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DISCUSSION PAPER SERIES

IZA DP No. 12267

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ABSTRACT

Helping under a Combination of Team and Tournament Incentives

We study how help can be fostered by means of a team bonus in the presence of rank-order tournaments. In a simple model we combine elements of relative rewards and a team bonus and study their effect on effort, help and sabotage. Quite intuitively the theoretical analysis suggests that team members help less as relative rewards increase. This problem is mitigated by a team bonus that is proportional to the output of the whole team. We compare different parameter constellations of the theoretical benchmark with behavior observed in a one-shot experiment.

JEL Classification: M52, J33, J41, L23, C72, C91

Keywords: help, relative rewards, team incentives, experiment

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1 Introduction

The performance of modern organizations more and more depends on well-functioning teams (Cappelli, Tavis 2018). Many organizational work processes (e.g. innovation and product development) organized on a project-by-project basis are not performed by single individuals, but rather need joint engagement by a whole group of employees. In such work environments, it is essential that team members are willing to provide help to each other, i.e., they need to share information and knowledge, give each other a hand, and discuss solutions to solve coworkers' problems. Think, for example, of modern *agile innovation methods*, like *scrum* as discussed in Rigby, Sutherland, Takeuchi (2016) and Rigby, Sutherland, Noble (2018). When employing such methods, organizations form and empower small, cross-functional teams of about three to nine people each. Teams break tasks into small modules, build working versions of the product in short cycles (of about two to four weeks) known as *sprints*, and quickly release prototypes to customers. Delivered prototypes secure a monetary gain to the company from which a certain percentage is often used as a team bonus to be (equally) shared among its members. Thus, team performance on a finished (sub-)module is easily measurable and incentivized while exact individual contributions of team members are not. The best one might hope for are relative evaluations of individual team members, for example, obtained from a 360 feedback evaluation. Such relative evaluations usually result in individual bonuses for the best performer(s) in the team. Incentives based on relative individual performance can also arise from forced distributions schemes where team members are ranked into categories like 'excellent', 'good', 'fair', and 'poor' according to a fixed distribution. The team members who end up classified as 'poor' are often excluded from the team in the future (see Croson et al. 2015). Relative incentives also arise from promotional tournaments, where the best team member earns a higher ranked position with a larger salary (see Altmann, Falk, Wibral 2012). The feasibility of shared team incentives *and* relative individual incentives raises questions of how rewards should be designed to motivate members of agile teams (Ghobadi, Campbell, Clegg 2017, Rahmani, Roels, Karmarkar 2018, Rejab et al. 2018)? Shared team incentives are valuable to induce a mindset of collaboration but might also come with free-riding. Rewards that single out individual relative performance reduce free-riding but discourage collaboration and help. In fact many organizations use a combination of both reward schemes which makes one wonder whether, and if so what kind of, such combinations improve the performance of teams (Pearsall, Christian, Ellis 2010)?

In this paper, we study different combinations of team and relative performance incentive schemes and their effects on the provision of help. Within a simple theory framework we analyze the effectiveness of such a combined compensation structure as an instrument to encourage help. We compare the predictions derived from this model with behavior observed in a tailored experiment by employing clear-cut treatments. Agents work in teams of three and face a combination of a shared team reward, i.e., a *team bonus*, and a relative reward, i.e., an *individual bonus*. While the team bonus rests on the joint absolute team output and is shared equally among all team members, the individual bonus is based on the relative individual output and is only awarded to the agent with the highest output. Each team member can choose levels of two activities: *help* (or on the opposite *sabotage*), which only affects the output of the two other team members, and *effort*, which increases one's own output. Both activities thereby affect the total output of the team defined as the sum of individual outputs. An agent's own effort and the help provided by the two other team members constitutes the agent's individual output.

We start our analysis by deriving the symmetric-equilibrium behavior. Additionally, we set up a one-shot lab experiment where decision situations are tailored according to our model. To our best knowledge, this is the first experiment that also tests the Lazear and Rosen (1981) tournament model in a clean one-shot setting. To stay as close as possible to the model we let participants choose effort and help/sabotage levels in an abstract way rather than letting them engage in a real effort task. Such an approach is frequently used in experimental labor markets (e.g., Bull Schotter, Weigelt 1987, Nalbantian, Schotter 1997, Charness, Kuhn 2013, Lezzi, Flemming, Zizzo 2015) and allows for controlling the respective cost structures of the two activities. It also allows for exactly observing the chosen levels of the two activities and abstracting from different productivity task-related abilities of different subjects. These features are essential for a valid comparison of our experimental findings with the equilibrium predictions (for a deeper discussion on this design choice, see, for example, Falk, Fehr 2003 and Falk, Hackman 2009). We take great care that participants can familiarize themselves with the complex strategic situation before they make their one-shot decision. For example, we provide participants with a choice simulator that enables them to explore the effects of different actions. In our experiment, we vary the size of the team bonus and the individual bonus and investigate their influence on help and effort provision. It turns out that our experimental findings are generally well in line with the equilibrium benchmark: A team bonus significantly fosters help activities even in the presence of an individual relative reward. Second, helping decreases gradually with an increasing individual bonus.

The novelty of our study lies in the focus on behavior in situations where helping others and individual effort is encouraged by means of a team bonus within a competitive situation. If the incentive to win the tournament is stronger than to cooperate due to the team incentive subjects should rather sabotage each other than help from an individually rational perspective. Other studies either focus on effort and sabotage within tournaments without team incentives and help (see, for example, Harbring, Irlenbusch 2005, 2008, 2011). Or, the combination of tournaments and team incentives are analyzed but only with regard to work effort and not help or sabotage (e.g., Irlenbusch, Ruchala 2008, Majerczyk, Sheremeta, Tian 2018).

Empirical evidence on help and sabotage is still rare in the economic literature.[1] Indeed, in the field both are difficult to observe, to measure and to quantify. The few existing empirical studies on help mostly employ survey data. For example, Drago and Garvey (1998) and Brown and Heywood (2009) find indications that helping is negatively correlated with individual relative rewards. Kräkel (2005) investigates a two-stage model in which players first decide whether they want to help or sabotage and then choose their efforts. Amegashie and Runkel (2007) theoretically consider an elimination contest between four players. Their analysis reveals that the most able player may decide to "help" the weaker player (by sabotaging the stronger player in the other semi-final. An experimental study by Brandts et al. (2016) employs repeated coordination games to study how commitment to help can contribute to solving performance traps. Among others, Falk, Fehr and Huffman (2008), Carpenter, Matthews and Schirm (2010) and Harbring and Irlenbusch (2011) provide experimental evidence on sabotage (i.e., negative help). However, these studies only focus on tournament incentives (and partly fixed wages); team incentives do not exist in these analyses. Participants do not have the option to help others in those frameworks. Several studies on tournaments in sport also provide empirical evidence on increased sabotage between competitors when high relative rewards are in place (e.g., Garicano, Palacios-Huerta 2006; Balafoutas, Lindner, Sutter 2012; Deutscher et al. 2013). For reviews of studies on sabotage in tournaments, see Harbring and Irlenbusch (2005), Charness and Kuhn (2011), and Chowdhury and Gürtler (2013). The reviewed studies, however, focus on sabotage (as the opposite of help) in rank-order tournaments but not in a context where tournament incentives are combined with a team bonus and also help is feasible.[2] More recently,

[1] Several other studies provide theoretical frameworks that investigate employees' willingness to engage in sabotage in tournaments what can be interpreted as reluctance to help (e.g., Lazear and Rosen 1981; Lazear 1989; Kräkel 2005; Gürtler and Münster 2013).

