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The Impact of Management Incentives in Intergroup Contests

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The Impact of Management Incentives in Intergroup Contests

Abstract:

In intergroup contests a manager advises and motivates her group's members. Her rewards often depend on the subsequent contest expenditure of the members. I test whether such incentives undermine the credibility and effectiveness of a manager's efforts. In the different experimental treatments the managers either benefit from very high or low expenditure or get a predetermined payment. The results show that different management incentives shape the expenditure of the group members even if managers have an advisory role only. However, group members follow recommendations more closely if management compensation is not linked to contest expenditures.

Keywords: Communication, Experiment, Rent-seeking, Management compensation, Group decision making

JEL Codes: C72, C92, D72, D74, M12

1 Introduction

In intergroup contests managers typically benefit if they push their group's members to ever higher effort levels. Military commanders, for example, can gain glory and promotion if their soldiers fight bravely and risk their lives. Coaches in any team sport win more titles if they encourage high training efforts and frugal lifestyles from their players. In other situations managers prefer rank-and-file members to be less competitive. Corporate mergers, for example, often lead to intra firm rivalry between the different units. (Weber and Camerer, 2003). Here, the career perspectives of junior managers depend on the success of their integration efforts, i.e., the minimization of rent seeking activities in their business units. In all these cases the economic incentives of the manager typically differ from the preferences of the group members. In this paper I want to identify whether and how such a conflict of interests between managers and group members impairs the leadership effectiveness of the manager.

In order to study this impairment I investigate the impact of group managers on contest expenditure in an experimental Tullock contest (Tullock, 1980) between groups. More specifically I analyze how managers coordinate group members in such contests, whether they direct group members towards high or low expenditure levels and how management incentives affect this coordination process. The focus is on managers who have a key role in internal communication processes but lack formal authority or punishment instruments. This restriction implies that managers cannot alter the financial incentives of the group members in any treatment which facilitates treatment comparisons. The experimental treatments differ with respect to the incentives of the managers, i.e. whether and how they benefit from the conflict expenditure of the group members. I also compare the behavior in these treatments with results from a control treatment in which groups do not have any manager.

The paper provides three distinctive contributions to the literature. This is the first paper that investigates management or leadership effects in contests between groups. Leadership studies in experimental economics typically investigate (endogenous) leadership in public good games or coordination games[1]. They do not study competitive environments

[1] Recent studies on leadership in public good games include Güth, Levati, Sutter and Van Der Heijden (2007), Arbak and Villeval (2011), Rivas and Sutter (2011), Bruttel and Eisenkopf (2012), Gächter, Nosenzo, Renner and Sefton (2013). Studies on leadership in coordination games are provided by Weber, Camerer, Rottenstreich and Knez (2001), Kuang, Weber and Dana (2007), Brandts, Cooper and Weber (2011). Bruttel (2009) and Bruttel and Fischbacher (2010) investigate leading-by-example in the context of the Bertrand Paradox. Lazear (2012) summarizes the non-experimental literature on leadership in his paper. He argues on

and do not look at the role of group leaders in intergroup relationships. Second, I investigate the impact of rather weak managers who can neither set incentives nor lead by example. By doing so, I measure a 'pure' coordination effect that is independent of group members' concerns about managerial retributions. Most studies and textbooks (e.g. Milgrom and Roberts, 1992) in economics study management behavior in the context of principal-agent relationships that allow for incentive contracts. People who lead by example in public good or coordination games can at least reasonably expect that followers have reciprocal preferences and reward their kindness. In this context my study provides a contrast to the interesting article of Sheremeta (2011) where some group members play a key role in the intergroup contest. These members can gain a higher prize than others but all members can invest into the outcome of the contest. Arguably the players with a higher valuation resemble incentivized managers. The treatments in Sheremeta (2011) vary both the asymmetry of the preferences and the 'technology' of the contest success function. As a consequence, the managers' investments become crucial in perfect-substitutes contests (like the one in my paper) and best-shot contests. In contrast, the managers in my experiment cannot make any investment at all.

The third contribution of my paper also relates to the issue of institutionally weak leadership. Since managers can only talk to their group members I provide a new approach to studying the impact of communication on behavior, more precisely how changes in incentives alter this impact. Riechmann and Weimann (2008) and Andreoni and Rao (2011) show the powerful coordination effect of communication. They argue that communication facilitates mutually beneficial coordination and recursive belief formation. Relatedly Brandts and Cooper (2007) and Eisenkopf and Bächtiger (2013) identify communication as an effective tool for third parties to change the cooperativeness of agents. In this paper I investigate whether conflicting incentives between the actual actors and the third party eliminate this benefit. In this context my contribution relates most closely to Kuang et al. (2007) who study the impact of external advisers in coordination games. They find that players are less likely to follow the advice if the advisor benefits from certain decisions. Note also that this paper provides a complementary contribution to the existing literature on communication in intergroup contests. While Sutter and Strassmair (2009), Leibbrandt and Sääksvuori (2012) or Cason, Sheremeta and Zhang (2012) focus on changes in communication structure (i.e. who can talk with whom) I keep this structure constant across the treatments.

page 92 that this "literature does not lend itself well to the type of scientific analysis and proof that could add additional insight into our understanding of the area".

It is a key characteristic of contests between groups that any decision of a group member implies two opposing externalities. If one person becomes more competitive she increases the chances of her fellow group members to win the prize but decreases the expected payoffs of the members in the other group. Previous studies have shown that people focus their prosocial behavior on 'in-group' members and discriminate against outsiders (Hewstone, Rubin and Willis, 2002, Charness, Rigotti and Rustichini, 2007, Chen and Li, 2009, Hargreaves Heap and Zizzo, 2009, Chen and Chen, 2011). Hence it is not surprising that highly competitive investments characterize the behavior of groups in contests but most studies also report substantial differences between the different group members.[2]

The competitiveness of groups is inefficient if the contest expenditure does not imply a positive externality for a third party.[3] The inequality in investments and subsequent payoffs within a group is also clearly undesirable for at least some subjects (Abbink et al., 2010). Communication between group members reduces differences in intra-group investments to some extent but it induces coordination at a rather competitive level (Sutter and Strassmair, 2009, Cason et al., 2012, Leibbrandt and Sääksvuori, 2012)[4]. Group managers might actually improve aggregate utility of group members if contest expenditure is wasteful. Hence the preferences and incentives of managers should play a crucial role in rent-seeking contests between autonomous groups or within organizations that decentralize key aspects of decision making to lower levels in the hierarchy.[5]

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[2] "The observation that intergroup conflicts increase individual willingness to sacrifice self-interest for group causes is one of the most agreed-upon observations in social psychology" (Bornstein and Ben-Yossef, 1994, p. 63). More recent studies support this claim in different competitive settings and show that aggregate competitive investments of group members are clearly above the standard equilibrium prediction. (Gunnthorsdottir and Rapoport, 2006, Huck, Konrad, Müller and Normann, 2007, Tan and Bolle, 2007, Burton-Chellew, Ross-Gillespie and West, 2010, Ahn, Isaac and Salmon, 2011). It is also a well-established fact that groups often fail to coordinate (Van Huyck, Battalio and Beil, 1990, Ochs, 1995, Bornstein, Gneezy and Nagel, 2002). More recently, Abbink, Brandts, Herrmann and Orzen (2010) also find "substantial heterogeneity" (p. 431 and Figure 3 in that paper) in the investments of individual members in a group.

[3] Examples for positive externalities are sport or research contests or promotion tournaments in firms (Lazear and Rosen, 1981). The administration of natural resource extraction provides an example for the inefficiency of competition between groups (van der Ploeg, 2010).

[4] Abbink et al. (2010) and Leibbrandt and Sääksvuori (2012) show that some subjects spend money to punish fellow group members with lower investments. The availability of punishment options within groups also leads to coordination at an extremely competitive level (see also Goette, Huffman and Meier (2006), Goette, Huffman, Meier and Sutter (2012)).

[5] Among others, Aghion and Tirole (1997) and Stein (2002) provide theoretical explanations for decentralized decision making in firms. Baker (1992) and Rajan and Wulf (2006) observe that large US firms have adopted more decentralized structures over time. Fan, Wong and Zhang (forthcoming) show for Chinese state-owned pyramid-like organizational structures that they insulate local managers from the pyramid's top in order to minimize political costs of state intervention. Similar deliberate separations often also apply to the governance of public universities or broadcasting services. Hence, it is not surprising that Goette, Huffman, Meier and Sutter (2012 p. 959) argue that introducing incentives for competitions between groups is a complicated decision for firms.

The results of my experiment show that group managers can coordinate the competitive behavior of their group members. Managers who benefit from highly competitive behavior of their group members induce the highest contest investments. Those managers who benefit from cooperative behavior induce the lowest investments. In general, group members in all treatments adjust their behavior according to the recommendation of the group managers. However, this adaptation is significantly stronger if managers get a fixed rather than an outcome-dependent payment. Management incentives impair the coordination efforts but do not eliminate them.

The paper now proceeds as follows. In the next section I present the experimental design, section 3 discusses the predictions and section 4 presents the results in detail. The paper concludes with a summary and discussion of the results.

2 Experimental Design

Common Features of all Treatments

All the treatments were based on essentially the same Tullock contest game between two groups as those in Abbink et al. (2010). I limited the size of each group to 2 persons ("group members"). Each member interacted in the same group and with a fixed opponent group for 10 rounds. At the beginning of each of the 10 rounds of the experiment each participant received an endowment of 1000 points (= 1 €) and could invest these as an input for his or her group. Any points not invested were added to the participant's point balance. As soon as everybody had made her decision, the computer determined according to the probabilities defined by investment levels which of the two groups would win the prize. The probability of a group winning the prize was equal to the total number of points invested by that particular group, divided by the sum of points invested by both groups. If no group member in both groups had invested any points, the winning probability would have been 50% for each group. The members of the winning group received an extra 1000 points each, regardless of their investment. After the lottery each participant was informed about whether his or her group had won or lost. Each participant also learned about how many points the other group member had invested in that round and of the total amount invested by the rival group. Of course, participants did not know the identity of the others in their group, or the identity of their opponent(s). The prize money was added to the winning group members' point balances, and the experiment then proceeded to the next round.

The Treatments

The experiment included four treatments: three treatments with one manager per group and one control treatment. All the features of a treatment were common information to the participants. Appendix A provides a translation of the experimental instructions[6]. In the *Control Treatment,* the participants played the Tullock contests between two groups as described above.

In all other treatments I added a third person or manager[7] to each group. In each round this manager communicated via computer with the group members in three stages.

