Motivating Teammates: The Leader's Choice between Positive and Negative Incentives

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Abstract

Team leaders often provide incentives for cooperation. A challenging question is how different incentive schemes and their actual choice by the leader shape the team's culture and contribute to the team's success. To shed light on this issue we investigate how a leader chooses between rewards or punishment in an experimental team setting and how teammates' contributions are influenced by this choice. Leaders show a clear initial preference for rewards, which diminishes over time in some teams. Leaders who observe more free-riders in their teams tend to switch to punishment incentives. A change from rewards to negative incentives results in an immediate and enduring increase in contributions. On the other hand, contributions show a decreasing trend in teams with a leader who sticks to rewards.

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PsycINFO Classification: 3660

JEL Classification: M52; J53; C92

"The […] most obvious way to bring about cooperation between employees […] is to pay for cooperation or to punish uncooperative behaviour."

Edward P. Lazear[1]

1 Introduction

One of the most prominent responsibilities of a leader in an organisation or a team is to shape its culture (Schein 2004). Culture affects how the everyday business of the team gets done — whether there is shared understanding during meetings, how priorities are set and whether they are uniformly recognised, whether promises that get made are carried out, whether team members agree on how time should be spent, whether voluntary contributions to the team's endeavours are the norm or whether free-riding is the dominant behavioural pattern, and so forth. Schein (2004) argues that "cultures begin with leaders who impose their own values and assumptions on a group" (p. 2).[2] Leaders can shape a team's culture in various ways, for example, by charismatic motivational speeches, by giving an example, or by incentives, i.e., by rewarding desired actions and by punishing unwanted activities. Even the actual choice of an incentive scheme, i.e., whether rewarding or punishing is predominantly performed, shapes the organisational culture. A constant threat of punishment might induce a culture of fear and anxiety while rewards might create a more positive and appreciating atmosphere. On the other hand rewards need constantly be provided if the desired behaviour is exhibited by the team members. This might lead team members to become accustomed to rewards, which can result in a reduction of the motivational power of rewards over time. Additionally, a culture of rewards might even be demotivating if the leader has (unwillingly) forgotten to provide an expected reward or intentionally stops to provide them. In contrast, in a culture of punishment the actual provision of the incentive is not needed if the team members exhibit the desired behaviour. It is only necessary to punish if the actual behaviour falls short of the expectations. Thus, the problems of accustomisation or occasional omission of the incentives appear to be less severe in a culture of punishment.

In the current study, we focus on the leader's choice of incentive schemes to shape a team's culture. In a literature review, Podsakoff (1982) argues that "research on the variables affecting a supervisor's use of rewards and punishment is still in its infancy" (p. 76). With few recent studies on this topic as notable exceptions, his statement is still valid. In this paper

[1] Lazear (1998), pp. 269-270.

[2] Schein (2004) defines culture of a group as "a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems" (p. 17).

we shed light on the following questions: Which incentive scheme do team leaders actually prefer if they can choose between a culture that predominantly relies on rewards and a culture that relies on punishment? How does the leader's choice influence the performance of the teammates? Do the prospects of receiving rewards motivate the teammates more than the threat of punishment? Which of the two schemes induces more cooperation? Which one is more profitable for the team as a whole, the leader, and the other teammates? In how far is the effectiveness of an incentive scheme path-dependant, i.e., how do teammates react if the leader switches from a reward scheme to a punishment scheme and vice versa?

Since these questions need to be answered on an empirical basis and different arrangements cannot easily be controlled for in the field, we approach the topic by means of an experiment. The experimental approach has the decisive advantage that one can control for situational variables in a clean manner and unambiguously observe the chosen actions. We consider a simple model, in which the leader is a *primus inter pares*[3], i.e., she simultaneously contributes to the team's production as the other team members do. Additionally, she is the one who decides on the incentive scheme applicable to the teammates before each phase.[4] The production process of the team is modelled such that from the perspective of an individual member it is beneficial to free-ride, although from the viewpoint of the team as a whole everybody should contribute as much as he can. To overcome this dilemma situation, the leader can administer incentives to individual team members after having observed their individual contributions. For simplicity, we assume that the leader can perfectly monitor the contributions of each team member. Afterwards all team members can observe the contributions of each individual member as well as the individually received incentive tokens. Three phases are played in each team. A phase consists of 10 rounds each with a contribution stage followed by an incentive stage. Before each phase the leader can decide on the type of incentives applicable for the next 10 rounds.

The paper is structured as follows. The next section discusses related studies and how they differ from the present experiment. Section 3 introduces our experimental model and design. Section 4 reports the results. Section 5 concludes with some remarks on implications and suggestions for future research.

[3] In the following we will refer to the other team members as *teammates*.

[4] Alchian and Demsetz (1972) model the leader similarly. In their setting the leader monitors the teammates, as a solution to the free-rider problem in teams. Their team leader, however, is the residual claimant, i.e., he is paid the residual of the team's profit minus the compensation of the teammates.

2 Related Literature

Our work is related to studies dealing with incentives in experimental social dilemmas with a special emphasis on endogenous institution choice. We also refer to potentially detrimental effects of punishment. Additionally, we tackle the leadership literature in economics and psychology separately and distinguish between findings from organisational and social psychology.

Incentives in social dilemma experiments

In our study we allow the leader to choose repeatedly between two incentive schemes, the leader can choose to reward or punish her teammates. While we consider centralised incentive institutions, it has been shown in recent experimental studies that decentralised incentive institutions foster cooperation when they are available in social dilemma situations. Despite the second order public good problem, free-riders are heavily punished and contributors are rewarded (see, e.g., Yamagishi 1986, Ostrom et al. 1992, Fehr and Gächter 2000, Fehr and Falk 2002, Andreoni et al., 2003). In a repeated setting punishment may initially also enhance cooperation even if it is only symbolic although cooperation decreases over time in this case (Masclet et al. 2003). Sefton et al. (2007) find that the contributions may become higher when both, decentralised reward *and* decentralised punishment possibilities are present. Dickinson and Isaac (1998) report that exogenous rewarding of both absolute and relative contributions increases efforts for a joint project. Contributions are highest when rewards are given for high relative contributions, i.e., the contributions are evaluated with respect to the heterogeneous endowments ("abilities") of each member.[5] Dickinson (2001) shows that exogenous penalties tend to be more effective in increasing contributions than prizes are. Güth et al. (2007) investigate an informative setting in which the leader in addition to being able to give an example also has the power to (temporarily) exclude a player from the group. The presence of such an "empowered" leader increases contributions, however, contributions are lower if the leader role is rotated among the group members compared to a situation when the leader is a fixed player. Fixed leaders make less use of the extraction possibility.

The study by Sutter et al. (2008) is quite similar to ours with respect to the contribution mechanism and the endogenous choice of incentives. In their study, all players *vote* on a mechanism before interacting in a repeated public goods setting (the alternatives include peer rewarding, peer punishment or simply no incentives at all). Once a punishment institution is

[5] Sutter (2006) and Irlenbusch and Ruchala (2008) demonstrate that rewards also increase contributions when they are awarded by a deterministic tournament mechanisms.

determined, each player can bilaterally choose to punish each other player. The study documents that participants are quite reluctant to vote for a punishment institution. When the option of institution choice is given repeatedly, Gürerk et al. (2007) find that the punishment institution becomes more and more accepted – possibly because group members have experienced free-riding in the reward institution. In their setting the punishment institution achieves considerably high efficiency in later rounds. Tyran and Feld (2006) show that mild legal sanctions do not necessarily achieve compliance when they are exogenously provided. They are much more effective when they are endogenously self-imposed. In this case people expect others to comply with the law to a larger extent which induces them to do the same. In contrast to these studies in our setting, only one single member – the leader of a team – chooses the incentive scheme and the leader is the only member of the team who is allowed to administer incentives (see Nikiforakis et al., 2007, for another setting with asymmetric sanctioning institutions). Moreover, the leader is not subject to sanctions from other teammates. While in the setting by Sutter et al. (2008) the institution is chosen only once in the beginning, in our setting the leader can change the incentive scheme after some periods. Thus, we focus on incentives that are endogenous and centralised. The leader deliberately administers the incentives and the teammates have no say in how the leader does so – neither can they elect the leader nor can they vote directly on the incentive scheme.

