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Management Impact in an Experimental Intergroup Contest

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Management Impact in an Experimental Intergroup Contest

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Abstract:

The paper presents experimental evidence on the impact of managers and their incentives on the behavior of group members in intergroup contests. I find that members follow the non-binding investment recommendations of their group manager in particular if the managers' payoff does not depend on the members' behavior. Different incentives schemes induce the managers to lead the groups into different directions but incentivized managers are less capable of inducing very high or low contest investments.

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

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

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1 Introduction

Most groups have (and need) some person who tries to coordinate the activities of the members. Such a manager can be a CEO with explicit formal authority, or a group member who leads by example, or some *primus inter pares* who acts rather as an informal chairman. Even in the latter case the manager can successfully coordinate the activities of the group members if she facilitates the communication process within the group.¹ However, incentives shape the behavior of the managers and these incentives can conflict with the preferences of the group members, particularly in contests. Many generals led hazardous campaigns to gain glory without putting their own life seriously at risk. Senior politicians can gain reputation from cross-party cooperation while the party members call for ideological purity. Mergers and acquisitions fail if employees resist management sponsored integration processes and focus on rent-seeking instead. Such a conflict of interests may impair the coordination activities of the manager.

In order to identify 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, how management incentives affect this coordination and whether the managers direct group members towards high or low expenditure levels. The focus is on managers who have a key role in internal communication processes but lack formal authority or punishment instruments. This implies that managers cannot alter the financial incentives of the group members in any treatment. Hence, I measure a ‘pure’ coordination effect that is independent of group members’ concerns about managerial retributions and their own coordination efforts. 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. Experimental studies in economics typically investigate (endogeneous) leadership in public

¹ Riechmann and Weimann (2008) and Andreoni and Rao (2011) show the powerful coordination effect of communication. They argue that communication facilitates mutually beneficial coordinative acts and recursive belief formation.

good games or coordination games². They do not study competitive environments and do not look at the role of local leaders in intergroup-relationships. Second I investigate the impact of rather weak managers who can neither set incentives nor lead by example. 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. Leaders in public good or coordination games can at least reasonable expect that followers have reciprocal preferences and reward their kindness. In this context our paper 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. Brandts and Cooper (2007) and Eisenkopf and Bächtiger (forthcoming) also study relatively weak managers (or mediators) in some of their treatments. They identify communication as an effective tool for third parties to change the cooperativeness of agents even if the third party has particular monetary interests in the outcome. Third the key studies on the role of communication in intergroup contests like Sutter and Strassmair (2009), Leibbrandt and Sääksvuori (2012) or Cason, Sheremeta and Zhang (2012) alter the communication structure (i.e. who can talk with whom). The communication structure in my experimental intergroup contest is constant across the treatments with managers. Only the incentives of the manager change.

It is a key characteristic of group competition in general and this experiment in particular 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.³

² 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.

³ “The observation that intergroup conflicts increases 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,

The competitiveness of groups is inefficient if the contest expenditure does not imply a positive externality for a third party.⁴ 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)⁵. Hence 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.⁶

The results of my experiment show that group managers can coordinate the competitive behavior of their group members. In general, the group members adapt their behavior according to the recommendation of the group managers. This adaptation is significantly stronger if managers get a fixed rather than an outcome-dependent payment. Managers who benefit from a competitive behavior of their group members induce the highest contest investment. Those who benefit from a more cooperative behavior induce the lowest investment. However, they do not achieve significantly lower investments than managers with a fixed payment because they do not make, on average, lower recommendations and because group members are less likely to follow any low recommendations of an incentivized manager. In the next section I present the design of the experimental design, section 3

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.

⁴ 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).

⁵ 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)).

⁶ 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.

discusses the predictions and section 4 presents the results. 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). However, I limited the size of each group to 2 persons (“group members”). At first I describe the *Control Treatment*. The features of this control treatment appear in all other treatments in which I added a third person (“manager”) to each group. This manager could not interfere in the game directly but recommended specific decisions. Each member (and later on also each manager) interacted in the same group and with a fixed opponent group for 10 rounds. All the features of a treatment were common information to all participants. Appendix A documents a translation of the experimental instructions⁷.

