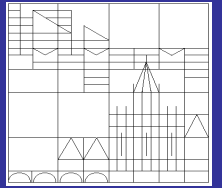




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# The Impact of Leadership Incentives in Intergroup Contests

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# The Impact of Leadership Incentives in Intergroup Contests

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## Abstract:

The heterogeneous effort supply in intergroup contests explains why groups have a manager. However, the objectives of group managers and members often differ. Using data from an experiment this paper studies whether this conflict of interests affects leadership effectiveness. The managers have an advisory role only and cannot change the monetary incentives of the group members in any context. Depending on the treatment some managers prefer more competition than the group members, some less, and some do not have any incentive at all. The results show that managers can coordinate their groups rather effectively. Their incentives shape the competitive behavior of the ‘subordinates’. However group members follow the non-binding investment recommendations of their group manager more closely if management compensation is not incentivized.

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

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

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## **1 Introduction**

Groups typically have some person who coordinates the activities of the members. The potential benefits of these group managers or leaders are particularly large in intergroup contests because seemingly identical group members differ enormously with respect to their contributions to the common objectives (Abbink, Brandts, Herrmann and Orzen, 2010). However, the objectives of the manager often differ from the preferences of the group members in these contests. In some cases leaders derive huge benefits from competitive subordinates. Military commanders, for example, can gain glory and promotion if their soldiers fight bravely. In other cases managers prefer rank-and-file members to be less competitive. Senior politicians can gain reputation from cross-party cooperation while the party members call for ideological purity. Corporate mergers between rivals often imply that the career perspectives of junior managers depend on the success of their integration efforts. They have to convince employees at the lowest level of the hierarchy who typically dislike more cooperation across groups (Weber and Camerer, 2003). In this paper I want to identify how the conflict of interests 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, 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 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<sup>1</sup>. They do not study competitive environments 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. The third contribution 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 (forthcoming) 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.

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

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<sup>1</sup> 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 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”.

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.<sup>2</sup>

The competitiveness of groups is inefficient if the contest expenditure does not imply a positive externality for a third party.<sup>3</sup> 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)<sup>4</sup>. 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.<sup>5</sup>

The results of my experiment show that group managers can coordinate the competitive behavior of their group members. Managers who benefit from a competitive behavior of their group members induce the highest contest investments. Those managers who

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<sup>2</sup> “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 et al. (2010) also find “substantial heterogeneity” (p. 431 and Figure 3 in that paper) in the investments of individual members in a group.

<sup>3</sup> 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).

<sup>4</sup> 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)).

<sup>5</sup> 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.

benefit from a more 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 ( $= 1 \text{ €}$ ) 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 randomly which of the two groups would win the prize. The members of the winning group received an extra 1000 points each, regardless of their investment. 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. 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<sup>6</sup>. 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<sup>7</sup> 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. It 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 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. In the *Dove Treatment* the probability of a manager winning the additional

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<sup>6</sup> 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.

<sup>7</sup> In the instructions I used the more neutral term “external participant” for this third person.

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. 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 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	$\pi_{MA} = 1500$	
Hawk	$E(\pi_{MA}) = 1000 + \frac{A}{A+B} 1000;$	$E(\pi_{1A}) =$ $1000 + \frac{A}{A+B} 1000 - a_1;$ with $A = a_1 + a_2; B = b_3 + b_4$
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

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.

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

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  $1 - \frac{A}{A+B}$ . 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

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

The symmetric Nash equilibrium of this stage game, given the assumption that group members are risk-neutral and motivated only by their own monetary earnings, 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.

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 plausible explanation for this phenomenon is the in-group effect discussed in the introduction of this paper. A player incorporates the impact of her effort choice on the payoff of the other group member into her utility function.<sup>8</sup> I integrate this in-group effect into the utility function as follows:

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

The variable  $\alpha$  captures the in-group effect (Charness et al., 2007, Chen and Li, 2009, Chen and Chen, 2011). I assume common knowledge about a homogeneous  $\alpha \geq 0$  for all participants. 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.

The existence of managers in the Coordination Treatment allows for (indirect) communication within a group. Experimental evidence suggests that such communication increases the variable  $\alpha$ , and subsequently the contest expenditure, of group members (Sutter and Strassmair, 2009, Leibbrandt and Sääksvuori, 2012).

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

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<sup>8</sup> Of course, there are other valid explanations for this phenomenon, too. The results in Balafoutas, Kerschbamer and Sutter (2012) and Eisenkopf and Teyssier (2013) suggest that envy towards the members of the other group can also explain this ‘overinvestment’.

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 use communication to adjust the group identity variable  $\alpha$  and align the agents' objectives with their own interests.

**Hypothesis 2:** Investments by group members increase in the following order across the treatments: Dove < Coordination < 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 another criterion for the effectiveness of leadership, 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 a 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 manager 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. A manager in the Coordination Treatment can build trust 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 also 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.

Empirical support for hypothesis 4 implies that we will observe rather conservative effects regarding the other hypotheses. If group managers did not follow the management recommendations of incentivized managers at all the results will neither show a difference in investments between these treatments (as predicted by hypothesis 2) nor a coordination success of the incentivized managers (as predicted by hypothesis 3). In a less extreme context hypothesis 4 suggests a trade-off regarding the provision of management incentives that are not aligned with those of the group members. These incentives shape the direction of group behavior at the expense of leadership effectiveness.