Although incentives have been shown to help inducing desired behaviour, there are also findings of ambivalent effects of incentive systems. Firstly, people seem to be reluctant to opt for negative incentives (see, e.g., Sutter et al. 2008). Additionally, detrimental effects of incentives on cooperation have been documented (for reviews see Deci et al., 1999; Frey and Jegen 2001; Bowles 2008). Detrimental effects of punishment are shown, for example by Gneezy and Rustichini (2000) who report a clever field study that introduces a monetary fine for late-coming parents in day-care centres. Surprisingly as a result the number of late-comers increases. Apparently the fine was considered to be a price for being late. Fehr and Rockenbach (2003) show that if a principal deliberately decide in favour of a punishment incentive scheme, performance of agents is considerably reduced. An analogous but weaker effect of performance crowding out is reported in Fehr and Gächter (2002). They find that even the promise of a performance contingent *reward* of a fixed size may undermine voluntary effort contributions. The results from these studies give the impression that the punishment institution, in particular, is prone to detrimental effects. This might induce a leader to refrain from opting for negative incentives but rather go for the possibility to administer rewards.

Leadership studies in economics

Our study is related to several recent studies by economists on leadership in voluntary contribution settings.[6] A relatively weak form of leadership is present if the leader can make an initial announcement to the group about what amount should be contributed. Houser et al. (2007) study such a setting, in which an elected leader makes a non-binding contribution suggestion. They compare this setting with one in which the announcement does not originate from a human leader but from a computer move. They find that group members' decisions are significantly influenced by human leaders' suggestions while suggestions that do not originate from a human leader have virtually no impact. Their findings indicate that a simple focal point explanation cannot alone explain the effectiveness of leadership. A higher degree of commitment of the leader is analysed in settings in which a leader can *give an example* by actually choosing her contribution first. Her contribution is subsequently revealed to the other group members before they simultaneously decide on their contributions.[7] In such a setting leadership effects can already be observed when leaders have the same information on the environment as the other group members (Moxnes and van der Heijden 2003; van der Heijden and Moxnes 2003; Gächter and Renner 2004; Güth et al. 2007). Moxnes and van der Heijden (2003), for example, find a significant leader effect, i.e., lower contributions, in a public bad game, when the leader chooses first and his choice is visible for the other players. In general these studies find that leaders' and followers' contributions are highly correlated even in one shot games (Gächter and Renner 2004), and that average contributions with a leader are often higher than without leadership. Gächter and Renner (2004) report that in repeated interactions the followers contribute systematically less than the leader. Thus, leaders also reduce their contributions over time, which brings down the team production over time. These findings have partially been attributed to peer-pressure, conformism, and social preferences (Falk and

[6] There is also a modest literature on leadership in coordination games which are characterised by several Nash equilibria – in contrast to voluntary contribution games where players have a dominant strategy to free-ride. Wilson and Rhodes (1997) consider a setting in which a leader can announce her intended action before all group members choose simultaneously. The presence of such a leader tends to increase coordination. Additionally they introduce uncertainty about the leader's payoff structure which considerably reduces the effect of a leader. Asymmetries in payoffs between team members are also considered in Brandts et al. (2006). They find a conformity effect of leadership. A study by Weber et al. (2001) shows that followers misattribute low coordination in a weakest-link game to leader's lack of ability to motivate. Weber (2006) finds evidence that coordinated groups can be grown by starting with small groups and sequentially increasing the group size. Leaders, however, tend to increase the group size too quickly. Coelho and Irlenbusch (2008) analyse a similar setting as Weber (2006) in which the leader cannot only choose the growth path of the group but also can give an example by publicly announcing her actual action before the followers choose.

[7] These studies are closely related to public good experiments in which a sequential structure of private contributions is employed (Weimann 1994, Bardsley 2000, Fischbacher et al. 2001). Potters et al. (2005), e.g., find that contributions in sequential-move public good are larger than those of the simultaneous-move game. A similar experiment is also conducted by Rapoport (1997). For a survey on public good experiments see Ledyard (1995). Positional order effects in common pool resource games are analysed by Budescu et al., (1992, 1995).

Ichino 2003, Huck and Biel 2006, Mohnen et al. forthcoming). Leadership effects can even be stronger if the leader has private information on the potential gains of cooperation which she can signal to the other group members by her contribution (Meidinger and Villeval 2002, Potters et al., 2005; Potters et al. 2007; Levati et al. 2007). Potters et al. (2005) find that the presence of a leader who has discretionary power to determine the shares from the team output improves the team performance compared to a situation in which the team output is split equally among the team members.[8] Apart from the latter paper all these studies do not allow the leader to react directly on the contributions of the teammates with rewards or punishment. Rather they concentrate on allowing the leader to give a (non-binding) recommendation or even an example (which is binding for the leader) on a desired contribution. In our study we investigate the influence of a leader when she repeatedly chooses an incentive scheme and administers rewards and punishment accordingly. To focus on the effect of the incentivising capacity of the leader our design models the leader as a regular team member in all other respects. In particular, the leader does not have superior information about the team's environment compared to the other team members.

Leadership studies in psychology

Leadership is also a natural topic in psychology (for an overview see Messick and Kramer 2005). In recent years *organisational psychologists* have paid particular attention to transactional and transformational leadership styles (Bass 1999, Judge and Piccolo 2004, Yukl 2005). Exhibiting transactional leadership (also called contingent reinforcement style) means that followers agree with, accept, or comply with the leader in exchange for praise, rewards, and resources or the avoidance of disciplinary action. (Charismatic-)transformational leaders inspire and motivate followers in ways that go beyond exchanges and incentives. Bass (1999; p. 21) argues that "the best leaders are both transformational and transactional". Aviolo (1999, p. 37) even suggests that "transactions are the base for transformations". Recent meta-studies on leadership styles seem to support this complimentary view that without the foundation of transactional leadership, transformational effects may not be possible (see e.g., Lowe et al.,

[8] The concepts of "Leading by example" and "Leading by sacrifice" have also been analysed theoretically by Hermalin (1998, 2007). Other recent theoretical studies on leadership include Rotemberg and Saloner (1993, 2000), Blanes i Vidal and Möller (2007), Dewan and Myatt (2007), Ferreira and Rezende (2007), Bolton et al. (2008), Majumdar and Mukand (2008). There are also some recent empirical studies that confirm the importance of leadership with field data. Bertrand and Schoar (2003) demonstrate that CEOs' management style is significantly related to manager fixed effects in performance regressions. Jones and Olken (2005) examine the case of national leaders by tracing linkages between nations' leaders and nations' growth rates. Their results suggest that individual leaders can play crucial roles in shaping the growth of nations. Bennedsen, Pérez-González and Wolfenzon (2007) find evidence in Danish data that the death of a CEO, or a close family member, is strongly correlated with a later decline in firm profitability. Goodall et al. (2008) find a large effect of the coach's 'expert knowledge on the performance of teams in National Basketball Association (NBA).

1996, Judge and Piccolo, 2004, Bono and Judge, 2004). In our study we focus on the pure transactional aspect of leadership, i.e., we allow the leader to exchange positive and negative incentives in return for high or low contributions of the team mates. In our experiment the leader cannot convey any transformational or charismatic attitudes. Thus, we can analyse the pure effect of incentives and we can identify whether different ways of administrating them are more successful, i.e., whether rewarding and punishing in a contingent way induces higher cooperation.

Early experimental studies in *social psychology* deal with the effect of a leader in common-pool-resource dilemmas (Messick et al. 1983, Samuelson et al. 1984, and Samuelson and Messick 1986). Group members can provide a leader with the power to determine the amount to extract. This seems to be especially attractive if the common pool is near depletion. Recently, there has been a revived focus on leadership in social psychology research (for a review, see van Knippenberg et al. 2004). The findings by van Vugt and De Cremer reveal that groups have a general preference to select leaders with a legitimate power base (i.e., democratic, elected, internal leaders). These preferences are particularly pronounced when the identification with the group is high. Tyler (2002), De Cremer and van Knippenberg (2002, 2003), and De Cremer et al. (2005) find that there is a positive effect on contributions if the leader adheres to the principles of procedural fairness. Mulder et al. (2006) demonstrate that participants, who experienced the presence of a incentive system, trust fellow group members less than participants who had not. Incentives also undermine cooperation when trust is initially high. In our study the leader is not elected by the teammates but she is an “internal” member of the team in the sense that she can contribute in the same way as the other teammates. Since we want to focus on the pure effect of incentives in our experiment we refrain from using extra mechanisms that could create higher degrees of identification with the leader or the team.