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 party. Any points not invested were added to the participant’s point balance. As soon as everybody had made her decision, the computer determined randomly which of the two parties would win the prize. The members of the winning party received an extra 1000 points each, regardless of their investment. The probability of a party winning the prize was equal to the total number of points invested by that particular party, divided by the sum of points invested by both parties. After the lottery each participant was informed of 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 party. 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 party members’ point balances, and the experiment then proceeded to the next round.

⁷ Because I wanted to minimize the inducement of an in-group effect via terminology I described a group of 2 as a “Team” in the German instructions, while the term “Group” summed all four participants from both “teams” who interacted across the ten periods.

The Manager Treatments

In all other treatments I added a third person (“manager”) to each group. In the instructions I used the more neutral term *external participant* for this third person. In each round this manager communicated via the computers with the group member 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 same number to both group members.

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 could earn another 1000 points per period depending on the inputs of their respective group members. 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 party, divided by the sum of points invested by both parties. 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* party, divided by the sum of points invested by both parties. In both treatments this zero-sum game ensures that aggregate efficiency considerations did not affect the decisions of the group members. 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 learned about how many points

the other group member had invested in that round and of the total amount invested by the rival party.

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 but simply shifts money from 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 argument for each manager that falls in line with their 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 summarizes the differences in manager compensation between the treatments.

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

Treatment	Expected Payoff Group Member*	Expected Payoff Manager**
Coordination		$\pi_{MA} = 1500$
Hawk	$E(\pi_{1A}) =$	$E(\pi_{MA}) = 1000 + \frac{A}{A+B} 1000;$
Dove	$1000 + \frac{A}{A+B} 1000 - a_1;$	$E(\pi_{MA}) = 1000 + \left(1 - \frac{A}{A+B}\right) 1000;$
	with $A = a_1 + a_2; B = b_3 + b_4$	
Control		-----

* 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 ; ** denotes the expected payoff in points for the manager of group A.

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

There are two groups with two members each. Players 1 and 2 are members of one group, players 3 and 4 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.

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

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 $1 - \frac{A}{A+B}$)⁸. 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 last period

$$(A + B)^2 = 1000B. \quad (2)$$

The symmetric Nash equilibrium of this finitely repeated game, given the assumption that group members are risk-neutral and motivated only by their own monetary earnings, predicts in all treatments that each party 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.

Most studies in the contest literature document effort levels in tournaments and contests that exceed standard equilibrium predictions (see 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 (see footnote 1 in the introductions). A plausible explanation for this phenomenon is that a player incorporates the impact of her effort choice on the payoff of the other group member into her utility function. Of course, there are other valid explanations for this phenomenon, too. Balafoutas, Kerschbamer and Sutter (2012) and Eisenkopf and Teyssier (forthcoming) show that envy also explains this

⁸ The expected payments for players 2, 3 and 4 are calculated accordingly.

‘overinvestment’. The existence of managers in the Coordination treatment allows for (indirect) communication within a group. Such communication increases the contest expenditure of group members even more. (Sutter and Strassmair, 2009; Leibbrandt and Sääksvuori, 2012). In line with this argument the utility function of the group member 1 changes as follows:

$$E[U(\pi_{1A})] = 1000 + (1 + \alpha) \frac{A}{A + B} 1000 - a_1 \quad (3)$$

The variable α captures the in-group effect (Charness et al., 2007; Chen and Li, 2009; Chen and Chen, 2011). The group member incorporates the impact of her effort choice on the payoff of the other group member into her utility function. Communication within a group increases α . Assuming common knowledge about identical $\alpha \geq 0$ for all group members the resulting first order condition with respect to a_1 yields

$$(A + B)^2 = (1 + \alpha)1000B \quad (4)$$

There exists a symmetric equilibrium $A = B$ in which any combination of investments by individual group members that adds up to $(1 + \alpha)250$ 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

Note that Hypothesis 1 does not hold if the group members are particularly envious towards the manager. After all, she recommends an investment without bearing the costs. This inequality essentially means that the manager must be able to distract the group members from such payoff comparisons when she assigns the investment targets of the groups.

In the experiment a manager had enormous control over the communication. She sent an opening message and concluded the chat with a recommendation. Moreover, there was no direct communication between the group members. I assume that a change in incentives has the same impact as the changes in communication structure that have been observed in Sutter and Strassmair (2009) or Leibbrandt and Sääksvuori (2012). More specifically I expect that the managers can change group identity (i.e. adjusting the group identity variable α in my simple model) by aligning the agents’ objectives with their own interests.