## **4 Results**

First 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 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 ( $\Delta$ ) in investments between the two members of a group in a period.

Table 2: Descriptive statistics across all periods

Treatment	N			Recommend.	Investment	$\Delta$ 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)

\*  $\Delta$  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. In both treatments, the investments per member exceed the Nash equilibrium ( $250/2 = 125$  points) by more than 100%.<sup>9</sup> This suggests that prosocial preferences toward in-group members (the variable  $\alpha$  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 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

<sup>9</sup> 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)

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)<sup>10</sup>. The investments in the Coordination Treatment are between the Dove and Hawk Treatments. Unlike predicted in Hypothesis 2 they do not differ significantly from any of these treatments.

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

Now we focus on the impact of the management recommendation. One measure of coordination success is the difference in investments between group members in one period. The last variable in Table 2 ( $\Delta$  Invest) provides information about this measure of coordination success in the treatments. Hypothesis 3 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 Treatment.

Table 3 provides results from two estimations that investigate 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 and the Dove Treatments 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. 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  $\times$  Period and Hawk  $\times$  Period) show that coordination does not improve in these treatments over time.

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<sup>10</sup> The same holds for the differences in recommendations.

Table 3: Panel estimations of investment differences within groups across the treatments

Dep. Var.: $\Delta$ 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 <sup>2</sup>	.042	.050

N = 1080 (108 groups  $\times$  10 periods), Std. Err. (in parentheses) 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 states that group members follow the recommendations of managers without incentives more strongly because they do not have a desire to mislead their group members.

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.<sup>11</sup>

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  $(\text{Rec.-300})^2$  captures the squared difference between the actual recommendations

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



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 ( $\text{Dove} \times (\text{Rec}-300)^2$  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.

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

Dep. Var.: Investments	Model 3	Model 4
Benchmark: Coordination Treatment		
Rec. -300 <sup>†</sup>	.898*** (.049)	.893*** (.051)
Hawk	7.013 (11.414)	17.785 (13.959)
Dove	-20.366 (22.360)	16.416 (18.414)
Hawk $\times$ (Rec.-300) <sup>†</sup>	-.207*** (.073)	-.032 (.087)
Dove $\times$ (Rec.-300) <sup>†</sup>	-.346** (.164)	-.210* (.125)
(Rec.-300) <sup>2</sup>		.173 $\times 10^{-4}$ (.812 $\times 10^{-4}$ )
Hawk $\times$ (Rec-300) <sup>2</sup>		-.507 $\times 10^{-3}$ *** (.192 $\times 10^{-3}$ )
Dove $\times$ (Rec-300) <sup>2</sup>		-.514 $\times 10^{-3}$ *** (.227 $\times 10^{-3}$ )
Constant <sup>†</sup>	283.254*** (7.297)	282.230*** (10.096)
R <sup>2</sup>	.648	.655

N = 1600 (160 subjects  $\times$  10 periods), Std. Err. (in parentheses) adjusted for 40 clusters in contests, significance levels: \*\*\* < .01, \*\* < .05, \* < .1; <sup>†</sup> 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 ( $\leq 200$ ) 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). Furthermore treatment differences are stable across the periods (Table B3).

**Result 4:** 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.<sup>12</sup> 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.

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

Dep.	Var.:	Model 5a	Model 5b	Model 5c
Investments		Lower Tercile Recommend. $\leq$ 200	Intermediate Tercile $200 <$ Recomm. $\leq$ 450	Upper Tercile Recomm. $>$ 450
Benchmark: Coordination Treatment				
Rec.-300 <sup>†</sup>		.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 <sup>2</sup>		.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; <sup>†</sup> 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

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

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.<sup>13</sup> 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 degree of differentiation of the accompanying advice.

## 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 group managers have a large influence on their group members. Group members follow the (non-binding) management recommendations rather 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. Regarding the incentive effects the results are somewhat differentiated. 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 context 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

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<sup>13</sup> 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.

reduce the managers' real authority with group members. However, the incentives do not eliminate the leadership credentials.

The results contribute to the understanding of leadership and coordination in intergroup contests in several ways. We 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.

## References

- Abbink, K., Brandts, J., Herrmann, B. and Orzen, H. (2010). "Intergroup conflict and intra-group punishment in an experimental contest game." *American Economic Review* 100(1): 420-447.
- Aghion, P. and Tirole, J. (1997). "Formal and real authority in organizations." *Journal of Political Economy* 105: 1-29.
- Ahn, T., Isaac, R. M. and Salmon, T. C. (2011). "Rent seeking in groups." *International Journal of Industrial Organization* 29(1): 116-125.
- Andreoni, J. and Rao, J. M. (2011). "The power of asking: How communication affects selfishness, empathy, and altruism." *Journal of Public Economics* 95(7): 513-520.
- Arbak, E. and Villeval, M.-C. (2011). "Voluntary leadership: Motivation and influence." *Social Choice and Welfare*: 1-28.
- Avolio, B. J., Walumbwa, F. O. and Weber, T. J. (2009). "Leadership: Current theories, research, and future directions." *Annual Review of Psychology* 60: 421-449.
- Baker, G. P. (1992). "Beatrice: A study in the creation and destruction of value." *The Journal of Finance* 47(3): 1081-1119.
- Balafoutas, L., Kerschbamer, R. and Sutter, M. (2012). "Distributional preferences and competitive behavior." *Journal of Economic Behavior & Organization* 83(1): 125-135.
- Bornstein, G. and Ben-Yossef, M. (1994). "Cooperation in inter-group and single-group social dilemmas." *Journal of Experimental Social Psychology* 30: 52-52.
- Bornstein, G., Gneezy, U. and Nagel, R. (2002). "The effect of intergroup competition on group coordination: An experimental study." *Games and Economic Behavior* 41(1): 1-25.