3 Experimental Design

We model team production in a voluntary contribution setting. A team consists of N members: N-1 teammates and one *team leader*. The role of the *team leader* is randomly assigned to one of the team members. As the teammates the team leader may voluntarily contribute to a team project, but in addition the team leader has the ability to choose an incentive scheme. The team leader chooses between a positive (POS) and a negative (NEG) incentive scheme, which allow her to exert positive and negative incentives, respectively. The chosen scheme is

applied in the subsequent 10 periods.[9] All teammates are informed about the leader's choice. Each period has an identical structure and consists of two stages. In stage 1, the team leader and the teammates simultaneously decide on the effort they contribute to their team's project, which is basically modelled as a voluntary contribution mechanism with a constant marginal productivity $R = 1.6$. Effort per agent is restricted to a maximum of $y = 20$. For simplicity, the costs of effort are assumed to be identical for all agents and equal to 1 for each effort unit, i.e., $c_i(e_i) = e_i$ with $0 \leq e_i \leq y$ for $i = 1, \ldots, N$. If $q > 1$ is the exogenously given revenue for one unit of output, the total profit of the team is given by $q \cdot R \cdot (e_1 + \ldots + e_N)$. Let $0 < \phi < 1$ denote the share of the team's profit that the firm gives to the team as wage. Note that we abstract from modelling the firm explicitly. We assume that the team members apply an equal sharing rule, thus each team member earns $\phi \cdot q \cdot R \cdot (e_1 + \ldots + e_N)/N$. To keep things simple in the experiment, we normalise $\phi \cdot q$ to be equal to 1. If the condition $1 < R < 1/N$ is satisfied, it is individually rational not to contribute to the team's output, although it would be socially optimal to contribute maximal effort.[10]

Depending on the chosen incentive scheme, in stage 2 the leader has the possibility to individually assign positive or negative incentives to each of the teammates. For this purpose, the leader exogenously receives 20 additional tokens – one might think of an extra budget that is given from a higher management level to the team leader for bonus payments or for exerting disciplinary actions. The leader is free to assign any amount of the additional tokens to the teammates and keep the rest as a fringe benefit for the own account. Both positive and negative incentives have a leverage of 1:3, i.e., for each token assigned by the leader, the payoff of the teammate is increased by 3 tokens in POS and decreased by 3 tokens in NEG, respectively. Note that in NEG a teammate may obtain a negative period income if the amount of tokens assigned to this teammate is high enough. At the end of each period, all team members receive feedback on all individual contributions, payoffs and received tokens. The values for the leader and the teammates are indicated separately.

Which incentive schemes should we expect leaders to choose?

A leader with myopic *self-centred preferences*, who is only interested in maximizing his or her monetary payoff, is not likely to engage in costly reward or punishment activities. Thus,

[9] We keep the incentives schemes fixed for 10 periods to resemble the fact that corporate codes of conducts and corporate cultures cannot be changed every day but have to be stuck to for a certain period of time (see Schein, 2004).

[10] See Holmström (1982), for similar approaches to model team production in experiments see Nalbantian and Schotter (1997), Croson (2001), Sutter (2006) and Irlenbusch and Ruchala (2008).

in our setting the leader should be indifferent with respect to both incentive schemes since with both incentive schemes he or she earns (and keeps) the same amount of endowment. However, a leader with self-centred preferences could have a taste for a specific incentive scheme if the leader presumes that the use of incentives may increase teammates' contributions. In this case the leader may profit from the return of the public good. Such a leader would choose NEG if he or she thinks that punishment is a better instrument to increase contributions. The leader would choose POS if he or she thinks that rewards are more effective to promote high contributions.

A leader with *social preferences* does not solely care for the own monetary payoff. For example, an inequity averse player as suggested by Fehr and Schmidt (1999) cares about the inequity between the own and other players' payoffs and receives disutility both from advantageous and disadvantageous inequality. Several researchers have already come up with theoretical explanations why teams, in which members exhibit social preferences, tend to behave more cooperatively (see, e.g., Huck and Biel, forthcoming; Biel 2004; Mohnen et al., 2007). Their explanations are related to the effect of peer pressure which has also been verified empirically (see, e.g., Falk and Ichino, 2003). If negative incentives are available, Fehr and Schmidt (1999) have shown that already a single player with preferences of inequality aversion is able to discipline a whole group of free-riders by a credible threat to punish. Thus, in NEG a leader with a sufficient distaste for disadvantageous inequality in payoffs is able to "enforce" a positive contribution level. In general, this is less likely with positive incentives as they are available in POS (see Sutter et al., 2008; Gürerk et al., 2007). Thus, a leader who dislikes disadvantageous inequality would tend to opt for NEG as an incentive scheme.

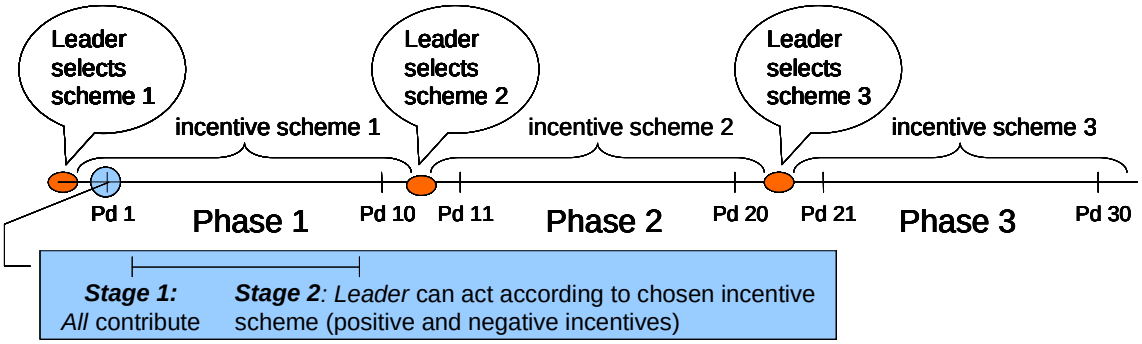
A leader with *efficiency preferences* who is interested in maximizing the total utility of the team might be inclined to choose POS, since in POS the leader has the possibility to increase efficiency unilaterally by allocating rewards. Each reward token assigned generates a net benefit of 2 tokens for the team. Several researchers have shown that efficiency is indeed an important driving force (see, e.g., Charness and Rabin 2002). Huck et al. (2007) provide an illuminating approach on social norms inside the firm by arguing that these tend to develop into the direction to support efficiency.

Experimental Implementation

Our experiment considers teams of $N = 6$ players, with one team leader and five teammates each. Thus, the marginal per capita return (MPCR) a in our setting amounts to

$a = R/N = 1.6/6$, which lies between 1/6 and 1. In a given team we study three phases with T = 10 periods each. Before the first period of each phase the leader decides on the incentive scheme that will rule the next 10 consecutive periods. The setup of the experiment is common information among all players, i.e., all players are informed about the total number of sequences at the beginning of the experiment. Figure 1 visualises the sequence of the experiment.

Figure 1: The sequence of actions in the experiment



120 students from the University of Erfurt were randomly allocated to 20 experimental teams of six subjects each, i.e., our data base consists of 20 independent observations. The instructions[11] were framed in a neutral language. We labelled team leaders as "type *A*" players and the teammates as "type *B*" players. We did not speak of rewards or punishment. Instead, we used the terms positive and negative tokens assigned by the type *A* player to the type *B* players. A session lasted for approximately 90 minutes and average earnings were about 15 Euros.

4 Results

In this section we report our experimental findings. We first look at the overall contributions and payoffs and continue by investigating the leaders' incentive scheme choices and their consequences in contributions. All reported non-parametric statistical tests (Mann-Whitney U-tests for independent samples and Wilcoxon matched-pairs signed-ranks tests for dependent samples) are based on averages over independent observations. Reported significance levels are two-tailed.

