# Managerial Discretion and Task Interdependence in Teams

Markus C. Arnold[a]

Ivo D. Tafkov[b]

November, 2015

**Authors' note:**
[a] University of Bern; phone: +41 31 631 3735; email: markus.arnold@iuc.unibe.ch
[b] Georgia State University; phone: +01 404 413 7226; email: itafkov@gsu.edu

We thank Jasmijn Bol, Alexander Brüggen, Eddy Cardinaels, Christine Denison, Robert Gillenkirch, Ron Guymon, Lynn Hannan, Jim Hesford, Kun Huo, Steve Kachelmeier, Alexis Kunz, Laurence van Lent, Jeremy Lill, Michael Majerczyk, Tim Mitchell, Don Moser, Drew Newman, Bill Rankin, Jeroen Suijs, Kristy Towry, Michael Williamson, Flora Zhou, workshop participants at Ecole Hôtelière de Lausanne, Tilburg University, 2015 Management Accounting Section midyear meeting, 2015 Canadian Academic Accounting Association Annual Conference, 2015 Global Management Accounting Research symposium, and 2015 American Accounting Association annual meeting for their helpful comments. We also thank Alan He and James Wilhelm for research assistance, and Robert Grasser for programming assistance. We gratefully acknowledge financial support from Georgia State University and the University of Bern.

**Managerial Discretion and Task Interdependence in Teams**


## Abstract

Prior research suggests that providing managers with discretion over team bonus allocation can improve team performance relative to equal team bonus allocations because it enhances the relation between team members' contributions to team output and their rewards. This study investigates whether task interdependence influences managers' ability to enhance this relation and, therefore, alters the effect of managerial discretion over compensation on team performance. Task interdependence reflects the degree to which the increase in team performance resulting from a team member's effort depends on the efforts and skills of the other team members. It is therefore an important variable for team work because when task interdependence is present, the potential benefits of using teams in terms of enhanced information sharing, coordination and helping behavior particularly large. Consistent with our predictions, we find that managers are able to use their discretion over team bonus allocation to enhance the relation between team members' contributions to team output and reward to a lower degree when task interdependence is present than when it is absent. Also consistent with our predictions, we find that the effect of managerial discretion over bonus allocation on team performance depends on task interdependence. Specifically, our results show that managerial discretion over compensation has a *positive* effect on team performance relative to equal team bonus allocations when task interdependence is absent and *negative* effect on team performance when task interdependence is present. The results also suggest that predicted effects of task interdependence become more pronounced when task interdependence goes up. Our results have practical implications for firms, which have flexibility in designing their incentive systems in a team environment, because we identify conditions under which the effectiveness of granting managers discretion over team compensation is likely to vary.



**Keywords:** *Team-based incentives; teams; discretion; task interdependence*

**Data Availability:** *Data are available from the authors upon request.*

## I. INTRODUCTION

Firms often use teams to accomplish their objectives (Sprinkle 2003; Pizzini 2010; Chen et al. 2012). Teams can facilitate coordination and helping among employees, which makes them particularly useful when team members' tasks are interdependent (Wheelan 2009; Wagner and Hollenbeck 2009). Tasks are interdependent when the degree to which the increase in team performance resulting from a team member's effort depends on the effort and skills of the other team members (Wageman and Baker 1997; Wagner and Hollenbeck 2009). Thus, the more interdependent team members' tasks are, the more they need to coordinate their actions and help one another in order to achieve the team's objectives.

In most team settings, objectively capturing and distinguishing among team members' contributions is unattainable or cost-prohibitive (Towry 2003; Maas et al. 2012). In such settings, a potential solution is to allocate the team bonus equally among team member. This, however, creates free-riding incentives for team members (Prendergast 1999; Plott and Smith 2008). To address this problem, firms often give managers of the teams, who can have access to additional, non-verifiable sources of information, discretion over evaluating and rewarding individual team members (Bailey et al. 2011). This is often done via discretionary bonus pools which are funded based on team performance and allocated among team members by managers at their discretion (hereafter, discretion over compensation) (Fisher et al. 2005; Bailey et al. 2011). Accounting research has provided evidence that discretion over compensation positively affects employee motivation in settings in which team performance is the sum of each individual member's output (Fisher et al. 2005; Arnold et al. 2015). However, in such settings, task interdependence is absent and the benefits of teams are limited because team members do not need to coordinate their actions and help one another in order to achieve the team's objectives. As task interdependence is likely to be present in many team settings in practice (Wagner and Hollenbeck 2009), it is important to

develop a better understanding of these settings. When task interdependence is present, however, the positive effects of discretion over compensation on team performance may not hold for two reasons. First, when task interdependence is present it may be more difficult for managers to link team members' rewards to their contributions to team performance because managers have to consider not only how hard (effort intensity) but also how smart (well-coordinated effort) a team member works. Second, managerial discretion may reduce team cohesion as it introduces a competitive element in the team-based incentive system. This may hurt coordination and helping in the team which are particularly important when task interdependence is present. Therefore, we investigate whether task interdependence mitigates managers' ability to use discretion over compensation to improve team performance and, as a consequence, decreases the positive effect of managerial discretion on team performance.

