agents in terms of setting a minimum requested contribution helps the agents to increase their cooperation.

4.5 The Impact of Communication

4.5.1 The Behavioral Impact of Communication

In this section we analyze the impact of communication on agents' behavior in our experiment. We implement a chat-software which allows the agents to communicate about their contribution. The principal is not able to take part in the chat. There is no limitation of time, hence agents can use the chat as long as they want. However, the chat is "cheap talk", i.e. the agents are not bounded to the announcements in the chat. In order to ensure that agents do not try to identify each other and to threaten to do anything if someone is shirking, the chat is observed during the whole experiment. Once an agent has made his contribution decisions for all contracts, he is excluded from the chat.

As the chat sessions do not differ from the sessions without chat with regard to the profit and cost functions we do not expect any behavioral differences between the treatments. If there is an incentive to deviate from any announcements higher than the Nash contribution, due to the cheap talk communication should not have any behavioral impact (Farell 1987, 1993, Rabin 1990). However, lots of studies show that cooperation is positively and robustly affected by the social distance between the participants which in turn can be influenced by communication (Bohnet/Frey 1999, Hoffmann et al. 1996, Sally 1995). Hence, the coordination dilemma in public goods can be reduced even by a non-binding communication (Farell/Gibbons 1989, Farell/Rabin 1996, Isaac/Walker 1988).

Presumption 4.5:
Communication reduces the social distance within teams. We expect to observe higher average contribution rates in each kind of contract.

Furthermore, the question arises if communication changes the agents' perception of the different ranges of contribution in the three contracts. While chatting about the optimal contribution rate, agents might point out the different meanings of the three contracts and create a more sophisticated understanding of the intention of each contract. Nevertheless, as agents just meet once during the experiment and as there is still no chance to commit each other to any contribution the coordination dilemma should be still the same, too.

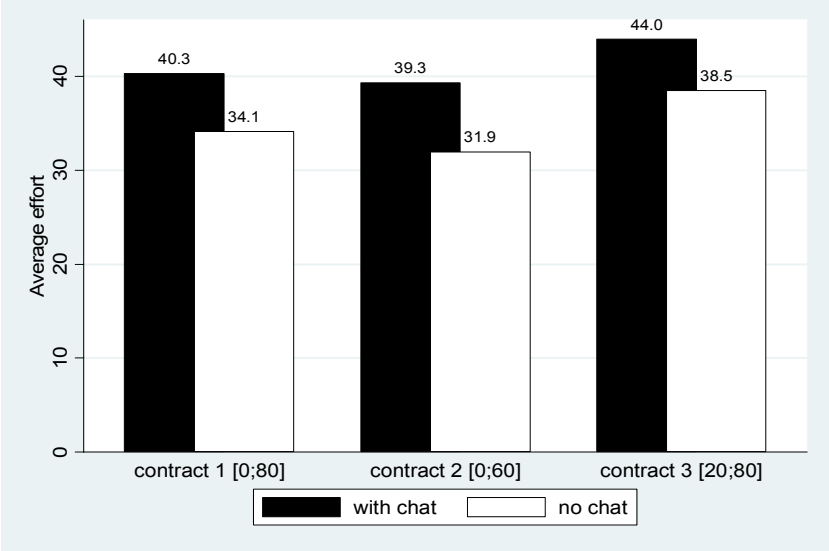
Presumption 4.6:
We expect no change in the rank of the average contribution rates between the three contracts compared to the treatment without chat. Average contribution should still be highest in contract 2 and lowest in contract 3.

4.5.2 Experimental Evidence with Communication

Our data give support to the positive impact of communication on agents' contribution. As shown in figure 4.4, the average

contribution is higher in the treatment with chat[25] as in the treatment without chat.

Figure 4.4: Average contribution per treatment and contract



[N = 294 observations with chat and 147 observations without chat]

For each kind of contract, the differences between the treatment with and without chat are highly statistically significant (Mann-Whitney U-Test, two-tailed, $p<0.001$). But even though the agents' contribution increases with the opportunity to communicate, it still does not reach the team optimum. The chat logs show that agents try to agree on the team optimum, but cannot accomplish it. In about 57% of the chat logs, we observe a clear free-riding behavioral pattern in the corresponding actual contributions. People provide obviously lower contributions as they announce in the chat. Furthermore, in some cases agents try to influence or even to bluff each other. In 35% of the chats, agents give approximately what they

[25] Due to a software problem, we only use the data of the first session with chat for our analysis.

signalize. Most often, they give relatively high contributions. In 8% of the chats, we are not able to interpret the chat logs, because agents do not use the chat to discuss about their contributions. In the following we report a typical chat protocol[26] with the corresponding contributions:

"Agent 1: *60 is the optimum in every case*.
Agent 2: *I think 56 is the optimum (...) for 56 I get 66,64 and for 60 I get 66,5. (...) it should be 56, shouldn't it?*
Agent 1: *And then you come along again and give less* ☹
Agent 3: *How often did you experience that? (...) In my team it always worked.*
Agent 1: *Ok, 56!!!!*"

Table 4.3 lists the actual contributions accompanying this chat log:

Table 4.3: Actually given contributions of team 6, period 4, session 1

	Agent 1	Agent 2	Agent 3
contract 1 [0;80]	**15**	**24**	**40**
contract 2 [0;60]	**15**	**24**	**40**
contract 3 [20;80]	**25**	**24**	**40**

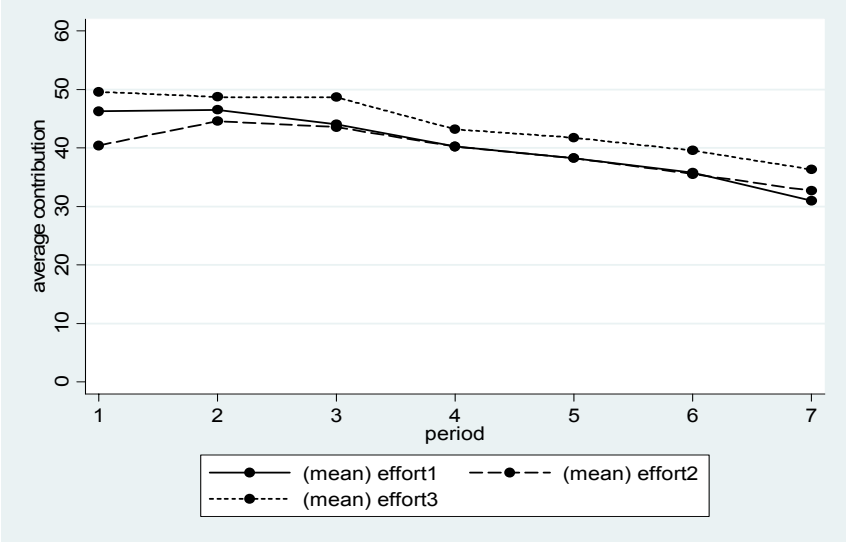
Result 4.5:
Communication increases the average contribution in each kind of contract.

Despite of the communication there is no change in the rank between the three contracts, so average contribution is still highest for the lower bounded contract and still lowest for the upper bounded contract (Wilcoxon signed-rank test, $p<0.001$). Figure 4.5 shows that

[26] Original conversation in the chat protocol was in German, translation by the authors.

the averages in contract 3 are clearly higher than the averages in contract 1 and contract 2 in all periods. But the relation changes if we compare the averages per period between contract 1 and contract 2. The average contribution of contract 1 starts being higher in the beginning of the experiment and falls below the average contribution of contract 2 in the last period. Hence, it might be that the principal's decision to set the upper limit appears in a different light if agents have the opportunity to chat about it. However, the difference in period 7 is statistically not significant.

Figure 4.5: Average contribution per period with chat



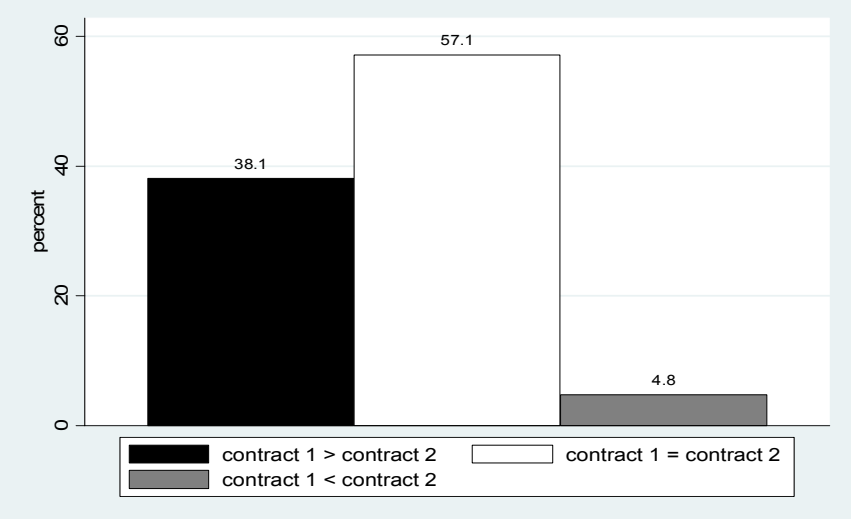
[N = 21 observations per period]

Result 4.6:

We observe no change in the rank of the three contracts due to communication. Average contribution is still highest in contract 3 and lowest in contract 2.

Again, we also look at agents' individual favoritism between the three contracts. According to section 4.3, we check in which contract each agent's average contribution is highest, disregarding the absolute level of the given contribution. Figure 4.6 shows the individual reactions between contract 1 and 2. Compared to figure 4.2 there is hardly a difference between the distributions with chat and without chat (Fisher exact test). Again the majority of agents are indifferent between the two contracts. However, the part of agents who favors contract 1 is significantly higher than the part of agents who favors contract 2 (Binomial-test, two-tailed, p=0.039).

Figure 4.6: Agents' individual reaction to contract 1 and contract 2 with chat

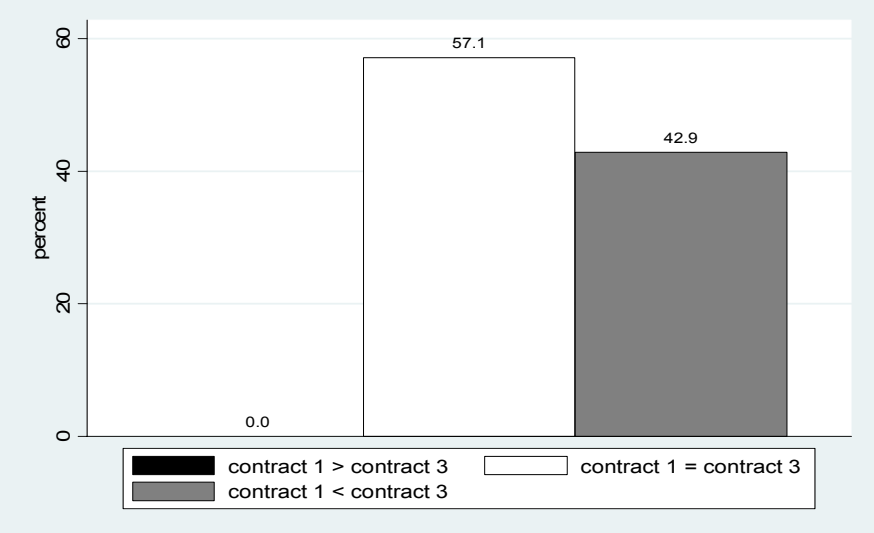


[N = 21 observations]

According to this, figure 4.7 shows the individual reactions between contract 1 and 3. Compared to figure 4.3 the relation changes, because now the majority of agents is indifferent between contract 1 and 3. No agent favors contract 1 and 42.9% favor the

third contract. Obviously, the part of agents favoring contract 3 is significantly higher than those favoring contract 1 (Binomial-test, one-tailed, p=0.063).

Figure 4.7: Agents' individual reaction to contract 1 and contract 3 with chat



[N = 21 observations]

Result 4.7:

Even with communication giving a supporting coordination device in terms of setting a requested minimum amount to the agents seems to increase the average contributions. The coordination dilemma is significantly lower in contract 3 than in contract 1 or 2.