[2] Nalbantian and Schotter (1997) investigate group incentives, such as gain sharing and profit sharing and tournaments between teams. They, however, do not look at the combination of individual relative rewards and team incentives. Garvey and

Heursen (2018) studies the provision of real effort help as sharing correct answers among group members under individual piece rate. She does not find any systematic negative effect of relative performance feedback on help.

The current paper is organized as follows: In section 2, we provide a simple model-theoretical analysis of the effect of a compensation scheme that combines individual bonuses and team bonuses on help. Section 3 introduces the experimental design and procedure. Section 4 analyses our experimental data. Section 5 concludes by discussing implications of our findings.

2 A Simple Model on Helping in Teams

We consider a team of 3 agents who act simultaneously. Agent $i \in \{1, 2, 3\}$ chooses an activity t_i from an interval $[-\bar{t}, \bar{t}]$ that equally affects the output of the other agents $j \in \{1, \dots, 3\}, j \neq i$ in a productive way (when t_i is positive) or in a destructive way (when t_i is negative). Thus, $t_i > 0$ can be interpreted as *help* and $t_i < 0$ as *sabotage*.[3] In addition, the agent chooses individual *effort* e_i from an interval $[0;\ \bar{e}]$ that raises her individual output y_i.

An output y_i of an agent i is determined by the following function

$$y_i = \sum_{j \neq i} t_j + e_i + \varepsilon_i \qquad (1)$$

where ε_i is a stochastic variable, independent and uniformly distributed over an interval $[-\bar{\varepsilon}, \bar{\varepsilon}]$ and resembles randomness in the production technology or a performance measurement error. The costs of each activity are assumed to be convex and to follow the functions $C_t(t_i) = at_i^2$ and $C_e(e_i) = be_i^2$ with $a, b > 0$.

The compensation of an agent i consists of a *fixed payment* m, a *team bonus* $k \sum_{j=1}^{3} y_j$ and a potential *individual bonus* Δ paid only to the one agent with the highest individual output.[4] The team bonus is the same for all agents. It is proportional to the total team output, i.e., the sum of the outputs of all agents, multiplied with a marginal per capita return $k \geq 0$ (henceforth referred to as *team bonus factor*). The probability $\varphi_i(t_i, t_{-i}, e_i, e_{-i})$ for an agent i to obtain the individual bonus depends on the received and exerted help (or sabotage), as

Swan (1992) analyze a theoretical model, where a manager designs a hybrid incentive scheme combining relative reward and group piece rate. Similar to our model, in their setup the agents exhibit effort and help or sabotage that has an equal influence on the other team members. Assuming that the total group output is not verifiable, they show that hybrid incentive schemes resulting from flattening tournament prize and offering a group piece rate might be optimal when sabotage can occur.

[3] Here we focus on a situation in which help and sabotage can only be targeted at all other team members. See Harbring et al. (2007) for settings in which players can individually sabotage each other.

[4] We assume that in the case of a tie the individual bonus Δ is allocated by a fair random draw.

well as her own and the other team members' efforts. The expected payoff function of an agent *i* is given by

$$\Pi_i = m + k\sum_{j=1}^{3}\left(2t_j + e_j + \varepsilon_j\right) + \Delta\,\varphi_i(t_i, t_{-i}, e_i, e_{-i}) - C_t(t_i) - C_e(e_i) \quad (2)$$

As a benchmark, we derive the symmetric Nash-equilibrium prediction assuming that all agents are risk neutral and aim to maximize their own expected monetary payoffs. We obtain the following first-order conditions from maximizing the payoff described in (2) with respect to t_i and e_i:

$$2k + \frac{\partial\varphi_i(t_i,t_{-i},e_i,e_{-i})}{\partial t_i}\Delta = 2at_i \quad \text{and} \quad k + \frac{\partial\varphi_i(t_i,t_{-i},e_i,e_{-i})}{\partial e_i}\Delta = 2be_i \quad (3)$$

Assuming uniformly distributed random components, one can show that the marginal probabilities of receiving the individual bonus Δ depend only on the size of the interval from which the random components are drawn (Orrison et al. 2004; Harbring and Irlenbusch 2005). In particular, it follows that

$$\frac{\partial\varphi_i(t_i,t_{-i},e_i,e_{-i})}{\partial t_i} = -\frac{1}{2\bar{\varepsilon}} \quad \text{and} \quad \frac{\partial\varphi_i(t_i,t_{-i},e_i,e_{-i})}{\partial e_i} = \frac{1}{2\bar{\varepsilon}} \quad (4)$$

Hence, the marginal effect of devoted help on the chance to receive the individual bonus Δ is exactly the opposite of the marginal effect of effort. This is quite intuitive since one additional unit of an agent's *i* effort, *ceteris paribus,* improves her relative standing to the same extent as helping lowers it.

By using the result (4) the first-order conditions in (3) is reduced to

$$t_i^* = \frac{k}{a} - \frac{\Delta}{4a\bar{\varepsilon}} \quad \text{and} \quad e_i^* = \frac{k}{b} + \frac{\Delta}{4b\bar{\varepsilon}} \quad (5)$$

Result (5) constitutes the benchmark levels of help and effort in a symmetric Nash-equilibrium. As we see, both activities are increasing in the team bonus factor *k*. The impact of the individual bonus Δ on help and effort is, however, different: Although Δ has a positive impact on effort, it has a negative impact on help.

3 Experimental Design and Procedure

We employed the model described in section 2 to investigate helping and the combination of team and tournament incentives by means of an experiment. In the experiment we considered teams of three agents and used the following parameterization: $a = 25/3$, $b = 25/4$, and $\bar{\varepsilon} = 30$. Note, that hereby we assumed that exerting effort is less costly than help (and sabotage).[5] Each agent chose the amount of help t_i from the integer interval [–40; 40] and the amount of effort e_i from the integer interval [0; 40]. When subjects made their decisions, they were informed about the team bonus factor, the size of fixed payment and the individual bonus, and the cost functions.

TABLE 1 – PARAMETERS, TREATMENTS AND BENCHMARK

Treatments and team bonus factor (ECU)	Benchmark help (t*) and effort (e*)	Individual bonus scenarios (ECU)				
		Δ = 0	Δ = 3,000	Δ = 6,000	Δ = 9,000	Δ = 12,000
k = 0	t*	0	–3	–6	–9	–12
	e*	0	4	8	12	16
k = 50	t*	6	3	0	–3	–6
	e*	4	8	12	16	20
k = 100	t*	12	9	6	3	0
	e*	8	12	16	20	24
	Fixed payment (m)	14,000	13,000	12,000	11,000	10,000
	Sum of fixed & individual payments (3m + Δ)	42,000	42,000	42,000	42,000	42,000

Note: Each subject takes part in exactly one treatment and decides on help and effort for each of five scenarios, i.e., combinations of fixed payment and individual bonus. Afterwards one scenario (i.e., an individual bonus Δ with the respective fixed payment) is randomly chosen and implemented.

Each participant had to decide on the levels of effort and help (either positive or negative) for five scenarios with different individual bonus sizes Δ (see Table 1). The values of all random components in a team were not known to the team members when the decisions were made. The expected sum of the individual payments (i.e., the sum of the fixed individual payments 3m and the individual bonus Δ) was held constant within a treatment. Since the individual bonus differs across scenarios, the fixed payment m also varies. We varied the team bonus factor $k \in \{0; 50; 100\}$ across treatments.[6] Table 1 summarizes our treatments, our scenarios in each treatment and our benchmark predictions. Note that for our

[5] We have situations in mind where it is relatively cumbersome to provide help, e.g., because one has to familiarize oneself with the tasks of those whom one tries to help. Of course, different ways of modeling would be feasible. The chosen parameters also determine a possible second benchmark, i.e., efficient behavior (maximizing the total payoff of all team members). The total marginal revenue of the team from help is 6k and the marginal revenue from effort is 3k. Equalizing the marginal revenues and the respective marginal costs of help (i.e., $50t_i/3$) and of effort (i.e., $50e_i/4$) one obtains: $t^{eff} = 9k/25$ and $e^{eff} = 6k/25$. Note, that the efficiency benchmark does not vary with the magnitude of the individual bonus since ex-ante the expected sum of the individual bonus and the fixed payment is constant.