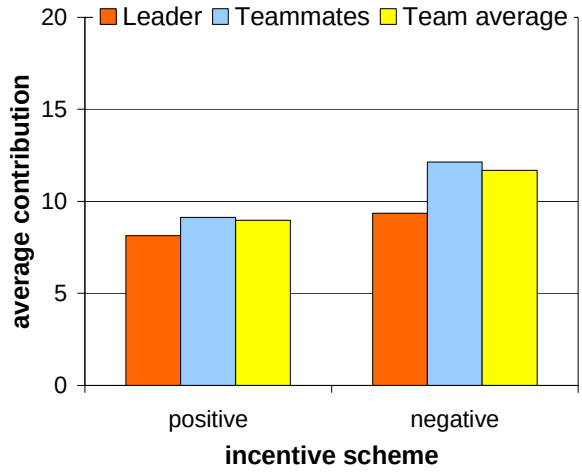
[11] A translation of the instruction sheet is given in Appendix. Original instructions were written in German. They are available upon request from the authors.

4.1 Overall contributions, payoffs, and efficiency

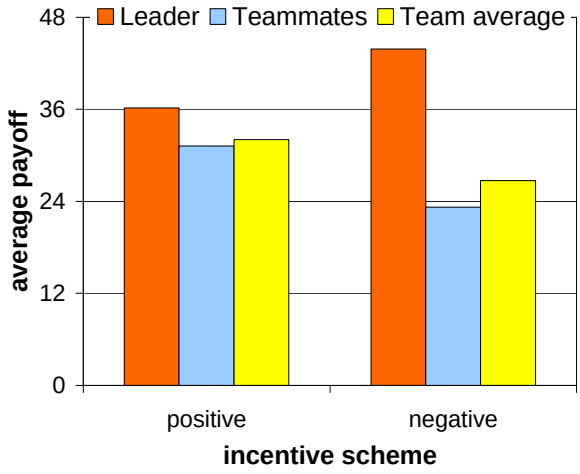
To gain a first impression whether and if so how the different incentive schemes influence subjects' behaviour, we study the contributions and payoffs under each incentive scheme, irrespective of the phase when it is chosen. Panel a of figure 2 shows that averaged over all phases, team contributions are higher under NEG than under POS (p = 0.031).[12] This is also true if one considers the contributions of leaders (p = 0.094) and teammates (p = 0.080) separately. Within an incentive scheme, however, the contributions of teammates and leaders are not significantly different.

Figure 2: Overall contributions and payoffs dependent on incentive scheme and type

a) Average contributions



b) Average payoffs



Although contributions are higher in NEG than in POS overall payoffs are higher in POS than in NEG (p = 0.000) as shown in panel b of figure 2. This is not completely surprising, given the fact that positive tokens sent by the leaders are tripled and thereby increase overall efficiency. When comparing the payoffs of both types of players, we identify an interesting difference: teammates' earnings are higher in POS than in NEG (p = 0.000), whereas leaders earn slightly more in NEG than in POS (p = 0.097). Thus team leaders who are primarily interested in their own payoff should choose NEG, whereas team leaders which strive for increasing efficiency should choose POS. In both schemes, leaders' payoffs are significantly

[12] This result is different than what Sefton et al. (2007) report. They do not find a significant difference in contributions between their "sanction" (i.e., punishment) and "reward" treatments. This could be due to the fact that in Sefton et al. the "leverage" for punishment as well as for rewards was 1:1. This means for each money unit invested in incentives the earnings of the recipient of the incentives decreases or increases exactly by one money unit. In our design, the leverage of incentives is 1:3. This increases the incentive power considerably.

higher than teammates' payoffs. This is true for POS (p = 0.001) as well as for NEG (p = 0.000). However, the differences between the payoffs are less pronounced in POS.

We measure efficiency as the relation between the possible maximum payoff a team can obtain and the payoff a team actually achieves in the experiment. In both settings, it would be efficient if all team members contribute their whole endowment. As already argued above, in POS, it is socially optimal if the leader allocates all reward tokens to the teammates, since every token sent by the leader increases the team's net payoff by two additional tokens. In NEG, however, it is socially optimal when the team leader refrains from assigning any tokens to the teammates, since each token in total reduces the team payoff by four tokens. Averaged over all three phases, in NEG, teams obtain 72.7% of the maximum possible payoff, whereas in POS teams manage to obtain 76.0% of the maximum possible payoff. Thus, both incentive schemes do not differ significantly from each other in terms of efficiency achieved (p = 0.473).

4.2 Leaders' incentive scheme choice behaviour

In the initial phase the leader's choice is surprisingly clear: 19 out of 20 team leaders opt for POS whereas only one leader prefers NEG. A binomial test rejects that the observed distribution of choices could come about by chance (p = 0.000). Hence, initially, leaders are clearly reluctant to adapt negative incentives for their teams[13]. In phase 2, 11 leaders stick to POS, whereas eight leaders switch from POS to NEG. The single team leader who initially chooses NEG switches to POS after the first phase. Thus, in phase 2, the majority of the leaders (60%) again opt for rewards. In the last phase of the experiment, 5 of the 8 leaders who choose NEG in phase 2 remain in NEG. Three leaders switch from NEG to POS. Four of the 11 leaders, who choose POS twice, switch to NEG in phase 3 while seven leaders choose POS three times in a row. Hence, also in the last phase, the majority of leaders (55%) opt for POS. However, the number of leaders who choose NEG increases from phase to phase.

What influences a leader's decision to either stick to the incentive scheme or to change it?

When choosing the incentive scheme leaders may just flip a coin and randomly decide which scheme to apply. Or they may simply stick to one choice or alternate between both schemes. The first two rules are completely history independent, while the latter rule refers to the previously chosen scheme, but not to its performance. Alternatively a leader's choice of the current incentive scheme may be influenced by the performance of the previous incentive

[13] This observation is in line with the results of Gürerk et al. (2006) and Sutter et al. (2008).

scheme. We investigate the question whether and if so how leaders conduct a performance dependent choice by evaluating the influence of various performance characteristics on the likelihood to switch from POS in phase 1 to NEG in phase 2. The phase 1 performance characteristics we consider are the average contributions and their variance, the average team leaders' payoffs, the average teammates' payoffs, and their variance. We compare the 11 groups that chose POS both in phase 1 and phase 2 to the 8 groups that started in POS and switched to NEG in phase 2.

Contributions: While average contributions in phase 1 are not significantly different between teams switching to NEG and those remaining in POS in phase 2 ($p = 0.600$), teams whose leaders switch from POS to NEG have significantly more ($p = 0.032$) contributions of zero among the teammates (on average 16.6%) than teams in which the leader also chooses POS in phase 2 (on average 4.2%). Moreover, in teams where leaders change to NEG, the variance in contributions increases significantly in the second half of phase 1 ($p = 0.027$) compared to the first half of phase 1. In teams who stick to POS the increase in variance is not significant ($p = 0.139$).[14]

End behaviour in phase 1: Teams with leaders changing from POS to NEG in phase 2 exhibit a sharp decrease of teammates' contributions in the last period of phase 1. In period 10 the contributions decrease on average by 16.1% compared to periods 7-9. On the other hand, in teams whose leaders stick to POS on average contributions even *increase* in the last period by 5.9% ($p = 0.129$).

Payoffs: Average leaders' payoffs ($p = 0.888$) as well as average teammates' payoffs ($p = 0.778$) in phase 1 are not significantly different between teams switching to NEG and those remaining in POS. However, in the second half of phase 1, the increase in average variance is significantly higher ($p = 0.062$) in teams in which the leader switches than in teams that remain in POS.

What is the impact of changing the incentive scheme on team performance? In the following section we first analyse the immediate impact of switching from POS to NEG. In a second step we investigate whether the differences in contributions after a switch are just a restart effect or whether they are permanent.

Does switching from POS to NEG have an immediate effect on contributions?

[14] The results are qualitatively not different if we look at teammates and leaders separately.