4.6 The Impact of Good and Bad Experiences

Beside the different ranges of contribution and the implementation of the chat, agents' behavior might also be determined by the fact that agents repeatedly play the game for seven periods. Even though due to the matching algorithm the participants do not meet more than once during the experiment there might be some learning behavior. As shown in figures 4.1 and 4.5, in both treatments we observe a declining trend over the seven periods which seems to be even stronger when agents can use the chat. This could be explained by the learning hypothesis. The learning hypothesis means that participants may not immediately understand the incentive of the game to free-ride, but they will learn it after some periods of repetition (Andreoni 1988b). In the beginning there might be more agents who try to agree on a cooperation rate because they understand that this would be beneficial for the whole team. But when they recognize that they fail reaching the team optimum and feel being ripped off by their colleagues, they might try to obtain higher payoffs by giving less in the following period themselves. This means they learn to free-ride due to the bad experiences they have made. According to Fischbacher et al. (2001), these people can be called the "conditional cooperators", i.e. people who would be willing to provide more if others provide more, too. Fischbacher et al. show that only about a third of the subjects are real free-riders giving nothing at all. But about 50% are conditional cooperators whose behavior is strongly influenced by their beliefs about the other people's contribution. Hence, we presume the following about agents' behavior:

Presumption 4.7:

Bad experiences in the past reduce agents' willingness to contribute in the future.

We call an agent having made bad experiences if his contribution in the past exceeds the average contribution of his team members.[27] We concentrate on the average of the two other agents because each agent just gets to know the collective team output and does not get to know the individual contributions of his partners.

To measure the influence of the bad experience we use the ratio between the collective team contribution and each agent's individual contribution per group and per period. If all agents provide the same amount, the ratio reaches a value of 3. If an agent has given more than the others, the ratio would be smaller than 3. If he has given less, the ratio exceeds the value of 3. Hence, we define a dummy-variable "bad experience" that takes the value of 1 if the ratio is smaller than 3.[28] In order to control not only for the influence of the last period but also for previous experiences, we further calculate a moving average of the last three periods. Table 4.4 shows the results of an OLS-regression:

[27] Hence, free-riders most often make good experiences, because they provide less than their team partners.

[28] If an agent has given a contribution of 0, the ratio cannot be calculated. In this case, the dummy "bad experience" is set manually to 0.

Table 4.4: Dependent variable: Agents' contribution in contract 1, 2, 3

	contribution 1	contribution 2	contribution 3
bad experience	20.60*** (2.80)	20.20*** (2.61)	14.94*** (2.40)
treatment	5.73* (3.15)	7.73** (3.20)	5.75** (2.52)
period	yes	yes	yes
const	38.84*** (2.85)	33.20*** (2.44)	41.62*** (2.48)
R-squared	0.26	0.29	0.22
observations	441	441	441

[Note: Robust standard errors clustered for subjects (63 clusters) are in parentheses. Statistical significance at the 1% (5%, 10%) level denoted *** (**, *).]

The experience has a striking influence in all contracts. But in opposite to what we have presumed, having made bad experiences in the past does not reduce agents' contributions, it even raises substantially their willingness to contribute. We try to find a reason for this effect by arguing conversely. Most often, those agents who have reached a high payoff and in line with our definition therefore have made good experiences in the past are free-riders. If the strategy to free-ride has been successful, there is no incentive to change the future strategy.[29] Thus, once an agent has got a high payoff due to free-riding, he is going to free-ride again. As the majority of agents are free-riders in our experiment, it might be that this effect dominates the potential negative reaction of disappointed agents who have made bad experiences in the past.

[29] Remember that the final payoff is determined by one randomly chosen period in the end of the experiment, i.e. players have an incentive to perform best in each period instead of smoothing their payoffs over all periods.

Result 4.8:

Good experiences in the past in sense of having reached a high payoff by providing a low contribution reduce agents' contribution in the future, too. In turn, having made bad experiences in the past seems to increase the agents' willingness to provide a high contribution.

4.7 Discussion

In this study we analyze the impact of different types of coordination devices on agents' behavior in a team situation. We wanted to investigate if a coordination device given in terms of a limited autonomy could be an issue to reduce free-riding in teams. We conducted a simple experimental game with groups of four participants. One principal had to choose one out of three different types of contract to offer to his three agents. The three contracts differing in their limitations were chosen according to the given profit-, cost- and production functions. There are three thresholds we expected to be important in our experimental environment: the Nash predicted contribution ($e_i = 18.75$), the team best contribution ($e_i = 56.25$) and the first best contribution ($e_i = 75$). If agents were selfish and just focused on their own profit, they should choose the contribution in the Nash equilibrium. By choosing the team best contribution the agents maximize the team's collective payoff excluding the principal while by choosing the first best contribution they include the principal's payoff in their calculus. So the principal

can decide either not to restrict the agents' choices at all (contract with range from 0 to 80) or to protect the agents from giving more than the team best contribution (range from 0 to 60) or to force the agents to give a requested minimum amount (range from 20 to 80).

The following observations are the most important among our findings: As expected, agents' reaction varies with regard to the different ranges of contributions. The average contribution is highest if agents are bounded below and lowest if they are bounded above. Agents apparently appreciate the supporting coordination device given by the principal by setting a requested minimum amount because it reduces the danger being totally exploited by the other team members. Thus, agents are willing to give higher contributions themselves in order to reach a higher cooperation rate which is favorable for all participants. Furthermore, the requested minimum amount seems not to be seen as a signal of distrust or selfishness by the principal which might reduce agents' motivation.

To check whether the opportunity to communicate between the agents might have any influence on agents' perception of the principal's contract decision, we implement a chat-software in a further treatment. Now the agents are allowed to communicate about their contribution rate but they are still not able to commit each other to what they have announced. We show that even a non-binding communication in a one-shot game can help to reduce the social distance between the team members and therefore to increase the average given contribution rate. However, we observe no change in the impact of the different ranges of contribution on agents' behavior.

Concluding, our results indicate that agents appreciate getting support to solve their coordination dilemma. Giving a coordination device by setting a requested minimum standard is seen as a helpful

support that encourages the agents to provide higher contributions and that reduces the incentive to free-ride. To go further into that question and in order to see if agents deliberately would commit themselves to a certain contribution to reach a higher cooperation rate maybe one could let the agents endogenously decide between different degrees of autonomy in sense of different ranges of contribution in further treatments.

4.8 Appendix to Chapter 4

Experimental Instructions (Originals were in German)

Periods and Roles

- The experiment consists of seven periods.
- There are players A and players B. Roles are randomly chosen in the beginning and do not change during the experiment.
- In each period, one player A is randomly assigned to three players B. The other participants' identity will be unknown. Groups are changing in each period, but you will never meet twice another participant.

Player A's decision

- Player A has to offer a contract to the players B. He can decide between three different types of contract:
  1. Each player B has to choose an effort out of the range [0; 80].
  2. Each player B has to choose an effort out of the range [0; 60].
  3. Each player B has to choose an effort out of the range [20; 80].
- Effort is costly to the players B (see cost table). The higher the effort, the higher are the costs.

Player B's decision

- Simultaneously to player A's decision, the players B choose an effort for each of the three types of contract.

- So each player B gives three possible efforts within the particular limitations of each contract before he gets to know which type of contract player A actually decided on.

[**Only for the treatment with chat**:

- The players B have the opportunity to discuss with the other players B of their group via a controlled chat software about the effort decisions for the different contract types. It is not allowed to identify each other.
- Once a player B has made his effort decisions, he can no longer participate in the chat in this period, but he can observe the communication between the two remaining players B.]

Publication of decisions

- After each player B has given an individual effort for each of the three contracts, player A's decision will be announced.
- Each player will learn the sum of the efforts the whole group has given for the chosen type of contract. They will not learn the collective efforts of the two other contracts.
- No one (neither player A nor player B) will learn the individual efforts of each player B, so no one knows which effort has been chosen by which player B.

Realization of the earnings

- The collective output of all players B per group is the sum of the three efforts for one contract multiplied by 1,5.

$$collective\ output = Y = 1,5 * \sum_{i=1}^{3} effort_i$$

- This collective output will be split between player A and the players B as follows:
    - Player A's profit is 25% of the collective output:
      $profit\ player\ A = 0,25 * Y$
    - Player B's profit is 25% of the collective output as well but minus his individual costs:
      $profit\ player\ B = 0,25 * Y - costs\ of\ input$

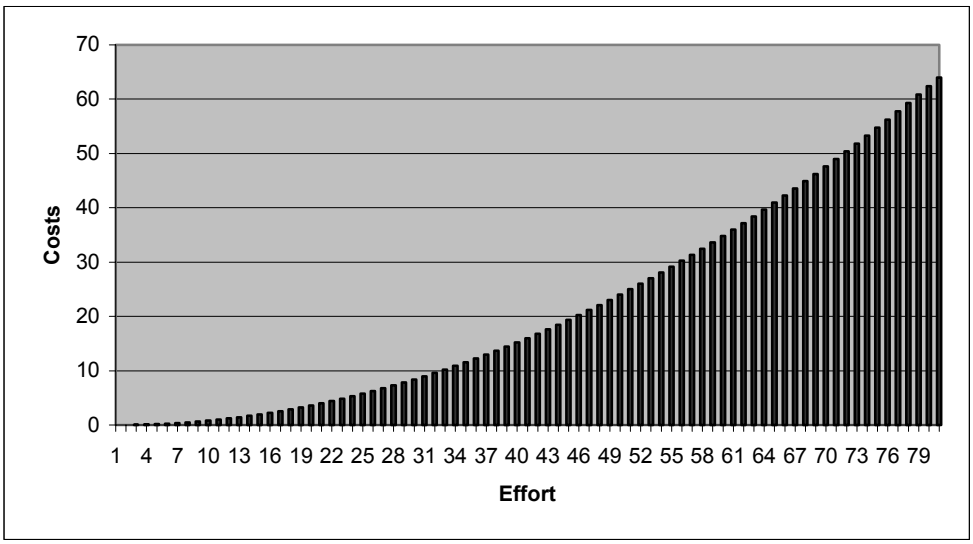
Endowment and payoffs

- In the beginning of each period each player B gets an endowment in the experimental currency "taler" of 35 talers.
- The players A get an endowment of 20 talers.
- In the end of the experiment one of the seven periods is randomly chosen and paid off with an exchange rate of 0,23 € per taler.

Please note:

- No communication at all will be allowed – expect via the experimental software.
- For each played period there will be one record card, so you may have a look at the results of the previous periods
- The payoff will be anonymously. No one will get to know the other participants earnings.
- These instructions will be collected when the experiment is finished.

Cost Table and Chart:



Effort	Costs	Effort	Costs	Effort	Costs	Effort	Costs
0	0	20	4	40	16	60	36
1	0.01	21	4.41	41	16.81	61	37.21
2	0.04	22	4.84	42	17.64	62	38.44
3	0.09	23	5.29	43	18.49	63	39.69
4	0.16	24	5.76	44	19.36	64	40.96
5	0.25	25	6.25	45	20.25	65	42.25
6	0.36	26	6.76	46	21.16	66	43.56
7	0.49	27	7.29	47	22.09	67	44.89
8	0.64	28	7.84	48	23.04	68	46.24
9	0.81	29	8.41	49	24.01	69	47.61
10	1	30	9	50	25	70	49
11	1.21	31	9.61	51	26.01	71	50.41
12	1.44	32	10.24	52	27.04	72	51.84
13	1.69	33	10.89	53	28.09	73	53.29
14	1.96	34	11.56	54	29.16	74	54.76
15	2.25	35	12.25	55	30.25	75	56.25
16	2.56	36	12.96	56	31.36	76	57.76
17	2.89	37	13.69	57	32.49	77	59.29
18	3.24	38	14.44	58	33.64	78	60.84
19	3.61	39	15.21	59	34.81	79	62.41
						80	64

Chapter 5

On the Interaction of Reciprocity and Inequity Aversion in a Real Effort Experiment [30]

5.1 Introduction

While chapters 2, 3 and 4 mainly deal with impact of reciprocity, in this chapter we also incorporate the impact of fairness respectively inequity aversion in our study.