To our knowledge, we are the first to investigate how discretion over compensation and task interdependence affect team performance because, as mentioned earlier, accounting research on the usage and effect of managerial discretion has only employed settings in which task interdependence is absent (Fisher et al. 2005; Maas et al. 2012; Arnold et al. 2015).[1,2] We investigate our research question via an experiment. As task interdependence is a continuum (Wageman and Baker 1997; Wagner and Hollenbeck 2009), we capture one end of the continuum where task interdependence is absent as a baseline setting as well as two settings in which the interdependence of the team tasks make coordination and helping essential for team performance.

[1] Wageman (1995) utilizes a field setting with managerial discretion over compensation to investigate the interplay between task and outcome interdependence on team performance. However, she manipulates task and outcome interdependence while holding managerial discretion constant. Therefore, her study does not inform about how managerial discretion over compensation affects team performance when task interdependence is present.

[2] Research in other areas has studied the effect of formal incentive schemes on team performance in settings with task interdependence when individual outputs are verifiable and can be contracted on by analyzings formula-based individual vs. team rewards (Rosenbaum et al. 1980; Wageman and Baker 1997; Fan and Gruenfeld 1998; Pearsal et al. 2010; Barnes et al. 2011). These incentive schemes either induce greater coordination and helping among team members at the cost of lower individual effort levels (team rewards) or greater individual effort levels at the cost of lower coordination and helping among team members (individual rewards). In contrast, as detailed below, from an economic perspective, managerial discretion over compensation should reduce free-riding *independent of* the existence of task interdependence when the manager has non-verifiable information about team members' contributions.

The two types of task interdependence are detailed below. The basic setting consists of three employees and a manager, who are assigned to the same team for six periods. Each period, employees perform a real effort task which involves decoding numbers into letters. They have to choose how much to work on their own task and how much to help other employees while performing the tasks. Employees observe each other's contributions to each task perfectly while performing the task. Managers, however, are not able to monitor employees' contributions perfectly but receive non-verifiable noisy signals of each employee's contributions to each of the three tasks (i.e., an employee's own task and the other employees' tasks). Importantly, the level of noise does not differ according to whether an employee contributes to his own task or another employee's task, which eliminates the possibility that helping behavior is avoided because it results in noisier signals to the manager. Employees are compensated from a bonus pool, which is an objectively-determined, increasing function of team output. The manager's bonus is based on team performance, thus, she benefits from greater team performance.

We vary (between-subjects) managers' discretion over team members' compensation (present or absent) and task interdependence (present or absent). Nested within the task interdependence present condition we vary (also between-subjects) the source of task interdependence (conjunctive or disjunctive). Discretion over compensation is operationalized by allocating the team bonus equally among the employees (discretion absent) or by giving the manager discretion over the team bonus allocation to the employees (discretion present). To operationalize the existence and source of task interdependence while maintaining a high level of experimental control, we create stylized prototypes of additive, conjunctive, and disjunctive tasks (Steiner 1972).[3] We keep the real effort task (decoding) constant and manipulate task interdependence through the way in which the team

[3] Steiner (1972) typology of additive, conjunctive, and disjunctive tasks is commonly used by prior research on task interdependence (Day et al. 2004; Wagner and Hollenbeck 2009).

members' outputs map into team performance (Steiner 1972; McGrath 1984; Day et al. 2004).[4] This design choice allows us to manipulate the task characteristic that is necessary for testing our theory, i.e., the need for coordination among employees, while controlling for the influences of other task characteristics beyond the scope of our study. Specifically, we use the additive task in which team performance is the sum of each individual member's output as our baseline condition in which task interdependence is absent. In contrast, in the conjunctive (disjunctive) task team performance depends heavily on the output of the individual with the *worst* (*best*) performance and, thus, task interdependence is present in these two tasks. We use two types of task interdependence (conjunctive and disjunctive) to ensure that our results are robust to different types, and potentially different levels, of task interdependence.