To answer this question, we calculate the difference between the average contributions at the start of phase 2 (periods 11 and 12) and the end of phase 1 (periods 9 and 10). In any case one could expect occurrences of restart effects; however, it is unclear whether such effects are of different sizes depending on the institution in phase 2. It turns out that when remaining in POS 8 out of 11 teams increase their contributions while when switching to NEG 6 out of 8 raise their contributions. The average increase when switching to NEG (+60.4%) is significantly higher (p = 0.002) than the average increase when remaining in POS (+13.6%). Thus, in both cases we observe versions of a restart effect. However, the increase in NEG is higher than the increase in POS. Hence, a change from POS to NEG in phase 2 causes an immediate increase in contributions while remaining in POS does not induce such an increase in contributions. This pattern seems to be stable over the phases. Four out of the 11 leaders who choose POS twice decide to change to NEG in phase 3. Again the contributions increase immediately in NEG in phase 3. Compared to the last two periods of phase 2 in POS, contributions in NEG in the first two periods of phase 3 increase (+28.2%) whereas contributions in POS even decrease (-7.4%). This difference is significant (p = 0.024). Is the increase in NEG just a stronger restart effect or does it induce a sustainable change of contributions?

Does switching from POS to NEG have a "long run" effect on contributions?

We investigate the sustainability in contributions when the incentive scheme is changed from POS to NEG by comparing average contributions before the change to the average contributions after the change. Considering the change from phase 1 to phase 2, and from phase 2 to phase 3, a total of 12 teams change from POS to NEG. In 10 of these teams, average contributions increase whereas in two of them contributions decrease. On average, contributions rise from 9.0 to 11.1 tokens after the change of the incentive scheme (p = 0.064). Interestingly, *both* leaders and teammates increase their contributions after a change to NEG. On average, leaders' contributions rise from 7.9 to 9.2 units (p = 0.311) and 8 of the 12 leaders contribute more after a change to NEG. The increase in teammates' contributions is even larger from 9.2 to 11.3 units (p = 0.064).

There is no significant change in average contributions (over phases) when groups choose POS both in phase 1 and phase 2 (9.2 tokens in phase 1 and 10.0 tokens in phase 2, p = 0.399) and the trend in contributions from phase 2 to phase 3 is even negative for groups that choose POS in all three phases (10.6 tokens in phase 2 and 8.6 tokens in phase 3, p = 0.078). The latter is mainly due to the significant decrease in teammates' contributions in phase 3 (from

10.7 in phase 2 to 8.5 tokens in phase 3, $p = 0.078$). Leaders' contributions also tend to decrease (from 9.9 to 9.1 tokens, $p = 0.375$).

The above analysis suggests that team leaders choose the incentive schemes depending on previous performance. Therefore, we continue our analysis with a path-dependent analysis of contributions and payoffs. Our experimental setup asks leaders to choose one of the two incentive schemes at the beginning of each of the three phases. This allows us to analyse contributions and payoffs dependent on the chosen sequence of incentive schemes by leaders and incentive scheme choices dependent on teammates' behaviour. Since there are two incentive schemes and three phases, there are 8 possible "paths" that can be chosen. In the experiment, we actually observe 5 different paths, which we will analyse in more detail.

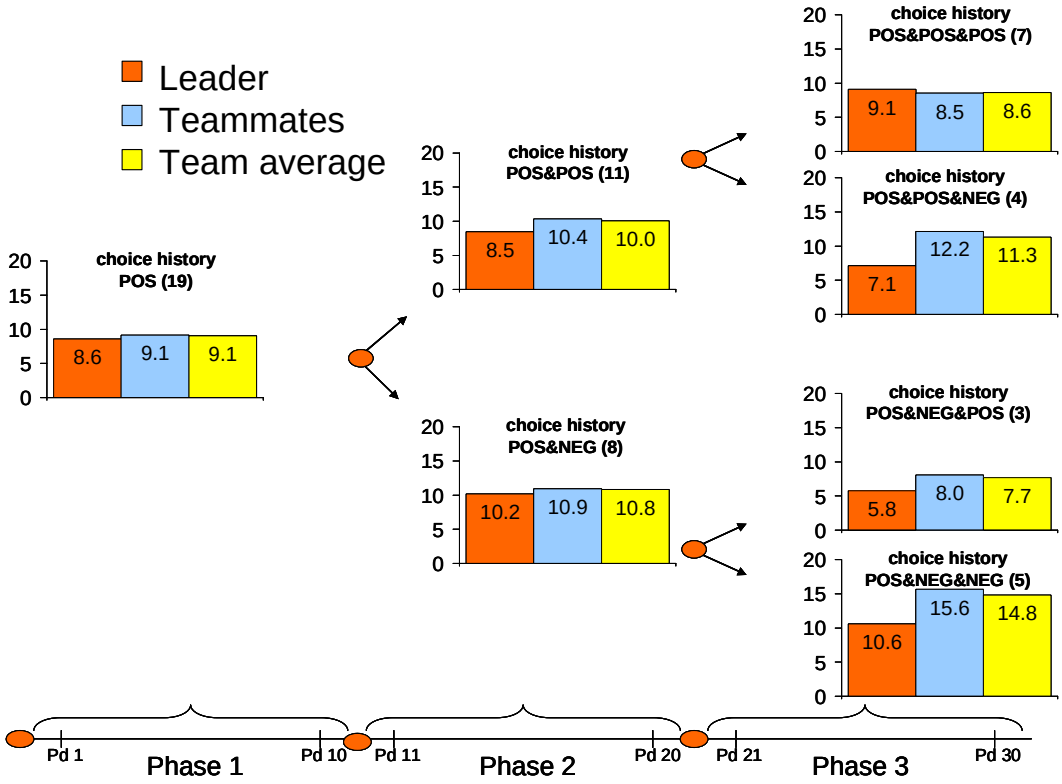
4.3 Path-dependent analysis of contributions and payoffs

Path-dependent analysis of contributions

In the experiment we observe all possible four paths beginning with POS in the initial phase, i.e., POS&POS&POS, POS&POS&NEG, POS&NEG&POS and POS&NEG&NEG. In contrast, we observe only one path beginning with NEG (NEG&POS&POS). Because the path starting with NEG is just a single observation, the following analysis will focus on the four paths beginning with POS in phase 1. Figure 3 visualises these four paths with the path-dependent contributions in the different phases separated for leaders and teammates as well as averaged over the two types of players. The numbers in brackets indicate the number of observations for each path.

We observe that in phase 2 and in phase 3 contributions are higher in NEG than in POS. The highest team contributions (14.8 tokens) are obtained in the last phase in POS&NEG&NEG. Leaders who choose this path as well as their teammates contribute the highest amounts observed in the experiment. In contrast, the lowest contributions are observed in the last phase in POS&NEG&POS (7.7 tokens). It is interesting that this is the only path with a re-change to an incentive scheme chosen in the past, i.e., from POS to NEG in phase 2 and back again to POS in phase 3. Here, we observe the lowest contributions of leaders as well as of teammates. The decrease in contributions in the last phase of this path could be due to a loss of trust since in this path leaders choose NEG after they have chosen POS before. Contributions are most egalitarian in path POS&POS&POS where the leaders stick to POS throughout the experiment.

Figure 3: Path-dependent contributions in different phases



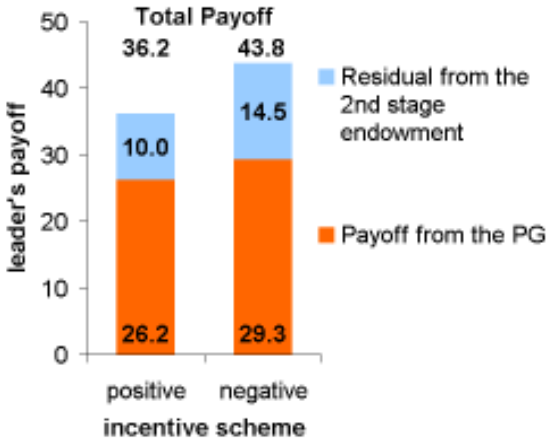
In the third phase, the highest contributions are made in POS&NEG&NEG. This is also true when we look at leaders and teammates separately. The second highest contributions are found in POS&POS&NEG, i.e., the highest contributions "on the long run" are observed in paths ending with NEG. Indeed, teams experiencing NEG in phase 3 contribute significantly more than teams experiencing POS in phase 3 ($p = 0.024$).

Path-dependent analysis of payoffs

As figure 4 shows, on average leaders obtain higher payoffs in NEG than in POS. Leaders' returns from the team production are higher in NEG (29.3) than in POS (26.2) in essence because average contributions – by leaders *and* by teammates – are higher in NEG. Moreover, in stage 2 leaders spend less on negative incentives in NEG (20.0 – 14.5 = 5.5) than they spend on the positive incentives in POS (20.0 – 10.0 = 10.0). Also teammates' average payoffs from the team production stage are higher in NEG (26.5) than in POS (25.2). However, in stage 2, teammates in NEG experience a decrease in payoffs (–3.3) due to received negative tokens, while their payoff increases in POS due to the received positive tokens (6.0). The net effect from both stages is that teammates earn less in NEG (23.2) than in POS (19.2), although contributions are higher in NEG.