- At first, the manager had 60 seconds in order to send identical free form statements to both group members. The group members could not send messages in this stage which allowed the manager to explain his proposals.
- Afterwards the manager chatted with each group member separately for another 60 seconds. At this stage the group members could send messages to the manager but they could not communicate directly with each other. All communication took place via onscreen chat boxes. All participants were told not to reveal their identity.
- In the last stage the manager recommended an investment level by typing in a number between 0 and 1000. This number referred to the individual investment of a single group member, not the aggregate investment of the group. The computer broadcasted the number to both group members.

The communication procedure allows the manager to control the intragroup conversation, in particular the transfer of messages between the group members. The procedure provides for a clean measurement of management impact in intergroup contests without relying on one-way communication.

I varied the incentives of the manager across the treatments. In the *Coordination Treatment* a manager got 1500 points per period. In the other treatments each manager received 1000 points per period and competed with the manager of the other group for another 1000 points. The success of a manager depended on chance and the inputs of the group

[6] In the German instructions I described a group of two as a "Team", while the term "Group" summed all four participants from both "teams" who interacted across the ten periods.
[7] In the instructions I used the more neutral term "external participant" for this third person.

members in both groups. The managers themselves could not invest any point. In the *Hawk Treatment* the probability of a manager winning the additional 1000 points was equal to the total number of points invested by his or her own group, divided by the sum of points invested by both groups. Such a hawkish manager resembles the general who benefits from rent-seeking and self-sacrifice of the subordinates. In the *Dove Treatment* the probability of a manager winning the additional 1000 points was reversed. Now it was equal to the total number of points invested by the *other* groups, divided by the sum of points invested by both groups. Such a dovish manager resembles, for example, a junior manager who might enhance her career if she can overcome post-merger resistance in her business unit. It also sketches a political leader who can increase her electability if she overcomes resistance from party ideologues and fosters cross party cooperation. These types of leaders have a strong incentive to discourage rent-seeking activities of their group members. Note that the zero-sum game between managers in both treatments ensures that the investments of group members do not imply a positive externality on the aggregate welfare of the managers. This procedure does not rule out that agents sympathize with their own manager at the expense of the other manager.

In each treatment it was common knowledge that the incentives of both managers of the competing groups were the same. After the lottery each participant was informed about whether his or her group had won or lost and whether the manager had received the additional 1000 points. As in the Control Treatment each participant also received information about how many points the other group member had invested in that round and about the aggregate investment of the rival group.

Table 1 summarizes the differences in manager compensation across the treatments. These payment schemes for the managers have some key advantages. On average all managers get 1500 points per period, as in the Coordination Treatment. A change in the behavior of the group members does not change the aggregate payoff of the managers but simply shifts money from one manager to another. Hence efficiency motives incorporating the managers' payoff do not alter the decisions of the group members. This is also the reason why I did not consider a mixed treatment with dovish and hawkish managers in the opposing groups. It might induce group members to follow the recommendations of the manager simply because such a move could have a beneficial effect for both managers. The payment schemes also provide a relatively simple communication strategy for each manager that falls in line with the own incentives. Hawkish managers can call for high investments by appealing to the increased probability of winning the prize. Dovish managers can refer to the cost savings and maximization of total payoffs of the group members when they recommend low payments.

Table 1: Payoff functions for an arbitrary group member and an arbitrary manager across the treatments in a single period

Treatment	Expected Payoff Manager*	Expected Payoff Group Member**
Coordination	$\pi_{MA} = 1500$	$E(\pi_{1A}) =$ $1000 + \frac{A}{A+B}1000 - a_1$; with $A = a_1 + a_2$; $B = b_3 + b_4$
Hawk	$E(\pi_{MA}) = 1000 + \frac{A}{A+B}1000$;	
Dove	$E(\pi_{MA}) = 1000 + \left(1 - \frac{A}{A+B}\right)1000$;	
Control	No Manager	

* denotes the expected payoff in points for the manager of group A; ** denotes the expected payoff in points for subject 1 in group A who makes an investment of a_1. Subject 2 is a fellow group member (investment a_2), Subjects 3 and 4 are in Group B and made investments b_3 and b_4.

Procedural Details

The 296 participating subjects were recruited with ORSEE (Greiner, 2004) among the students of the University of Konstanz. The experiment was programmed with z-Tree (Fischbacher, 2007) and conducted between May and November 2012 at *Lakelab*, the economics laboratory at the University of Konstanz. The experiment lasted about 60 minutes and participants earned 12.70 Euros on average (about 16.30 USD at the time of the experiment).

3 Behavioral Predictions

The key question in this paper is whether management incentives influence the impact of a manager's coordination efforts. To derive predictions about this impact the analysis starts with the standard assumptions that group members are risk-neutral and motivated only by their own monetary earnings. Afterwards I incorporate two additional assumptions about the impact of communication on the preferences of the group members and study how these assumptions affect the predictions.

There are two groups with two members each. Let us assume that players 1 and 2 are members of one group while players 3 and 4 are in the opposing group. Group member 1 makes an input of $0 \leq a_1 \leq 1000$ points. The fellow group member 2 makes an input of a_2, the members in the opposing group's inputs are denoted with b_3 and b_4. In each treatment and period, player 1 gets the following expected income.

$$E(\pi_{1A}) = 1000 + \frac{A}{A+B}1000 - a_1; \tag{1}$$

with $A = a_1 + a_2$, $B = b_3 + b_4$ and $0 \leq a_1, a_2, b_3, b_4 \leq 1000$. Players 1 and 2 have a per capita endowment of 1000 points and win another 1000 points each with probability $\frac{A}{A+B}$. For players 3 and 4 in the other group the probability is $1 - \frac{A}{A+B}$. The expected payments for players 2, 3 and 4 are calculated accordingly. In equilibrium, the parameters A and B reflect the correct beliefs of the agent regarding the input choice of the other participants. As in Abbink et al. (2010 p. 424) the relevant first order condition yields in the stage game

$$(A + B)^2 = 1000B. \tag{2}$$

The symmetric Nash equilibrium of this stage game predicts in all treatments that each group invests 250 points. More specifically, any combination of investments by individual group members that adds up to 250 points constitutes an equilibrium. This assessment holds for all treatments and periods.

These predictions are not in line with empirical evidence. Most studies in the contest literature document effort levels in tournaments and contests that exceed standard equilibrium predictions (see the introduction or the relevant literature review in Öncüler and Croson (2005) or Dechenaux, Kovenock and Sheremeta (2012)). If people are part of a group this 'overinvestment' increases. A prominent explanation for this phenomenon is the in-group effect discussed in the introduction of this paper (Charness et al., 2007, Chen and Li, 2009, Chen and Chen, 2011). A player incorporates the impact of her effort choice on the payoff of the other group member into her utility function. Freeriding on the back of the other group member becomes less attractive[8] Moreover, these in-group effects increase with intra-group communication (Sutter and Strassmair, 2009, Cason et al., 2012, Leibbrandt and Sääksvuori, 2012). I integrate this in-group effect into the model as follows:

$$E[U(\pi_{1A})] = 1000 + \big(1 + \gamma(c)\big)\frac{A}{A+B}1000 - a_1 \tag{3}$$

The variable $\gamma(c)$ captures the in-group effect. I assume common knowledge about a homogeneous $\gamma(c)$ for all participants in the same treatment. It is a function of whether

[8] Of course, there are other valid explanations for this phenomenon, too. Sheremeta (2013) shows that the overinvestment increases in the relative size of the endowment and in the number of contestants. Bounded rationality, positional and other regarding preferences provide prominent explanations of the phenomenon. For example, the results in Balafoutas, Kerschbamer and Sutter (2012) and Eisenkopf and Teyssier (2013) identify envy towards the members of the other group as a key factor.

(indirect) communication takes place (i.e., $c > 0$ in the Coordination, Hawk and Dove Treatments) or not (i.e. $c = 0$ in the Control Treatment). One can interpret the continuous variable $c \geq 0$ as a parameter of communication quality. Assumption 1 captures the in-group effect and how communication increases it.

Assumption 1: The size of the in-group effect increases in the communication parameter c (i.e., $\frac{\partial \gamma(c)}{\partial c} > 0$, with $(\gamma | c = 0) > 0$).

The derivative of the utility function (3) with respect to a_1 yields

$$(A + B)^2 = \big(1 + \gamma(c)\big)1000B \tag{4}$$

There exists a symmetric equilibrium $A = B$ in which any combination of investments by individual group members that adds up to $\big(1 + \gamma(c)\big)250$ points constitutes an equilibrium.

Hypothesis 1: Average investments of a group member are ranked in the following order across the treatments: Coordination > Control > $\frac{250}{2}$ points

Like the Coordination Treatment, the Hawk and Dove Treatments also allow for indirect communication. However, if indirect communication in these treatments aligns the preferences among the group members, then the direct communication with the manager should induce the group members to take the payoffs of the manager into account (Sutter and Strassmair, 2009, Andreoni and Rao, 2011, Cason et al., 2012, Leibbrandt and Sääksvuori, 2012). However, group member may not trust the incentivized manager to act as an honest broker (Kuang et al., 2007). They may also dislike that that the manager can win extra money without taking any risk. The psychological literature suggests that management incentives can be detrimental for the relationship - and thus the alignment of preferences - between managers and group members, diminishing the manager's credibility and potential for leadership (Uhl-Bien, Graen and Scandura, 2000, Avolio, Walumbwa and Weber, 2009). Hence, group members expect a group manager in the Coordination Treatment to provide more credible information.

Assumption 2: The communication parameter c is smaller in the Hawk and Dove Treatments than in the Communication Treatment

Let $\beta > 0$ denote the extent to which a group member incorporates the payoffs of the manager into her utility function. Again we assume it to be uniform and common knowledge across groups in a treatment. Hence, the utility function of a member in the Hawk Treatment is as follows:

$$E\left[U\left((\pi_{1A}|Hawk)\right)\right] = 1000 + (1+\gamma(c)\,)\frac{A}{A+B}1000 + \beta\left[\frac{A}{A+B}1000\right] - a_1 \tag{5}$$

The term in the large brackets represents the expected variable payoff of the manager of group A. The resulting first order condition implies $(A+B)^2 = (1+\gamma(c)+\beta)1000B$ and $A = B = (1+\gamma(c)+\beta)250$.

In the Dove Treatment the expected variable payment of the manager decreases in the members' effort. The utility function of a group member is as follows:

$$E\left[U\left((\pi_{1A}|Dove)\right)\right] = 1000 + \left(1+\gamma(c)\right)\frac{A}{A+B}1000 + \beta\left[\frac{B}{A+B}1000\right] - a_1 \tag{6}$$

The resulting first order condition leads to these aggregate effort levels of the two group members: $A = B = (1+\gamma(c)-\beta)250$. The alignment of preferences is irrelevant in the Coordination Treatment because the payoff of the manager is predetermined.