Hypothesis 2: Investments by group members increase in the following order across the Treatments: Dove \leq Coordination \leq Hawk, with Dove $<$ Hawk

Hypotheses 1 and 2 focus on the average investment choices of group members across the treatments. They suggest the direction in which a manager leads her group. Now I consider the effectiveness of the leadership, i.e. the extent to which group members actually follow the advice. 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 an uniform level in line with this first order condition, the manager makes the symmetric equilibrium more salient and induces coordination at this level (as in Mehta, Starmer and Sugden, 1994). The case for coordination within the group becomes even stronger if I take inequity aversion between the group members or a meritocratic notion of desert into account. These preferences induce multiple equilibria in team production processes with perfectly substitutable inputs of the members (Gill and Stone, 2011).

Hypothesis 3: The presence of a group managers and the resulting communication within a group induces more homogeneous investment choices within a group. Therefore, the difference in investments between the two members of a group in a period is larger in the Control Treatment than in the treatments with a manager.

Hypothesis 3 claims that group members follow the advice of their manager. Now, I discuss to which degree this should be the case and why. A manager in the Coordination Treatment can build trust (and reduce free riding) between the group members by pointing out that both members have the same interests. Because this manager gets a fixed payment the group members have no immediate motive to distrust the honesty of the advice. Managers in the Hawk and Dove Treatments have financial incentives that are to some extent in conflict with those of the members. The psychological literature suggests that the relationship between managers and group members suffers in this context, diminishing the manager's potential for leadership (Uhl-Bien, Graen and Scandura, 2000; Avolio, Walumbwa and Weber, 2009). Hence, the group members should not follow the advice of an incentivized group manager so strongly if they expect the manager to pursue her own interests at the expense of the agents.

Hypothesis 4: Group members follow the recommendations of managers in the Dove and Hawk treatments less strongly than recommendations in the Coordination Treatment.

Of course, there are some plausible arguments that speak against this hypothesis. For example, the absence of incentives makes it more difficult to predict in which direction a manager changes group identity. Even a somehow benevolent person might flip a coin whether to enhance her own group's interest or focus on efficiency, i.e. the maximization of payoffs of all involved agents. This uncertainty affects the formation of beliefs regarding the behavior of the other group. In these circumstances multiple equilibria could arise even in the context of identical players and it becomes less clear whether the recommendation of a manager is actually helpful.

4 Results

In this section I compare the results from the different treatments in light of my hypotheses. Later on, I provide a more detailed analysis of the communication between the managers and the group members. Table 2 documents for each treatment the main descriptive statistics across all periods. The contest 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.

Table 2: Descriptive statistics across all periods

Treatment	N			Recommend.	Investment	Δ Invest*
	Contests	Group members	Manager			
				(standard deviations in parentheses)		
Coordination	12	48	24	331.25 (260.95)	311.31 (262.33)	56.89 (125.67)
Hawk	14	56	28	437.65 (220.86)	385.30 (215.43)	102.57 (160.45)
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.

Initially, I focus the analysis on the impact of managers on the investments of the group members. Figure 1 shows the average investments of group members across treatments and periods. Investments in the Coordination Treatment and without any manager (Control Treatment) are at about the same level treatments. They do not differ significantly.

Figure 2 shows the average investment recommendations of group members across treatments and periods. At an aggregate level the actual investments are remarkably similar to the recommendations. In both treatments, the investments per member exceed the Nash equilibrium ($250/2 = 125$ points) by more than 100%.⁹ This suggests that prosocial preferences toward in-group members (the variable α in my little 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: In the Control Treatment the expenditure per group exceeds the equilibrium level predicted by standard theory (i.e. > 250 points). Investment choices in the Coordination Treatment are NOT higher than those in the Control Treatment.

INSERT FIGURES 1 AND 2 HERE

⁹ 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)

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 < .05)¹⁰. At an aggregate level, investments in the Coordination Treatment do not differ from those in the Dove and Hawk Treatments.

Result 2: Investments by group members increase in the following order across the Treatments: Dove \leq Coordination \leq Hawk, with Dove < Hawk. This result confirms Hypothesis 2.