The role of fairness in social interactions has already been elucidated from sociologists and social psychologists in the mid of the twentieth century (e.g. Heider 1958, Homans 1958, Adams 1965, Walster et al. 1973). Economists, too, started to incorporate fairness

[30] This chapter is based on Gerlach (2007c).

considerations in their work only few years later (Selten 1978, Güth 1994). The comparison of wages between workers and the consequences of inequity have been subject to many labor market studies in recent years. Hence, workers' reaction to unequally distributed wages is most often explained by the influence of social preferences like altruism, reciprocity or inequity aversion (e.g. Kahneman et al. 1986, Fehr et al. 1993, Fehr/Gächter 1998, 2000a, Gächter/Fehr 2002, Fehr/Schmidt 2003, Charness 2004).

An important question is whether and under which circumstances people perceive an action as unfair or unkind. Equal payment even for workers on the same hierarchy need not automatically be fair (e.g. Holmström 1982, Erev et al. 1993, Abeler et al. 2006). On the other hand, even though efficiency wage theory is based on the concept of wage comparisons (Akerlof/Yellen 1990), it is a challenge to adjust unequal payment accordingly to different performance standards without unnecessarily discriminating some workers (Clark et al. 2006, Torgler et al. 2006). Thus, it is the ratio between input and outcomes that determines perceived equity (Adams 1963).

But beside the distribution of input and outcomes, perceived equity also depends on the underlying intention of an action which refers to a person's reciprocal preferences. As already discussed comprehensively in the preceding chapters, people who reciprocate are those who react kindly when they are treated kindly themselves respectively those who punish an unkind action. Instead, inequity aversion refers to the consequences of inequity. Inequity averse people dishonor unequal distributed returns.

While the influences of distribution and intention based concerns on agents' behavior are difficult to distinguish from each other empirically, many theoretical approaches just concentrate on

one of the two aspects, distribution or intention. For example, Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) assume that actions are only consequentialistically and not intentionally driven. Hence, players reward kind actions or punish unkind actions only to enhance equity and not to sanction unfair behavior.

On the other side, Rabin (1993) and Dufwenberg and Kirchsteiger (2004) assume that players only reciprocate to reward or punish the intention of an action while the distribution of the outcomes is not seen as a determining factor. Hence, interpersonal comparisons between two outcomes as a driver of players' behavior are neglected. An approach to combine both aspects is given by Falk and Fischbacher (2006) who take into account that the perceived kindness of an action depends on both, the consequences as well as the intention of an action. They assume that reciprocal behavior is mainly driven as an answer to kindness. But if an action is perceived as kind or unkind depends on the consequences as well as on the actor's underlying intention. Hence, this theory can also explain why the same consequences of an action can trigger different reactions.

The contribution of this chapter is to investigate experimentally the interdependencies between the consequences and the employer's intention of unequally paid wages. We try to separate the influences of equity and reciprocity on agents' motivation to exert effort in a lab experiment. Charness (2004) analyzes a similar question. He shows that players' behavior is mainly attributed by both, distribution and intention based concerns. However, in the Charness experiment the employee has to make an abstract effort decision. In contrast, we use a real effort task to simulate more realistically a labor market. Agents have to count the number of "7" in a block of

random numbers. Thus, this task is quite independent of individual abilities.

We conduct a simple experimental game with groups consisting of one principal and two agents. The agents receive a fixed wage which is independent of the effort they exert, but by solving their real effort task they can increase the principal's payoff. In the first treatment, both agents get the same fixed wage. In the second treatment, agents are unequally paid. The (randomly chosen) lower paid agent gets 25% less than the higher paid agent. The important point is that the principal has no power of decision at all in this treatment, because the unequal payment is given exogenously by the experimenters.[31] This point changes in the third treatment where the principal can decide whether he wants to pay his agents equally or unequally keeping the saved residual fixed wage for his own. Note that the principal can just decide whether to give the same high fixed wage to both agents or to give a 25% lower wage to one (again randomly chosen) agent of his group, but he cannot give the same low fixed wage to both agents.

Thus, by analyzing the second treatment where agents are exogenously unequally paid, we can disregard the influence of reciprocity with regard to the principal. If there is any impact of agents' behavior due to the unequal payment, the difference in effort should be influenced by equity concerns. In contrast, any behavioral reaction in the third treatment where the unequal payment is endogenously chosen by the principal could be due to either equity concerns or reciprocity. Hence, differences in agents' behavior between the second and third treatment might be attributed to reciprocal influences.

[31] The assumption of exogenously given unequal wages might be compared with given legal or union-based regulations in a real work environment.

Our results show that neither pure equity concerns nor pure intention based reciprocity can explain how agents response to unequal payment. Agents' behavior seems to be strongly affected by both aspects.

The remainder of this chapter is organized as follows: In section 5.2 we describe our experimental design and procedure. We derive our behavioral predictions in section 5.3 and show our experimental results in section 5.4. The paper concludes in section 5.5.

5.2 Experimental Design and Procedure

The experiment was conducted in October 2006 at the Cologne Laboratory of Experimental Economics at the University of Cologne, Germany. We conducted three different treatments with 60 participants per treatment. None of the participants took part in more than one session. We used the online recruiting-system ORSEE (Greiner 2004) to recruit students from all faculties of the University of Cologne. The experiment was programmed with the software z-tree (Fischbacher 1999). Each session lasted about 45 minutes and students left the laboratory with an average earning of 10.50 €.

In the beginning of the experiment, the participants draw a number between 1 and 30 that indicated their place in the laboratory. Before the experiment started the instructions were distributed and read out and questions were answered. As we used a real effort task, we wanted to get sure that possible differences in agents' effort exertion could not be derived from different talents. Therefore, we adopt the task used in Mohnen et al. (2007). Students had to count

the number of "7" in a block of random numbers. We limited the maximum number of possible counted blocks to 25 in not more than five minutes in order to motivate agents to edit the task faithfully. For each accurately answered block we credited eight cent to the students' account, for each incorrectly answered block they got nothing. To avoid any strategically considerations, the players got no feedback about their performance. Furthermore, in the beginning of the experiment we conducted one period where agents had to solve the task for their own benefit. This period was not part of the main experiment; it was just implemented to be able to compare the employees' effort when they are working for their own benefit or for the employer's benefit. Henceforth, we call this period the "ability checker".

After having played the ability checker, the participants were assigned to the role of a principal or an agent and the main experiment started. We used the descriptions "employer" and "employee"[32] to make participants more sensitive to the labor market context. One employer and two employees were assigned to a group of three. During the whole main experiment which consisted of four periods of five minutes they stayed in the same group constellation and did not change their role. However, players stayed anonymously, hence no one knew with whom he was playing in a group. Before each period started, the fixed wage was credited to the employees' account and each employee got to know his own as well as the other employee's wage. After this, they had to work on exactly the same task as it was given in the ability checker, but now for each accurately answered block we credited eight cent to the employer's account and not to the employees' accounts. Thus, the employees'

[32] As the original instructions are in German, we used the words "Arbeitnehmer" and "Arbeitgeber".

payoff in the main experiment was completely independent of the performance, by solving the real effort task they could just increase the employer's payoff. After five minutes the period was finished. Again, the players got no feedback about their performance. They just received their fixed wage for the next period and the next period started. Note that the fixed wage did not change during the whole experiment but varied between the three treatments, as it will be shown below. After the fourth period the main experiment was finished. Again we conducted an ability checker for each player (employer and employee). As in the ability checker in the first period, for each accurately answered block we credited 8 cent to each player's own account. Afterwards, the participants were asked to answer some questions concerning their motivation to act and the experiment was finished. Each employee's payoff was composed of the result of the accurately answered blocks in the two ability checkers in round 1 and 6 and the fixed wage from round 2 to 5. The employers as well got the result from their accurately answered blocks in round 1 and 6 and the result of the correctly answered blocks of their two employees in round 2 to 5. In addition, each player (employer and employee) got a show-up fee of 2.50 €.

The experimental procedure was the same in all treatments. Hence, the difference between the treatments is given by different fixed wages the employer has to offer to his employees. In the first treatment, the employer starts with an endowment of 16 € that he has to give completely to the employees: 2 € in each of the four periods per employee. Thus, it is common knowledge to all participants that the employer has no power of decision at all and that his payoff solely depends on the employees' work.

In the second treatment, the employer still has nothing to decide, but he starts with an endowment of 14 € instead of 16 €. This

time he has to give unequal wages to his employees, namely a fixed wage of 2 € per period to one employee and a fixed wage of 1.50 € to the other employee. The lower paid employee is randomly chosen in the beginning of the second period and does not change during the four periods of the main experiment.

While in the first and second treatment the equal respectively unequal payment is exogenously given, in the third treatment the employer gets an active part and can decide whether he wants to pay equal or unequal wages to his employees. This decision, however, has to be made just once in the beginning of the experiment and remains constant over all periods. The employer starts with an endowment of 16 €. Either he can give 2 € per period to both of his employees or he gives 2 € to one employee and 1.50 € to the other (again randomly picked) employee. But he is not allowed to give the lower wage of 1.50 € to both employees. Hence, by choosing the unequal payment, the principal keeps the remaining 2 € from his endowment.

In the following, we call the first treatment where all agents are equally paid T(Equal), the second treatment where agents are exogenously unequally paid T(Exogenous) and the third treatment where the principal can decide whether to pay equally or unequally T(Endogenous).

5.3 Behavioral Predictions and Hypotheses

According to standard economic theory, agents are supposed to be selfish and try to maximize their own payoff. As exerting the real effort task in our experiment is boring and therefore costly to the agents and as agents' payoff is independent of their performance in the main experiment, a selfish agent would refrain from counting the "7". Hence, agents would get their fixed wage and the principal would get nothing at all. However, there is substantial evidence suggesting that fairness motives affect the behavior of many people. Concretely, we expect to observe a kind of altruism in T(Equal). Because the principal has no impact on the fixed wage the agents receive, we call those agents who work despite of the independency between their work and their payoff to behave altruistically.

Presumption 5.1:
Even though the employees receive a fixed wage in all treatments, there is a substantial amount of altruistic agents who deliberately solve the real effort task for the employer's benefit.

Now we focus on agents' reaction to the different payment schemes. In T(Equal), both agents receive equal wages, hence there should be no difference in agents' effort exertion for equity concerns[33]. This changes in T(Exogenous), where agents are exogenously unequally paid. As it is not the principal who decides about the imparity, there should be no reciprocal motives to reward or punish the principal's decision. Hence, if there are any differences

[33] We control for differences in the number of correctly counted blocks that are due to differences in agents' ability by comparing the ability checkers.

in the effort compared to the equal payment treatment, this could only be for equity reasons. According to the equity theory (Adams 1963, 1965), equity is said to occur when people perceive that the ratio between their outcome and input is equal to the ratio between outcome and input of the comparison person(s). Hence, regardless of the absolute levels equity depends on the relation between input and output. As in T(Exogenous) one agent per group gets a fixed wage which is 25% below the other agent's fixed wage, we suppose the lower paid agent to feel envy and therefore to spend less effort in order to adjust his ratio. On the other side, we expect no reaction of the higher paid agent. Of course, he should perceive the inequity between the outputs of both agents, too. Bus as this inequity is in favor to him, it might moreover lead to satisfaction instead of dissatisfaction (Pritchard 1969: 209). The idea that people suffer more from inequity that is to their disadvantage is a well known issue (e.g. Loewenstein et al. 1989) and finds also support in the literature concerning the impact of loss aversion (e.g. Tversky/Kahneman 1991). We suppose the higher paid agent not to feel responsible for the wage differential and just to have a feeling of having good luck. Hence, we derive our second presumption:

Presumption 5.2:
We suppose the lower paid employee to exert a lower effort in T(Exogenous) as in T(Equal) and compared to the higher paid employee. We do not expect to observe any differences in the higher paid employee's effort.