[6] This choice makes Δ more salient than k. Initially we thought to vary both k and Δ within one team. We felt, however, that this is too complex. Already when only varying Δ the task for the participants is quite difficult, which is the reason why we introduced the extensive exercise phase with calculation and simulation tasks. Alternatively, we could have kept Δ fixed in a team and vary only k. This would, however, have altered the total bonus sum between different decision situations of a team which might have added a further degree of complexity. A second alternative would have been to expose each team with only one combination of Δ and k. By doing so, however, we would have needed many more participants. We had one additional reason why we varied Δ and not k within one team: We were particularly interested in a one-shot test of the Lazear and Rosen (1981) tournament model and therefore put some emphasis on varying Δ within one team. Moreover, only a positive Δ may affect the incentive to help, i.e. to sabotage others.

parameterization in equilibrium the activity t^* becomes negative for $\Delta > 120k$, i.e., help turns into sabotage.

According to the benchmark analysis in section 2, in all three treatments, the amount of help is decreasing in Δ while individual effort is increasing in both Δ and *k*. In the treatment with *k* = 0 an agent's earnings are only a function of her individual relative performance. In other words, in this treatment the incentive scheme resembles a situation with a pure tournament incentive like suggested by Lazear and Rosen (1981). Thus, no positive help should be observed in this treatment. In the treatment *k* = 50 each group member receives 50 per unit of the produced team output. In this treatment, help should be observed in the scenarios with a low individual reward of Δ = 0 and Δ = 3,000 and sabotage when Δ = 9,000 or higher. In the treatment *k* = 100 the team bonus factor is relatively large, and thus our benchmark suggests help to be observed in all bonus scenarios except Δ = 12,000, for which the help equals 0.

The experiment was conducted in the Laboratory for Experimental Research at the University of Cologne.[7] We ran 6 sessions with 18 subjects each, i.e., in total, 108 students of different disciplines were involved (36 subjects per treatment).[8] Subjects were randomly allocated to different treatments and matched in groups of three. Each subject was allowed to participate only in a single session. To avoid session effects, in each session we had teams in all three treatments. In order to make the treatments as comparable as possible, all participants were provided with exactly the same instructions, which differed only in the team bonus factor *k*. We implemented a mild work context frame by using the terms 'help' and 'sabotage' and by calling effort 'work'. All payoff relevant parameters (bonuses, payments, costs) were expressed during the experiment in Experimental Currency Units (€1 equivalent to ECU 1,000), in order to avoid decimal numbers and make calculations for participants easy.

To keep the experimental setting close to the model and to avoid strategic play in repeated interactions, we conducted the experiment in a 'one-shot' setting. Since participants had no chance to learn over rounds, we took great care that they had the opportunity to familiarize themselves with the setting and that it was sufficiently well understood. Therefore, each participant had to go through three stages of an *exercise phase* for the five individual bonus scenarios: (*i*) *calculation stage*: subjects practiced step-by-step calculation of payoffs for

[7] Recruitment was done with the help of ORSEE (Greiner 2004). The experimental software was developed by using zTree (Fischbacher 2007). For the instructions and screenshots employed in the experiment see appendix B. Original screens and instructions were in German. They are available from the authors on request.

[8] One participant was excluded from the data analysis, as he had insufficient German skills and could not read the instructions.

decisions chosen by themselves, (*ii*) *quiz stage*: subjects answered quiz questions regarding the relationship between decisions and payoffs, and (*iii*) *simulation stage*: subjects were provided with an automatic payoff calculation mask and could gain experience by simulating the behavior of a team by entering values and clicking on a "compute" button.[9]

After the exercise phase, a message on the screen informed the participants about the start of the *decision phase*. As mentioned above, subjects made decisions for each of the five bonus scenarios without any information about the individual random components or about the effort or sabotage/help of the other team members. After the decisions, the experiment continued with belief elicitation about the average effort and help provided by the other team members.[10] At the end of the experiment, one bonus scenario was randomly selected and implemented, i.e., this scenario became payoff-relevant. Before the subjects learned their earnings, they were asked to complete a questionnaire including demographic variables, risk preferences elicitation questions and a 20-item competitiveness survey (Smither and Houston 1992). Outputs were then computed and payoffs determined. The subjects were paid privately. The average earnings were €18.16 plus the show-up fee of €4.50 (according to the lab rules, participants had to receive €2.50 show-up fee on top of their earnings; we rewarded them with additional €2 for filling in the post-experimental survey). Each session lasted about 2.5 hours including the time for reading instructions, exercise phase, decision phase, beliefs elicitation and post-experimental questionnaires. Translated instructions and screen shots are provided in the appendix.[11]

4 Results

Figure 1 shows the average help and effort and compares it to the benchmark. Each panel corresponds to one treatment and the team bonus factor increases from the left panel to the right panel. Overall, the observed help matches the theory quite well. The figure shows that help increases with an increasing team bonus factor. A Jonckheere-Terpstra test of ascending ordered alternatives applied separately for each Δ scenario delivers significant *p*-values at the

[9] In the calculation stage subjects were guided through the calculation of profits step-by-step. The screen provided them with the decisions of three team members, for each of the five combinations of low and high individual bonuses. The screen also showed (fictitious) random components for each team member. Based on this participants had to calculate values such as individual work result, group result, individual and group bonus, costs of work and help/sabotage as well as total payoffs. This extended calculation with over 120 values lasted for more than an hour, since subjects had to wait for everyone to complete the correct calculations. In the quiz stage, we asked subjects 12 comprehension questions (see instructions in the appendix). On average they have answered 10.6 questions correctly. In the last stage of the exercise phase, subjects could simulate the decisions of two fictitious team members and their own decisions. They could initiate draws of random components by the computer and the calculation of payoffs. On this stage they spent about 15 minutes.

[10] Also here subjects had to state their beliefs for five different individual bonus scenarios. They received €0.10 for every correct guess and €0.05 for every guess deviating by not more than 5 from the actual decision of fellow players.

[11] Original instructions were provided in German. They are available from the authors upon request.

1% and 5% level (all tests reported in this paper are two sided unless noted otherwise). For the exact numbers see Table 2. As visual inspection in Figure 1 suggests help significantly deviates from the benchmark only for Δ = 9,000 in treatment *k* = 0 and for Δ = 12,000 in treatment *k* = 50 (p = 0.0548 and p = 0.0271, respectively, Wilcoxon signed-rank test). Interestingly, in the settings with *k* = 50 there is significantly more help for every Δ than for *k* = 0 while there is no significant difference between helping activities between *k* = 50 and *k* = 100 for a given individual incentive Δ. Thus, already the smaller team bonus we implemented enhances helping similarly effectively as the higher team bonus of *k* = 100.[12]

TABLE 2 – COMPARISON OF AVERAGE HELP

Individual bonus	Treatment *k* = 0	Treatment *k* = 50	Treatment *k* = 100	Jonckheere-Terpstra test of ascending ordered alternatives
Δ = 0	-0.17	5.97	10.81	$p < 0.001$
WSR test 0 vs. 3,000	$p = 0.003$	$p = 0.048$	$p = 0.044$	
Δ = 3,000	-3.8	3.67	10.08	$p < 0.001$
WSR test 3,000 vs. 6,000	$p = 0.008$	$p = 0.03$	$p = 0.003$	
Δ = 6,000	-5.03	1.47	5.61	$p < 0.001$
WSR test 6,000 vs. 9,000	$p = 0.014$	$p = 0.019$	$p = 0.007$	
Δ = 9,000	-6°	0.64	1.64	$p = 0.025$
WSR test 9,000 vs. 12,000	$p < 0.001$	$p = 0.313$	$p = 0.003$	
Δ = 12,000	-9.49	-0.03°°	-0.03	$p = 0.012$

Note: ° (°°, °°°) at the 10% (5%, 1%) level significantly above the benchmark level (WSR test).