The last variable in Table 2 provides information about the coordination success of the managers which is the focus of Hypothesis 3. It suggests that managers, and particularly those in the Coordination treatment, achieve some coordination between group members as the difference in investments is smaller than in the Control treatments. Table 3 provides results from two estimations that explore these treatment differences in greater detail. The control treatment provides the benchmark in both estimations. The first model estimates the investment gaps just by using the dummy variables for each treatment as independent variables. Across all ten periods only managers in the Coordination treatment achieve a greater coordination success than in the control treatment. The second model takes dynamic aspects into account by controlling for time effects in each treatment. In the first period managers in the Coordination and the Hawk treatments achieve more coordination than group members achieve on their own. The significant coefficient for period shows that group members in the Control Treatment improve coordination on their own along the periods. The significant (negative) coefficients for some the interaction terms (Coordination \times Period and Hawk \times Period) show that coordination does not improve in these treatments over time.

¹⁰ The same holds for the differences in recommendations.

Table 3: Panel 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 \times Period		8.96* (4.89)
Hawk \times Period		7.69* (4.54)
Dove \times Period		1.59 (5.13)
Constant	141.00*** (15.27)	179.76*** (29.77)
R ²	.042	.050

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

Result 3: The presence of a group manager without incentives and the resulting communication induce more homogeneous investment choices within a group. The difference in investments between the two members of a group is larger in the Control Treatment. This difference decreases over time.

Result 3 implies a partial rejection of the third hypothesis because it does not extend to all three manager treatments and across all periods. Hypothesis 4 suggests that group members follow the recommendations of managers without incentives more strongly because they do not have a desire to mislead their group members. A comparison of Figure 1 and Figure 2 already suggests at the aggregate level that members follow the recommendations of managers. 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 discernible time trends. Figure 4 provides complementary information to Figure 3. It shows the individual investments relative to the

recommended input. The Figure suggests that group members deviate from recommendations of Hawk and Dove managers in particular if these managers make rather low or high recommendations relative to the median recommendation of 300 points.

INSERT FIGURES 3 AND 4 HERE

The following estimations provide statistical support for these impressions. In Table 4 I present results from a regression which uses the managers' recommendations as explanatory variables and the actual investment in the same period as dependent variable. In Model 3 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. I subtracted 300 points from each recommendation. 300 points is the median recommendation across all treatments.

The results from Model 3 in Table 4 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) Treatments¹¹. 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 Peace Treatments. The impact of the recommendation is lower in these treatments but it is still a highly significant predictor for investments.

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 $(\text{Rec}-300)^2$ captures the squared difference between the actual recommendations and the median recommendations. 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 $(\text{Dove} \times (\text{Rec}-300)^2$ and $\text{Hawk} \times (\text{Rec}-300)^2$) state that the impact of rather extreme recommendations is relatively small in the Hawk and Dove Treatments. Appendix B documents results from several additional estimations that support and help explaining the treatment differences observed in Table 4.

¹¹ I get similar results using the median recommendation in the Coordination Treatment (which is 250) as benchmark instead.

Table 4: The impact of management recommendations on investment choices across the treatments

Dep. Var.: Investments	Model 3	Model 4
Benchmark: Coordination Treatment		
Recommendation -300 [†]	.898*** (.049)	.893*** (.051)
Hawk	7.013 (11.414)	17.785 (13.959)
Dove	-20.366 (22.360)	16.416 (18.414)
Hawk × Recommendation [†]	-.207*** (.073)	-.032 (.087)
Dove × Recommendation [†]	-.346** (.164)	-.210* (.125)
(Rec.-300) ²		.173×10 ⁻⁴ (.812×10 ⁻⁴)
Hawk × (Rec-300) ²		-.507×10 ⁻³ *** (.192×10 ⁻³)
Dove × (Rec-300) ²		-.514×10 ⁻³ ** (.227×10 ⁻³)
Constant [†]	283.254*** (7.297)	282.230*** (10.096)
R ²	.648	.655

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

Result 4: Group members follow the recommendations of managers in the Dove and Hawk treatments less strongly than in the Coordination Treatment.

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.¹² 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.

¹² Various checks for different subsamples and quantiles not documented in this paper support the robustness of these results.