- Brandts, J. and Cooper, D. J. (2007). "It's what you say, not what you pay: An experimental study of manager–employee relationships in overcoming coordination failure." *Journal of the European Economic Association* 5(6): 1223-1268.
- Brandts, J., Cooper, D. and Weber, R. (2011) "Legitimacy, social distance, and leadership in the turnaround game." Department of Economics, Florida State University Working Paper.
- Bruttel, L. V. (2009). "Group dynamics in experimental studies—the bertrand paradox revisited." *Journal of Economic Behavior & Organization* 69(1): 51-63.
- Bruttel, L. V. and Fischbacher, U. (2010) "Taking the initiative: What motivates leaders?" University of Konstanz Working Paper.
- Bruttel, L. V. and Eisenkopf, G. (2012). "No contract or unfair contract: What's better?" *Journal of Socio-Economics* 41: 384– 390.
- Burton-Chellew, M. N., Ross-Gillespie, A. and West, S. A. (2010). "Cooperation in humans: Competition between groups and proximate emotions." *Evolution and Human Behavior* 31(2): 104-108.
- Cason, T. N., Sheremeta, R. M. and Zhang, J. (2012). "Communication and efficiency in competitive coordination games." *Games and Economic Behavior* 76(1): 26-43.
- Charness, G., Rigotti, L. and Rustichini, A. (2007). "Individual behavior and group membership." *American Economic Review* 97(4): 1340-1352.
- Chen, R. and Chen, Y. (2011). "The potential of social identity for equilibrium selection." *American Economic Review* 101(6): 2562-2589.
- Chen, Y. and Li, S. X. (2009). "Group identity and social preferences." *American Economic Review*: 431-457.
- Dechenaux, E., Kovenock, D. and Sheremeta, R. (2012) "A survey of experimental research on contests, all-pay auctions and tournaments." Chapman University Working Paper.
- Eisenkopf, G. and Teyssier, S. (2013). "Envy and loss aversion in tournaments." *Journal of Economic Psychology* 34: 240–255.
- Eisenkopf, G. and Bächtiger, A. (forthcoming). "Mediation and conflict prevention." *Journal of Conflict Resolution*.
- Fan, J. P. H., Wong, T. and Zhang, T. (forthcoming). "Institutions and organizational structure: The case of state-owned corporate pyramids." *Journal of Law, Economics, and Organization*.
- Fischbacher, U. (2007). "Z-tree: Zurich toolbox for ready-made economic experiments." *Experimental Economics* 10(2): 171-178.
- Gächter, S., Nosenzo, D., Renner, E. and Sefton, M. (2013). "Who makes a good leader? Cooperativeness, optimism and leading-by-example." *Economic Inquiry* 50(4): 867–879.
- Gill, D. and Stone, R. (2011) "Desert and inequity aversion in teams." Working Paper, Available at [ssrn.com/abstract=1886431](http://ssrn.com/abstract=1886431).
- Goette, L., Huffman, D. and Meier, S. (2006). "The impact of group membership on cooperation and norm enforcement: Evidence using random assignment to real social groups." *American Economic Review* 96(2): 212-216.
- Goette, L., Huffman, D., Meier, S. and Sutter, M. (2012). "Competition between organizational groups: Its impact on altruistic and antisocial motivations." *Management Science* 58(5): 948-960.
- Greiner, B. (2004). "The online recruitment system orsee 2.0—a guide for the organization of experiments in economics." *Papers on Strategic Interaction, University of Cologne, Working Paper Series in Economics* 10.