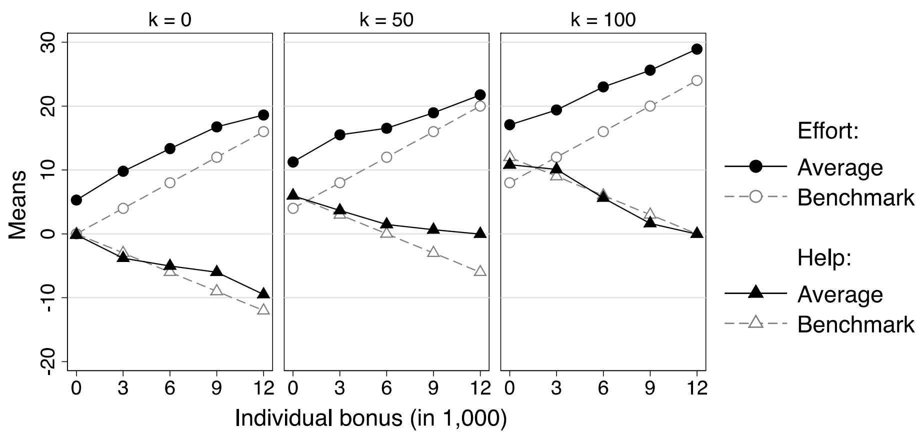

FIGURE 1 – AVERAGE EFFORT AND HELP

Note: Each panel represents one of the three treatments where the team bonus factor *k* increases over the panels from left to right. The horizontal axis shows the individual bonus Δ and the vertical axis shows the average amounts of help and effort. Black lines exhibit the observed average values and dashed lines depict benchmarks from the equilibrium analysis in section 2.

[12] The differences between helping activities in *k*=0 and *k*=50 are significantly different for each prize difference at a level of 1%, except for Δ=9000 yielding *p*=0.0211, MW U test.

Table 3 shows the effect of incentive schemes manipulations in a GLS regression with individual clusters. In model (1) the dependent variable is help. With treatment $k = 50$ being the reference group, the treatment dummy $k = 0$ has a highly significant and substantially negative impact on help ($\beta = -7.24$, p-value < 0.001). In particular, subjects in the treatment $k = 50$ exerted 7.24 units more help than in the treatment where the team bonus factor is 0, ceteris paribus. The regression coefficient for the dummy $k = 100$ is positive, but not significant ($\beta = 3.28$, p-value = 0.245).[13] When we control for gender and competitiveness score in model (2), our results remain virtually unchanged.[14]

TABLE 3 – EFFECT OF INCENTIVES ON HELP AND EFFORT

Dependent variable:	Help				Effort			
	(1)		(2)		(3)		(4)	
Independent variables	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Treatment $k = 0$	-7.24***	(2.04)	-7.08***	(1.93)	-4.04*	(2.24)	-4.07*	(2.25)
Treatment $k = 100$	3.28	(2.82)	3.74	(2.77)	6.01***	(2.181)	6.02***	(2.23)
Δ = 0	4.85***	(0.93)	4.85***	(0.94)	-6.40***	(0.96)	-6.40***	(0.96)
Δ = 3,000	2.65***	(0.74)	2.64***	(0.74)	-2.72***	(0.69)	-2.72***	(0.69)
Δ = 9,000	-1.94**	(0.78)	-1.93**	(0.79)	2.80***	(0.56)	2.80***	(0.56)
Δ = 12,000	-3.86***	(0.91)	-3.86***	(0.92)	5.47***	(0.80)	5.47***	(0.81)
Competitiveness			-1.17	(0.98)			0.40	(0.81)
Female			2.03	(1.91)			0.87	(1.83)
Intercept	2.00	(1.79)	0.81	(1.91)	16.97***	(1.76)	16.55***	(2.01)
N of subjects	107		107		107		107	
R^2within	0.23		0.23		0.34		0.34	

Note: GLS regressions with individual random effects with treatment and individual bonus dummies. Robust standard errors clustered on individuals are reported in parentheses. The reference treatment is $k = 50$. The reference group for individual bonus is Δ = 6,000. The competitiveness measure ($M = 11.26$, $\sigma = 4.34$) is standardized. The stars indicate significance levels: * p-value < 0.1, ** p-value < 0.05, *** p-value < 0.01. In both models, the coefficient of Δ = 0 is significantly larger than the coefficient Δ = 3,000, and the coefficient Δ = 9,000 than Δ = 12,000 (p-values ≤ 0.004 Wald test).

As expected the impact of the individual bonus on help goes in the opposite direction. Tested with the two-sided Wilcoxon signed-rank test, in each of the three treatments the help under $\Delta_{i+3,000}$ bonus scenario is lower than in Δ_i scenario for $i \in \{0; 3,000; 6,000; 9,000\}$ (virtually all p-values ≤ 0.048, for details see Table 2). Also the regression analysis from Table 3 where Δ = 6,000 is the reference group provides evidence for the negative effect of the individual bonus on help: All individual bonus dummy coefficients are significant (all p-values ≤ 0.014) and their coefficient size decreases with increasing Δ (all p-values ≤ 0.004, pairwise two-sided Wald tests).

[13] The fact that the difference in help is not significant between the treatments $k = 50$ and $k = 100$ in the regression analysis may be explained by relatively high help (compared to the benchmark) that subjects provided in the treatment $k = 50$, when Δ = 9,000 and 12,000. Indeed, when we run five separate regressions (one for each Δ), the $k = 100$ dummy is significant when Δ ≤ 3,000 (all p-values ≤ 0.07) but statistically insignificant when Δ ≥ 6,000 (all p-values ≥ 0.202).

[14] We use the competitiveness index developed by Smither and Houston (1992) that includes 20 'yes/no' items such as for example 'I like competition' or 'I try to avoid competing with others'. The aggregated index measures the number of the affirmative answers in favor of competition.

OBSERVATION 1: *Help increases with the team bonus factor and decreases with the individual bonus.*

TABLE 4 – CLASSIFYING HELPING BEHAVIOR (PERCENTAGES)

Treatment	Help > 0	Help ≥ 0	Sabotage < 0	Sabotage ≤ 0
$k = 0$	8.57	8.57	11.43	62.86
$k = 50$	33.33	38.89	5.56	22.22
$k = 100$	30.56	38.89	0	8.33

Note: The numbers report the percentage of subjects per type in a particular treatment. In columns "Help > 0" ("Sabotage < 0"), we report the fraction of subjects who helped (sabotaged) under *all* five individual bonus scenarios. In columns "Help ≥ 0" ("Sabotage ≤ 0"), we report the fraction of subjects who helped (sabotaged) *at least once* and never sabotaged (helped).