Table 5: Differences in investment choices across the treatments, controlled for recommendations and differentiated for high low and intermediate recommendations

Dep. Investments	Var.:	Model 5a Lower Tercile Recommend. \leq 200	Model 5b Intermediate Tercile 200 < Recomm. \leq 450	Model 5c Upper Tercile Recommend. > 450
Benchmark: Coordination Treatment				
Recommendation [†]		.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 Peace)	500 in 36 clusters (142 in Coordination, 226 in Hawk, 132 in Peace)	508 in 33 clusters (148 in Coordination, 242 in Hawk, 118 in Peace)

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

A brief review of the chat communication suggests that the opening messages reflect the incentives to some extent. Managers in the Hawk Treatment rather focused their opening statement on the benefits of winning (“You have to invest more if you want to get 1000 points”) or stoked envy (“The others won because you did not invest enough”) while those in the Dove Treatment emphasized the definite loss of contest expenditure. Interestingly some dovish managers also referred to the benefits of winning (e.g. “High expenditure may increase your winning chances but you definitely lose your input”) while effectively no hawkish manager took the cost argument into account.¹³ Managers in the coordination treatment appeared to make more balanced opening statements. This reading suggests that one reason for the lower impact of incentivized recommendation is the lower differentiation of the accompanying advice.

¹³ The fact that average recommendations in the Dove Treatment are insignificantly higher (and not significantly lower) than the actual investments (see Table 2) also suggests that managers consider the members’ benefits of winning the contest. In contrast average recommendations in the Hawk Treatment are significantly higher than the subsequent investments.

5 Conclusions

This paper investigated the impact of group managers on the behavior of group members in intergroup contests. I find that group members follow the (non-binding) recommendations of the manager rather strongly, in particular if the managers' payments are predetermined. Different incentive schemes induce the managers to lead the groups into different directions but the group members are less likely to follow the recommendations. This holds in particular for very low and very high recommendations.

The results show that group managers have a large influence on their group members. A key part in the regulatory impact derives from the powerful role of managers in communication processes. They start the communication process and close it with a recommendation while group members themselves cannot communicate with each other. Because group members have an interest in coordination managers can exercise real authority even without formal authority, as Aghion and Tirole (1997) put it.

The impact of management incentives on behavior is limited. They shape the direction of management recommendations. Incentives reduce the managers' real authority with group members but do not eliminate it. However, the size of the incentive effect 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 differences between the treatments are smaller than the difference between each treatment and the Nash Equilibrium for purely selfish preferences.

The dovish management incentives in the experiment are clearly insufficient instruments to reduce the high competitiveness of group members. Managers without incentives are significantly more capable to induce low investments than those with anti-competitive incentives. However, the unincentivized managers are less inclined to recommend these low investments. It is a task for future research to identify alternative mechanisms that induce managers to recommend low investments without harming their reputation. The strong impact of communication in the experiment suggests that simply asking managers to do so might actually achieve the objective without paying them accordingly.