Hypothesis 2: Investments by group members increase in the following order across the treatments: Dove < Coordination ≤ Hawk

The investments in the Dove Treatment are expected to be strictly lower than in the Coordination Treatment because the communication parameter is smaller (Assumption 2) and the group members take the payoffs of their manager into account. The differences between the Hawk and the Coordination Treatment are less clear. In general the investments in the Hawk Treatment should be higher than in the Coordination Treatment because the group members also take the impact on the payoffs of the manager into account. However the smaller communication parameter c in the Hawk Treatment (relative to the Coordination Treatment, see Assumption 2) reduces the impact of this preference alignment.

The previous hypotheses make claims regarding the impact of managers on aggregate effort. Now the focus is on the coordination success of the manager in the different treatments. The multiplicity of equilibria for individual investments within a group suggests immediately how a manager can affect the decisions of the group members. By recommending a uniform level of inputs the manager makes the symmetric equilibrium more salient and induces coordination at this level (as in Mehta, Starmer and Sugden, 1994).[9] This coordination success also depends on the communication parameter *c*. The more group members trust a manager the more likely they are to honor the coordination efforts.

Hypothesis 3a: The differences in investments between the two members of a group in a period increase in the following order across the treatments: Control > Hawk = Dove > Coordination.

Hypothesis 3b: Group members follow the recommendations of managers in the Dove and Hawk Treatments less strongly than recommendations in the Coordination Treatment.

The hypotheses can be summarized as follows: The incentives shape the direction of group behavior at the expense of leadership credibility. The lack of credibility undermines the manager's effectiveness.

4 Results

This section is divided into three subsections. At first, I compare the average investments of group members across the treatments (Hypotheses 1 and 2). Afterwards the focus is on the coordination success of group managers in the different treatments (Hypotheses 3a and 3b). The final subsection provides an explorative analysis of the communication content that helps explaining the results in greater detail.

Table 2 documents for each treatment the main descriptive statistics across all periods. The contests column provides the number of independent observations. Each contest includes two groups with altogether four members (and two managers, if applicable). The table contains information about the managers' recommendations, the mean investment choices of a group member as well as the average difference (Δ) in investments between the two members of a group in a period. Throughout this result section I use Wilcoxon rank-sum tests to compare the average investments across treatments. In these tests I take the average of the relevant decisions of group members of both competing groups in a contest as a single unit of observations.

[9] The case for coordination within the group becomes even stronger with inequity aversion between the group members or a meritocratic notion of desert. These preferences induce multiple equilibria in team production processes with perfectly substitutable inputs of the members (Gill and Stone, 2011).

Table 2: Descriptive statistics across all periods

Treatment	N			Recommend.	Investment	Δ Invest*
	Contests	Group members	Manager	(standard deviations in parentheses)		
Hawk	14	56	28	437.65 (220.86)	385.30 (215.43)	102.57 (160.45)
Coordination	12	48	24	331.25 (260.95)	311.31 (262.33)	56.89 (125.67)
Dove	14	56	28	281.15 (258.42)	252.48 (227.10)	90.70 (127.06)
Control	14	56	---	---	298.76 (189.87)	141.00 (146.62)

* Δ Invest denotes the differences in investments between members of the same group in one period.

4.1. Average Investments of Group Members Across the Treatments

Investments in the Coordination Treatment and without any manager (Control Treatment) are at about the same level treatments. They do not differ significantly ($p = .918$) This insignificance holds across all periods. Figure 1 shows the average investments of group members across treatments and periods. In both treatments, the investments per member exceed the Nash equilibrium (250/2 = 125 points) by more than 100%.[10] Wilcoxon sign-rank tests reveal that these differences are significant in both treatments ($p = .006$ for the Coordination Treatment and .088 for the Control Treatment). This result implies that even in the Control Treatment we observe a strong in-group effect without indirect communication. The size of the effect suggests that prosocial preferences toward in-group members (the variable γ in the theoretical model) provide a plausible but insufficient explanation for the behavior of group members. Anti-social preferences (like envy) towards the members of the opposing group are likely to be relevant as well.

Result 1: Average investments of a <u>group member</u> are ranked in the following order across the treatments: Coordination = Control > $\frac{250}{2}$ points

[10] In the Control Treatment the excess investment is about 174 points or about 90% of a standard deviation. In the Coordination Treatment it is about 186 points or 71% of a standard deviation (see Table 2)

INSERT FIGURE 1 HERE

Hypothesis 2 predicts that investments in the Coordination Treatment are between those in the Hawk and the Dove Treatments. Figure 1 shows that this is largely correct. Members in the Hawk Treatment provide the highest inputs, members in the Dove Treatment the lowest inputs. Two-sample Wilcoxon rank-sum tests reveal that investments in the Hawk and the Dove Treatments differ significantly in every period (all p-values < .10, p = .004 for mean investments across all periods)[11]. Unlike predicted in Hypothesis 2 the investments in the Coordination Treatment do not differ significantly from those in the Dove Treatment (p = .355 across all periods). Average investments in the Hawk Treatment are insignificantly higher than those in the Coordination Treatment (p = .136 across all periods).

Result 2: Investments by group members increase in the following order across the treatments: Dove ≤ Coordination ≤ Hawk, with Dove < Hawk.

The differences in investments reflect the differences in the recommendations of the managers across the treatments (see Table 2). On average, managers in the Hawk Treatment make significantly higher recommendations than those in the Dove Treatment (p = .036). The recommendations of managers in the Coordination Treatment are in between. They do not differ significantly from these two treatments (p. =.327 in comparison with the Dove Treatment and p = .122 in comparison with the Hawk Treatment). In the following subsection we discuss now in greater detail how the managers in the different treatments coordinate their group members.

4.2. Coordination Success of Managers across the Treatments

One measure of coordination success is the difference in investments between group members in one period. The last variable in Table 2 (Δ Invest) provides information about this measure of coordination success in the treatments. Table 3 provides results from two random effect GLS estimations that investigate the treatment differences in greater detail. The standard errors are clustered at the Contest level. Mixed effect estimations that take the multilevel facets of the data into account deliver similar results. Moreover, I do not display estimations that capture intertemporal effects because they turned out to be irrelevant. The Control

[11] The same holds for the differences in recommendations.

Treatment provides the benchmark in both estimations. The first model estimates the investment differences in a group just by using the dummy variables for each treatment as independent variables. Across all ten periods managers in the Coordination and the Dove Treatments achieve a greater coordination success than in the Control Treatment. Wilcoxon rank-sum tests confirm these results ($p < .01$ across all periods for both comparisons). The same test also shows lower intragroup investment differences in the Hawk Treatment than in the Control Treatment (p. = .066). The second model in Table 3 takes dynamic aspects into account by controlling for time effects in each treatment. Initially managers in the Coordination and the Hawk Treatments achieve more coordination than group members achieve on their own. The significant negative coefficient for period shows that group members in the Control Treatment improve coordination on their own along the periods. The significant positive coefficients for some of the interaction terms (Coordination × Period and Hawk × Period) show that coordination does not improve in these treatments over time.

Table 3:
Random effect GLS estimations of investment differences within groups across the treatments

Dep. Var.: Δ Investments	Model 1	Model 2
	Benchmark: Control Treatment	
Coordination (Treatment Dummy)	-84.12*** (19.25)	-133.40*** (34.51)
Hawk (Treatment Dummy)	-38.43 (23.84)	-80.74** (35.71)
Dove (Treatment Dummy)	-50.30** (23.35)	-59.07 (43.09)
Period		-7.05* (3.97)
Coordination × Period		8.96* (4.89)
Hawk × Period		7.69* (4.54)
Dove × Period		1.59 (5.13)
Constant	141.00*** (15.27)	179.76*** (29.77)
R^2	.042	.050

N = 1080 (108 groups × 10 periods), Std. Err. (in parentheses) adjusted for 54 clusters in Contests, significance levels: *** < .01, ** < .05, * < .1

Result 3a: The differences in investments between the two members of a group in a period increase in the following order across the treatments: Control ≥ Hawk = Dove ≥ Coordination.

Overall Result 3 confirms the predictions of Hypothesis 3a regarding the order of investment differences in a group across the treatments. The fact that coordination success of managers with incentives is not so obvious suggests that some members trust their incentivized manager while others do not. Perhaps more interesting is the fact that the treatment differences decrease over time. All group members have a strong interest in coordination.

Hypothesis 3b states that group members follow the recommendations of managers without incentives more strongly. Figure 2 shows the average investment recommendations of managers across treatments and periods. A comparison of Figure 1 and Figure 2 suggests at the aggregate level that members follow the recommendations of managers.

INSERT FIGURE 2 HERE

In Figure 3 I document the share of group members who implement the recommendation of the group managers across the treatments and periods. About 50% of the recommendations have been implemented exactly, most often in the Coordination Treatment, followed by the Hawk and the Dove Treatments. There are no significant time trends.

INSERT FIGURE 3 HERE

Figures 4, 5 and 6 provide complementary information to Figure 3. They show the individual investments relative to the recommended input in Hawk, Coordination, and Dove Treatments. A comparison of these figures suggests that group members are more likely to deviate from recommendations of Hawk and Dove managers than from managers without any incentives, in particular in the case of rather low or high recommendations.

INSERT FIGURES 4, 5, 6 HERE

The following estimations provide statistical support for these impressions. Table 4 shows results from a regression which uses the managers' recommendations (Variable Rec.-300) as explanatory variables and the actual investment in the same period as dependent variable. As the variable name suggests I subtracted 300 points from each recommendation. 300 points is the median recommendation across all treatments.[12] The standard errors in these random effect GLS estimations are clustered at the Contest level. Further estimations not documented in this paper revealed that the results are robust for alternative estimation procedures and learning effects.

In Model 3 in Table 4 I interact the recommendation term with treatment dummies in order to test whether the recommendation has a different impact on the decision across the treatments. The results read as follows. A recommendation of 300 points yields an average investment of about 283 points in the Coordination Treatment. The same recommendation yields insignificantly higher (lower) investments in the Hawk (Dove) Treatments. Changing the recommendation by 1 point alters the investment choice by about .90 points in the Coordination Treatment, but only .69 points (.90-.21) in the Hawk Treatment and .55 points (.90-.35) in the Dove Treatment. The impact of the recommendation is lower in these treatments but it is still a highly significant predictor for investments ($p < .01$ in both treatments).