Let us look closer at the individual heterogeneity regarding the helping behavior. To do so, we classify the subjects based on their helping behavior: Subjects, who provide help under all five scenarios, are categorized as *helpers*. Correspondingly, the subjects who sabotage under all five individual bonus scenarios are classified as *saboteurs*. Table 4 reports the percentage of observed types. In the treatment $k = 0$, 8.57% could be classified as helpers and 11.43% as saboteurs. The percentage of helpers is almost four time bigger in treatment $k = 50$ ($p < 0.001$, two-sided test of proportions). The percentage of saboteurs is halved in $k = 50$ as compared to $k = 0$ (albeit this difference is not significant, $p = 0.122$). A similar trend as in treatment $k = 50$ is observed in treatment $k = 100$. Although the percentage of helpers doesn't go beyond 30%, the fraction of saboteurs goes to 0 and is thereby significantly lower than in treatments $k = 0$ and $k = 50$ ($p = 0.0003$ and $p = 0.013$, test of proportions). The decrease in the share of saboteurs is even more extreme if we include the subjects who sabotaged one time or more and never helped (see columns 3 and 5 of Table 4).[15]

TABLE 5 – COMPARISON OF AVERAGE EFFORT

	Treatment			Jonckheere-Terpstra test
Individual bonus	$k = 0$	$k = 50$	$k = 100$	of ascending ordered alternatives
Δ = 0	5.29°°°	11.25°°°	17.08°°°	$p < 0.001$
WSR test 0 vs. 3,000	$p < 0.001$	$p < 0.001$	$p = 0.019$	
Δ = 3,000	9.8°°°	15.5°°°	19.39°°°	$p < 0.001$
WSR test 3,000 vs. 6,000	$p < 0.001$	$p = 0.0831$	$p < 0.001$	
Δ = 6,000	13.34°°°	16.53°	23°°°	$p < 0.001$
WSR test 6,000 vs. 9,000	$p < 0.001$	$p = 0.002$	$p = 0.002$	
Δ = 9,000	16.74°°	18.94	25.61°°°	$p < 0.001$
WSR test 9,000 vs. 12,000	$p < 0.001$	$p = 0.007$	$p < 0.001$	
Δ = 12,000	18.6	21.75	28.92°°°	$p < 0.001$

Note: ° (°°, °°°) at the 10% (5%, 1%) level significantly above the benchmark level (WSR test).

[15] Table A2 in the appendix reports the regression results of our basic specification reported in Table 3 for three different subsamples: (i) those who sabotaged at least once and never helped, (ii) those who helped at least once and never sabotaged, and (iii) the remainder. The results indicate that saboteurs (as well as remainders) react as predicted to an increase of relative rewards with respect to helping activities while helpers do not show a considerable reaction. Admittedly, in part this might be an artefact of the type definition and/or the small number of observations and therefore should be interpreted with caution.

Now let us have a look at the effort provision. As seen in Figure 1, effort provision also tends to be in line with our benchmark prediction. However, the effort is often significantly higher than the benchmark predicts (see Table 5 for an overview). Effort increases with the individual bonus and team bonus factor. The increases are highly significant (virtually all p-values < 0.01, WSR and Jonckheere-Terpstra tests, for more details see Table 5). Model (3) of Table 3 reports the regression analysis in support of this observation: Effort in the treatment $k = 0$ is approximately 4 units lower than in the $k = 50$ treatment ($\beta = -4.04$, p-value = 0.072). In the $k = 100$, effort is approximately 6 units higher than in $k = 50$ ($\beta = 6.01$, p-value = 0.006). With respect to the variation in Δ, we observe significantly higher effort when the individual bonus increases (all p-values < 0.001).

OBSERVATION 2: *Effort increases with the team bonus factor and with the individual bonus.*

Note that effort levels are, however, significantly higher than the benchmark in the scenarios when $\Delta \leq 9{,}000$ (virtually all p-values < 0.01, WSR test, see Table 5 for an overview).

The beliefs about the help and effort exerted by the other two team members are highly correlated with the actual individual decisions. In general, the same effects of individual and team incentives are evident in beliefs. See Table A1 in the appendix for more details.

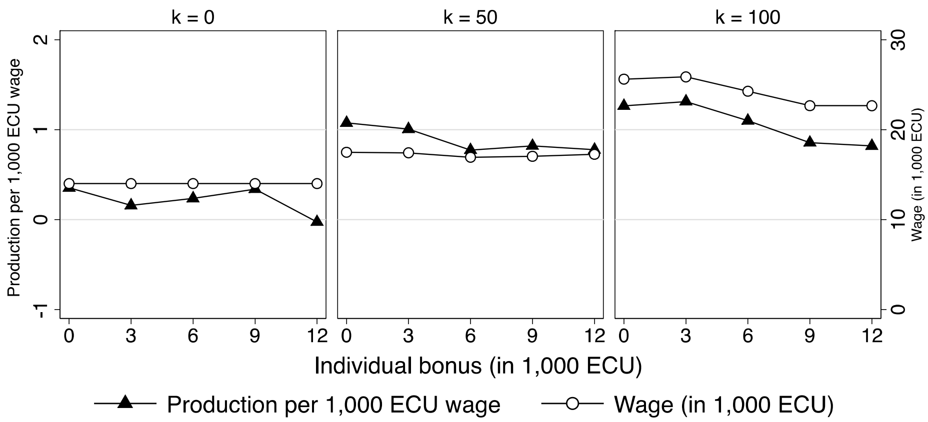

FIGURE 2 – AVERAGE WAGE AND PRODUCTION

Note: Each panel represents one treatment where the team bonus factor k increases over the panels from left to right. The horizontal axis is the individual bonus (Δ). Average wage was computed as $(42{,}000/3 + 3k(2t_i + e_i))/1{,}000$. Production per 1,000 wage units is computed as $(2t_i + e_i)/((42{,}000/3 + 3k(2t_i + e_i))/1{,}000)$.

In sum, our results show that the team incentives and the individual bonus tend to have a positive effect on effort. While an individual bonus seems to harm the provision of help, team incentives successfully mitigate this problem. This implies that the team bonus should raise the output produced by the agents, since on the one hand, they refrain from imposing sabotage, and on the other hand, they exert help and high effort.

Since in treatment k = 50 and k = 100 the sabotage is significantly reduced, the team production naturally becomes more efficient (i.e., produced output is not destroyed by tournament competition). In what follows we look at the efficiency from the perspective of a contract designer and an agent. We compute two different measures of the efficiency: *production output per 1,000 ECU wage* and *production output per 1,000 ECU agent's costs*. Figure 2 plots production output per *wage* costs and average wage costs. As can be seen, wage efficiency actually increases with k. The increase is significant for all Δ (all p–values ≤ 0.0476, Jonckheere-Terpstra test of ascending ordered alternatives). There is, however, no significant difference between treatment k = 50 and k =100 (p-values > 0.4, MWU test). Model (1) in Table 6 confirms this result with regression analysis. Thus, agents' production output per received wage unit grows with the team bonus factor k.

TABLE 6 – EFFICIENCY MEASURES

Dependent variable:	Production output per 1,000 ECU wage (1)		Production output per 1,000 ECU agent's costs (2)	
Independent variables	Coef.	SE	Coef.	SE
Treatment k = 0	-0.66**	(0.27)	1.27	(10.02)
Treatment k = 100	0.25	(0.26)	-7.54	(6.54)
Δ = 0	0.20*	(0.11)	6.47**	(2.93)
Δ = 3,000	0.12	(0.09)	3.05	(2.30)
Δ = 9,000	-0.03	(0.10)	-2.22**	(0.92)
Δ = 12,000	-0.18*	(0.10)	-4.76***	(1.31)
Competitiveness	-0.16*	(0.10)	0.15	(2.29)
Female	0.36*	(0.20)	2.55	(7.14)
Intercept	0.66**	(0.27)	14.05	(8.58)
N of subjects	107		102	
R^2within	0.04		0.08	

Note: GLS regressions with individual random effects and robust standard errors clustered on individuals in parentheses. The reference group for individual bonus is Δ = 6,000. The reference treatment is k = 50. The competitiveness measure (M = 11.26, σ = 4.34) is standardized. The stars indicate significance levels: * p-value < 0.1, ** p-value < 0.05, *** p-value < 0.01. In both models, the coefficient of Δ = 0 is significantly larger than the coefficient Δ = 3,000, and the coefficient Δ = 9,000 than Δ = 12,000 (p-values < 0.01, Wald test).