- Gunnthorsdottir, A. and Rapoport, A. (2006). "Embedding social dilemmas in intergroup competition reduces free-riding." *Organizational Behavior and Human Decision Processes* 101(2): 184-199.
- Güth, W., Levati, M. V., Sutter, M. and Van Der Heijden, E. (2007). "Leading by example with and without exclusion power in voluntary contribution experiments." *Journal of Public Economics* 91(5): 1023-1042.
- Hargreaves Heap, S. P. and Zizzo, D. J. (2009). "The value of groups." *American Economic Review*: 295-323.
- Hewstone, M., Rubin, M. and Willis, H. (2002). "Intergroup bias." *Annual Review of Psychology* 53(1): 575-604.
- Huck, S., Konrad, K. A., Müller, W. and Normann, H. T. (2007). "The merger paradox and why aspiration levels let it fail in the laboratory." *The Economic Journal* 117(522): 1073-1095.
- Kuang, X. J., Weber, R. A. and Dana, J. (2007). "How effective is advice from interested parties? An experimental test using a pure coordination game." *Journal of Economic Behavior & Organization* 62(4): 591-604.
- Lazear, E. P. and Rosen, S. (1981). "Rank-order tournaments as optimum labor contracts." *Journal of Political Economy* 89: 329-348.
- Lazear, E. P. (2012). "Leadership: A personnel economics approach." *Labour Economics* 19(1): 92–101.
- Leibbrandt, A. and Sääksvuori, L. (2012). "Communication in intergroup conflicts." *European Economic Review*.
- Mehta, J., Starmer, C. and Sugden, R. (1994). "The nature of salience: An experimental investigation of pure coordination games." *American Economic Review* 84(3): 658-673.
- Milgrom, P. and Roberts, J. (1992). "Economics, organization and management". Englewood Cliffs, Prentice Hall.
- Ochs, J. (1995). "Coordination problems". "Handbook of experimental economics". Roth, A. and Kagel, J. Princeton, Princeton University Press: 195-252.
- Öncüler, A. and Croson, R. (2005). "Rent-seeking for a risky rent a model and experimental investigation." *Journal of Theoretical Politics* 17(4): 403-429.
- Rajan, R. and Wulf, J. (2006). "The flattening firm: Evidence on the changing nature of firm hierarchies from panel data." *Review of Economics and Statistics* 88(4): 759-773.
- Riechmann, T. and Weimann, J. (2008). "Competition as a coordination device: Experimental evidence from a minimum effort coordination game." *European Journal of Political Economy* 24(2): 437-454.
- Rivas, M. F. and Sutter, M. (2011). "The benefits of voluntary leadership in experimental public goods games." *Economics Letters* 112(2): 176-178.
- Stein, J. C. (2002). "Information production and capital allocation: Decentralized versus hierarchical firms." *The Journal of Finance* 57(5): 1891-1921.
- Sutter, M. and Strassmair, C. (2009). "Communication, cooperation and collusion in team tournaments—an experimental study." *Games and Economic Behavior* 66(1): 506-525.
- Tan, J. H. W. and Bolle, F. (2007). "Team competition and the public goods game." *Economics Letters* 96(1): 133-139.
- Tullock, G. (1980). "Efficient rent seeking". "Toward a theory of the rent-seeking society". Buchanan, J., Tollison, R. and G. Tullock. College Station, Texas A&M University Press.
- Uhl-Bien, M., Graen, G. B. and Scandura, T. A. (2000). "Implications of leader-member exchange (lmx) for strategic human resource management systems: Relationships as

social capital for competitive advantage." *Research in Personnel and Human Resources Management* 18: 137-186.

van der Ploeg, F. (2010). "Voracious transformation of a common natural resource into productive capital." *International Economic Review* 51(2): 365-381.

Van Huyck, J. B., Battalio, R. C. and Beil, R. O. (1990). "Tacit coordination games, strategic uncertainty, and coordination failure." *American Economic Review* 80(1): 234-248.

Weber, R., Camerer, C., Rottenstreich, Y. and Knez, M. (2001). "The illusion of leadership: Misattribution of cause in coordination games." *Organization Science* 12(5): 582-598.

Weber, R. A. and Camerer, C. F. (2003). "Cultural conflict and merger failure: An experimental approach." *Management Science* 49(4): 400-415.