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Figures

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

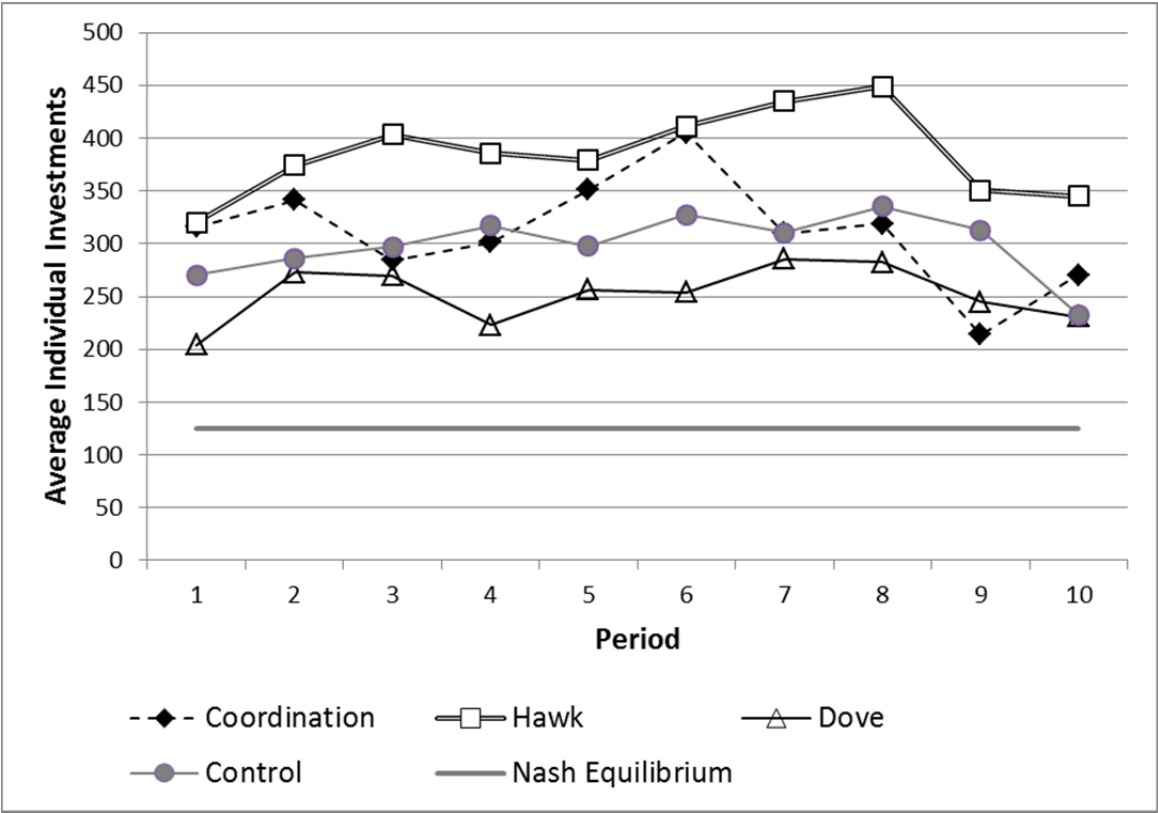


Figure 2: Average investment recommendations across treatments and periods.