When looking at the production output per 1,000 units of *agents'* costs, we observe only little evidence for the treatment difference (for Δ equal 3,000, 6,000 and 12,000 p–values ≤ 0.0847, Jonckheere-Terpstra test of ascending ordered alternatives; there is no significant difference for the pairwise comparison between treatments k = 50 and k = 100 with the MWU test). The regression analysis as reported in model (2) of Table 6 delivers no significant treatment difference.[16]

[16] As our model does not specify the monetary value of produced output, the total welfare as the difference between the output and agents' costs cannot be computed.

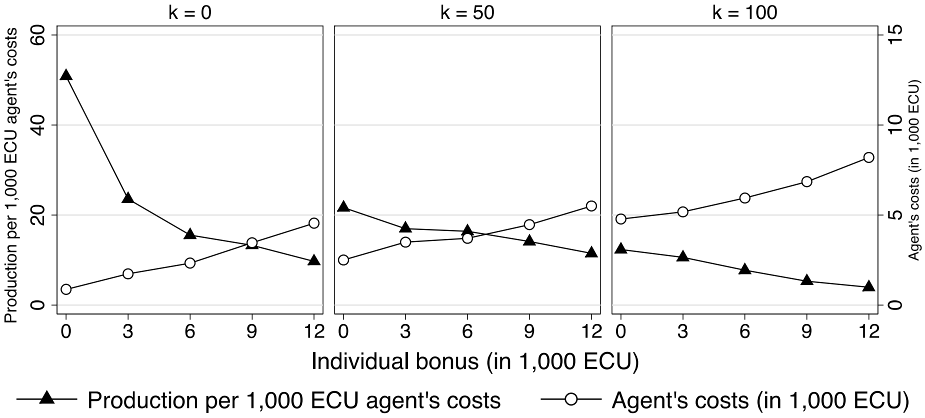

FIGURE 3 – AVERAGE AGENT'S COSTS AND PRODUCTION

Note: Each panel represents one treatment where the team bonus factor k increases over the panels from left to right. The horizontal axis is the individual bonus (Δ). Average agent's costs were computed as $(e_i^2 * 25/4 + t_i^2 25/3)/1{,}000$. Production per 1,000 ECU agents costs is computed as $(2t_i + e_i)/(e_i^2 * 25/4 + t_i^2 25/3)/1{,}000$.

5 Conclusion

In line with tournament theory, we find clear evidence of relative rewards reducing help in a one-shot experiment. Team incentives on the contrary encourage subjects to support their team members with helping activities even if they are combined with relative rewards.

According to the theoretic prediction team members sabotage each other in case of a strong individual incentive to outperform others. Though, we do not observe such a strong tendency to harm others. Taking a closer look at individual behavior we find that the proportion of participants who never help substantially decreases if we add a team bonus to the setting while the proportion of participants who never sabotage increases. Measuring efficiency in terms of output produced per wage costs we find that efficiency increases with adding a team bonus but does not increase further by doubling the team bonus. On the contrary, implementing a strong individual reward reduces efficiency considerably. Thus, a small positive team bonus already induces help and reduces sabotage compared to a situation with relative individual rewards and no team bonus.

Moreover, we find a tendency to oversupply effort which is in line with previous studies on tournaments, e.g. Bull et al. (1987), Schotter and Weigelt (1992) or Harbring and Irlenbusch (2008). Kräkel (2008) focuses on this phenomenon and offers a theoretical explanation by integrating negative and positive emotions into a tournament model. Assuming that agents feel pride or joy when winning the tournament and are disappointed when losing he modifies the actual prizes by defining "perceived" prizes. Thus, agents' optimal efforts provided in a rank-order tournament are higher when these emotions also drive agents' behavior. The idea of integrating a positive utility component in case of winning a competition is in line with other approaches, e.g. the joy of winning (Charness, Masclet, Villeval 2014), competitive preferences (Fershtman, Hvide, Weiss 2006) or status concerns (Moldovanu, Sela, Shi 2007).[17] Interestingly, Kräkel (2008) also incorporates risk aversion into the classical tournament model and finds that higher of risk aversion negatively affects effort provision. Contrary to this result we find a weak indicator for a positive correlation of risk aversion and effort supply.[18] In the light of these theoretical predictions and our data the relationship of risk aversion, competitive preferences and behavior in tournaments obviously requires further investigation to gather a better understanding of these parameters and to disentangle their effects. Also the role of emotions as modelled by Kräkel (2008) needs to be the focus of future research on individual behavior in competitive settings.

Our findings have an immediate implication for organizations. First, individual behavior of team members may be affected by setting collective and relative individual incentives which is roughly in line with economic theoretical reasoning. Second, we find an interesting deviation from our theoretical model. Our results indicate that implementing a team bonus may even have a more positive effect on helping than predicted from a rational perspective. Therefore, when help among team members is vital (e.g. in agile teams in engineering, scientific research, innovation, or product development), relative rewards should be reduced and be accompanied by at least small team bonuses.

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[17] One could argue that this does not apply to the settings with $\Delta = 0$. As participants had to make decisions for all five scenarios of Δ we speculate that the effort enhancing effect of the tournament settings carried over to those settings to some extent or that there is a social norm inducing participants to work at least a bit.

[18] When running a regression analysis similar to the one in Table 3, with the difference between chosen effort and benchmark effort as the dependent variable, we observe a positive but rather small coefficient for risk aversion ($\beta = 1.49$, *p*-value = 0.021). Risk aversion was measured on the scale 1 to 6 by a hypothetical, post-experimental question ‘Imagine you won in a lottery €100,000. You can invest some of this money into a well-known bank for two years. There is a chance that your investment will be doubled, but there is also the same high chance that you will lose half of your investment. How much of the €100,000 would you like to invest?’ Answer options: €100,000; €80,000; €60,000; €40,000; €20,000; €0. We don’t observe any significant relationship between risk-aversion and help. Moreover, we cannot confirm a relationship between the competitive index and effort provision.

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Appendix

TABLE A1 – EFFECT OF INCENTIVES ON BELIEFS ABOUT HELP AND EFFORT

Dependent variable:	Belief about help of others				Belief about effort of others			
	(1)		(2)		(3)		(4)	
Independent variables	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Treatment *k* = 0	-7.58***	(1.93)	-7.62***	(1.91)	-3.86*	(2.01)	-3.94**	(2.00)
Treatment *k* = 100	4.38*	(2.34)	4.37*	(2.26)	3.36	(2.06)	3.24	(2.07)
Δ = 0	6.10***	(0.83)	6.10***	(0.84)	-7.27***	(0.84)	-7.27***	(0.84)
Δ = 3,000	2.24***	(0.65)	2.24***	(0.65)	-2.68***	(0.51)	-2.68***	(0.51)
Δ = 9,000	-2.32***	(0.71)	-2.32***	(0.71)	2.78***	(0.53)	2.78***	(0.53)
Δ = 12,000	-4.67***	(0.83)	-4.67***	(0.83)	5.15***	(0.68)	5.15***	(0.68)
Competitiveness			0.52	(0.85)			0.84	(0.74)
Female			0.82	(1.69)			0.42	(1.68)
Intercept	-0.77	(1.55)	-1.15	(1.74)	20.66***	(1.54)	20.53***	(1.74)
N of subjects	107				107			
R^2within	0.33				0.42			

Note: GLS regressions with individual random effects with treatment and individual bonus dummies. Robust standard errors clustered on individuals are reported in parentheses. The reference treatment is *k* = 50. The reference group for individual bonus is Δ = 6,000.