Model 4 in Table 4 supports the impression of Figure 4 regarding the treatment differences in the recommendation impact. Agents are reluctant to implement recommendations from the manager that deviate strongly from the median recommendation. The variable $(Rec.-300)^2$ captures the squared difference between the actual recommendations and the median recommendation. Since the coefficient of this variable is insignificant and small it implies that the relationship between recommendations and actual inputs is essentially linear in the Coordination Treatment. The negative and significant interaction coefficients ($Dove\times(Rec-300)^2$ and $Hawk\times(Rec-300)^2$) state that the impact of rather extreme recommendations is relatively small in the Hawk and Dove Treatments.

[12] I get similar results using the median recommendation in the Coordination Treatment (which is 250) as benchmark instead.

Table 4: Random effect GLS estimations of the impact of management recommendations on investment choices across the treatments

Dep. Var.: Investments	Model 3	Model 4
	Benchmark: Coordination Treatment	
Rec. -300 †	.898*** (.049)	.893*** (051)
Hawk	7.013 (11.414)	17.785 (13.959)
Dove	-20.366 (22.360)	16.416 (18.414)
Hawk × (Rec.-300)†	-.207*** (.073)	-.032 (.087)
Dove × (Rec.-300)†	-.346** (.164)	-.210* (.125)
$(Rec.-300)^2$		$.173\times10^{-4}$ ($.812\times10^{-4}$)
Hawk × $(Rec-300)^2$		$-.507\times10^{-3}$*** ($.192\times10^{-3}$)
Dove × $(Rec-300)^2$		$-.514\times10^{-3}$** ($.227\times10^{-3}$)
Constant†	283.254*** (7.297)	282.230*** (10.096)
R^2	.648	.655

N = 1600 (160 subjects × 10 periods), Std. Err. (in parentheses) adjusted for 40 clusters in contests, significance levels: *** < .01, ** < .05, * < .1; † I subtracted 300 points (the median recommendation) from each recommendation.

Appendix B documents results from several additional estimations that explore in greater detail the treatment differences observed in Table 4. Table B1 support the insight that subjects in the Hawk and Dove Treatments do not follow both very high recommendations (> 450 points) or very low ones (≤ 200) as closely as those in the Coordination Treatment while recommendations around the median have essentially the same impact in all treatments. The treatment differences regarding the impact of recommendations documented in Table 4 do not qualitatively depend on whether the group had won the prize in the previous round or not (Table B2 and B3). Furthermore treatment differences are stable across the periods (Table B4). Overall the results confirm Hypothesis 3b.

Result 3b: Group members follow the recommendations of managers in the Dove and Hawk Treatments less strongly than in the Coordination Treatment. This holds in particular for very high and very low recommendations.

The impact decline of rather extreme recommendations in the Hawk and Dove Treatments leads to interesting differences in actual investments for a given recommendation level. Model

5a in Table 5 shows that low recommendations lead to significantly higher investments in the Hawk and the Dove Treatments than in the Coordination Treatment.[13] In these treatments high recommendations (Model 5c) also lead to rather low investments but the differences are not significant because of the much larger variation in investments for a given recommendation. Again, the standard errors in these random effect GLS estimations are clustered at the Contest level and the results are robust for alternative estimation procedures and learning effects.

Table 5: Random effect GLS estimations of the differences in investment choices across the treatments, controlled for recommendations and differentiated for high, low and intermediate recommendations

Dep. Var.: Investments	Model 5a Lower Tercile Recommend. ≤ 200	Model 5b Intermediate Tercile 200 < Recomm. ≤ 450	Model 5c Upper Tercile Recomm. > 450
Benchmark: Coordination Treatment			
Rec.-300†	.792*** (.0791)	.745*** (.080)	.520*** (.118)
Hawk	31.164** (15.356)	-8.375 (17.822)	-27.349 (39.230)
Dove	24.867** (11.440)	12.152 (17.052)	-119.561 (80.992)
Constant	261.538*** (17.651)	280 569 (12.677)	392.855 (45.618)
R^2	.281	.158	.188
N	592 in 39 clusters (190 in Coordination, 92 in Hawk, 310 in Dove)	500 in 36 clusters (142 in Coordination, 226 in Hawk, 132 in Dove)	508 in 33 clusters (148 in Coordination, 242 in Hawk, 118 in Dove)

Std. Err. (in parentheses) adjusted for clusters in contests, significance levels: *** < .01, ** < .05, * < .1; † I subtracted 300 points from each recommendation.

4.3. Content Analysis of the Communication.

In this subsection I provide some exploratory content analysis to examine what kinds of messages are associated with investment levels and coordination success across the treatments. The procedure resembles the approaches in Cason et al. (2012) and Leibbrandt

[13] Various checks for different subsamples and quantiles not documented in this paper support the robustness of these results.

and Sääksvuori (2012) who again built there approach on many similar previous studies, in particular Brandts and Cooper (2007). First, I randomly selected a session from each treatment to develop a coding scheme. The scheme was based on the types of messages exchanged and conjectures based on group identity and learning, resulting in the 29 categories. Out of these categories 14 focused on the opening statement of the manager and 15 on the subsequent chats (see Table 6). Each chat room discussion was coded by two individuals independently according to these categories. The unit of observation for coding was all messages in a given period within each group (i.e., between the manager and the two group members). If a unit of observation was deemed to contain the relevant category of content, it was coded as 1 for that category and 0 otherwise. Each unit was coded under as many or few categories as the coders deemed appropriate. The coders also knew the experimental instructions provided to subjects so that they understood the strategic environment the subjects faced. The analysis focuses on those categories in which the coders had a moderate or substantial agreement, as measured by Cohen's Kappa (Cohen, 1960). This measure takes a value of 0 when the agreement is consistent with random chance and 1 when the coders agree perfectly. The categories with bold letters in Table 6 indicate a strong degree of consistency (Cohen's Kappa > .6) while those in italics do not even have a moderate degree of consistency (<.3).

The descriptive statistics in Table 6 show that most managers provide a fairly precise strategy already in their opening statement. The results also suggest some meaningful differences between the treatments. However, few of the differences turn out to be statistically significant in random effect GLS estimations with error terms clustered at the Contest level ($p < .05$, detailed results not documented in this paper). Perhaps unsurprisingly managers in the Hawk Treatment are significantly more likely to emphasize that high investments increase chances of winning the prize (Category 5). Interestingly, managers in the Coordination treatment discuss the behavior in the previous round more often (Category 8).

The group members frequently suggest alternative strategies in all treatments in the subsequent chat communication. In this communication stage any significant treatment difference is between the Coordination Treatment and the other two treatments. Group members in the Coordination Treatment are less likely to criticize the behavior of the other group member (Category 18). The manager is also more likely to transmit messages between the members in this treatment (Category 21). They also seem to act more honestly in the transfer of messages but the rating consistency for relevant category 22 is low. On the other hand group members in the Coordination Treatment are more likely to demand more precise recommendations from their manager (Category 28).

Table 6: Categories for coding messages and observed frequency in chat communication. (First round communication in parentheses)

Opening Statement of the Manager

Cat.	Description	Hawk	Coo.	Dove	Cat.	Description	Hawk	Coo.	Dove
1	*Manager is silent or claims to be clueless*	.03 (.04)	.08 (.11)	.06 (.09)	8	Looks one round backward	.31 (0)	.44 (0)	.27 (0)
2	*Manager does not care, awaits suggestions from players.*	.11 (.04)	.19 (.14)	.14 (.04)	*9*	*Looks back for more than one round*	.03 (0)	.06 (0)	.05 (0)
3	**Recommends a strategy (higher or lower investments or specific investments)**	.71 (.61)	.62 (.50)	.61 (.46)	*10*	*Looks ahead for more than one round*	.04 (.05)	.03 (.02)	.02 (.04)
4	*Emphasizes that high investments are wasteful.*	.06 (.10)	.06 (.09)	.09 (.21)	11	Reasoning about prospective behavior of the other group	.18 (.05)	.24 (0)	.14 (.04)
5	Emphasizes that high investments increase chances	.13 (.25)	.05 (.14)	.08 (.13)	12	Verbal punishment (including abusive language)	.01 (0)	.02 (0)	.02 (0)
6	*Appeal to beat the other group*	.01 (.04)	.02 (.05)	.01 (0)	13	Appraisal for behavior	.12 (0)	.12 (0)	.08 (0)
7	*Appeal to coordinate with the other group*	.01 (0)	.01 (.05)	.03 (.05)	14	(factual) critique for behavior.	.08 (0)	.06 (0)	.06 (0)

Parallel chat communications between manager and group members

Cat.	Description	Hawk	Coo.	Dove	Cat.	Description	Hawk	Coo.	Dove
15	**A group member wants to learn about the opinion of the other player**	.21 (.03)	.23 (.10)	.22 (.30)	*23*	*Manager criticizes a specific member in the separate chat.*	.03 (0)	.02 (0)	.04 (0)
16	**A member recommends an (alternative) strategy**	.80 (.64)	.83 (..59)	.72 (.64)	*24*	*Manager demands alternative proposal*	.04 (.04)	.09 (.06)	.04 (.08)
17	*A member does not trust the manager*	.03 (0)	.01 (.04)	.05 (.05)	*25*	*Manager accepts critique or alternative proposal*	.20 (.09)	.22 (.22)	.15 (.18)
18	A member criticizes the other member	.10 (0)	.04 (0)	.12 (0)	*26*	*Manager objects to critique or alternative proposal*	.27 (.27)	.12 (.04)	.21 (.20)
19	*A member criticizes the manager*	.01 (0)	.03 (0)	.06 (.05)	27	Contradictions are not eliminated. No agreement.	.33 (.45)	.33 (.46)	.27 (.30)
20	A player does not communicate at all	.01 (.02)	.02 (.02)	.09 (.07)	28	At least one member demands specific recommendations	.06 (.25)	.11 (.33)	.05 (.21)
21	**Manager transfers messages between members**	.46 (.25)	.67 (.40)	.37 (.23)	*29*	*Manager makes unequal suggestions to the different members.*	.09 (.09)	.02 (0)	.07 (.05)
22	*Manager transfers incorrect messages between members*	.06 (.05)	.01 (0)	.06 (0)					

Bold Letters denotes codes with Cohen's Kappa reliability above 0.6. *Italics* denote codes with Cohen's Kappa reliability below 0.3.