Based on behavioral theory, we predict and find that managerial discretion and task interdependence interact in affecting team performance. Specifically, we find that managers are able to use discretion over compensation to enhance the relation between an employee's contribution to team output and reward to a lower degree when task interdependence is present than when task interdependence is absent. Our analysis indicates that the weaker relation between contributions and rewards when task interdependence is present exists because managers do not ignore inefficient efforts (i.e., uncoordinated effort that does not contribute to team output) when allocating the team bonus pool. Also consistent with our predictions, we find that the effect of discretion over compensation on team output depends on task interdependence. Specifically, our results show that discretion over compensation has a *positive* effect on team output relative to equal bonus allocation when task interdependence is absent and a *negative* effect when it is present. The results also show that the predicted effects of task interdependence on team performance are more

[4] Although additive, conjunctive, and disjunctive tasks differ in ways other than the way team members' outputs map into team performance, extant research (McGrath 1984; Barrick et al. 1998) identifies the way in which the team members' outputs map into team performance as the crucial factor for differentiating among the three task types. We further discuss the implications of this design choice in our conclusion.

pronounced when task interdependence is higher. Supplemental analyses indicate that differentiating compensation among team members hurts coordination and helping and this harms team performance under task interdependence.

This study provides insight into the role of managerial discretion in motivating team performance. Ironically, our results suggest that managerial discretion is *most* useful for improving team performance in an environment when the potential benefits of employing teams in terms of enhanced information sharing, coordination, and helping behavior are lowest (i.e., no task interdependence) and *least* useful when the potential benefits are highest (i.e., task interdependence).

Our study identifies conditions under which the effectiveness of managerial discretion over compensation is likely to vary. Our results help explain why firms are often reluctant to grant managers discretion over team members' compensation even when managers have private non-verifiable information about individual contributions to the team performance that can be used for compensation purposes (De Matteo et al. 1997; Weinberger 1998).[5] Prior research finds that although employees generally disfavor incentive systems that allocate compensation equally among them as failing to reflect individuals' relative contributions to the team's success, firms often distribute bonuses equally among the members of a team (De Matteo et al. 1997; Weinberger 1998). This research recommends that differentiating compensation among team members to reflect their individual contributions to the team can be more effective in motivating both effort at the individual level and coordination and helping behavior at the team level than allocating compensation equally among team members (Pearce and Ravlin 1987; Heneman and von Hippel 1995; Weinberger 1998). Our results suggest, however, that such a recommendation is not universal to all types of team tasks. Rather, we provide evidence that firms should consider limiting managers' discretion over compensation when task interdependence is present in order to avoid

[5] For example, in a survey of team-based practices De Matteo et al. (1997) find that 76 percent of surveyed firms distribute bonuses equally among team members.

discouraging coordination and helping behaviors. Thus, our study implies that firms need to consider both the nature of the tasks as well as how coordination and helping behavior among team members may ultimately affect team performance when making decisions regarding the extent of managerial discretion over team compensation.

The remainder of the paper is organized as follows. Section II provides background information and develops the hypotheses. Section III describes the experimental design. Section IV reports the results. Section V summarizes and discusses the results.

## II. THEORY AND HYPOTHESES DEVELOPMENT

### Task Interdependence

Task interdependence reflects the degree to which the increase in team performance resulting from a team member's effort depends on the effort and skills of the other team members (Wageman and Baker 1997; Wagner and Hollenbeck 2009). Thus, the higher the task interdependence, the greater the importance of coordination and helping behavior is for achieving team objectives (Wageman 1995; Wageman and Baker 1997).

Tasks vary in their level of task interdependence (Wageman and Baker 1997; Wagner and Hollenbeck 2009). On one end of the continuum we have tasks such as *additive tasks* which require the summing of team members outputs for performance. Here, the need for coordination and helping behavior is low or even absent. Examples include moving a heavy object by workers or physical therapists working for one medical office. Even though in the latter case, giving advice to other team members about treatment methods and coordination in, e.g., organizing patients may also increase team performance but the benefits of helping and coordination are likely to be limited. On the other end of the continuum, we have tasks in which the coordination and helping behavior is essential, such as *conjunctive* tasks, in which team performance depends heavily on the

output of the individual with the worst performance, or *disjunctive tasks*, in which team performance depends heavily on the output of the individual with the best performance. Examples of conjunctive tasks include building a product on an assembly line where failing to properly install any component can result in an underperforming product and making a movie, where mediocre plot, acting, sound, or picture can result in an overall mediocre movie. Examples of disjunctive tasks include choosing the best project to be executed from a set of options and producing a creative advertising slogan, where a single team member can come up with the project/slogan or team members can build on each other's ideas to generate such a project/slogan.