TABLE A2 – HETEROGENEOUS REACTION ON TEAM AND INDIVIDUAL INCENTIVES

	Subsample 1: Sabotaged at least once & never helped		Subsample 2: Helped at least once & never sabotaged		Subsample 3: Remainder	
Dependent variable:	Help	Effort	Help	Effort	Help	Effort
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Treatment *k* = 0	0.15	-1.14	-4.55	-10.80**	0.16	-3.54
	(2.63)	(3.37)	(3.44)	(4.67)	(1.35)	(4.35)
Treatment *k* = 100	-1.76	11.70**	6.10	4.67	-0.01	6.18**
	(2.76)	(5.53)	(4.11)	(3.86)	(1.48)	(3.07)
Δ = 0	6.39***	-11.85***	0.77	-4.16**	6.60***	-3.84***
	(1.09)	(1.47)	(1.04)	(1.87)	(1.98)	(1.42)
Δ = 3,000	1.61***	-5.24***	1.29	-1.45	4.42***	-1.70*
	(0.49)	(1.22)	(0.90)	(1.51)	(1.66)	(0.94)
Δ = 9,000	-2.64***	3.85***	-0.68	0.29	-2.30	3.81***
	(0.69)	(1.01)	(0.58)	(0.85)	(1.86)	(0.96)
Δ = 12,000	-5.21***	6.48***	-0.23	3.35***	-5.44***	6.21***
	(1.19)	(1.71)	(0.99)	(1.09)	(1.92)	(1.31)
Intercept	-8.61***	16.45***	11.65***	20.19***	-1.61	13.86***
	(2.54)	(3.11)	(2.21)	(3.30)	(1.60)	(2.51)
N of subjects	33	33	31	31	43	43
R^2within	0.52	0.56	0.05	0.17	0.26	0.33

Note: GLS regressions with individual random effects with treatment and individual bonus dummies. Robust standard errors clustered on individuals are reported in parentheses. The reference treatment is *k* = 50. The reference group for individual bonus is Δ = 6,000. Inclusion of controls for gender and competitiveness score doesn't change the results. The stars indicate significance levels: * *p*-value < 0.1, ** *p*-value < 0.05, *** *p*-value < 0.01

Experimental Instructions
in Treatments *k* = 0, *k* = 50 and *k* = 100

The following handout was distributed to all participants (Translation from German – the original instructions in German are available from the authors upon request):

Explanations for the Experiment

Groups

You will be assigned to a **group** consisting of **3 employees**. During this experiment you only interact with the members of your group. The composition of the group is random. It will not be made public which participants form a particular group.

Costs and payoffs are indicated in a fictitious currency named „Taler".

Decisions

Each employee chooses the amount of her/his **work** out of the set {0, …, 40}.

At the same time, she/he can either sabotage or help the other two employees. In order to do so, she/he chooses a number out of the set {0, ..., 40}. Each employee has to decide on whether this number is the amount of **sabotage** or the amount of **help** for both of her/his fellow employees. It is not possible to simultaneously sabotage and help.

For these two activities, e.g. work on the one hand and sabotage or help on the other hand, the employee has to bear **costs** (for the effort expended). The costs are shown in the two cost tables. The higher the amount of one activity is, the higher the cost.

Work Result

Each employee is allotted a **random component** out of a set ranging from {–30, ..., +30}. Each random component is equally probable and independently drawn for each individual.

The **work result** is the sum of the random component and the amount of work chosen by her/him. Furthermore, the amount of **sabotage** by the *other* two employees is subtracted and the amount of **help** by the *other* two employees is added.

The **work result**, therefore, **increases** when the employee is **working more** and when the other two employees are helping. The work result **decreases** if the **other two employees are sabotaging**. (If one of your fellow employees chooses sabotage while the other one is helping, the amount of sabotage is subtracted from your work result and the amount of help is added to it.)

Each one of the other two participants can either choose sabotage or help. This **always affects their two fellow employees**. **Three different scenarios** are possible:

Situation I	Situation II	Situation III
Both fellow employees **sabotage.**	**One** of the other employees **sabotages,** the **other one helps.**	**Both** fellow employees **help.**
Own work result = Own work + random component **– Sum of the sabotage by the two employees**	Own work result = Own work + random component **– sabotage by the one employee + help by the other employee**	Own work result = Own work + random component **+ Sum of the help by the two employees**

Payoff

The payoff of each participant consists of her/his wage which includes a **group component** and an **individual component**. Costs for work and sabotage or help are subtracted.

Individual Component

- The individual component is determined by the relative level of work result achieved by each of the three employees. The employee with the **highest work result** gains a **high payment**, and the two employees with **lower work results** gain a **low payment**. (If there are identical work results the one for the higher payment is randomly drawn.)
- Please choose the amount of work and sabotage or help for **five different combinations of high and low payment** (see table, combinations **A-E**).
- The sum of the two low and the high payment is always 42,000 Talers.
- Please note: In combination A there is no difference between the payments for the employees. This means that every employee will get a payment of 14,000 Talers irrespective of the work results.

Combination	Sum of payments = **42.000 Talers**	
A	**14.000 Taler for each** employee	
	Low payment	**High payment**
B	13,000	16,000
C	12,000	18,000
D	11,000	20,000
E	10,000	22,000

At the end of the experiment one of the combinations A-E is randomly drawn. The decisions made by the three employees for this combination determine their payments.

Group Component

- Each employee receives a **group component** consisting of a bonus factor and the amount of the group result.
- The **group result** is the sum of the three work results of the group.
- The **bonus factor** is announced at the beginning of the experiment. It is the same for all three employees in your group.

Group Component = Bonus Factor * Group Result

The **payment** results after costs are subtracted from the wages:

Payment = Group Component + Individual Component **– Costs for own work – Costs for own sabotage or help**

Each employee gets to know the amount of his payment after the experiment.

At the end of the experiment the payment of the allotted combination is converted at the exchange rate 1 Euro per 1000 Taler.

All the participants get a show-up-fee of 2,50 Euros, which is independent of the payment obtained.

Exercise Phase

The experiment starts with an exercise phase. It consists of a **calculation stage** and a **simulation stage**. During the calculation stage you are supposed to calculate work results and wages based upon values that you have chosen yourself. During the subsequent simulation stage you can get to know the consequences of a number of various combinations of values.

Table of Costs

Effort	Costs
0	0
1	6
2	25
3	56
4	100
5	156
6	225
7	306
8	400
9	506
10	625
11	756
12	900
13	1056
14	1225
15	1406
16	1600
17	1806
18	2025
19	2256
20	2500
21	2756
22	3025
23	3306
24	3600
25	3906
26	4225
27	4556
28	4900
29	5256
30	5625
31	6006
32	6400
33	6806
34	7225
35	7656
36	8100
37	8556
38	9025
39	9506
40	10000

Help / Sabotage	Costs
0	0
1	8
2	33
3	75
4	133
5	208
6	300
7	408
8	533
9	675
10	833
11	1008
12	1200
13	1408
14	1633
15	1875
16	2133
17	2408
18	2700
19	3008
20	3333
21	3675
22	4033
23	4408
24	4800
25	5208
26	5633
27	6075
28	6533
29	7008
30	7500
31	8008
32	8533
33	9075
34	9633
35	10208
36	10800
37	11408
38	12033
39	12675
40	13333

Explanations for the Exercise Phase

Before you make your decisions that will be relevant for your payment, you participate in an exercise phase in order to get to know and understand the structure of the experiment.