## Figures

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

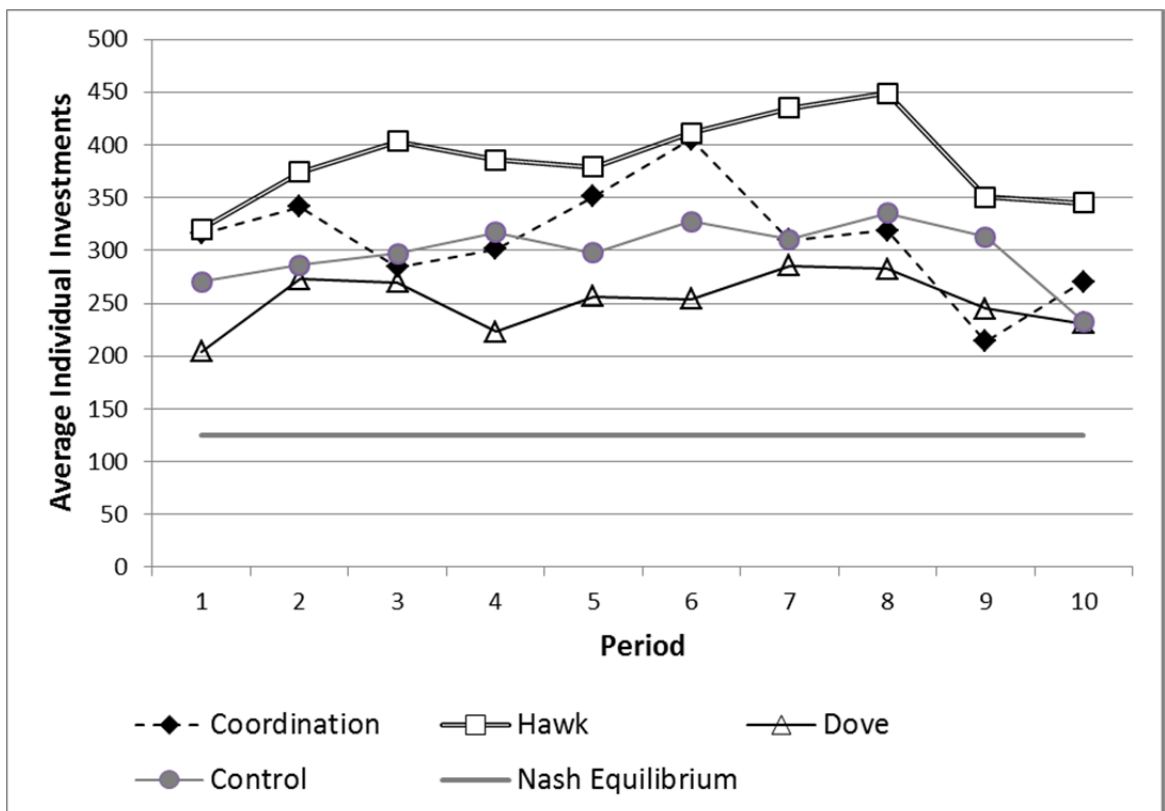


Figure 2: Average investment recommendations across treatments and periods.