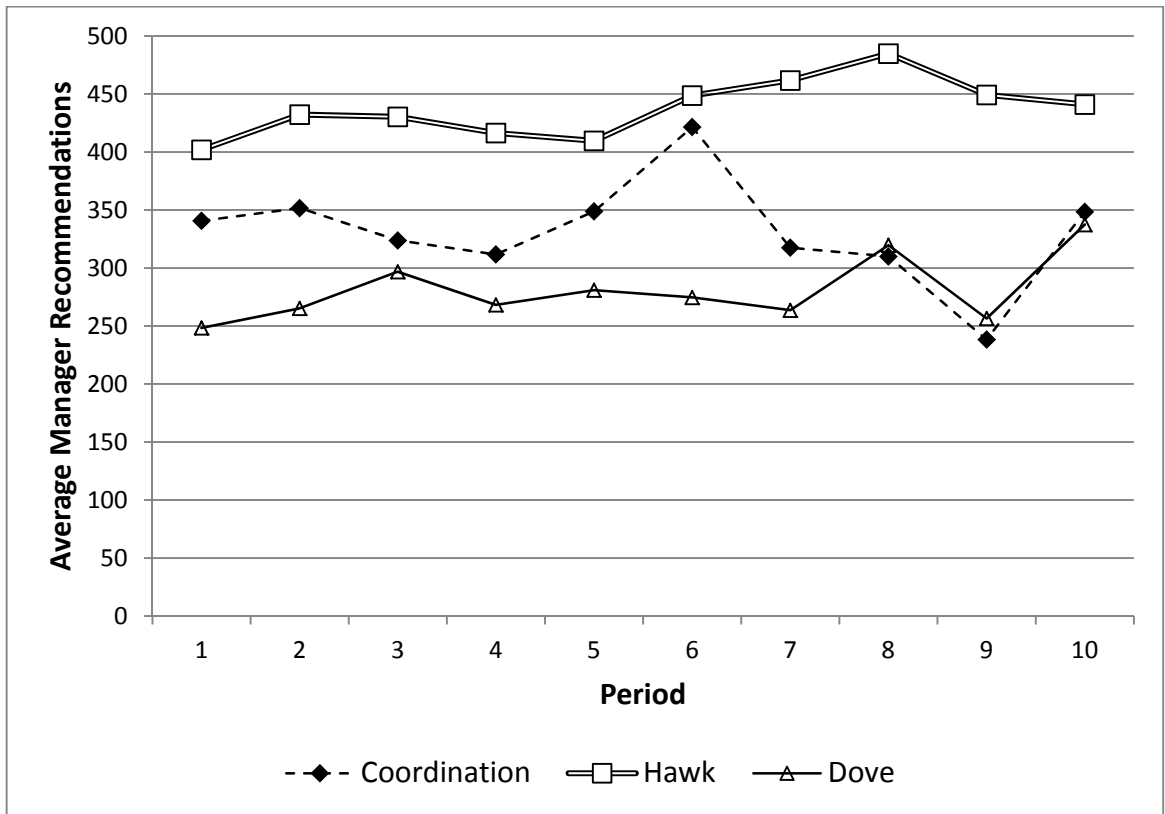


Figure 3: Share of group members who follow the recommendations of the managers

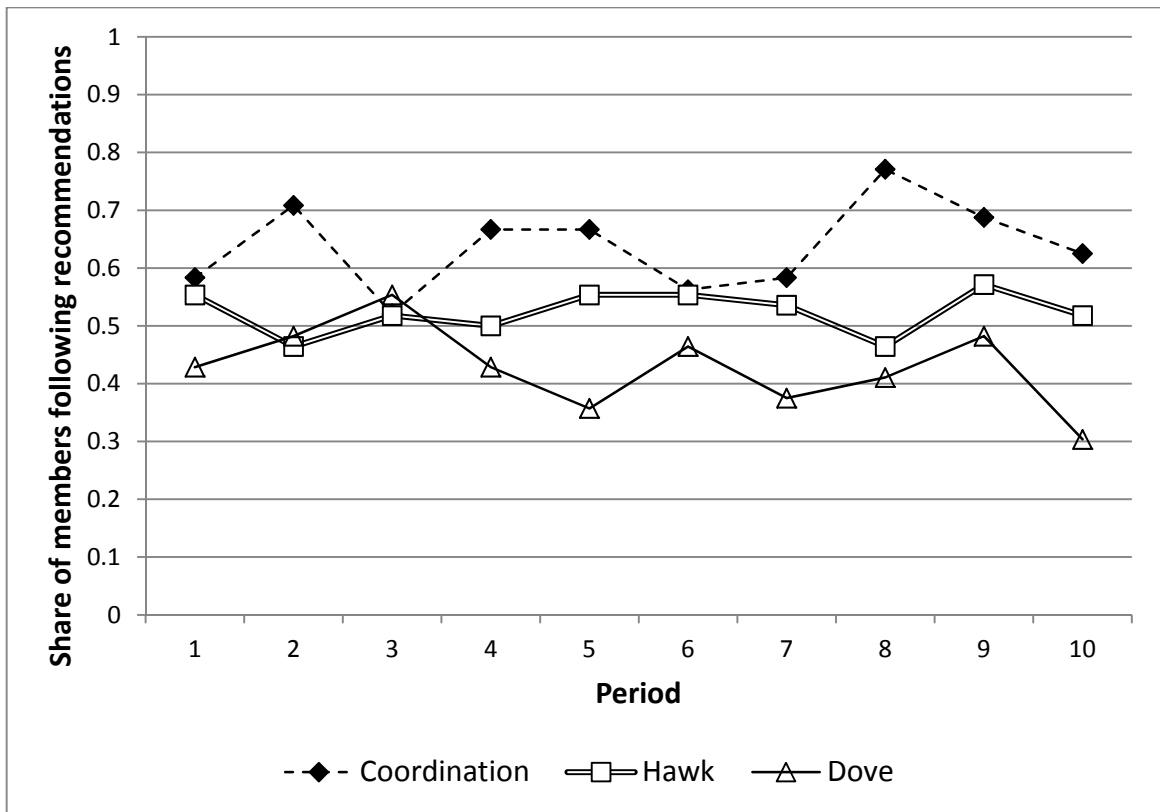
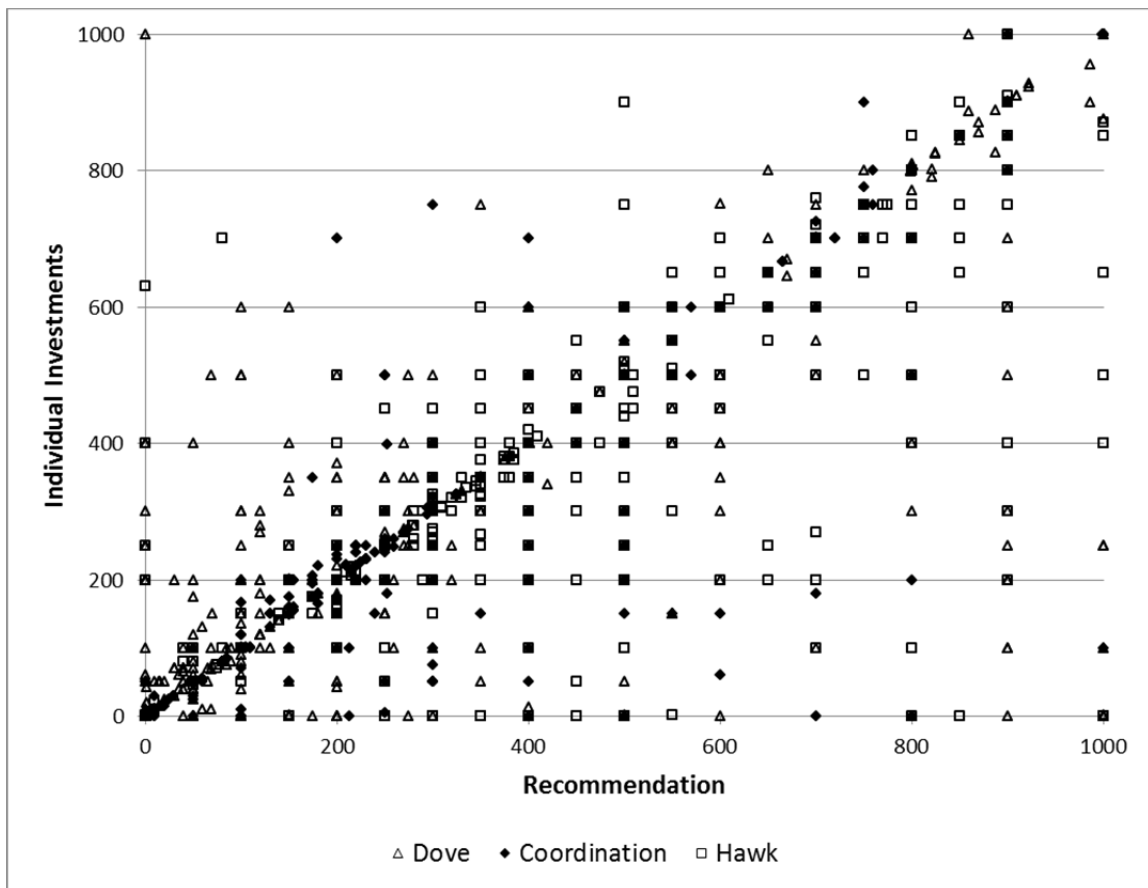