Figure 4: Composition of payoffs

a) composition of leaders' payoff



b) composition of teammates' payoffs

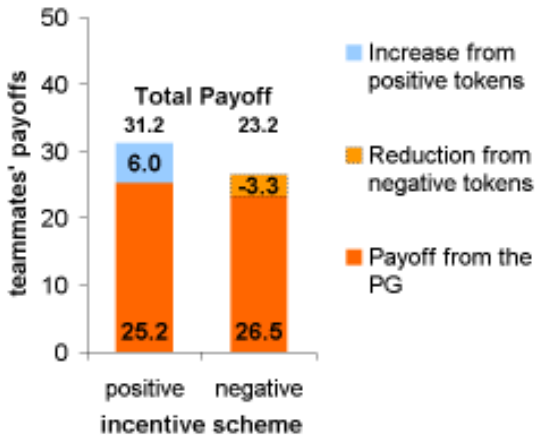
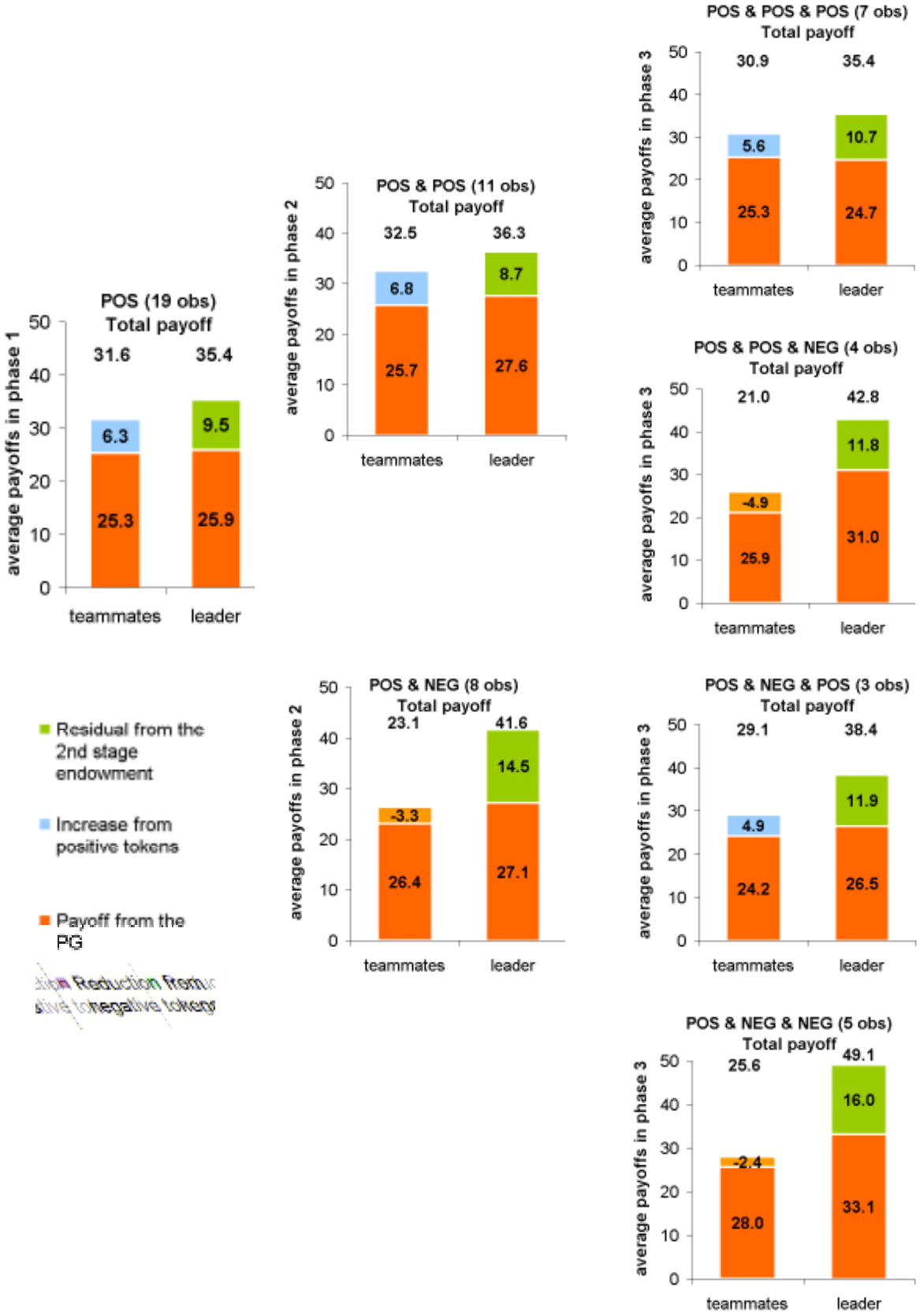


Figure 5 shows the path-dependent evolution of payoffs. In phase 1, in POS (19 observations) leaders on average obtain 35.4 whereas teammates obtain 31.6 (p = 0.003). In phase 2, in teams who stick to POS (11 obs.) both leaders' and teammates' payoffs increase. The increase in payoffs, however, is not significant; neither for teammates (from 31.8 to 32.5, p = 0.700) nor for the leaders (from 35.6 to 36.3, p = 0.365). In teams, who change from POS to NEG (8 obs.), leaders' payoffs increase significantly (from 35.1 to 41.6, p = 0.055) whereas teammates' payoffs decrease significantly (from 31.5 to 23.1, p = 0.008).

In phase 3, compared to phase 2, teams who still stick to POS (7 obs.) experience a decrease in payoffs. The decrease in teammates' payoffs (from 33.1 to 30.9) is significant (p = 0.031) whereas the decrease in leaders' payoffs (from 35.5 to 35.4) is not significant (p = 0.938). On the other hand, four leaders who change to NEG in phase 3 after choosing POS twice, experience an increase in payoffs (from 37.8 to 42.8) whereas teammates' payoffs decrease sharply (from 31.4 to 21.0). In teams who switch to NEG in phase 3 and stick to the same incentive scheme in phase 3 (5 obs.), leaders' payoffs increase again in phase 3 (from 47.4 to 49.1) whereas teammates' payoffs increase slightly (from 25.3 to 25.6). In teams who change to POS after choosing POS in phase 1 and NEG in phase 2 (3 obs.) both teammates' and leaders' payoffs increase (from 19.2 to 29.1 and from 32.0 to 38.4, respectively).

Figure 5: Path-dependent payoffs in different phases



What is the most successful path? Figure 6 in the Appendix shows the aggregate overall payoffs of the four paths which begin with POS in phase 1. In terms of payoffs, the most successful path is POS&POS&POS with an aggregated payoff (over all 3 phases) of 32.7 tokens per team member (including the leader). This success, however, is largely due to the efficiency increasing effect of rewards. If we focus on the productive part, i.e., on teams' average contributions, the most successful path is POS&NEG&NEG.

4.4 Leadership effects

Do leaders lead? And do teammates follow their leader?

As stated in 4.2, averaged over all phases, there exists no significant difference between leaders' and teammates' contributions under both incentive schemes. This is somewhat surprising, since the leader is the only team member who cannot receive incentives and thus might be less motivated to contribute. Does the leader exert higher effort to set an example for the other team members? In our setting, teammates and the leader contribute simultaneously. At the end of each period, each player is informed on the leader's contribution and receives anonymous information about the contributions of each of the other teammates. Thus, following the leader's example in the same period is not possible. However, imitation of the leader by the teammates may take place with a time lag, e.g., teammates may adapt to the leader's contribution from the previous period. It is also possible for a teammate to compare and adjust his or her contribution to other teammates' contributions. To investigate whether such an imitative behaviour actually occurs, we ran a panel regression with the teammates' average contributions[15] in period t as the dependent variable. Teammates' average contributions in the previous period (t–1) and the leader's contribution in period t–1 were two of the independent variables. With dummy variables we controlled for possible interaction effects as well as for order effects which may be important because of the path-dependency.