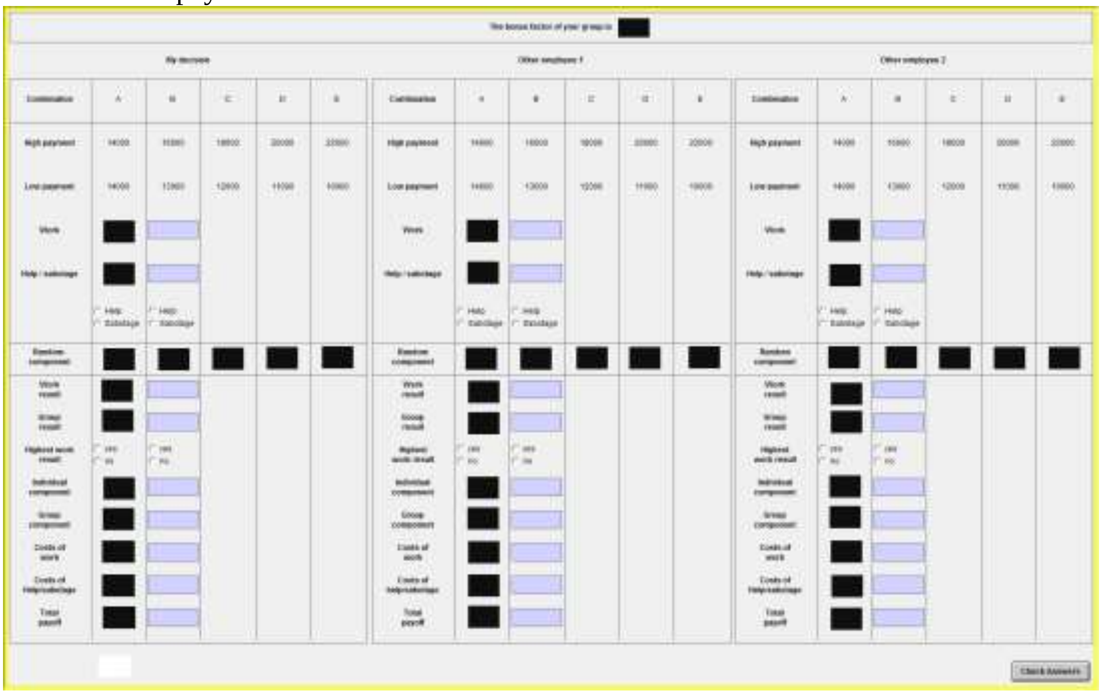
This exercise phase consists of two stages: the calculation stage and the practice stage.

Calculation Stage

First, you participate in the **calculation stage**. We ask you to calculate your payoff and the other group members' payoffs. Take screen 1 as an example: **For combination A, please enter a possible decision for work and help/sabotage for all three employees of your group.** (In our screenshots the numbers already entered before are blackened.)

Based on these figures, we ask you to **calculate the following values:**

- Work result per employee
- Group result
- Whether an employee has the highest work result or not
- Individual component
- Group component
- Costs of work (see table of costs)
- Costs of help/sabotage (see table of costs)
- Total payoff



Screen 1

You have to enter the values until they are calculated correctly according to the instructions. You can check whether the values are correct by using the button **„Check Answers"**. You will get feedback on the mistakes you made. **If you have any questions do not hesitate to ask us. Please raise your hand; we will come to your cabin.** A pocket calculator is at your disposal for the calculation.

If you have finished the calculation for combination A, the boxes for the next combination appear. Please repeat the calculation with new decisions for this combination.

Before the start of the exercise stage, you are asked to answer some **test questions** in order to check if you have understood the experiment correctly.

Simulation Stage

After having calculated the values for all five combinations, the **simulation stage** commences. It consists of a **maximum of two rounds**.

In each round, you enter **hypothetical numbers** for work and help/sabotage for the **other two employees** in your group. (see screen 2).

Screen 2

After having entered numbers for the other two employees, please enter **your own decisions** for work and help/sabotage. (see screen 3).

If you click on the button **„Calculate"**, you will be shown the corresponding values (work result, group component, etc.).

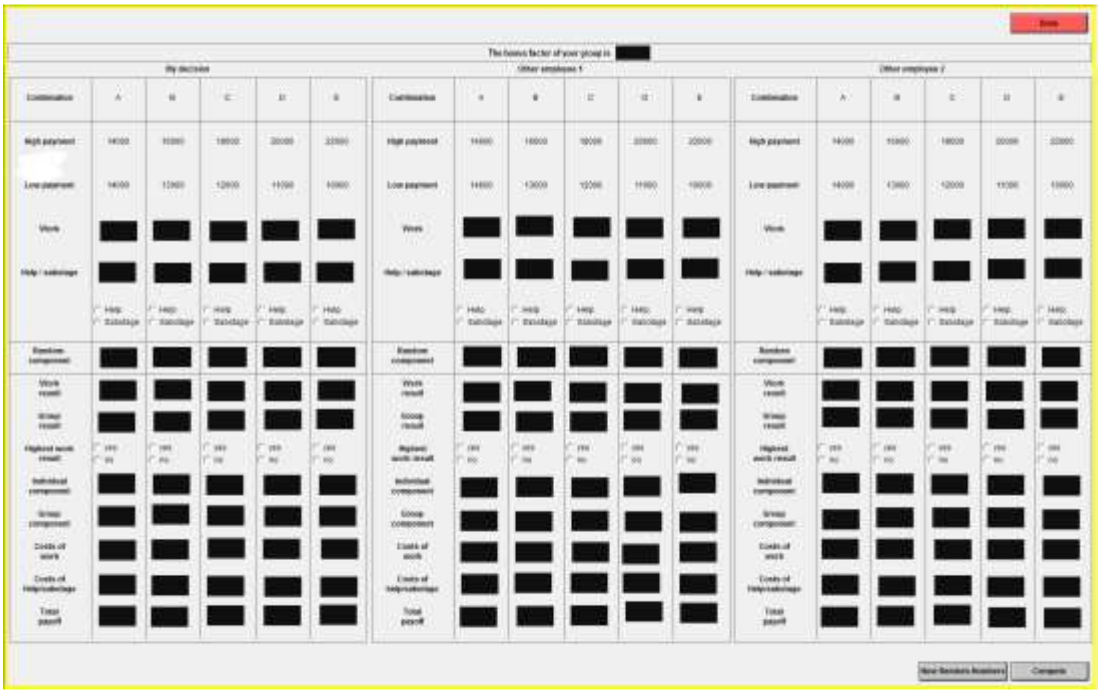
Screen 3

When the results are shown, you can get new numbers by clicking on the button **„New Random Numbers“**. (see screen 4). By doing this, you can get an impression of payments with various random numbers. You can request new random numbers as often as you want.

Please note: Random numbers are allotted individually for each employee. However, they are kept constant per employee across the various combinations.

If you would like to practice some more, please use the button **„More“**. In the next round starting now, you can enter new decisions for work and help/sabotage. You can only practice for a **maximum 2 of rounds**.

If you think you have practiced enough before the 2 rounds are over, please use the button **„Done“**. The exercise stage will be terminated immediately.



Screen 4

Attention!

Do not use the button „Done“ too early. Make sure before that you have understood everything.

The trial phase should allow you to get to know the consequences of various decisions.

On-Screen Quiz
(between the Calculation Stage and Simulation Stage)

First Screen (All questions to be answered by yes or no)

- If I am sabotaging the other employees in my group, I will improve my chances of getting a high payment.
- If I am helping the other employees in my group, I will improve my chances of getting a high payment.
- If I am working harder, I will improve my chances of getting a high payment.
- If I am sabotaging the other employees in my group, my group component will increase.
- If I am helping the other employees in my group, my group component will increase.
- If I am working harder, my group component will increase.

Second Screen

- If another employee in my group is sabotaging, my chances of getting a high payment will improve.
- If another employee in my group is helping, my chances of getting a high payment will improve.
- If another employee in my group is working harder, my chances of getting a high payment will improve.
- If another employee in my group is sabotaging, my group component will increase.
- If another employee in my group is helping, my group component will increase.
- If another employee in my group is working harder, my group component will increase.