Model 3 in Table 4 estimated the impact of the manager on effort choices, in particular whether the recommendation has a different impact on the decision across the treatments. This is essentially a measure of coordination success. Model 6 in Table 7 replicates Model 3 in Table 4 but uses the dummies of all consistently rated communication categories as control variables. The treatment differences in the recommendation impact remain the same. The significance of some dummy variables suggests that the style of communication shapes the inputs of the group members. For example, investments decrease when one member does not communicate (Category 20) or when the group does not reach an agreement (Category 27).

Model 7 shows how specific communication characteristics affected the impact of recommendations on investments across all treatments. Models 7a – 7c replicate these estimations for the three treatments. The most interesting treatment differences are between the Coordination Treatment on the one side and the Hawk and Dove Treatments on the other side. Managers in the Hawk and Dove Treatment can increase the effectiveness of their recommendations if they explain their strategy already in the opening statement (Cat 3 × (Rec.-300)). They lose effectiveness if at least one group member asks about the opinion of the other member (Cat 15 × (Rec.-300)) which is perhaps a signal of distrust in the manager's recommendation. Interestingly the group members are more likely to follow the recommendations of the Hawk and Dove managers if at least one of the members has proposed an alternative recommendation (Cat 16 × (Rec.-300)). In this case the manager's final recommendation probably reflects this alternative opinion. If groups are not capable of agreeing during the communication it reduces the effectiveness of final recommendations in the Hawk and Dove Treatments but not in the Coordination Treatment (Cat 27 × (Rec.-300)). On the other hand managers in the Coordination Treatment are the only ones whose recommendation impact decreases with a silent group member (Cat 20 × (Rec.-300)).

Overall these differences between the treatments suggest that the management incentives in the Hawk and Dove Treatments amplify the relevance of intra-group disagreements. It therefore seems important for successful coordination that managers whose incentives differ from those of their group members focus in particular on the resolution of disagreements and misunderstanding within their group.

Table 7: Random effect GLS estimations of the influence of communication characteristics on the impact of recommendations on investments across treatments.

Dep. Var.: Investment	Model 6	Model 7	Model7a	Model7b	Model7c
	Benchmark: Coordination Treatment		Hawk only	Coordination only	Dove only
(Rec. -300)†	0.906*** (0.044)	0.586*** (0.090)	0.631*** (0.081)	0.842*** (0.077)	0.388** (0.167)
Hawk	5.431 (10.048)	-8.142 (11.883)			
Dove	-9.920 (21.097)	-11.318 (15.346)			
Hawk × (Rec.-300)†	-0.210*** (0.062)				
Dove × (Rec.-300)†	-0.315** (0.151)				
Cat 3	9.192 (7.625)	-2.972 (6.809)	-21.402* (11.436)	4.255 (8.689)	10.063 (12.058)
Cat 3 × (Rec.-300)†		0.174*** (0.053)	0.191*** (0.070)	0.055 (0.067)	0.282*** (0.040)
Cat 5	12.139 (13.886)	18.564* (10.698)	44.189 (31.010)	-28.658 (24.879)	12.041 (18.208)
Cat 5 × (Rec.-300)†		-0.050 (0.045)	-0.128 (0.102)	0.083 (0.080)	-0.088 (0.064)
Cat 8	11.540* (6.637)	4.779 (6.863)	2.451 (11.502)	11.102 (8.469)	9.849 (14.113)
Cat 8 × (Rec.-300)†		0.162*** (0.044)	0.088 (0.088)	0.106* (0.054)	0.208** (0.102)
Cat 11	-0.866 (9.422)	-2.239 (6.898)	-8.622 (16.756)	-11.204 (13.022)	25.260* (14.019)
Cat 11 × (Rec.-300)†		0.013 (0.051)	-0.033 (0.095)	-0.020 (0.071)	0.025 (0.074)
Cat 12	-32.825 (40.381)	-31.038 (20.299)	17.716 (33.959)	-19.519 (35.073)	-47.881 (31.369)
Cat 12 × (Rec.-300)†		-0.115 (0.118)	-0.468 (0.227)	0.035 (0.070)	-0.261 (0.231)
Cat 13	8.968 (10.357)	12.094 (9.973)	25.669* (13.091)	18.201* (9.273)	-2.727 (44.161)
Cat 13 × (Rec.-300)†		-0.013 (0.066)	-0.074 (0.144)	0.068 (0.044)	-0.108 (0.140)
Cat 14	-10.366 (13.800)	-2.847 (12.215)	-32.567 (29.814)	-29.599 (24.621)	-11.076 (27.140)

Cat 14 × (Rec.-300)†		-0.002 (0.077)	0.259*** (0.079)	-0.261 (0.238)	-0.103 (0.132)
Cat 15	-13.942* (8.243)	-1.735 (4.605)	11.293 (13.991)	5.925 (6.819)	-8.294 (12.452)
Cat 15 × (Rec.-300)†		-0.116* (0.056)	-0.233*** (0.078)	0.032 (0.042)	-0.162** (0.067)
Cat 16	19.161** (8.994)	12.401* (7.515)	-9.534 (16.298)	4.586 (14.329)	42.641** (21.364)
Cat 16 × (Rec.-300)†		0.125*** (0.042)	0.183** (0.084)	-0.080 (0.068)	0.283*** (0.097)
Cat 18	-9.967 (21.338)	2.194 (16.045)	5.151 (36.682)	4.141 (20.268)	-8.652 (13.819)
Cat 18 × (Rec.-300)†		-0.135 (0.102)	-0.158 (0.241)	-0.058 (0.074)	-0.138 (0.149)
Cat 20	-86.211*** (26.179)	-69.942*** (16.601)	-37.972** (19.075)	-83.557** (34.993)	-49.854* (28.892)
Cat 20 × (Rec.-300)†		-0.434*** (0.064)	0.202 (0.180)	-0.528*** (0.129)	-0.254 (0.175)
Cat 21	2.643 (8.804)	0.802 (8.464)	27.494* (15.226)	4.980 (13.758)	-11.278 (16.356)
Cat 21 × (Rec.-300)†		0.051 (0.041)	-0.068 (0.081)	0.071 (0.072)	0.054 (0.115)
Cat 27	-26.628*** (8.925)	-18.875*** (6.619)	-9.449 (16.948)	-4.484 (8.001)	-13.783 (13.979
Cat 27 × (Rec.-300)†		-0.175*** (0.045)	-0.254*** (0.095)	0.011 (0.030)	-0.167** (0.072)
Cat 28	-16.575 (15.256)	-10.538 (13.685)	4.159 (8.112)	-7.015 (12.346)	-7.212 (37.093)
Cat 28 × (Rec.-300)†		0.087 (0.077)	-0.140 (0.273)	0.071 (0.044)	-0.022 (0.218)
Constant	270.549*** (11.232)	285.469*** (13.977)	294.683*** (17.698)	274.140*** (18.920)	244.464*** (30.322)
R^2	.665	.701	.578	.852	.652
N	1600 in 40 clusters	1600 in 40 clusters	560 in 14 clusters	480 in 12 clusters	560 in 14 clusters

5 Conclusions

This paper investigated the impact of group managers on the behavior of group members in intergroup contests. These managers could advise their group members without changing their monetary incentives. In general, the results show that even these rather weak group managers have a large influence on their group members. Group members follow the (non-binding) management recommendations strongly. Because group members have an interest in coordination managers can exercise real authority even without formal authority, as Aghion and Tirole (1997) put it.

More specifically this study was set up to investigate how conflicting incentives between managers and group members affect the leadership effectiveness. I varied management incentives across three treatments, including a treatment with predetermined manager compensation. The incentives of the manager shape the direction of the recommendations which again influence the behavior of the group members. However, the overall incentive effect on behavior is not particularly strong. While opposite management incentives lead to significant differences in behavior of group members the impact of each incentive scheme is insignificant relative to the behavior without (incentivized) management. The average contest expenditure exceeds equilibrium prediction for purely selfish preferences by at least 100% in each treatment. Followership in the treatments with incentivized managers explains this rather weak incentive effect to some extent. Group members are less likely to follow the recommendations in these treatments than in the treatment without management incentives. This holds in particular for very low and very high recommendations. Conflicting incentives reduce the managers' real authority with group members. The analysis of the communication characteristics suggests that this holds in particular in case of disagreements between incentivized managers and their group members. However, the incentives do not eliminate the leadership credentials entirely.

The results contribute to the understanding of leadership and coordination in intergroup contests in several ways. I studied the impact of rather weak managers who could neither design incentive contracts nor lead by example. The results show that effective leadership towards very high or low contest expenditure is rather difficult without appropriate instruments for punishment and rewards. This evidence provides an explanation why most armies honor self-sacrifice and enforce strict discipline. However 'peaceniks' seem to have a tougher job than 'war lords' as it is more difficult to restrain conflict expenditure than to elicit it in the first place. Even in those treatments with dovish leaders or no manager at all, I observe investments clearly above the standard equilibrium predictions. As in-group effects drive these seemingly excessive investments, the results provide a behavioral rationale for the difficulties of government or opposition leaders in parliaments in finding support for bipartisan legislation. They also give an idea why corporate mergers between rivals often fail. The resistance of employees against more cooperation is hard to overcome. The paper also complements the literature on the impact of communication on preferences. Previous studies have shown that one takes the interests of the communication partners into account. This study shows that the incentives of the communication partner moderate this alignment of preferences. Changing incentives shape the direction of behavior but weaken the alignment if they reinforce the conflict of interests between the communicating agents.

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Figures

Figure 1: Average investment choices of group members across treatments and periods.