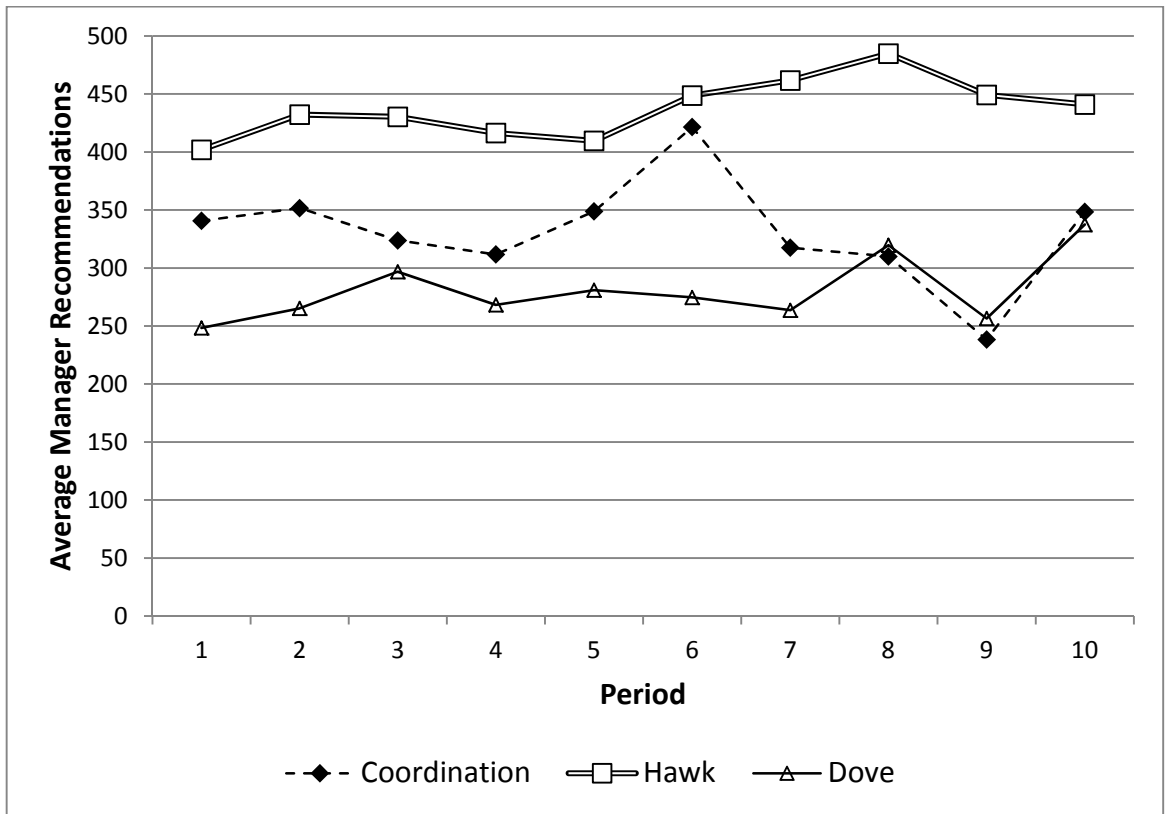




Figure 3: Share of group members who follow the recommendations of the managers

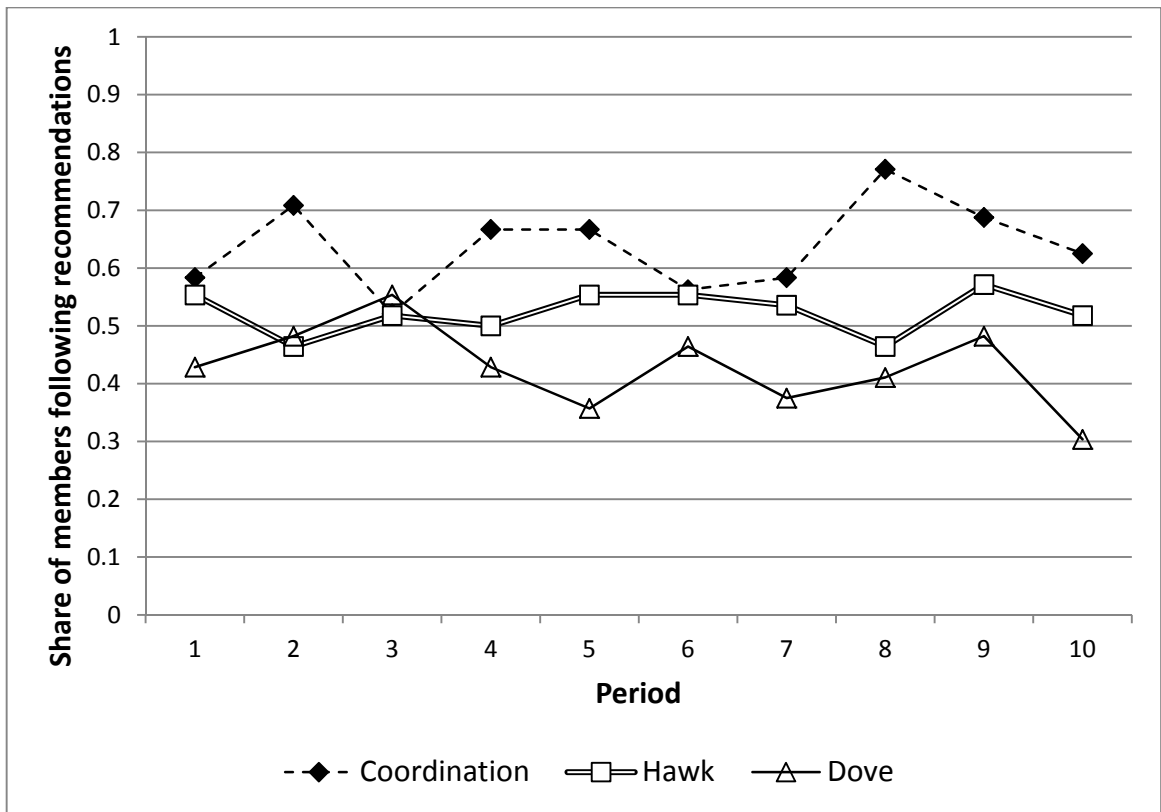


Figure 4: Recommendations and contest investments in the Hawk Treatment  
(The bubble size increases in the number of observations)

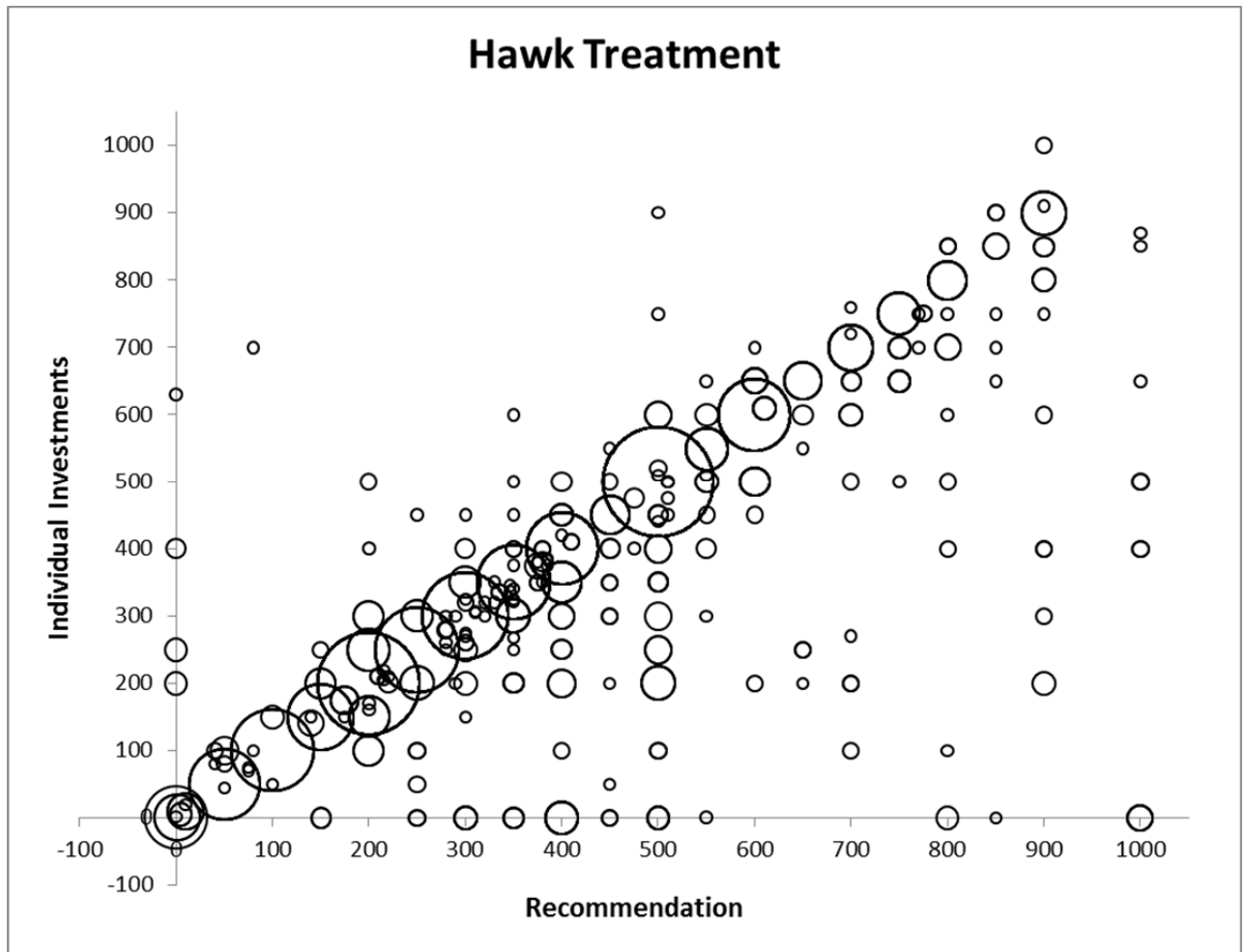


Figure 5: Recommendations and contest investments in the Coordination Treatment  
(The bubble size increases in the number of observations)