In T(Endogenous), the principal can decide if he wants to pay his agents equally or unequally. If the principal prefers the unequal payment keeping the residual fixed wage for his own, this decision

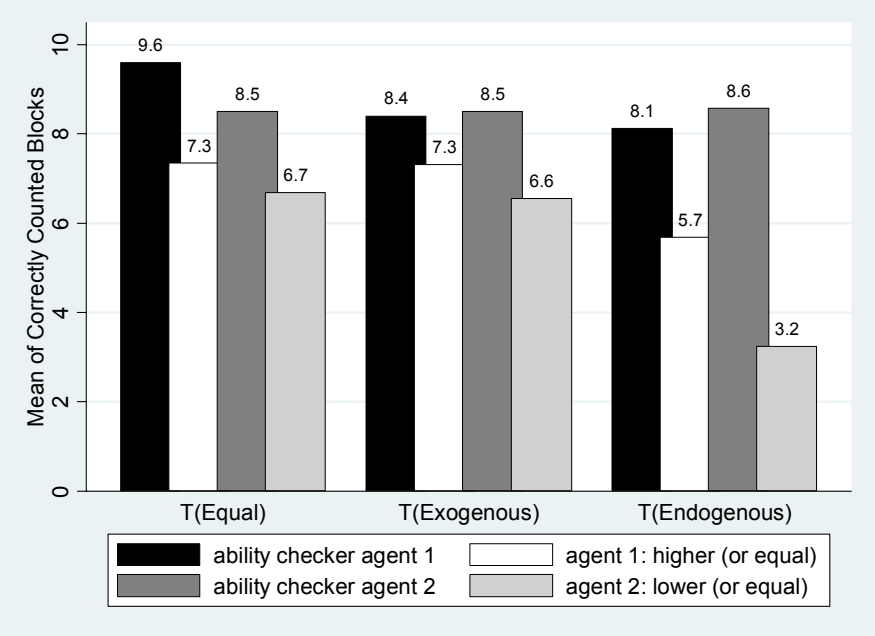
could be perceived unkindly from the agents' point of view because the principal voluntarily discriminates one agent for his own benefit. Hence, in addition to the impact of equity concerns (as predicted above in presumption 5.2), agents might also react reciprocally. Beside of the feeling of envy, the lower paid agent now might also have the need to sanction the principal by exerting less effort. Again, we suppose the higher paid agent to have no feeling of guilt and furthermore to have no need to sanction the principal's unkind decision because the discrimination leads to his satisfaction. But as the principal's decision to offer unequal wages is directed towards both agents, and as the one who earns less is picked randomly, even the higher paid agent might react reciprocally by punishing the principal's unkindness.

Presumption 5.3:
In T(Endogenous), we expect to observe a further loss in the lower paid employee's effort compared to T(Exogenous). Furthermore, we expect to observe a loss in the higher paid employee's effort compared to T(Equal) and T(Exogenous).

5.4 Results

In this section we present our experimental results and discuss possible explanations for the observed behavior. We use the number of the correctly counted blocks as an indicator for each agent's effort. First of all, we show some descriptive details in figure 5.1.

Figure 5.1: Mean of correctly counted blocks



[N = 20 independent observations per agent and per treatment]

The black and dark-gray bars show the average correctly counted blocks (excluding the principals' performance) in the ability checkers in the first and sixth period separated for the two types of employees. Not surprisingly, in all treatments averages are significantly higher in the ability checkers where agents work for their own payoff than in the periods of the main experiment (Wilcoxon signed-rank test, two-tailed, $p<0.001$). But even in the main experiment, agents deliberately work on their real effort task (Wilcoxon signed-rank test, two-tailed, $p<0.001$). In T(Equal), there is only one agent who exerts effort in the ability checkers but not in periods two to five. In T(Exogenous), again only one of the agents refuses to work.[34] In T(Endogenous), there are three agents exerting no effort at all in the main periods but in the ability checkers. Hence,

[34] But this agent does not work at all in the ability checkers, too.

we can confirm presumption 5.1, that most of the agents altruistically exert effort even if it is only for the principal's benefit and not for their own one.

Result 5.1:
Most of the employees behave altruistically. They deliberately exert effort that is only advantage to the employer.

In T(Equal), there is no significant difference in efforts between the two agents (Wilcoxon signed-rank test).[35] This observation corresponds to our expectations, because agents are equally paid and hence there should be no motivational differences for fairness purposes. According to presumption 5.2, we expected to observe a loss in the lower paid agent's effort due to a feeling of envy towards the higher paid agent in T(Exogenous). Interestingly, the data report other behavior. Compared to T(Equal), there is no significant difference in agents' effort exertion, neither for the higher nor for the lower paid agent (Mann-Whitney U-Test). Furthermore, efforts between the higher and lower paid agent in T(Exogenous) do not differ significantly, too.[36] This result contradicts our prediction. It seems that the exogenously given unequal payment does not influence agents' behavior. As mentioned in the previous section, a disadvantaged agent should try to eliminate or reduce the imparity in his ratio between input and outcome compared to the other agent. An issue to reach this objective is to adjust one's own inputs or outcomes. In the present situation, an agent has no chance to change

[35] However, the ability checkers between agent 1 and agent 2 differ slightly significantly (Wilcoxon signed-rank test, two-tailed, p=0.05).

[36] We also observe no differences in the ability checkers between T(Equal) and T(Exogenous) (Mann-Whitney U-Test) or between the agents in T(Exogenous) (Wilcoxon signed-rank test).

his output in the main experiment because he gets the same fixed wage in each period. Hence, an obvious reaction would be to adjust his input which means to exert less costly effort (presumption 5.2). Apparently, this mechanism does not work in this treatment.

But according to Adams, there are several other ways to reduce the inequity. One possible explanation might be that the disadvantaged person cognitively distorts his or the other's input or outcome. This means that the inequity appears in another light. In the context of T(Exogenous) it might be that the lower paid agent does not perceive the imparity between the outcomes as a relevant difference. As the wages are given exogenously, it is only a question of luck to get the higher or the lower wage. Thus, the lower paid agent does not feel any individual disadvantage and therefore the inequity might trigger no change in the agent's behavioral reaction.

Result 5.2:
Unequal wages without any human intervention do not involve a reaction of the disadvantaged employee. Hence, exogenously given inequity is no relevant factor to determine the employees' effort.

Next, we analyze agents' reaction in T(Endogenous), where the principal can decide whether he wants to pay his agents equally or unequally. As predicted in presumption 5.3, we expect that the loss in the lower paid agent's effort should be higher than in T(Exogenous) because in addition to the inequity aversion, agents also might reciprocate to the principal's decision. This time, the data give support to our prediction.[37] Compared to T(Exogenous) as well as to T(Equal), the lower paid agent exerts significantly less effort

[37] Fortunately, most of the principals chose the unequal payment. Only 20% of the principals decided to offer equal wages.

(Mann-Whitney U-Test, $p<0.01$ in both cases). Furthermore, there is a highly significant difference between the higher and lower paid agent in T(Endogenous) (Wilcoxon signed-rank test, two-tailed, $p<0.01$) even though there is no difference in the ability (Wilcoxon signed-rank test). Thus, despite of the identical consequences of the unequal wages in both treatments, in T(Endogenous) inequity matters much more due to the underlying intention of the principal. By deciding to pay the agents unequally and to keep the residual fixed wage for his own, the principal signals his selfish intention which is punished by the disadvantaged agent. On the other side, comparing the lower paid agents' reaction in T(Endogenous) to T(Equal), we observe no significant difference (Mann-Whitney U-Test), so that we might conclude, that the consequences alone cannot explain the behavioral pattern we observe.

Furthermore, differences in the higher paid agent's effort exertion are statistically not significant between all treatments (Mann-Whitney U-Test). However, the higher paid agents' effort in T(Endogenous) is about 20% lower than in the two other treatments. Even though this difference is statistically not significant ($p=0.15$), it seems that because the selfish intention to offer unequal wages to the agents is directed to both agents and not exclusively to one special agent, the unequal payment also influences the higher paid agent.

Result 5.3:

Neither pure consequences nor pure underlying intention of unequal paid wages determines the employees' reaction. It is moreover a combination of both that triggers a person's perception of inequity and thereby his behavioral reaction.

5.5 Conclusion

This study tries to contribute to the investigation of the ambiguous interdependencies between reciprocity and inequity aversion when workers are paid unequally in organizations. We use the advantage of a laboratory experiment to control for the different influences. We conducted a simple experimental game with a real effort task and with groups consisting of one employer and two employees. Different treatments were designed in order to separate the influences of inequity aversion and reciprocity from each other. In the first T(Equal) and second treatment T(Exogenous), the employer has no power of decision at all because the payment schemes are given exogenously by the experimenters. In T(Equal) all employees are equally and in T(Exogenous) they are all unequally paid. By this, we are able to eliminate any reciprocal influences. In contrast to this, in the third treatment T(Endogenous), the employer has to choose whether he wants to pay his employees equally or unequally. Choosing the latter, he can save the residual fixed wage for his own profit, hence the unequal payment is an unkind and selfish action discriminating one of the two employees that might provoke the employees to reciprocate by punishing the employer's unfriendly decision.

We expected to observe a loss in the lower paid agents' effort in T(Exogenous) due to inequity aversion. Furthermore, we expected this loss to be even greater in T(Endogenous) because in addition to the distribution concerned reaction, agents might also sanction the unkind intention of the unequal payment.

Interestingly, these predictions cannot completely be confirmed by the data. In T(Exogenous), we observe no influence at all of the

given inequity. It seems that agents do not feel discriminated due to the externally given imparity and therefore do not have the need to change their ratio between input and outcome (Adams 1963). However, in T(Endogenous), we find support for the assumption of the negative impact of unequal wages on agents' motivation. The lower paid employee exerts significantly less effort compared to the higher paid employee as well as compared to T(Exogenous) and to the equally paid employees in T(Equal). Apparently, the imparity appears in a completely different light if it is given by the employer's decision. Nevertheless, the influence cannot only be attributed to reciprocity. If it was just the principal's underlying intention that triggered the loss in motivation, we should also observe a reduction in the higher paid agent's effort. As the lower paid agent is randomly picked in each group, the principal's decision is directed towards both agents and not to one special agent. Thus, even the favored agent might have a need to punish the principal's unkindness by exerting less effort. But even though there is a decline in the higher paid agents' effort of about 20% compared to T(Endogenous) and T(Exogenous), this difference is statistically not significant. Thus, pure reciprocity cannot explain the loss in agents' motivation, too. Consequently, agents' behavior seems to be driven by a combination of both, intention and distribution based concerns. If one can benefit from someone other's unfriendly action, there hardly seems to be a reason to sanction this action. On the other side, if one is disadvantaged, but this disadvantage occurs randomly, inequity is not perceived as unfair and causes no reduction in motivation.

Concluding, this study makes a contribution to the empirical distinction of the impact of inequity aversion and reciprocity. We show that the behavioral pattern with regard to fairness is neither

only triggered by the consequences of an action nor by the intention. People's behavior is moreover determined by a combination of inequity aversion and reciprocity.

5.6 Appendix to Chapter 5

Experimental Instructions

Welcome to this experiment!

Please read the instructions carefully. In case you have any questions, please raise your hand.
Please pay attention to the following:

- All your decisions during the experiment will be made anonymously.
- You will receive your payment at the end of the experiment. This also will be done anonymously.
- Throughout the whole experiment all communication is strictly forbidden

Course of the experiment:

- The experiment consists of 6 rounds, each lasting for 5 minutes.
- Rounds 1 and 6 differ from rounds 2 to 5.

The course of rounds 1 and 6 is as follows:
You will be asked to count the number of occurrence of the cipher 7 in blocks of random numbers. Please enter the result into the field on your screen and press the OK button..
ATTENTION: There is a maximum of 25 blocks of random numbers for you work with in each round.

Payment in round 1 and 6:

You will receive 8 cents for every correct answer on your account. There will be no credit for incorrect answers, however you will not loose any credit from your account either.

The course of rounds 2 to 5 is as follows:

You will be randomly assigned to two other participants to form a team for the course of the experiment. Each team consists of two employees and one employer. At the beginning of the second round you will see your role as being either an employer or an employee on your screen. Your role assignment will be randomly assigned. The formation of your team stays the same for rounds 2 to 5, but you will not be informed of the identity of the other team members.

Tasks in round 2 to 5:

T(Equal) and T(Exogenous):

- There are no tasks for employers, your screen remains white. After every period you will be notified about your employees' performance and you will have to confirm this by pressing the OK button in order to start the next round.
- As an employee you have to count the number of occurrences of the cipher 7 in blocks of random numbers (same task as in round 1 and 6).

T(Endogenous):

- As an employer you can choose to pay the same wage to both employees or to pay one employee more than the other one. Moreover, you will be notified about your employees' performance and you will have to confirm this by pressing the OK button in order to start the next round.

- As an employee you have to count the number of occurrences of the cipher 7 in blocks of random numbers (same task as in round 1 and 6).

ATTENTION: There is a maximum of 25 blocks of random numbers for you to work with in each round.