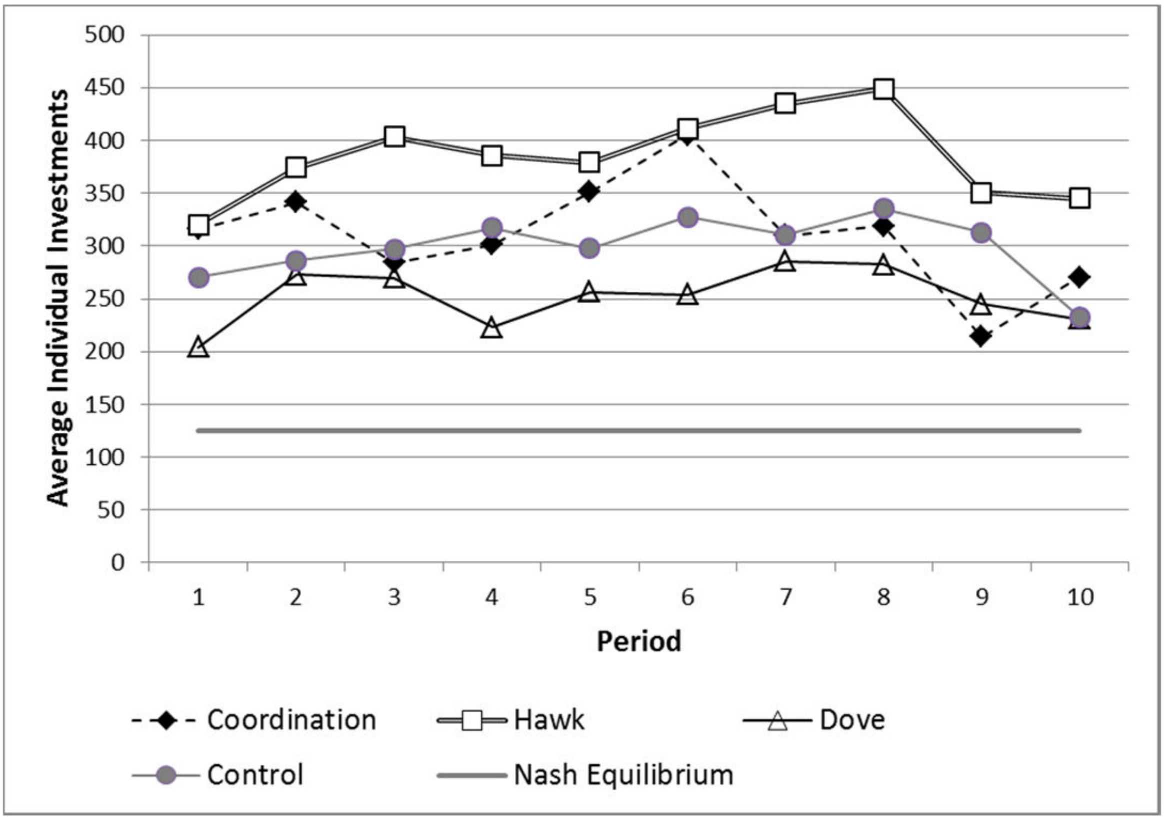


Figure 2: Average investment recommendations across treatments and periods.

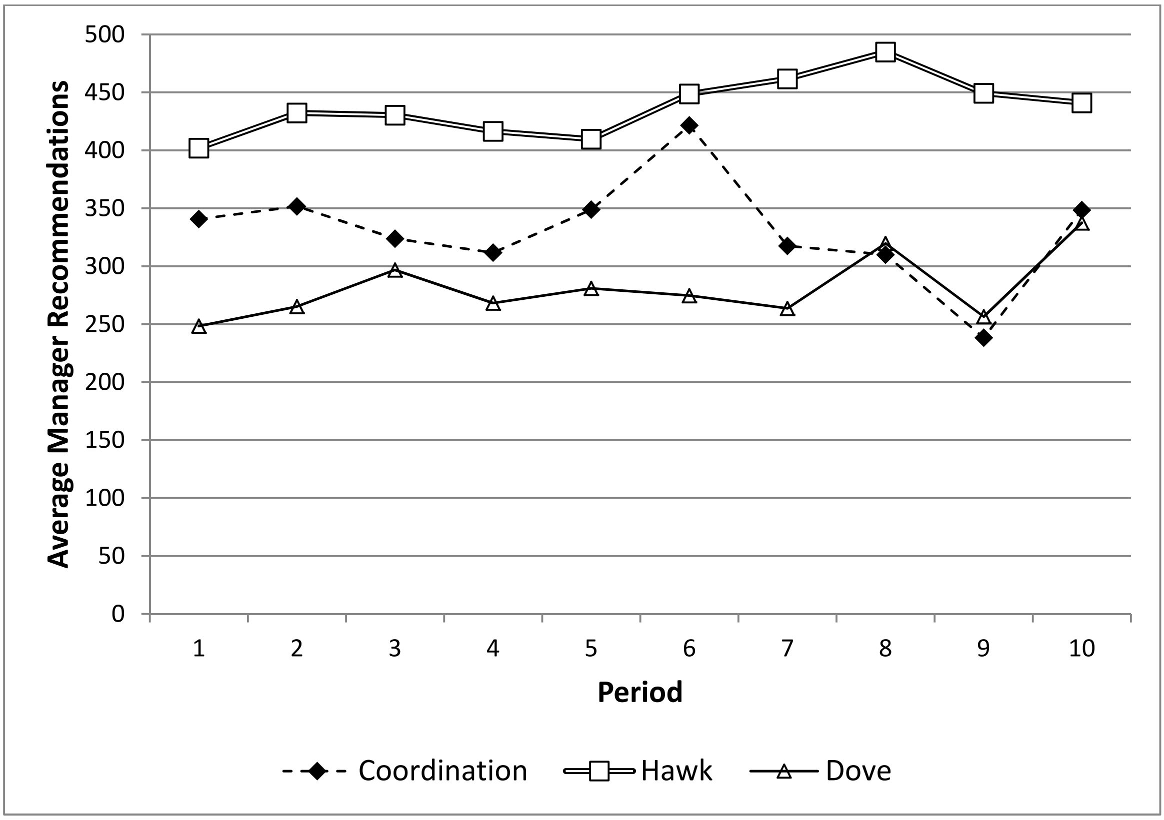


Figure 3: Share of group members who follow the recommendations of the managers

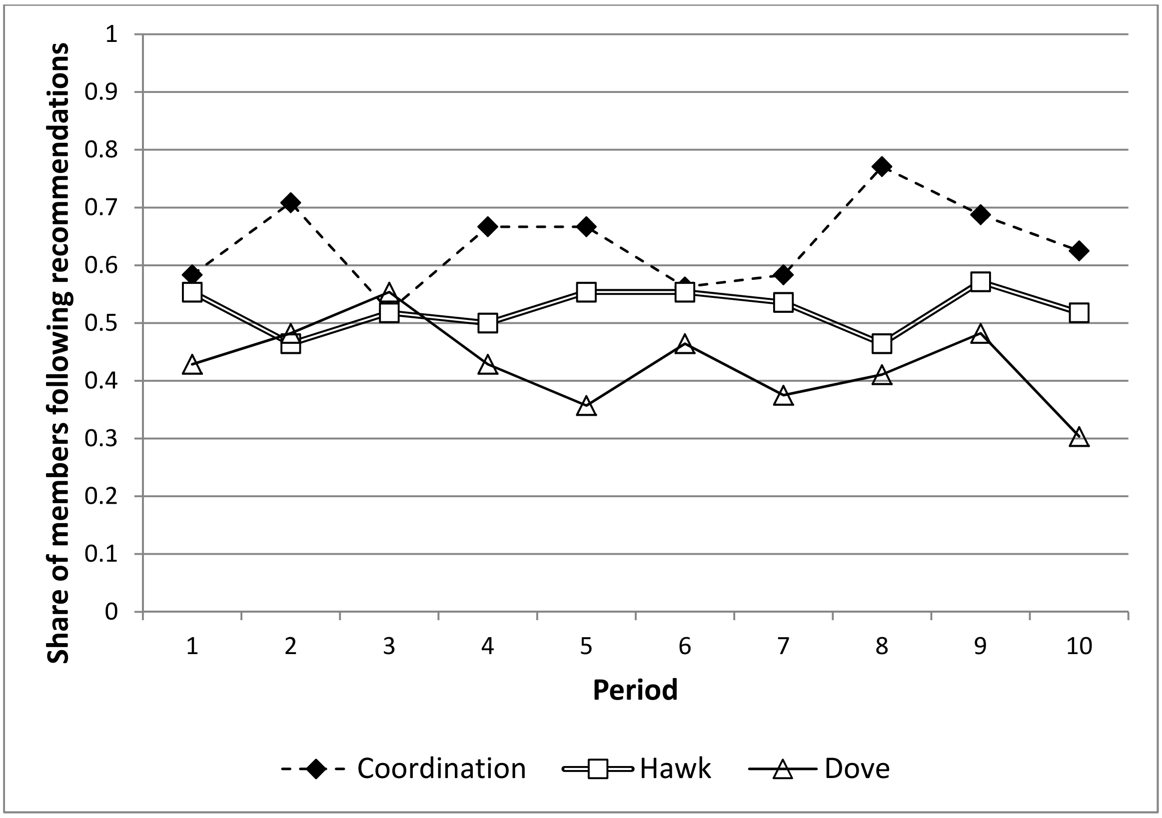


Figure 4: Recommendations and contest investments in the Hawk Treatment

(The bubble size increases in the number of observations)