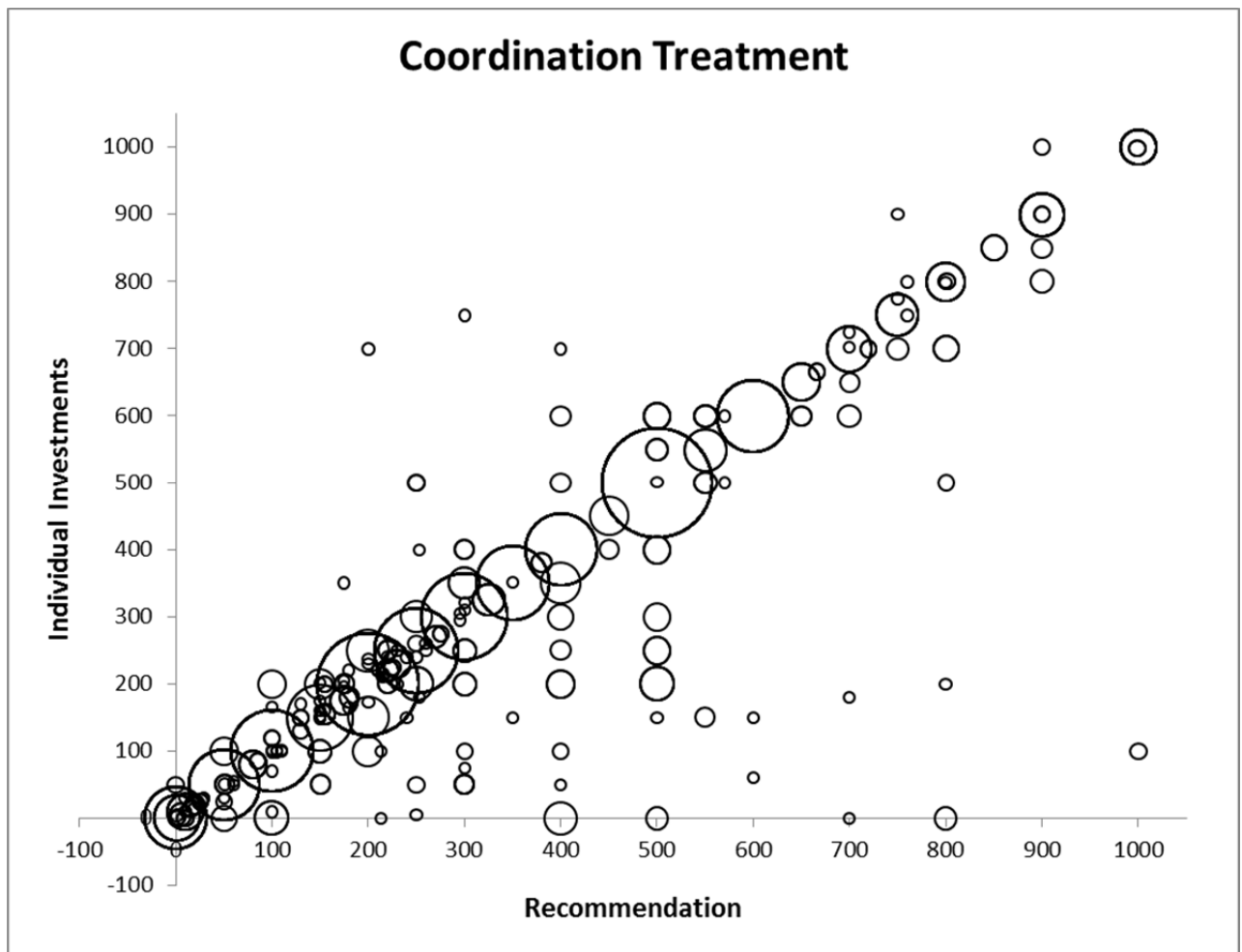
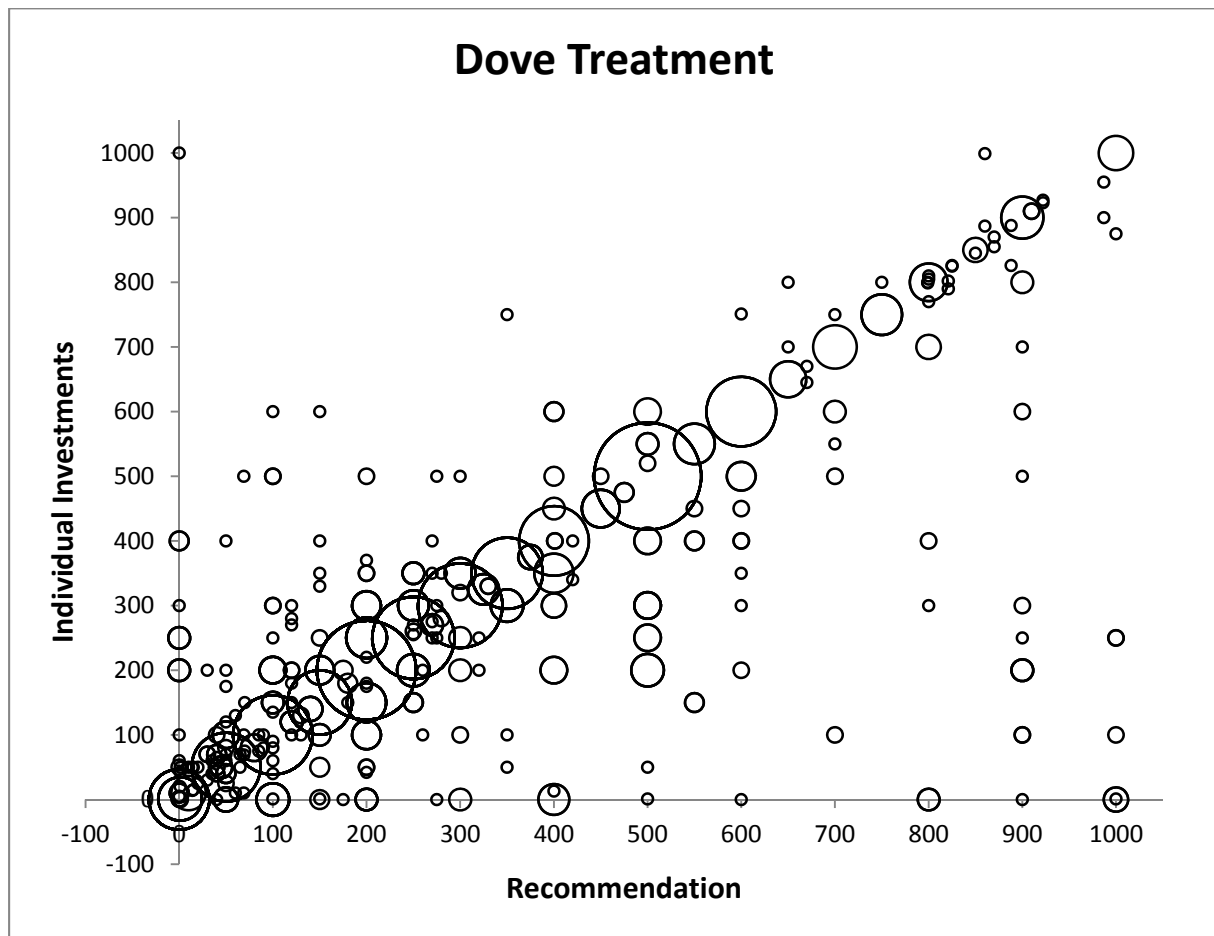