Earnings in round 2 to 5:

T(Equal):

- As an employer you will receive 16 Euro at the beginning of the experiment, which will completely be used to pay your employees. You will pay your employees automatically 2 Euro at the beginning of each round.

  For every correct answer of your two employees (counting the amount of 7s) 8 cents will be transferred to your account. You will not receive any credit for incorrect answers by your employees, however there will not be any loss on your account either.
- As the employee you will receive a performance-independent fixed wage of 8 Euro. You will receive a payment of 2 Euro on your account at the beginning of each round.

T(Exogenous):

- As an employer you will receive 14 Euro at the beginning of the experiment, which will completely be used to pay your employees. You will pay your employees automatically at the beginning of each round, one employee receives 2 Euro, the other one 1.50 Euro.

  For every correct answer of your two employees (counting the amount of 7s) 8 cents will be transferred to your account. You will not receive any credit for incorrect answers of your

employees, however there will not be any loss on your account either.

- One employee of the team will receive a performance-independent fixed wage of 8 Euro. He or she will receive a payment of 2 Euro at the beginning of each round. The team's other employee will receive a performance-independent fixed wage of 6 Euro. He or she will receive a payment of 1.50 Euro at the beginning of each round. The employee of the team who gets the lower wage, is determined by the randomly assigned seating in the laboratory. This decision cannot be influenced by the employer.

T(Endogenous):

- As an employer you will receive 16 Euro at the beginning of the experiment to pay your employees. You can either pay both employees 2 Euro per round or you can pay one employee 2 Euro per round and the other employee 1.50 Euro.
  In case you choose the unequal payment, the remaining 2 Euro of the payment at the beginning of the experiment will be transferred to your account.
  For every correct answer of your two employees (counting the amount of 7s) 8 cents will be transferred to your account. You will not receive any credit for incorrect answers by your employees, however there will not be any loss on your account either.
- Depending on the employer's decision each employee may receive a wage of 2 Euro per round or one employee may receive 2 Euro per round while the other employee receives 1.50 Euro per round. The employees receive their wage at the

beginning of each round. The employer's decision will be displayed on your screen.

In case the employer decides to pay unequal wages, the employee who gets the lower wage is determined by the randomly assigned seating in the laboratory. This decision cannot be influenced by the employer. It will be displayed on the employees' screens which employee will receive the lower wage.

At the beginning of rounds 2 to 5 every employee will be notified of how much money is transferred on his/her and the team's other employee's account.

Although your employer gets a feedback about the performance of his/her team's employees, you as an employee will not get any direct feedback about the (correct) amount of number blocks you solved during the previous round.

After the 6th (and last) round you will be notified about your overall payout on your screens. In addition to your overall payout you will receive a show up fee of 2.50 Euro.

After all you will be asked to fill out a short questionnaire about the motives of your decisions.

Please remain seated until your cabin number will be called up. Please bring your cabin number and this instructions sheet with you to the front desk , in order to process the payout of your results.

Thank you very much for your participation!

Chapter 6

The Impact of Revealed Internal Pay Structures in Organizations [38]

6.1 Introduction

Investigating the impact of the revealing of internal pay structures in organizations, this chapter deals with a similar question we studied in chapter 5. We conduct a gift-exchange game using an abstract effort decision. The principal has to offer a wage to the agent who responds by providing effort in terms of choosing a (costly) number out of a range of possible numbers that reduces his outcome.

According to standard economic theory, a completely selfish agent would try to maximize his own payoff and therefore would

[38] This chapter is based on Gerlach (2007d).

give no effort at all after having received his wage. This should be anticipated by the principal who in return should offer no positive wage. However, as we already discussed comprehensively in the preceding chapters of this thesis, human behavior is also driven by other-regarding preferences like reciprocity, fairness or inequity aversion (see e.g. Berg, Dickhaut and McCabe 1995, Fehr et al. 1996, Fehr et al. 1997, Fehr et al. 1998, Fehr/Falk 1999, Gächter/Fehr 2002).

Theoretical explanations for these empirical findings that can be roughly classified into the distributional and the intentional approach all try to explain the impact of social preferences by extending the standard economic utility function by a term that characterizes the specific preferences. However, starting in the 1980s economists already took into account the influence of fairness on market mechanisms without remodeling the standard utility function. Kahneman et al. (1986) show that fair behavior might be counterproductive in maximizing a firm's profit in the short run but leads to higher profits in the long run. Moreover, they show that fairness judgments are strongly influenced by the context of a given situation. This approach has recently been taken over by James Konow (2003) who proposes an integrated justice theory synthesizing previous approaches from different fields of research. One essential point of this theory deals with the impact of information while making one's fairness judgment. An important question that arises is how far fairness judgments might be influenced by additional information.[39]

There are several studies that investigate the impact of additional information between co-workers in an experimental labor

[39] For example, Irlenbusch and Sliwka (2005b) show that reciprocal behavior in a gift-exchange game is much stronger in a more transparent situation.

market. One example is given by Güth et al. (2001) who show that agents' motivation is affected by horizontal influences. Agents who feel disfavored in comparison to their colleagues reduce their efforts. In contrast to this, Charness and Kuhn (2004) find the opposite result. Horizontal effectiveness is quite low. Agents' motivation strongly depends on their own wage but hardly on their colleagues' wages.

The aim of this chapter is to continue the experimental investigation of the influence of transparent internal pay structures on employees' motivation and to check for the controversial results of other studies. How far can employees be motivated or even demoralized by additional information in terms of revealed wages between employees? To answer this question, we conduct a simple gift-exchange game between one principal and three agents. The principal has to offer three (either equal or individual) wages to his agents and the agents in return may give an effort to the principal. In our first treatment, agents are not informed about their co-workers' wages and efforts. In contrast, in our second treatment they are. Hence, we are able to investigate if and how far the additional information might influence agents' effort decisions.

The two mentioned studies of Güth et al. and Charness and Kuhn have in common that they extend the standard model of one principal and one agent by one additional agent, hence they analyze the impact of co-workers' wages between two agents, where the group formation changes after each period. Furthermore, the two agents differ in their productivities so that it can be perceived as absolutely fair if the principal offers different wages to the agents. In both studies, agents are informed about their co-worker's wage

respectively the offered contract by the principal, but they do not get to know the other agent's effort decision.

In contrast, in our study we investigate the relation between one principal and three agents in order to accentuate the horizontal influences between the workers. To increase the comparability between the three workers, they all have the same productivity. Hence, it is easily to determine if the offered wages are fair or not because in the beginning of the experiment the principal should be indifferent between the agents. Apart from that, the group formation stays the same during the whole experiment which lasts about 20 periods. Since we are looking at the relationships between employers and employees, the repeated partner matching seems to be more realistic because labor market relations tend to be long-term relations. A further advantage of the partner matching is that we can use the information about wages and efforts of the preceding period, because workers are informed about their co-workers' wages as well as their effort decisions in the end of each period.

The remainder of this chapter is structured as follows: In Section 6.2 we formulate our hypotheses. Section 6.3 presents the experimental design and procedure. We describe our empirical results in section 6.4 and conclude the paper with a critical discussion in section 6.5.

6.2 Theoretical Predictions

According to standard economic theory, people are supposed to be selfish and profit-maximizing. None of the players would give a

positive wage respectively a positive effort. However, as mentioned in the introduction, human behavior is not only driven by egoistical motives. There is ample evidence that other-regarding preferences play an important role in decision making, too. These preferences can be based either on intentional or distributional concerns. Intention based preferences mean that agents react with regard to the underlying intention of an action. If an action is perceived to be kind, reciprocal people are willing to reward this action by reacting kindly themselves. Thus, if the principal offers a positive wage, a reciprocal agent should answer by giving a positive effort, too. On the other hand, reciprocal people are also willing to punish an unkind action (Dufwenberg/Kirchsteiger 2004). In line with this, we derive our first presumption:

Presumption 6.1:
In both treatments, we expect to observe agents who reciprocate. If the principal gives a positive wage, agents give a positive effort, too. The higher the wage, the higher the effort.

Beside the fact that the principals give positive wages because they might anticipate that agents react reciprocally to generous wages, some principals might react reciprocally themselves. Since the group formation does not change during the whole experiment, we expect the principals' wage decision to depend strongly on the agents' effort decision of the previous period.

Presumption 6.2:
In both treatments, we also expect to observe reciprocal principals who reward generous effort decisions. The higher the given effort, the higher the wage offer of the following period should be.

In the next step, we analyze the impact of distribution based preferences. People who are inequity averse compare their own payoff with other people's payoff and dislike unequally distributed payoffs (see e.g. Akerlof/Yellen 1990, Fehr/Kirchsteiger 1994, Fehr/Schmidt 1999, Bolton/Ockenfels 2000). However, it is not clear which payoff might be the agent's reference point. Therefore, we distinguish between two kinds of influences, vertical and horizontal influences. Vertical inequity aversion concentrates on the distribution of the payoffs between two hierarchy levels, i.e. between the employer and the workers. On the other hand, horizontal inequity aversion refers to the payoff distribution within one hierarchy level, namely between the three workers. Thus, the vertical influences are given in both treatments. If an agent has earned a lower payoff than the principal in one period, he might try to eliminate this lack in the next period by reducing his effort.

Presumption 6.3:
In both treatments, we expect to observe a vertical inequity aversion. Agents whose payoff has been smaller than the principal's payoff in the actual period might reduce their effort in the following period in order to equalize the ratio between the payoffs.

In T(covered) where agents are not informed about their co-workers' wages and efforts, agents can only compare their own payoff with the principal's payoff. Thus, there are only vertical influences. In addition to these vertical influences, in T(transparent) agents also get the information about their co-workers' wages and efforts and therefore about their profits. Hence, agents also face horizontal influences. Apart from the principal's payoff, now they can compare their own payoff with their co-workers' payoff, too. We

expect the agents to aim at equally distributed payoffs within the same hierarchy level, because there are no differences in agents' productivity. Thus, equal payoffs might be perceived to be fair.

Presumption 6.4:
In T(transparent), beside the vertical inequity aversion we also expect to observe horizontal influences. Agents who have earned a lower payoff than their co-workers in one period might reduce their effort in the following period to increase their own payoff.

6.3 Experimental Design and Procedure

The experiment was conducted at the Laboratory of Experimental Economics at the University Bonn. 80 participants (students of all fields of study) were recruited via the online recruiting-system of the University Bonn. The experiment was programmed and conducted with the software z-tree (Fischbacher 1999).

The 80 participants were spread equally over four sessions with two sessions for each treatment. So there were 40 students playing under covered information and 40 students playing under transparent information. Each session consisted of 20 identical periods and lasted between 60 and 90 minutes. The participants were randomly and anonymously organized into groups of four where one team member was randomly assigned as principal and the other team members as agents. In order to avoid any contextual effects, the instructions were neutrally formulated. Principals and agents were

called player A and player B, the wage was called a transfer and the agents' effort was just an input. The formation of the group as well as the assignment to roles did not change during the whole session. None of the participants got to know his team members and no communication were allowed at all unless via the experimental software. Each session consisted of five independent observations.

In the beginning of each session, the students were read the instructions of the experiment in a separate room. After all questions had been answered, each participant threw a number between 1 and 20 that indicated the place in the laboratory and with this the participant's role during the experiment. Each student (principal and agent) started with an endowment of 70 in the experimental currency "Taler". One Taler was converted into Euro in the end of the experiment with an exchange rate of 0.08 €/Taler. In the beginning of each period, the principal had to choose a wage out of the range [0, 1, …, 16 Taler] for each of his three agents, so the maximum amount he could offer in a whole was 48 Taler. Whether the three wages were similar or differed from each other depended on the principal's decision. The wages were subtracted from the principal's total and credited to the agents. Afterwards, the agents had to make an abstract effort decision choosing a number out of the range [0, 1, …, 20]. The higher the number the more Taler were subtracted from the agents total and given to the principal, representing each agent's individual costs of effort. A table and chart with the costs of effort was handed out with the instructions to all participants.[40] After the agents had made their effort decision the profits were realized as follows:

[40] See appendix 6.

- profit (principal) = (effort of all of the three agents) – wages
- profit (agent) = wage – individual costs of effort

While in the first treatment one period now was finished and the next one started immediately, in the second treatment wages and efforts of all agents were made transparent within their group before the next period started, too. Henceforth, we call the first treatment T(covered) and the second treatment T(transparent).