Table 1 in the appendix shows the regression results. The average teammates' contributions in the previous period have a positive impact on teammates' actual contributions in POS. In NEG, the positive impact is even (significantly) larger as the respective interaction variable indicates. In POS, the leader's previous contribution has a small but significant impact on teammates' contributions in the actual period. This positive effect, however, is not present in NEG as one can see from the negative coefficient of the interaction variable with NEG. Actually exerted incentive tokens have a significantly positive effect on contributions in both incentive schemes.

[15] Teammate's average contribution excludes the leader's contribution.

How do leaders react on teammate's contributions?

To investigate the leader's reaction on teammates' behaviour we again use a regression analysis. In a model with similar specifications introduced in the previous section, now leader's contribution is the dependent variable. Teammates' average contribution of the previous period, leader's own contribution from the previous period and average tokens the leader sent in the previous period are among our independent variables. We again control for the path-dependency and for group effects. Table 2 in the Appendix presents the regression results. The regression coefficients show that both teammates' average contribution and the leader's own contribution influence the leader's actual contribution positively in a significant way in POS. The impact of teammates' average contribution is also positive in NEG, however, of smaller in magnitude. In NEG, the leader's own contribution in the previous period has a significantly greater impact than in POS. The leader's sent tokens in the previous period reduce the own contribution in the actual period in POS significantly. It seems that the leader performs a kind of trade-off between costs for providing incentives in the previous period and the own contribution in the actual period, i.e., if a leader has sent high rewards in the previous period then the leader lowers the own contribution in the actual period. However, the respective interaction dummy reveals that this relation is not observed in NEG. The reason may be that in NEG a leader needs not to send as many incentive tokens to promote cooperation – especially if the teammates behave well.

4.5 The use of incentives

How do team leaders actually use the available incentive mechanism? To answer this question we ran a regression with the allocated incentive tokens as the dependent variable (see Appendix, table 3). Interestingly, leaders do not seem to use the difference (between their own and the teammates' contributions) as a benchmark for rewarding or punishing. This emphasises the asymmetry between the leader and the teammates. Instead the difference between a teammate's contribution and other teammate's contributions seems to be relevant. The higher a teammate's contribution compared to the average of peers the higher is the reward and the lower is the punishment as the respective interaction variable reveals. The absolute magnitude of this effect is larger in NEG than in POS. Team leaders, however, are not only interested in aligning teammates' contributions but additionally use incentives to push average contributions up to the social optimum. The higher the deviation of the average teammates' contributions from 20 the lower is the reward. This effect, however, is rather small and not significant in NEG. Notably, punishment decreases over time in NEG as the interaction variable shows while reward has no significant trend.

5 Conclusion

In this study, we report on an experiment designed to analyse the behaviour of a team leader who can decide on a leadership style which either relies on punishment or on rewards as an incentive mechanism. Both mechanisms have been identified as essential ingredients for successful transactional leadership. The question is how a predominant focus on one of these mechanisms influences a team's performance. In our setting the choice of the leader is known to the team members before they decide on their contributions and it is kept fixed for a certain period of time before it can be altered again. This reflects that an established culture in a team or organisation – which is also largely shaped by the prevailing incentive mechanism (Schein, 2004) – cannot be changed on a day-by-day basis. The induced culture is likely to influence the contribution behaviour of organisational members. A constant threat of punishment might be perceived as discouraging by the subordinates, while a constant need for reward might burden the leader.

We find that the overwhelming majority of 95 percent of the leaders opt for the positive incentives in phase 1. This finding is in line with the observed reluctance regarding the punishment option observed in other studies (Sutter et al., 2008; Botelho et al., 2007). The initial preference for rewards, however, diminishes in some teams in later phases of the experiment. In the last phase, 45 percent of the leaders choose the negative incentives. This reflects findings reported in Gürerk et al. (2006) and is in line with the observation that, averaged over all phases, contributions are higher with punishment incentives than in the presence of rewards. Interestingly, this is not only true for the teammates, but also for the leader who himself does not have to fear punishment.

Leaders who experience frequent complete free-riding and high variance in contributions in their teams are more likely to change from positive to negative incentives. Apparently, they are disappointed with the performance of (some) teammates. Additionally, in teams whose leaders change from positive to negative incentives, contributions in the very last period decrease sharply. A change from positive incentives to negative incentives results in an immediate increase in contributions. The increase is higher than is likely to be explainable by a pure restart effect. This indicates that the anticipation (or the threat) of potential punishment already has a positive effect on contributions. The increase in contributions in the negative incentive scheme (NEG) is not a short-term straw fire: cooperation is sustained on a higher level. On the other hand, contributions show a decreasing trend in teams in which the leader constantly sticks to the positive incentive scheme (POS). A path-dependent analysis reveals

that contributions are highest in teams using the negative incentive schemes in phase 2 and 3. In terms of payoffs, however, NEG is only profitable for leaders. Teammates earn more in POS while team leaders obtain significantly higher profits in NEG. Joint profits are higher in POS and the most successful path in terms of joint profits is POS&POS&POS. On this path the difference between leaders' payoffs and teammates' payoffs is most egalitarian. Thus, self-centred team leaders should choose NEG, whereas efficiency-oriented or inequity averse team leaders should have a preference for POS.

Leaders administer actual negative and positive incentives largely on the basis of contribution differences among the teammates and on the basis of contribution differences to the socially optimal contribution. Leaders, however, seem also to perform a trade-off between allocating rewards and own contribution. The more rewards leaders allocate the less they contribute. In the positive incentive scheme, we observe a "leading-by-example effect" reported already in previous studies, i.e., teammates seem to contribute more the more the leader contributes (cf. Gächter and Renner 2004; Güth et al., 2007).

Our experimental results reveal a tension in the team leader's choice of the incentive scheme. On the one hand negative incentives seem to be the more powerful tool to encourage team members to exert effort. They generate higher payoffs for the leader. Positive incentives on the other hand induce a more pronounced follower effect, more egalitarian payoffs and higher efficiency gains. Almost all leaders resolve this tension by initially choosing POS. Not average contributions but free-riding behaviour causes leaders to choose negative incentives. Leaders' high payoffs keep them caught in NEG and a way back to efficiency enhancing POS is rarely observed.

Of course, it is always advisable to be cautious when drawing one to one inferences from a lab experiment with a quite stylised team setting for situations of teams in an organisation. Nevertheless, our results stress the importance of the team composition. If one can avoid too many free-riders from joining the team, e.g., by suitable screening or reputation mechanisms, the leader might be well advised to go for a rewarding team culture. Additionally, our findings suggest that the effectiveness of an incentive scheme is highly history dependent, i.e., it depends on what schemes have been employed in the past. For example, the POS scheme in the third phase seems to work quite differently depending on whether the team has experienced a POS&POS or a POS&NEG history in the first two phases before. As an implication one should advice team leaders to be cautious when planning to switch to a new

incentive scheme in a team. The change might indeed have irreversible consequences on the team culture that might not be nullified by simply going back to original incentive scheme.

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Appendix

Instructions for the experiment

General Information: At the beginning of the experiment, you are randomly assigned to groups each consisting of **6 participants**. One of the members in your group is randomly chosen as Type A participant. All other members in your group become Type B participants. During the whole experiment, your type does not change and you only interact with the members of your own group. At the beginning of the experiment, **500 experimental tokens** are assigned to the experimental account of each participant.

Course of Action: The experiment consists of **30 rounds** containing three blocks of periods of 10 rounds each. Before each block starts (i.e., before Round 1, 11, and 21) the Type A player chooses between two modes of token allocation: "**allocation of positive tokens**" or "**allocation of negative tokens**".

Each round consists of 2 stages. In stage 1, each group member (Type A as well as Type B participants) decides on the individual contribution to the project. In stage 2 Type A participant may influence the earnings of the other group members by allocating tokens.

Stage 1: Contributing to the Project: In stage 1 of each round, each group member is given an endowment of 20 tokens. You have to decide how many of the 20 tokens you are going to contribute to the project. The remaining tokens are kept in your account.