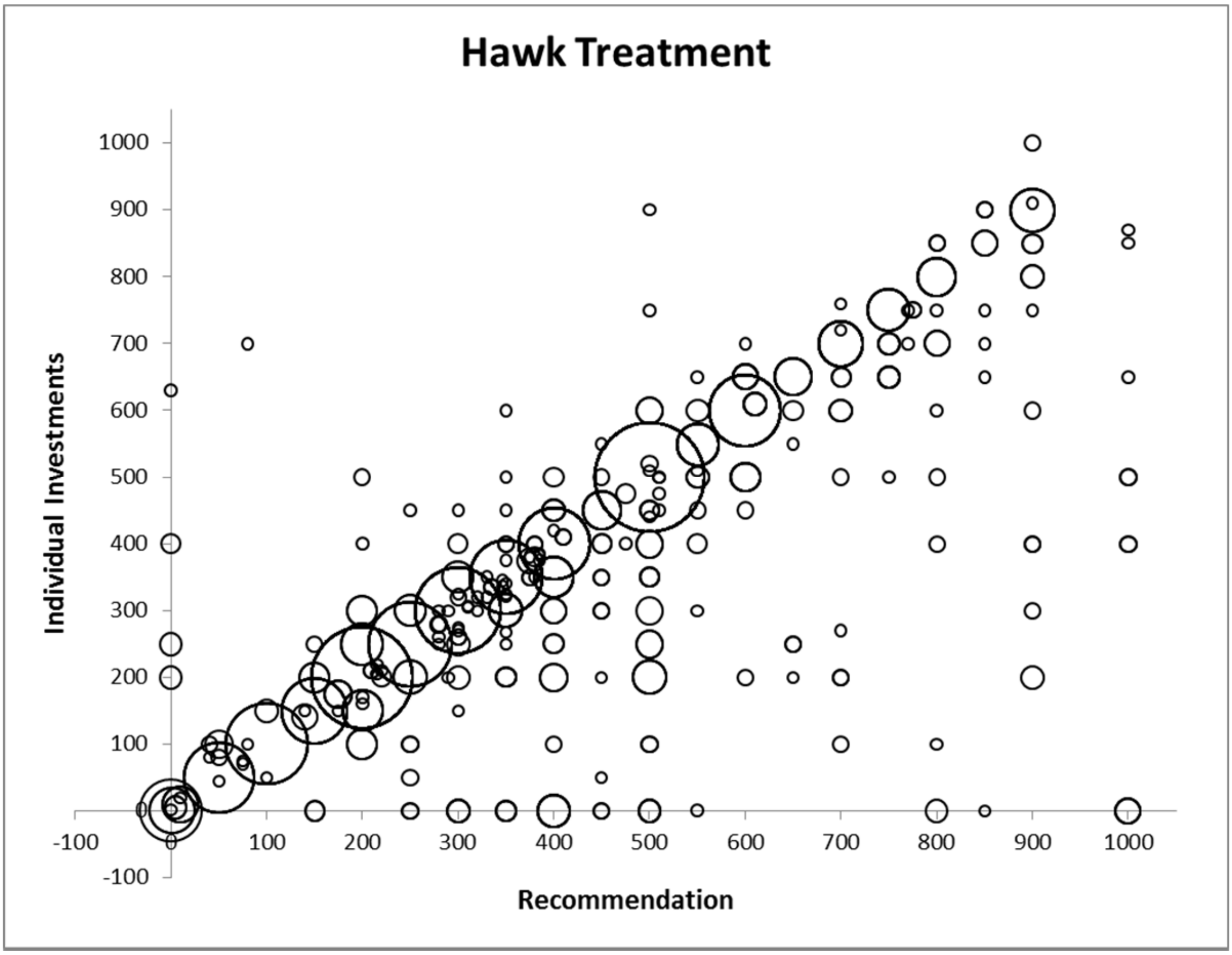


Figure 5: Recommendations and contest investments in the Coordination Treatment
(The bubble size increases in the number of observations)

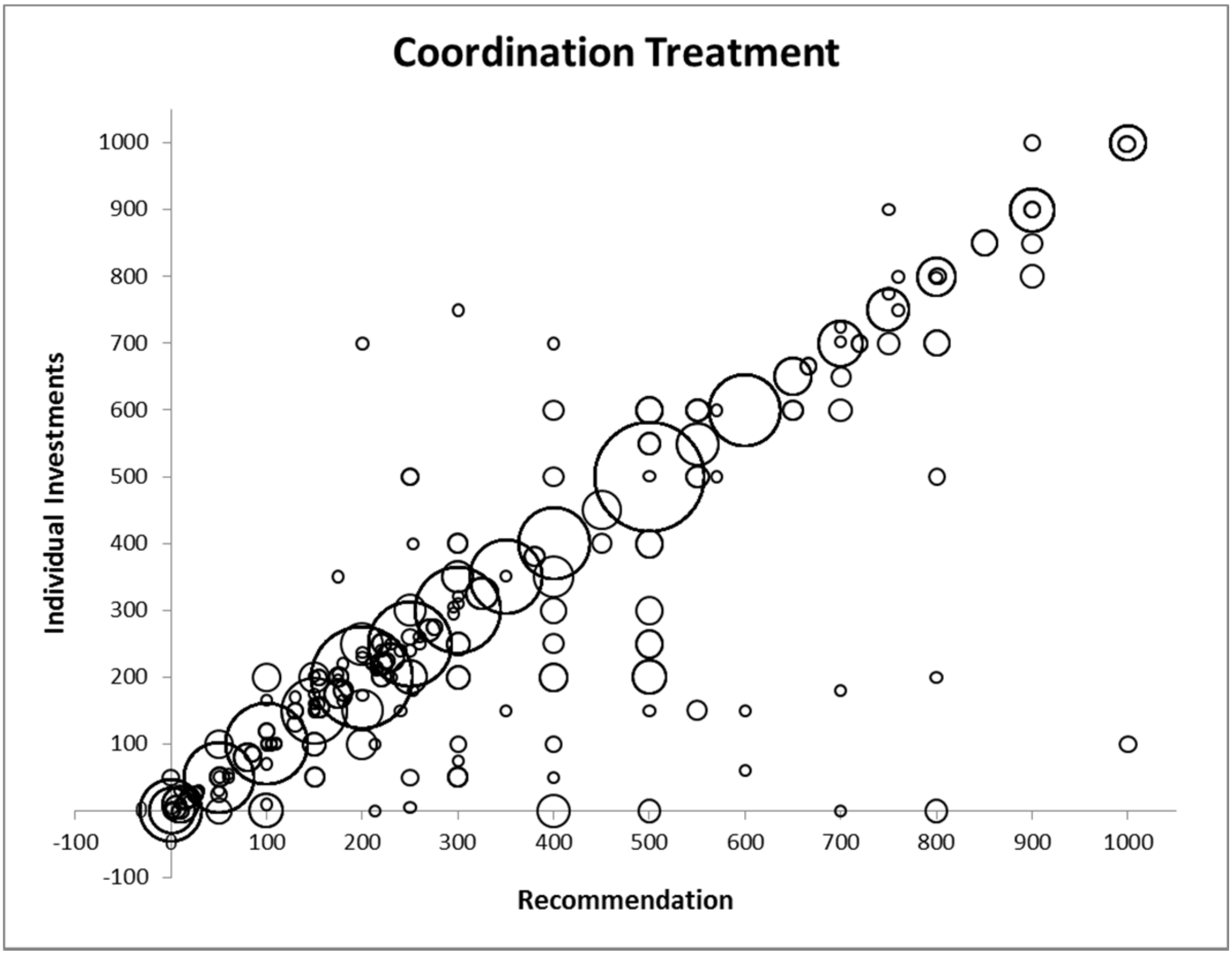
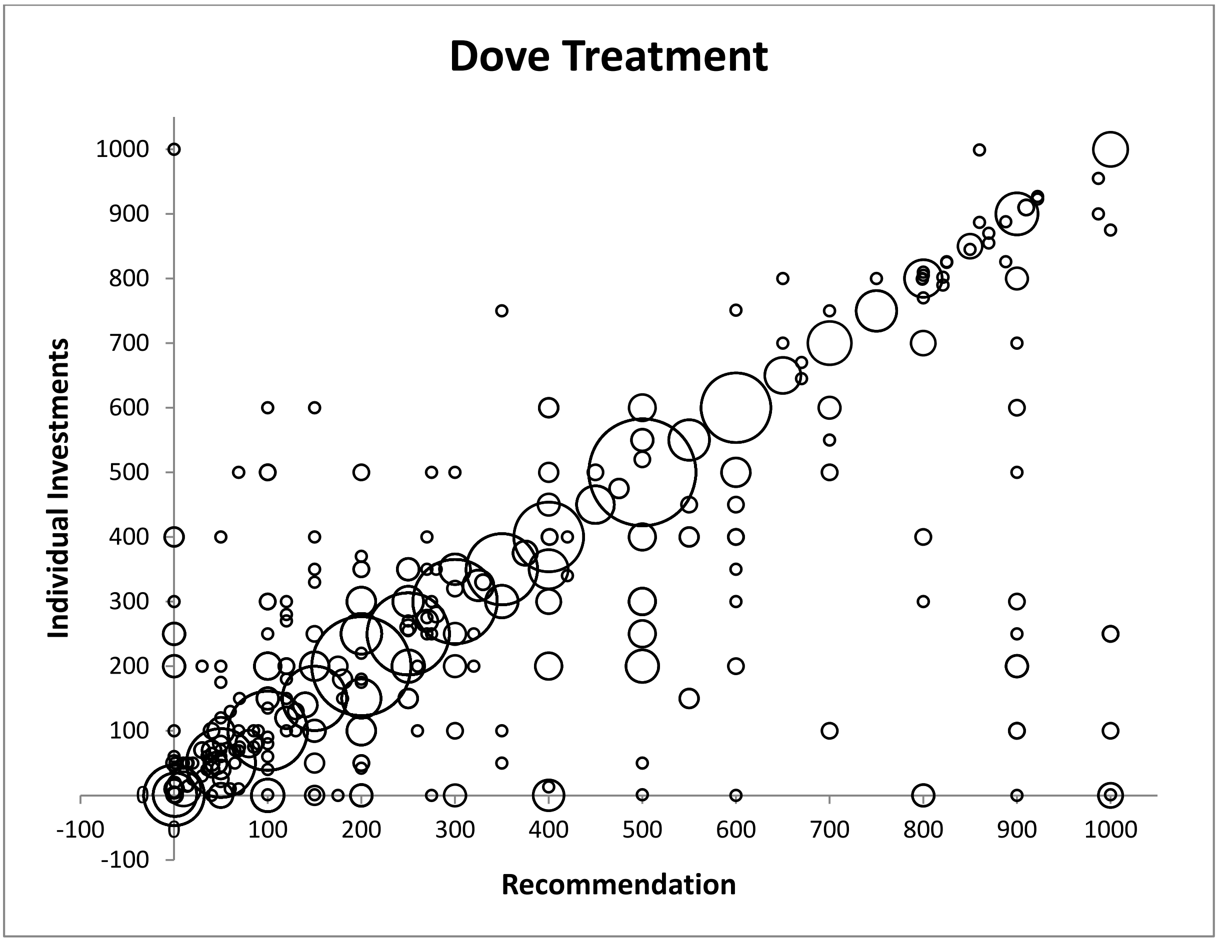


Figure 6: Recommendations and individual contest investments in the Dove Treatment

(The bubble size increases in the number of observations)



Appendix A – Instructions

Welcome to this economic experiment.

Your decisions and the decisions of the other participants will affect your payoff. Hence, it is important that you read these instructions carefully. Please contact us before the experiment starts if you have any question.

Please do not talk with the other participants during the experiment.

Otherwise we might exclude you from the experiment and any subsequent payment.

During the experiments we always talk about points that determine your income. At the end of the experiment we convert all points into Euros, using the following exchange rate.

10 points = 1 Euro-Cent

You get your payments at the end of the experiment in cash. Now we explain you the experiment in detail.

Experimental Setup

In this experiment we distinguish between external participants and team members. You are a **team member**.

At the beginning of the experiment we put you and another randomly chosen team member into a team. Your team and another team with the same characteristics constitute a group. We assign an external participant to each team. This external participant interacts with the respective team throughout the entire experiment.

The experiment lasts for 10 rounds. We do not change the composition of your team or the other team in your group. In each round either your team or the other team can win a prize. The success probability of your team depends on the inputs of the team members. Each team member of the successful team will get 1000 points on her account at the end of the round, irrespectively of the individual input. We add these points to a participant's account at the end of a round.

At the beginning of each round, each team member gets 1000 points. Each member can use between 0 and 1000 points inclusive as input. All other points remain on the account of the team member.