After the 20th period, the students had to answer some questions concerning their motivation to act and the experiment finished with the payout of the earnings.

6.4 Experimental Results

In the first step, we look at some descriptive details of our experimental data. Table 6.1 presents the average efforts and wages:

Table 6.1: Average efforts and wages

	T(covered)	**T(transparent)**
Average effort per period and agent	**6.54**	**6.40**
Average wage per period and agent (in Taler)	**5.33**	**5.42**

The average effort is slightly higher and the average wage slightly lower in T(covered) than in T(transparent). However, both differences are statistically not significant (Mann-Whitney U-Test).

To control for reciprocity in players' preferences, we check the influence of the given wage on agents' effort decision as well as the influence of the effort on the principals' wage offer in the next period. Therefore, we run two simple linear regressions that are shown in tables 6.2 and 6.3:

Table 6.2: Dependent variable: agents' effort decision

	T(covered)	**T(transparent)**
actual wage	0.958 (0.037)***	0.904 (0.047)***
period-dummies	yes	yes
R-squared	0.72	0.71
observations	600	600

[Note: Robust standard errors clustered for groups (10 clusters per treatment) are in parentheses. Statistical significance at the 1% (5%, 10%) level denoted *** (**, *).]

In both treatments, the principals' wage offer has a positive and highly significant influence on agents' effort decision. Thus, we can confirm presumption 6.1, that agents react reciprocally.

Table 6.3: Dependent variable: principals' wage offer

	T(covered)	T(transparent)
effort of previous period	0.754 (0.039)***	0.703 (0.042)***
period-dummies	yes	yes
R-squared	0.79	0.63
observations	570	570

[Note: Robust standard errors clustered for groups (10 clusters per treatment) are in parentheses. Statistical significance at the 1% (5%, 10%) level denoted *** (**, *).]

Table 6.3 shows the influence of agents' effort on the principals' decision making in the following period. In both treatments we find a positive and again highly significant influence on the principals' wage offer.

Result 6.1:

In both treatments, there is a substantial amount of players who behave reciprocally.

Next, we come to the impact of inequity aversion on agents' behavior. Firstly, we analyze the vertical influences. We generate a variable *vertical*, subtracting the agent's profit from the principal's profit[41] of the preceding period.[42] Hence, if the principal has earned more than the agent in the preceding period, *vertical* becomes a positive value, if he has earned less it becomes a negative value.

[41] Vertical = principal's profit – agent's profit

[42] To measure vertical inequity aversion we just consider the principal's profit from the interaction of the corresponding agent, disregarding the principal's profit from the two other agents of his group.

Table 6.4: Dependent variable: agents' effort decision

	T(covered)	T(transparent)
actual wage	0.966 (0.040)***	0.935 (0.049)***
vertical	0.006 (0.033)	0.058 (0.040)
period-dummies	yes	yes
R-squared	0.73	0.74
observations	570	570

[Note: Robust standard errors clustered for groups (10 clusters per treatment) are in parentheses. Statistical significance at the 1% (5%, 10%) level denoted *** (**, *).]

The estimation in table 6.4 shows that with and without wage transparency there is hardly any impact of vertical inequity aversion on the agents' motivation to exert effort.[43] The influence of the difference between the principal's and the agent's profit is neither economically interesting nor statistically significant. This result contradicts our prediction in presumption 6.3 where we expected to observe a kind of vertical inequity aversion in both treatments. A possible explanation might be found in the experimental design. In the first stage of a gift-exchange game, the principal chooses the wage level he wants to offer to the agent. In the second stage, the agent responds to the offered wage by choosing a corresponding effort level. Hence, the agent himself is responsible for the profit of both, principal and agent. If the agent finishes the period with a lower profit than the principal's one, this is just due to his own effort decision. Thus, it is not that surprising that the agents do not respond to unequally distributed payoffs.

[43] This effect has also been shown by Maximiano et al. (2004) who show that while comparing between two hierarchy levels, agents' behavior is mainly influenced by reciprocity instead of inequity aversion or fairness concerns.

Result 6.2:

We do not observe any impact of vertical inequity aversion on agents' behavior.

Next we investigate the horizontal influences between the three workers. As in T(covered) the agents are not informed about their co-workers' wages and efforts, there should be no horizontal influences. In T(transparent), however, we expect to observe some influences due to the given additional information. As done above to measure the vertical inequity aversion, we now generate a variable *horizontal* that measures the differences between the three agents' payoffs. This time, we subtract one agent's profit from the other two agents' average effort per group and per period.[44] Again, we use the data from one period to measure the horizontal inequity aversion in the next period. Table 6.5 shows the estimation of a linear regression:

Table 6.5: Dependent variable: agents' effort decision

	T(covered)	**T(transparent)**
actual wage	0.966 (0.038)***	0.931 (0.048)***
vertical	0.077 (0.055)	0.094 (0.051)
horizontal	- 0.172 (0.133)	- 0.105 (0.056)*
period-dummies	yes	yes
R-squared	0.74	0.74
observations	570	570

[Note: Robust standard errors clustered for groups (10 clusters per treatment) are in parentheses. Statistical significance at the 1% (5%, 10%) level denoted *** (**, *).]

[44] Horizontal = (sum of co-workers' profit)/2 – agent's profit

As expected, the variable *horizontal* has no significant influence in T(covered) where agents do not get the information about their co-workers. However, we find a negative and slightly significant effect in T(transparent). Agents who earned less than their co-workers reduce their effort in the following period.

Result 6.3:
We observe weak horizontal inequity aversion in T(transparent). Agents compare their own profit with their co-workers' profit and slightly reduce their effort if they have earned less before.

6.5 Discussion

In this study we investigate the impact of transparent wage distributions in organizations on workers' motivation in an experimental labor market. We extend the standard one principal-one agent relationship to an one employer-three workers setting in a gift-exchange game. While in one treatment the workers do not get any information about their co-workers, in a second treatment they are informed about their wages and efforts after each period.

Beside reciprocal behavior with regard to the intention that underlies a given wage offer, we also expected to observe agents' behavior to be affected by distributional concerns. These distributional concerns can be divided in vertical and horizontal influences, where the vertical inequity aversion refers to the payoff distribution between two hierarchy levels and the horizontal inequity aversion within one hierarchy level.

Our results show that reciprocity indeed is a major driver of agents' effort decision. However, we find only little evidence for the impact of inequity aversion. While there is no effect of vertical influences in both treatments, we find a weakly significant impact of horizontal influences in T(transparent) where agents are confronted with the additional information about their co-workers' wages and efforts. As this influence is missing in T(covered), we conclude that agents consider the horizontal payoff distribution in their calculus when wages are discovered.

A possible reason for the weak results concerning the vertical influences might be due to some details of our experimental design. As already mentioned, it is in the agents' own responsibility if their profit in one period exceeds the principal's profit or not. Thus, even if an agent has earned less than the principal in one period, there might be no incentive to react to this inequity. This might explain why the coefficient of the vertical inequity aversion is economically very small and statistically not significant. In line with Charness and Kuhn, one can also argue that the agents have to respond to several influences while choosing their effort, namely to the perceived adequacy of their received wage offer and to the profits of the other players. Hence, it might be that distributional influences are suppressed by reciprocal influences. This might even be strengthened by the fact that the distributional concerns refer to the preceding period while the intentional concerns refer to the actual period. The agent is not able to change the principal's and his own past profits, but he can control their actual profits.

Beside these arguments, one must also take into account that social behavior of course might be strongly affected by interpersonal contact which is eliminated in such a laboratory experiment. But

even in the anonymous and context-free situation as given in our experiment we do find the existence of social preferences in the players' behavioral pattern. Hence, due to the practical relevance of this research question it might be worthwhile to conduct further experiments implementing more realistic conditions, such as communication or a real effort task.

6.6 Appendix to Chapter 6

Experimental Instructions

Periods and roles

- The experiment lasts about 20 periods.
- During the experiment, you are part of a group that consists of four members. You will not know the identity of the other group members. The group constellation stays the same during the whole experiment.
- In each group, there are two kinds of players: One player A and three players B. The participants are randomly assigned to roles in the beginning and will not change their role during the experiment.

Course of the period

- **Player A's transfer decision**

  In the beginning of each period, player A offers three transfers to the players B, i.e. player A specifies three amounts in the experimental currency Taler from the range {0, 1, …, 16}. These transfers may but need not to be identical. The transfers are immediately subtracted from the player A's account and credited to the players B.
- **Player B's decision**

  When the transfers have been credited to the players B, each player B chooses a number from the range {0, 1, …, 20} he wants to give to player A. The higher the chosen the number, the higher are player B's individual costs (see table of costs). The according

costs are subtracted from player B's account and the chosen number is credited as Taler to player B.

- **Information (only T(covered))**
  Please note that the players B will not be informed about the other players' B transfers and numbers of their group! The period is now finished and the next one starts.
- **Information (only T(transparent))**
  After all players B have chosen their numbers, all players will get informed about the other players' B transfers and numbers of their group. The period is now finished and the next one starts.

Endowment and payoff

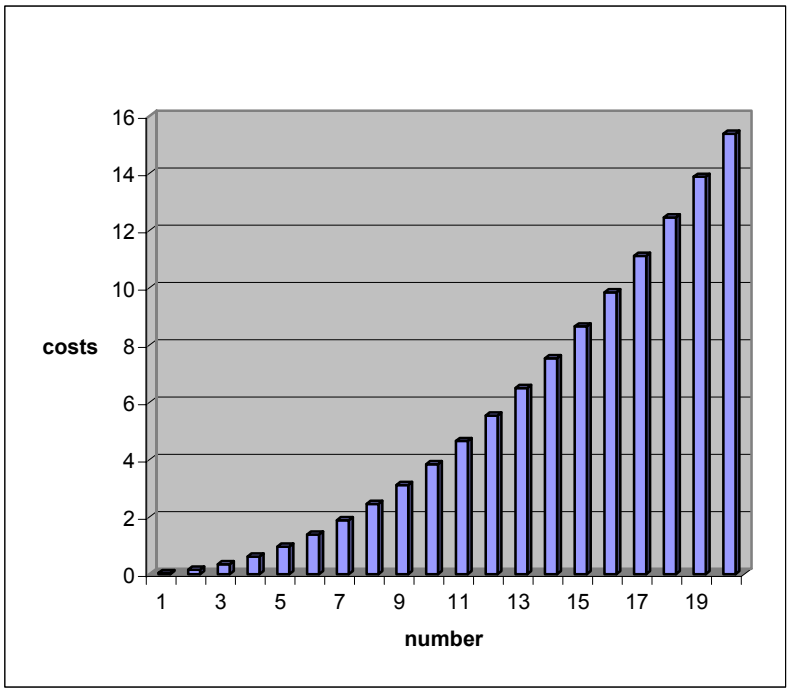
In the beginning of the experiment, each participant gets an endowment in the experimental currency Taler. This endowment of 70 Taler is the same for all players (A and B). In the end of the experiment, the total account will be paid with an exchange rate of 0.08€/Taler to the participants.

Please note:

- No communication will be allowed – except via the experimental software.
- All decision will stay anonymously, i.e. no one gets to know the other participants' identity.
- The payoff, too, will be anonymous, i.e. no participant gets to know the other players' payoffs.
- These instructions will be collected in the end of the experiment.

Good luck!

number		costs
1		0,04
2		0,15
3		0,35
4		0,62
5		0,96
6		1,39
7		1,86
8		2,46
9		3,12
10		3,85
11		4,65
12		5,54
13		6,50
14		7,54
15		8,65
16		9,85
17		11,12
18		12,46
19		13,86
20		15,39



References

Abeler, Johannes, Steffen Altmann, Sebastian Kube and Matthias Wibral (2006): Reciprocity and Payment Schemes: When Equality Is Unfair. *IZA Discussion Paper,* No. 2500.

Acemoglu, Daron and Andrew Newman (2002): The Labor Market and Corporate Structure. *European Economic Review*, 46, 1733-1756.

Adams, J. Stacey (1963): Wage Inequities, Productivity and Work Quality. *Industrial Relations*, 3, 9-16.

Adams, J. Stacey (1965): Inequity in Social Exchange. In: L. Berkowitz (ed.): *Advances in Experimental Social Psychology*, Vol. 2, New York: Academic Press, 1965, 267-299.