Figure 6: Recommendations and individual contest investments in the Dove Treatment  
(The bubble size increases in the number of observations)



## 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:

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

## **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 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:

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

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 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:

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

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 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:

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

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 ( $\leq 200$ , 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 recommendations<sup>14</sup>

Dep.	Var.:	Model 3a	Model 3b	Model 3c
Investments		Recommend. $\leq 200$	$200 < \text{Recomm.} \leq 450$	Recommend. $> 450$
Benchmark: Coordination Treatment				
Recommendation <sup>†</sup>		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 <sup>†</sup>		-.499** (.197)	-.039 (.140)	-.598*** (.141)
Dove	×			
Recommendation <sup>†</sup>		-.381*** (.137)	-.099 (.250)	-.782*** (.254)
Constant		316.931*** (15.434)	280.794 (12.584)	246.594*** (38.728)
R <sup>2</sup>		.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: \*\*\*  $< .01$ , \*\*  $< .05$ , \*  $< .1$ ; <sup>†</sup> We subtracted 300 points from each recommendation.

<sup>14</sup> 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  $\times$  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 <sup>†</sup>	.948*** (.038)	12.931 (15.522)
Hawk	2.169 (11.257)	.867*** (.062)
Dove	-23.842 (28.568)	-5.109 (17.082)
Hawk × Recommendation <sup>†</sup>	-.203** (.094)	-.159* (.089)
Dove × Recommendation <sup>†</sup>	-.393** (.175)	-.221 (.138)
Constant	286.008*** (6.096)	278.348*** (9.334)
R <sup>2</sup>	.692	.637

For each estimation: N = 720 (80 subjects × 9 periods), Std. Err. adjusted for 40 clusters in Contests, significance levels: \*\*\* < .01, \*\* < .05, \* < .1; <sup>†</sup> 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 <sup>†</sup>	.911*** (.059)	.888*** (.051)
Hawk	4.773 (11.636)	6.442 (17.921)
Dove	-26.403 (22.760)	-13.884 (21.596)
Hawk × Recommendation <sup>†</sup>	-.226** (.096)	-.174* (.103)
Dove × Recommendation <sup>†</sup>	-.377** (.185)	-.255* (.150)
Constant	286.712*** (7.505)	279.613*** (8.345)
R <sup>2</sup>	.649	.652

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