Calculation of your payoff in stage 1: Your payoff in stage 1 consists of two components:

- **tokens you keep** = endowment – your contribution to the project
- **earnings from the project** = 1.6 x sum of the contributions of all group members / number of group members

Thus, **your payoff in stage 1** amounts to:
20 – your contribution to the project
+ 1.6 x sum of the contributions of all group members / number of group members

The earnings from the project are calculated according to this formula for each group member. **Please note:** Each group member receives the same earnings from the project, i.e., each group member benefits from **all** contributions to the project.

Stage 2: Assignment of Tokens by the Type A participant: In stage 2, the Type A participant gets informed about how many tokens each group member contributed to the project. (**Please note: Before each round, the display order for the Type B participant is randomly determined.** Thus, it is not possible to identify a Type B participant by his or her position on the displayed list throughout different rounds.)

With the assignment of tokens, the Type A participant can increase or reduce the payoff (according to the chosen modus for the allocation of tokens) of a group member or keep it unchanged.

In each round the Type A participant receives an additional 20 tokens in stage 2. The Type A participant has to decide how many of the 20 tokens he or she is going to assign to each of the other group members. The remaining tokens are kept by the Type A participant. The Type A participant can check the costs of the token assignment by pressing the button *Calculation of Tokens*.

- The assignment of **0 tokens** to a Type B participant **won't change his or her payoff**.
- If the modus "**allocation of positive tokens**" is chosen for the current 10 block period, each **positive token** that is assigned to a Type B participant **increases his or her payoff by 3 tokens**.
- If the modus "**allocation of negative tokens**" is chosen for the 10 block period, each **negative token** that is assigned to a Type B participant **reduces his or her payoff by 3 tokens**.

Calculation of payoffs in stage 2:

Type A participant: Your payoff in stage 2 consists of **tokens you keep**

= 20 – sum of the tokens that you have assigned to the other group members

Type B participant: If the mode "**allocation of positive tokens**" is chosen

Your (positive) payoff from stage 2 is given by 3 x the number of tokens that you have received from the Type A participant.

Type B participant: If the mode "**allocation of negative tokens**" is chosen

Your (negative) payoff from stage 2 is given by 3 x the number of tokens that you have received from the Type A participant.

Calculation of your round payoff:

Your round payoff = Your payoff from stage 1 + your payoff from stage 2

Information at the end of the round: At the end of the round you will receive a detailed overview of the results obtained in all groups. For every group member, you are informed about his or her contribution to the project, payoff from stage 1, assigned tokens (Type A participant), received tokens (Type B participants), payoff from stage 2, round payoff. (**Please note: Before each round the display order for the Type B participants will randomly be determined.** Thus, it is not possible to identify a Type B participant by his or her position on the displayed list throughout different rounds.)

History: At the beginning of a new round and starting from the 2nd round, you receive an overview of the average results (as above) of all previous rounds. Additionally, a Type A participant receives this overview each time before each block starts i.e., when he or she decides on the modus of token allocation.

Total Payoff: The total payoff from the experiment is composed of the starting capital of 500 tokens plus the sum of round payoffs from all 30 rounds. At the end of the experiment your total payoff will be converted into Euro, with an exchange rate of 1 € per 100 tokens.

Please notice: Communication is not allowed during the whole experiment. If you have any questions please raise your hand. All decisions are made anonymously, i.e., no other participant is informed about the identity of someone who made a certain decision. The payment is anonymous too, i.e. no participant gets to know the payoff of another participant.

We wish you success!

Table 1: Average teammates' contributions

	Coefficient	Robust Std. Errors	z	P>|z|
Teammates' average contribution in the previous period	0.559***	0.079	7.05	0.000
Leader's contribution in the previous period	0.100***	0.028	3.62	0.000
Average tokens sent by the leader in the previous period	0.780***	0.158	4.94	0.000
Panel period (1..10)	-0.034	0.036	-0.95	0.342
Dummy for NEG (in the current phase)	-3.141***	0.765	-4.10	0.000
History POS in phase 1	0.085	0.335	0.25	0.799
History POS in phase 1 and POS in phase 2	-0.881***	0.317	-2.78	0.005
History POS in phase 1 and NEG in phase 2	-0.652**	0.324	-2.01	0.044
History NEG in phase 1 and POS in phase 2	-1.521***	0.445	-3.42	0.001
Teammates' average contribution in the previous period x NEG	0.441***	0.086	5.10	0.000
Leader's contribution in the previous period x NEG	-0.110***	0.039	-2.80	0.005
Average tokens sent by the leader in the previous period x NEG	-0.133	0.311	-0.43	0.670
Panel Period x NEG	0.088*	0.049	1.80	0.071
History POS in phase 1 x NEG	-0.056	0.472	-0.12	0.906
History POS in phase 1 and POS in phase 2 x NEG	0.563	0.473	1.19	0.234
History POS in phase 1 and NEG in phase 2 x NEG	1.112**	0.559	1.99	0.047
Constant	2.271***	0.676	3.36	0.001

Random-effects GLS regression, 540 observations.
R^2 (within) = 0.1561. R^2 (between) = 0.9641. R^2 (overall) = 0.7471.
Robust Std. Errors adjusted for 20 clusters in teams.
"History ..." dummies indicate the incentive scheme history until the current phase. An example: "History POS in phase 1 and POS in phase 2" is equal to 1 if the current phase is 3 and the incentive scheme was POS in phase 1 and also POS in phase2. The dummy is equal to 0 otherwise.

Table 2: Leader's contributions

	Coefficient	Robust Std. Errors	z	P>|z|
Teammates' average contribution in the previous period	0.399***	0.103	3.86	0.000
Leader's contribution in the previous period	0.542***	0.096	5.64	0.000
Average tokens sent by the leader in the previous period	-0.841*	0.510	-1.65	0.099
Panel period (1..10)	-0.015	0.049	-0.30	0.761
Dummy for NEG (in the current phase)	-1.094	1.197	-0.91	0.361
History for POS in phase 1	-0.209	0.648	-0.32	0.747
History for POS in phase 1 and POS in phase 2	-0.080	0.522	-0.15	0.878
History for POS in phase 1 and NEG in phase 2	-1.576*	0.881	-1.79	0.074
History for NEG in phase 1 and POS in phase 2	-2.314**	0.982	-2.36	0.018
Teammates' average contribution in the previous period x NEG	-0.259**	0.117	-2.22	0.026
Leader's contribution in the previous period x NEG	0.320***	0.114	2.81	0.005
Average tokens sent by the leader in the previous period x NEG	0.795	0.539	1.48	0.140
Panel Period x NEG	-0.096	0.085	-1.13	0.259
History POS in phase 1 x NEG	-0.374	0.731	-0.51	0.609
History POS in phase 1 and POS in phase 2 x NEG	-0.568	0.731	-0.78	0.437
History POS in phase 1 and POS in phase 2 x NEG	1.170	0.976	1.20	0.231
Constant	1.800	1.221	1.47	0.140

Random-effects GLS regression, 540 observations.
R^2 (within) = 0.0213. R^2 (between) = 0.9349. R^2 (overall) = 0.5937.
Robust Std. Errors adjusted for 20 clusters in teams.
"History ..." dummies indicate the incentive scheme history until the current phase. An example: "History POS in phase 1 and POS in phase 2" is equal to 1 if the current phase is 3 and the incentive scheme was POS in phase 1 and also POS in phase2. The dummy is equal to 0 otherwise.

Table 3: Received incentive tokens

	Coefficient	Robust Std. Errors	z	P>|z|
Contribution – Leader's contribution	-0.001	0.021	-0.06	0.951
Contribution – Peers' average contribution	0.193***	0.025	7.78	0.000
Deviation from the social optimum	-0.026***	0.004	-6.73	0.000
Panel Period	-0.024	0.015	-1.56	0.118
NEG	-1.914***	0.398	-4.81	0.000
(Contribution – Leader's contribution) x NEG	-0.051	0.032	-1.59	0.112
(Contribution – Peers' average contribution) x NEG	-0.544***	0.059	-9.14	0.000
Deviation from the social optimum x NEG	0.033***	0.005	6.07	0.000
Panel Period x NEG	-0.067**	0.034	-1.97	0.049
Constant	3.488***	0.281	12.40	0.000

Random-effects GLS regression, 3000 observations.
R^2 (within) = 0.5526. R^2 (between) = 0.44771. R^2 = 0.5328
Robust Std. Errors adjusted for 20 clusters in teams.

Figure 6: Average team payoffs aggregated after each phase