Akerlof, George A. (1982): Labor Contracts as Partial Gift-Exchange. *Quarterly Journal of Economics*, 97, 543-569.

Akerlof, George A. and Janet L. Yellen (1990): The Fair Wage – Effort Hypothesis and Unemployment. *Quarterly Journal of Economics*, 105, 255-284.

Amabile, T.M., W. DeJong and M. R. Lepper (1976): Effects of Externally Imposed Deadlines on Subsequent Intrinsic Motivation. *Journal of Personality and Social Psychology*, 34, 92-98.

Andreoni, James (1988a): Privately Provided Goods in a Large Economy: The Limits of Altruism. *Journal of Public Economics*, 35, 57-73.

Andreoni, James (1988b): Why Free Ride? Strategies and Learning in Public Good Experiments. *Journal of Political Economics*, 37, 291-304.

Andreoni, James (1995): Warm-Glow Versus Cold-Prickle: The Effects of Positive and Negative Framing on Cooperation in Experiments. *Quarterly Journal of Economics*, 110(1), 1-22.

Andreoni, James and John H. Miller (1993): Rational Cooperation in the Finitely Repeated Prisoner's Dilemma: Experimental Evidence. *The Economic Journal*, 103, 570-585.

Bénabou, Roland and Jean Tirole (2003): Intrinsic and Extrinsic Motivation. *Review of Economic Studies*, 70, 489-520.

Berg, Joyce, John Dickhaut and Kevin McCabe (1995): Trust, Reciprocity and Social History. *Games and Economic Behavior*, 10, 122-142.

Bewley, Truman F. (2007): Insights Gained from Conversations with Labor Market Decision Makers. *ECB Working Paper Series,* No. 776.

Bohnet, Iris and Bruno S. Frey (1999): Social Distance and Other-Regarding Behavior in Dictator Games: Comment. *American Economic Review*, 89, 335-339.

Bolton, Gary and Axel Ockenfels (2000): ERC – A Theory of Equity, Reciprocity and Competition. *American Economic Review*, 90, 166-193.

Bornstein, Gary and Ilan Yaniv (1998): Individual and Group Behavior in the Ultimatum Game: Are Groups More "Rational" Players? *Experimental Economics*, 1, 101-108.

Brewer, M.B. and R.M. Kramer (1986): Choice Behavior in Social Dilemmas: Effects of Social Identity, Group Size and Decision Framing. *Journal of Personality and Social Psychology*, 50, 543-549.

Brosig, Jeannette (2002): Identifying Cooperative Behavior: Some Experimental Results in a Prisoner's Dilemma Game. *Journal of Economic Behavior and Organization*, 47, 275-290.

Brosig, Jeannette, Axel Ockenfels and Joachim Weimann (2003): The Effect of Communication Media on Cooperation. *German Economic Review*, 4, 217-241.

Brosig, Jeannette, Joachim Weimann and Chun Lei Yang (2004): Communication, Reputation and Punishment in Sequential Bargaining Experiments. *Journal of Institutional and Theoretical Economics*, 160, 576-606.

Bull, Clive, Andrew Schotter and Keith Weigelt (1987): Tournaments and Piece Rates: An Experimental Study. *Journal of Political Economy*, 95(1), 1-33.

Burnham, Terence, Kevin McCabe, and Vernon L. Smith (2000): Friend-or-Foe Priming in an Extensive Form Bargaining Game. *Journal of Economic Behavior and Organization*, 43(1), 57-73.

Camerer, Colin F. (2003): Behavioral Game Theory. Princton: Princeton University Press.

Camerer, Colin F., George Loewenstein and Roberto Weber (1989): The Curse of Knowledge in Economic Setting: An Experimental Analysis. *Journal of Political Economy*, 97, 1232-1255.

Charness, Gary (2004): Attribution and Reciprocity in an Experimental Labor Market. *Journal of Labor Economics,* 22(3), 665-688.

Charness, Gary and Peter Kuhn (2004): Do Co-Workers' Wages Matter? Theory and Evidence on Wage Secrecy, Wage Compression and Effort. *IZA Discussion Paper*, No. 1417.

Clark, Andrew, David Masclet and Marie-Claire Villeval (2006): Effort and Comparison Income: Survey and Experimental Evidence. *GATE Working Paper*, 06-01.

Colman, Andrew M. (1995): Game Theory and its Applications in the Social and Biological Sciences. Oxford, U.K.: Butterworth-Heinemann.

Cookson, R. (2000): Framing Effects in Public Goods Experiments. *Experimental Economics*, 3, 55-79.

Davis, Douglas D. and Charles Holt (1993): Experimental Economics. Princeton, N.J.: Princeton University Press.

Davis, J. H. (1969): Group Performance. Reading, MA. Addison-Wesley.

Deci, Edward L. (1971): The Effects of Externally Mediated Rewards on Intrinsic Motivation. *Journal of Personality and Social Psychology*, 18, 105-115.

Deci, Edward L. (1975): Intrinsic Motivation. New York: Plenum.

Deci, Edward L. (1976): The Hidden Costs of Rewards. *Organizational Dynamics*, 4, 61-72.

Deci, Edward L. and J. Porac (1978): Cognitive Evaluation Theory and the Study of Human Motivation. In: Lepper, M.R. and D. Greene (eds.): *The Hidden Costs of Reward: New Perspectives on the Psychology of Human Motivation.* Lawrence Erlbaum, Hillsdale, NJ, 149-175.

Deci, Edward L., H. Eghrari, B. C. Patrick and D. Leone (1994): Facilitating Internalization: The Self-Determination Theory Perspective. *Journal of Personality*, 62, 119-142.

Deci, Edward L. and Richard M. Ryan (1985): Intrinsic Motivation and Self-Determination in Human Behavior. New York. Plenum.

Deci, Edward L. and Richard M. Ryan (2000): The 'What' and 'Why' of Goal Pursuits: Human Needs and the Self-Determination of Behavior. *Psychological Inquiry*, 11, 227-268.

Deci, Edward L., Richard Koestner and Richard M. Ryan (1999): A Meta-Analytic Review of Experiments Examining the Effects of Extrinsic Rewards on Intrinsic Motivation. *Psychological Bulletin*, 125, 627-668.

Dufwenberg, Martin and Georg Kirchsteiger (2004): A Theory of Sequential Reciprocity. *Games and Economic Behavior*, 47, 268-298.

Erev, Ido, Gary Bornstein and Rachel Galili (1993): Constructive Intergroup Competition as a Solution to the Free Rider Problem: A Field Experiment. *Journal of Experimental Social Psychology*, 29, 463-478.

Falk, Armin and Urs Fischbacher (2006): A Theory of Reciprocity. *Games and Economic Behavior*, 54, 293-315.

Falk, Armin, and Michael Kosfeld (2006): The Hidden Costs of Control. *American Economic Review*, 96(5), 1611-1630.

Farell, Joseph (1987): Cheap Talk, Coordination and Entry. *Rand Journal of Economics*, 18, 34-39.

Farell, Joseph and Robert Gibbons (1989): Cheap Talk Can Matter in Bargaining Games. *Journal of Economic Theory*, 48, 221-237.

Farell, Joseph (1993): Meaning and Credibility in Cheap Talk-Games. *Games and Economic Behavior*, 5, 514-531.

Farell, Joseph and Matthew Rabin (1996): Cheap Talk. *Journal of Economic Perspectives*, 10, 103-118.

Fehr, Ernst and Armin Falk (1999): Wage Rigidity in a Competitive Incomplete Contracts Market. *Journal of Political Economy*, 107, 106-134.

Fehr, Ernst and Urs Fischbacher (2002): Why Social Preferences Matter – The Impact of Non-selfish Motives on Competition and Incentives. *The Economic Journal*, 112, C1-C33.

Fehr, Ernst and Simon Gächter (1998): Reciprocity and Economics: The Economic Implications of Homo Reciprocans. *European Economic Review*, 42, 845-859.

Fehr, Ernst and Simon Gächter (2000a): Fairness and Retaliation: The Economics of Reciprocity. *Journal of Economic Perspectives*, 14, 159-181.

Fehr, Ernst and Simon Gächter (2000b): Cooperation and Punishment in Public Goods Experiments. *American Economic Review*, 90(4), 980-994.

Fehr, Ernst and Simon Gächter (2002): Do Incentive Contracts Crowd Out Voluntary Cooperation? Institute for Empirical Research in Economics, University of Zurich, *IEW Working Paper*, No. 34.

Fehr, Ernst, Simon Gächter and Georg Kirchsteiger (1996): Reciprocal Fairness and Noncompensating Wage Differentials. *Journal of Institutional and Theoretical Economics*, 152(4), 608-640.

Fehr, Ernst, Erich Kirchler, Andreas Weichbold and Simon Gächter (1997): When Social Norms Overpower Competition: Gift Exchange in Experimental Labor Markets. *Journal of Labor Economics*, 16, 324-351.

Fehr, Ernst and Georg Kirchsteiger (1994): Insider Power, Wage Discrimination and Fairness. *Economic Journal*, 104, 571-583.

Fehr, Ernst, Georg Kirchsteiger and Arno Riedl (1993): Does Fairness Prevent Market Clearing? An Experimental Investigation. *Quarterly Journal of Economics*, 108, 437-459.

Fehr, Ernst, Georg Kirchsteiger and Arno Riedl (1998): Gift Exchange and Reciprocity in Competitive Experimental Markets. *European Economic Review*, 42, 1-34.

Fehr, Ernst and Bettina Rockenbach (2003): Detrimental Effects of Sanctions on Human Altruism. *Nature*, 422, 137-140.

Fehr, Ernst and Klaus Schmidt (1999): A Theory of Fairness, Competition and Cooperation. *Quarterly Journal of Economic*, 114, 817-868.

Fehr, Ernst and Klaus Schmidt (2003): Theories of Fairness and Reciprocity – Evidence and Economic Applications. In: Dewatripont, M., L. Hansen and St. Turnovsky, (eds.): *Advances in Economics and Econometrics – 8th World Congress, Econometric Society Monographs*. Cambridge University Press, Cambridge.

Fischbacher, Urs (1999): Z-Tree: Zurich Toolbox for Readymade Economic Experiments – Experimenter's Manual. *IEW Working Paper*, No. 21.

Fischbacher, Urs, Simon Gächter and Ernst Fehr (2001): Are People Conditionally Cooperative? Evidence from a Public Goods Experiment. *Economic Letters*, 71, 397-404.

Frey, Bruno S. (1997a): Not just for the Money. An Economic Theory of Personal Motivation. Cheltenham and Brookfield: Elgar.

Frey, Bruno S. (1997b): Markt und Motivation. Wie Ökonomische Anreize die (Arbeits-)Moral verdrängen. München: Vahlen.

Frey, Bruno S. and R. Jegen (2001): Motivation Crowding Theory: A Survey of Empirical Evidence. *Journal of Economic Surveys*, 15(5), 589-611.

Fleishman, John A. (1988): The Effects of Decision Framing and Other's Behavior on Cooperation in a Social Dilemma. *Journal of Conflict Resolution*, 32, 162-180.

Gächter, Simon and Ernst Fehr (2002): Fairness in the Labour Market – A Survey of Experimental Results. In: Bolle, F. and M. Lehmann-Waffenschmidt (eds.): *Survey in Experimental Economics. Bargaining, Cooperation and Election Stock Markets*. Physica Verlag, 2002.

Gagné, Marylène and Edward L. Deci (2005): Self-Determination Theory and Work Motivation. *Journal of Organizational Behavior*, 26, 331-362.

Geanakoplos, J., D. Pearce and E. Stacchetti (1989): Psychological Games and Sequential Rationality. *Games and Economic Behavior*, 1, 60-79.

Gerlach, Petra (2007a): What's in a Frame? On Demand Effects and Trust in Experimental Studies. University of Cologne, Working Paper. Available at SSRN: http://ssrn.com/abstract=1024476.

Gerlach, Petra (2007b): On the Benefits of Control in Teams. University of Cologne, Working Paper. Available at SSRN: http://ssrn.com/abstract=1024480.

Gerlach, Petra (2007c): On the Interaction of Reciprocity and Inequity Aversion in an Experimental Labor Market Using a Real Effort Task. University of Cologne, Working Paper. Available at SSRN: http://ssrn.com/abstract=1024485.