The computer adds up the inputs within a team. The success probability is derived from the ratio between your team's input and the sum of both teams' inputs. If both teams invest the same amount the success probability is 50% for each team. This also holds if both teams invest 0 points. If one team makes a higher investment the success probability is also higher. However, it is not guaranteed that the team with the higher investment also wins the prize. More specifically the formula for the success probability is as follows:

$$Success\ probability = \frac{Input\ of\ your\ team}{Input\ of\ your\ team + Input\ of\ the\ other\ team}$$

External Participant

Each team has an exclusive external participant at its side. **These participants cannot make an input and they do not get anything of the team's prize.** They can get a separate bonus instead. The external participant has three communication tools at hand.

1. At the beginning of each round they have 60 seconds time to send an opening statement to the team members.
2. Afterwards they can communicate with the two team members separately via chat boxes.
3. After the chats the external participants have to send the team members a recommendation how many points each member should use as an input. Both team members get the same recommendation.

Only external participants can communicate with the team members. The team members cannot communicate between themselves directly.

For privacy reasons it is important that you do not send information containing your seat number or name.

Hawk Treatment:

Per round the external participants get 1000 points and they can get an additional bonus of 1000 points. To get this bonus the two external participants of the two teams compete with each other. Only one of them can get a bonus. The bonus assignment procedure is comparable to the prize assignment procedure of the teams. Hence, the success probability calculation is as follows:

$$Success\ probability = \frac{Input\ of\ your\ team}{Input\ of\ your\ team + Input\ of\ the\ other\ team}$$

The success probability for the external participant in the other team is calculated accordingly. Be aware that the bonus assignment for the externals occurs independently from the prize assignment for the teams. Both the team members and the external can get the 1000 points, or none of them, or only the external or only the team members.

Dove Treatment:

Per round the external participants get 1000 points and they can get an additional bonus of 1000 points. To get this bonus the two external participants of the two teams compete with each other. Only one of them can get a bonus. The bonus assignment procedure is comparable to the prize assignment procedure of the teams.

However, the success probability calculation is reverted. Now it is:

$$Success\ probability = \mathbf{1} - \frac{Input\ of\ your\ team}{Input\ of\ your\ team + Input\ of\ the\ other\ team}$$

The success probability for the external participant in the other team is calculated accordingly. Be aware that the bonus assignment for the externals occurs independently from the prize assignment for the teams. Both the team members and the external can get the 1000 points or none of them or only the external or only the team members.

All Treatments:

At the end of each period you learn about the inputs of the other team member and the other team. We also inform you about the payoffs of the teams and the external participants.

Examples (with random numbers)

(Calculations for the Dove Treatment, the values have been adapted for the other treatments)

Example 1:

Team member A invests 10 points and team member B 50. The members of the other team invested 120 points altogether. The success probability of the team is therefore 1/3:

$$success\ probability = \frac{10+50}{10+50+120} = \frac{60}{180} = \frac{1}{3}$$

If the team gets the prize, team member A gets the following amount of points:

$$1000 + 1000 - 10 = 1990$$

Team member B would get 1950 points in this case (1000+1000-50).

If the team does not get the prize, team member A gets the following amount of points:

$$1000 - 10 = 990$$

Team member B would get 950 points in this case (1000-50).

For the external participant the success probability for the bonus is as follows:

$$1 - \frac{10+50}{10+50+120} = \frac{2}{3}$$

The external participant either gets 1000 or 2000 points altogether.

Example 2:

Team member A invests 1000 points and team member B 500. The members of the other team invested 500 points altogether. The success probability of the team is therefore 3/4:

$$success\ probability = \frac{1000+500}{1000+500+500} = \frac{1500}{2000} = \frac{3}{4}$$

If the team gets the prize, team member A gets the following amount of points:

$$1000 + 1000 - 1000 = 1000$$

Team member B would get 1500 points in this case (1000+1000-500).

If the team does not get the prize, team member A gets the following amount of points:

$$1000 - 1000 = 0$$

Team member B would get 500 points in this case (1000-500).

For the external participant the success probability for the bonus is as follows:

$$1 - \frac{1000 + 500}{1000 + 500 + 500} = \frac{1}{4}$$

The external participant either gets 1000 or 2000 points altogether.

Timing of a round

1. Each team member gets 1000 points.
2. Communication
    a. 60 seconds for the opening statement of the external participant.
    b. 60 seconds chat communication between the external and the team members.
    c. Input recommendation by the external participant.
3. Input decision of the team members. The invested points are withdrawn from the 1000 points.
4. Decision about which team gets the prize.
5. Decision about which external gets the bonus.
6. The prizes and bonuses are added to the accounts. Information about the decisions of the other team member and the other team.

The experiment extends across 10 periods which all follow the same sequence. During the entire experiment the team composition of your team and the group does not change. We ask you to answer some questions during and after the experiments. We add all your earned points, convert them into Euro and pay you at the end of the experiment accordingly.

Appendix B Analyses of Subgroups

Further estimations (Table B1) support the insight that subjects in the Hawk and Dove Treatments do not follow both very high recommendations (> 450 points, Model 3a) or very low ones (≤ 200, Model 3c) as closely as those in the Coordination Treatment while recommendations around the median (Model 3b) have essentially the same impact in all treatments. The treatment differences regarding the impact of recommendations documented in Table 4 do not qualitatively depend on whether the group had won the prize in the previous round or not (Table B2). These differences are mainly driven by those participants who had contributed less than the other group member (Table B3). Furthermore treatment differences are stable across the periods (Table B4).

Table B1: Random effect GLS estimations of the impact of management recommendations on investment choices across the treatments, differentiated for high, low and intermediate recommendations[14]

Dep. Var.: Investments	Model 3a Recommend. ≤ 200	Model 3b 200 < Recomm. ≤ 450	Model 3c Recommend. > 450
Benchmark: Coordination Treatment			
Recommendation†	1.069*** (.059)	.789*** (.096)	.938*** (.085)
Hawk	-61.876** (29.394)	-8.812 (18.056)	176.582*** (48.963)
Dove	-51.513* (26.563)	12.700 (16.332)	158.852*** (59.859)
Hawk × Recommendation†	-.499** (.197)	-.039 (.140)	-.598*** (.141)
Dove × Recommendation†	-.381*** (.137)	-.099 (.250)	-.782*** (.254)
Constant	316.931*** (15.434)	280.794 (12.584)	246.594*** (38.728)
R^2	.297	.158	.2071
N	592 in 39 clusters (190 in Coordination, 92 in Hawk, 310 in Dove)	500 in 36 clusters (142 in Coordination, 226 in Hawk, 132 in Dove)	508 in 33 clusters (148 in Coordination, 242 in Hawk, 118 in Dove)

Std. Err. adjusted for clusters in contests, significance levels: *** < .01, ** < .05, * < .1; † We subtracted 300 points from each recommendation.

[14] Various checks for different subsamples and quantiles not documented in this paper support the robustness of most of these results. This holds in particular for estimations in which we assign weights to observations with a recommendation of 200 or 450 such that the weighted sum of observations in each model actually reflects one third of the altogether 1600 input decisions in these treatments. The p-value for the Dove × Recommendation in model 3a becomes 0.142 if we put investment recommendations of 200 points into the intermediate tercile. The number of observations decreases in the lower tercile from 592 to 446 in this case. As an even allocation of decisions across all terciles would assign 533 to each tercile we consider it as more appropriate to include a recommendation of 200 into the lower tercile.

Table B2: Random effect GLS estimations of the impact of management recommendations on investment choices across the treatments, differentiated for winning and losing groups in the previous round.

Dep. Var.: Investments	Group won in previous round	Group lost in previous round
Benchmark: Coordination Treatment		
Rec. -300 †	.948*** (.038)	.867*** (.062)
Hawk	2.169 (11.257)	12.931 (15.522)
Dove	-23.842 (28.568)	-5.109 (17.082)
Hawk × (Rec. -300)†	-.203** (.094)	-.159* (.089)
Dove × (Rec. -300)†	-.393**(.175)	-.221 (.138)
Constant	286.008*** (6.096)	278.348*** (9.334)
R^2	.692	.637

For each estimation: N = 720 (80 subjects × 9 periods), Std. Err. adjusted for 40 clusters in Contests, significance levels: *** < .01, ** < .05, * < .1; † We subtracted 300 points from each recommendation.

Table B3: Random effect GLS estimations of the impact of management recommendations on investment choices across the treatments, differentiated for winning and losing groups in the previous round and high or low contributors within each group.

Dep. Var.: Investments	Group won in previous round		Group lost in previous round	
	High contributor in previous round	Low contributor in previous round	High contributor in previous round	Low contributor in previous round
Benchmark: Coordination Treatment				
(Rec. -300)†	.911*** (.069)	.901*** (.065)	.843*** (.113)	.917*** (.076)
Hawk	27.902 (18.751)	33.678 (26.239)	39.971 (32.484)	-1.878 (26.511)
Dove	-11.580 (30.349)	-45.629 (37.262)	-11.007 (33.505)	-10.896 (22.103)
Hawk × (Rec. -300)†	-.157 (.115)	-.375*** (.132)	-.137 (.151)	-.296** (.137)
Dove × (Rec. -300)†	-.272 (.199)	-.417** (.202)	-.389* (.220)	-.263* (.135)
Constant	281.325*** (14.995)	276.294*** (9.360)	280.117*** (22.417)	270.967*** (13.255)
R^2	.656	.545	.513	.597
N	231	231	211	211

For each estimation: N = 720 (80 subjects × 9 periods), Std. Err. adjusted for 40 clusters in Contests, significance levels: *** < .01, ** < .05, * < .1; † We subtracted 300 points from each recommendation.

Table B4:

Random effect GLS estimations of the impact of management recommendations on investment choices across the treatments, differentiated for periods 1-5 and 6-10.

Dep. Var.: Investments	Periods 1-5	Periods 6-10
Benchmark: Coordination Treatment		
(Rec. -300)†	.911*** (.059)	.888*** (.051)
Hawk	4.773 (11.636)	6.442 (17.921)
Dove	-26.403 (22.760)	-13.884 (21.596)
Hawk × (Rec. -300)†	-.226** (.096)	-.174* (.103)
Dove × (Rec. -300)†	-.377** (.185)	-.255* (.150)
Constant	286.712*** (7.505)	279.613*** (8.345)
R^2	.649	.652

For each estimation: N = 800 (80 subjects × 10 periods), Std. Err. adjusted for 40 clusters in Contests, significance levels: *** < .01, ** < .05, * < .1; † We subtracted 300 points from each recommendation.

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