Figure 4: Deviations from recommended inputs across the treatments



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 Cent

Your 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 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 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:

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

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

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

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 externals 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

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

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 externals or only the team members.

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:

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

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 1950 points in this case (1000+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:

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

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). Furthermore treatment differences are stable across the periods (Table B3).

Table B1:: The impact of management recommendations on investment choices across the treatments, differentiated for high, low and intermediate recommendations¹⁴

Dep.	Var.:	Model 3a	Model 3b	Model 3c
Investments		Recommend. ≤ 200	$200 < \text{Recomm.} \leq 450$	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 Peace)	500 in 36 clusters (142 in Coordination, 226 in Hawk, 132 in Peace)	508 in 33 clusters (148 in Coordination, 242 in Hawk, 118 in Peace)

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 an 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 \times 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: 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		
Recommendation [†]	.948*** (.038)	12.931 (15.522)
Hawk	2.169 (11.257)	.867*** (.062)
Dove	-23.842 (28.568)	-5.109 (17.082)
Hawk × Recommendation [†]	-.203** (.094)	-.159* (.089)
Dove × Recommendation [†]	-.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: 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		
Recommendation [†]	.911*** (.059)	.888*** (.051)
Hawk	4.773 (11.636)	6.442 (17.921)
Dove	-26.403 (22.760)	-13.884 (21.596)
Hawk × Recommendation [†]	-.226** (.096)	-.174* (.103)
Dove × Recommendation [†]	-.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.