Gerlach, Petra (2007d): On the Impact of Transparent Wage Distributions and Horizontal Inequity Aversion in an Experimental Labor Market. University of Cologne, Working Paper. Available at SSRN: http://ssrn.com/abstract=1026207.

Gerlach, Petra and Philipe Gerlach (2007): On the Impact of Different Coordination Devices on Team Performance – An Experimental Study. University of Cologne, Working Paper. Available at SSRN: http://ssrn.com/abstract=1025821.

Gibbons, Robert (1997): Incentives and Careers in Organizations. In: Kreps, D. and K. Wallis (eds.): *Advances in Economic Theory and Econometrics*, Vol. II, Cambridge, U.K.: Cambridge University Press.

Greiner, Ben (2004): An Online Recruiting System for Economic Experiments. In: Kremer, Kurt and Volker Macho (eds.): *Forschung und wissenschaftliches Rechnen*, 79-93. GWDG Bericht 63, Goettingen: Gesellschaft für wissenschaftliche Datenverarbeitung.

Güth, Werner (1994): Distributive Justice: A Behavioral Theory and Empirical Evidence. In: H. Brandstätter and Werner Güth (eds.): *Essays on Economic Psychology*, Springer Verlag, 153-175.

Güth, Werner, Manfred Königstein, Judit Kovács and Eniko Zala-Mezõ (2001): Fairness Within Firms: The Case of One Principal and Multiple Agents. *Schmalenbach Business Review*, 53, 82-101.

Harbring, Christine (2006): The Effect of Communication in Incentive Systems – An Experimental Study. *Managerial and Decision Economics*, 27, 333-353.

Heider, Fritz (1958): The Psychology of Interpersonal Relations. New York: Wiley.

Hertwig, Ralph, and Andreas Ortmann (2001): Experimental Practices in Economics. *Behavioral and Brain Sciences*, 24, 383-451.

Hoffmann, Elizabeth, McCabe, Kevin and Vernon Smith (1996): Social Distance and Other-Regarding Behavior in Dictator Games. *American Economic Review*, 86, 653-660.

Hoffmann, Elizabeth, Kevin McCabe, and Vernon L. Smith (2000): The Impact of Exchange Context on the Activation of Equity in Ultimatum Games. *Experimental Economics*, 3, 5-9.

Holmström, Bengt (1982): Moral Hazard in Teams. *Bell Journal of Economics*, 13, 324-340.

Homans, George C. (1958): Social Behavior as Exchange. *American Journal of Sociology*, 63, 597-606.

Irlenbusch, Bernd and Dirk Sliwka (2005a): Incentives, Decision Frames and Motivation Crowding Out – An Experimental Investigation. *IZA Discussion Paper*, No. 1758.

Irlenbusch, Bernd and Dirk Sliwka (2005b): Transparency and Reciprocal Behavior in Employment Relations. *Journal of Economic and Behavioral Organization*, 56, 383-403.

Isaac, R. Mark and James M. Walker (1988): Communication and Free-Riding Behavior: The Voluntary Contribution Mechanism. *Economic Inquiry*, 26, 585-608.

Jackson, Jeffrey M. and Stephen G. Harkins (1985): Equity in Effort: An Explanation of the Social Loafing Effect. *Journal of Personality and Social Psychology*, 49(5), 1199-1206.

Kahneman, D., J. Knetsch and R. Thaler (1986): Fairness as a Constraint on Profit-Seeking: Entitlements in the Market. *American Economic Review*, 76(4), 728-741.

Karau, Steven J. and Kipling D. Williams (1993): Social Loafing: A Meta-Analytic Review and Theoretical Integration. *Journal of Personality and Social Psychology*, 65(4), 681-706.

Kerr, N. L. (1983): Motivation Losses in Small Groups: A Social Dilemma Analysis. *Journal of Personality and Social Psychology*, 45, 819-828.

Kerr, N. L. and and S. Bruun (1983): The Dispensability of Member Effort and Group Motivation Losses: Free Rider Effects. *Journal of Personality and Social Psychology*, 44, 78-94.

Kerr, N. L., G. P. Kramer and R.J. MacCoun (1996)**:** Bias in Judgment: Comparing Individuals and Groups. *Psychological Review*, 103, 687-719.

Kidwell, Roland E. and Nathan Bennett (1993): Employee Propensity to Withhold Effort: A Conceptual Model to Intersect Three Avenues of Research. *Academy of Management Review*, 18(3), 429-453.

Kocher, Martin and Matthias Sutter (2005): The Decision Maker Matters: Individual versus Group Behavior in Experimental Beauty-Contest Games. *Economic Journal*, 115, 200-223.

Kocher, Martin, Sabine Strauß and Matthias Sutter (2006): Individual or Team Decision-Making – Causes and Consequences of Self-Selection. *Games and Economic Behavior*, 56, 259-270.

Kocher, Martin and Matthias Sutter (2007): Individual versus Group Behavior and the Role of the Decision Making Procedure in Gift-Exchange Experiments. *Empirica*, 34, 63-88.

Konow, James (2003): Which is the Fairest One of All? A Positive Analysis of Justice Theories. *Journal of Economic Literature*, 41(4), 1188-1239.

Kugler, Tamar, Gary Bornstein, Martin Kocher and Matthias Sutter (2007): Trust between Individuals and Groups: Groups are less Trusting than Individuals but just as Trustworthy. Forthcoming in: *Journal of Economic Psychology*.

Kunz, A. and D. Pfaff (2002): Agency Theory, Performance Evaluation, and the Hypothetical Construct of Intrinsic Motivation. *Accounting, Economics and Society*, 27, 275-295.

Latané, B., K. Williams and S. Harkins (1979): Many Hands Make Light the Work: The Causes and Consequences of Social Loafing. *Journal of Personality and Social Psychology,* 37, 823-832.

Lazear, Edward (2000): Performance Pay and Productivity. *American Economic Review*, 90(5), 1346-1361.

Lazear, Edward and Sherwin Rosen (1981): Rank Order Tournaments as Optimal Labor Contracts. *Journal of Political Economy*, 89(5), 841-864.

Ledyard, John O. (1995): Public Goods: A Survey of Experimental Research. In: Kagel, John H. and Alvin E. Roth (eds.): *Handbook of Experimental Economics*. Princeton, NJ: Princeton University Press.

Lepper, Mark R. and David Greene (1975): Turning Play into Work: Effects of Adult Surveillance and Extrinsic Rewards on Children's Intrinsic Motivation. *Journal of Personality and Social Psychology*, 31, 479-486.

Lepper, Mark R. and David Greene (1978a): The Hidden Costs of Reward: New Perspectives on Psychology of Human Motivation. Hillsdale, NY: Erlbaum.

Lepper, Mark R. and David Greene (1978b): Overjustification Research and Beyond: Toward a Means-Ends Analysis of Intrinsic and Extrinsic Motivation. In M.R. Lepper and D. Greene (eds.): *The Hidden Costs of Reward: New Perspectives on the Psychology of Human Motivation*, Hillsdale, NY: Erlbaum, 109-148.

Levitt, Steven D. and John A. List (2006): What Do Laboratory Experiments Tell Us About the Real World? University of Chicago and NBER, Working paper.

Loewenstein, George (1999): Experimental Economics from the Vantage-Point of Behavioral Economics. *Economic Journal*, 109(453), 23-34.

Loewenstein, George F., Leigh Thompson and Max H. Bazerman (1989): Social Utility and Decision Making in Interpersonal Contexts. *Journal of Personality and Social Psychology*, 57(3), 426-441.

Maximiano, Sandra, Randolph Sloof and Joep Sonnemans (2007): Gift Exchange in a Multi-Worker Firm. Forthcoming in *Economic Journal*.

Mohnen, Alwine, Kathrin Pokorny and Dirk Sliwka (2007): Transparency, Inequity Aversion, and the Dynamics of Peer Pressure in Teams – Theory and Evidence. University of Cologne, Working Paper.

Nalbantian, Haig R. and Andrew Schotter (1997): Productivity under Group Incentives: An Experimental Study. *American Economic Review*, 87, 314-341.

Paarsch, Harry and Bruce Shearer (2000): Fixed Wages, Piece Rates, and Incentive Effects: Statistical Evidence from Payroll Records. *International Economic Review*, 41(1), 59-92.

Prendergast, Canice (1999): The Provision of Incentives in Firms. *Journal of Economic Literature*, 37(1), 7-63.

Pritchard, Robert D. (1969): Equity Theory: A Review and Critique. *Organizational Behavior and Human Performance*, 4, 176-211.

Rabin, Matthew (1990): Communication between Rational Agents. *Journal of Economic Theory*, 51, 144-170.

Rabin, M. (1993): Incorporating Fairness into Game Theory and Economics. *American Economic Review*, 83, 1281-1302.

Roth, Alvin E. (1995): Bargaining Experiments. In: Kagel, J.H. and Alvin E. Roth (eds.). *The Handbook of Experimental Economics*. Princeton, NJ: Princeton University Press, 253-342.

Rousseau, Denise M., Sim B. Sitkin, Ronald S. Burt and Colin Camerer (1998) : Not So Different After All : A Cross-Discipline View of Trust. *Academy of Management Review*, 23(3), 393-404.

Ryan, Richard M. and Edward L. Deci (2000): Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development and Well-Being. *American Psychologist*, 55, 68-78.

Sally, David (1995): Conversation and Cooperation in Social Dilemmas: A Meta-Analysis of Experiments from 1958 to 1992. *Rationality and Society*, 7, 58-92.

Schnedler, Wendelin and Radovan Vadovic (2007): Legitimacy of Control. University of Heidelberg, Department of Economics, Discussion Paper No. 450.

Selten, Reinhard (1978): The Equity Principle in Economic Behavior. In: H. Gottinger and W. Leinfellner, (eds.): *Decision Theory and Social Ethics; Issues in Social Choice*. Dordrecht: Reifel Pub., 289-301.

Shapiro, Carl and Joseph Stiglitz (1984): Equilibrium Unemployment as a Discipline Device. *American Economic Review*, 74, 433-444.

Sliwka, Dirk (2007): Trust as a Signal of a Social Norm and the Hidden Costs of Incentive Schemes. *American Economic Review*, 97(3), 999-1012.

Smith, Vernon L. (2002): Method in Experiment: Rhetoric and Reality. *Experimental Economics*, 5, 91-110.

Sonnemans, Joep, Arthur Schram and Theo Offerman (1998): Public Good Provision and Public Bad Prevention: The Effect of Framing. *Journal of Economic Behavior and Organization*, 34, 143-161.

Torgler, Benno, Sascha L. Schmidt and Bruno S. Frey (2006): Relative Income Position and Performance: An Empirical Panel Analysis. *IEW Working Paper*, No. 268.

Trivers, Robert L. (1971): The Evolution of Reciprocal Altruism. *Quarterly Review of Biology*, 46, 35-57.

Tversky, Amos and Daniel Kahneman (1981): The Framing of Decisions and the Psychology of Choice. *Science*, 211, 453-458.

Tversky, Amos and Daniel Kahneman (1986): Rational Choice and the Framing of Decisions. *Journal of Business*, 59(4), 251-278.

Tversky, Amos and Daniel Kahneman (1991): Loss Aversion in Riskless Choice: A Reference-Dependent Model. *Quarterly Journal of Economics*, 106(4), 1039-1062.

Walster, Elaine, G. William Walster and Ellen Berscheid (1973): New Directions in Equity Research. *Journal of Personality and Social Psychology*, 25(2), 151-176.

Weimann, Joachim (1994): Individual Behavior in a Free Riding Experiment. *Journal of Public Economics*, 54, 185-200.

Wermke, Matthias, Kathrin Kunkel-Razum and Werner Scholze-Stubenrecht (eds.) (2004): *Duden Band 8 – Das Synonymwörterbuch*. Dudenverlag: Mannheim.

Williams K., S. Harkins and B. Latané (1981): Identifiability as a Deterrent to Social Loafing: Two Cheering Experiments. *Journal of Personality and Social Psychology*, 40, 303-311.

Zuckerman, M., J. Porac, D. Lathia, R. Smith and Edward L. Deci (1978): On the Importance of Self-Determination for Intrinsically Motivated Behavior. *Personality and Social Psychology Bulletin*, 4, 443-446.