## Hypotheses

### *Managerial Usage of Discretion over Compensation*

Existing research shows that, in the absence of information on individual team members' contributions, managers tend to allocate the team bonus equally among team members (Bailey et al. 2011; Maas et al. 2012). However, when managers have non-verifiable information that indicates differences in the individual team members' contributions, managers are likely use it to differentiate team members' compensation in an attempt to enhance the relation between individual contributions and rewards so as to motivate future contributions (Baiman and Rajan 1995). Such contributions will increase team performance and benefit the manager whose compensation is tied to that performance. Additionally, fairness considerations are likely to induce managers to attempt to allocate the team bonus among the team members in a way that reflects their individual contributions to the team (Fehr and Schmidt 1999; Camerer 2003; Maas et al. 2012).

If managers use their private information to allocate compensation so as to reward team members based on their contributions to the team, such allocations will enhance the relation between contributions to team output and reward. From an economic perspective, this should be the case regardless of task interdependence because managers will reward only effort that increases team

performance (i.e., efficient effort). Failing to do so may lead to inefficient, costly effort that does not increase team performance and, therefore, according to economic theory, will be ignored by managers when distributing team bonus. Economic theory generally assumes that managers are rational and optimally use the non-verifiable information available to them. Existing research shows, however, that managers are often prone to random errors and systematic biases such as leniency, centrality, and halo biases when making bonus allocation decisions (Bol 2008, 2011; Bailey et al. 2011). Thus, we rely on behavioral theory to predict that the effect of managerial usage of non-verifiable information on the relation between employee contributions to team output and reward will depend on task interdependence.

When task interdependence is absent, the manager who attempts to strengthen the relationship between contribution to the team output and reward is likely to be able to do so because she has to be concerned only with a single dimension of effort, i.e., how hard team members work (effort intensity). When task interdependence is present, the manager's task becomes more complex because the manager has to weight multiple dimensions of effort, i.e., how hard (effort intensity) *and* how smart (effort toward coordination) team members work. To enhance the relation between contribution to the team output and desired behavior to a maximal degree, the manager should reward only efficient effort, i.e., coordinated effort that increases team performance, and ignore inefficient effort, i.e., uncoordinated effort that has no effect on team performance and, thus, is wasted. Extant research shows, however, that individuals often reward those who try hard simply for doing so regardless of the outcome produced (Weiner and Kukla 1970; Weiner 2000). The reason is that when someone does not contribute to the team output despite trying hard, the negative outcome may be attributed not to the lack of good intentions but rather to situational factors that are controlled by that individual to a lesser degree. Thus, we expect that managers will not completely ignore inefficient effort when allocating team compensation.

This will weaken the relationship between contribution to the team output and reward. Therefore, the relation between contribution to team output and reward induced by managers' use of discretion over compensation will be weaker when task interdependence is present compared to when it is absent. This discussion leads to the following predictions:

*H1a: When task interdependence is absent, managerial discretion over compensation will enhance the relation between contribution to team output and reward.*

*H1b: Managerial discretion over compensation will enhance the relation between contribution to team output and reward to a lesser degree when task interdependence is present than when task interdependence is absent.*

***Effect of Managerial Discretion over Compensation on Team Performance***

As predicted in H1a, without task interdependence, managers are likely to be able to allocate the bonus pool in a way that enhances the relation between individual contribution and rewards relative to equal bonus allocations, thereby motivating greater future contributions (see also Fisher et al. 2005). This means that team members should be more motivated to exert effort when their managers have discretion over how to allocate the team's compensation compared to when they do not have such discretion. The additional effort will have a positive effect on team performance. This yields the following hypothesis:

*H2a: When task interdependence is absent, team performance will be greater when managers have discretion over compensation than when managers do not have discretion over compensation.*

Next, we consider the effect of managerial discretion when task interdependence is present and coordination and helping one another is crucial to team success. Recall that from an economic perspective, managerial discretion should enhance the relation between employees' contributions to team output and reward independent of task interdependence. However, as discussed in H1b, behavioral theory predicts that managers are less able to enhance the relation between contribution to team output and reward when task interdependence is present compared to when it is absent.

Consequently, the positive effect of managerial discretion on employees' motivation to exert effort will be more muted when task interdependence is present.

In addition to having less positive effect on employees' motivation to exert effort when task interdependence is present, managerial discretion over compensation can have a negative effect on employees' motivation to coordinate their actions and help one another. Specifically, managerial discretion introduces a competitive element in the team-based incentive system because allocating a greater share of team compensation to a team member reduces the compensation that can be allocated to the remaining team members. This decreases the likelihood that team members perceive the task as truly a team task, thereby reducing their willingness to identify with the team (i.e., team cohesion) (Rosenbaum et al. 1980; Wageman 1995). To the extent that team cohesion motivates team members to coordinate their actions and help one another, a decrease in team cohesion will have a negative effect on team members' motivation to do so. Unlike in the case when task interdependence is absent the reduced motivation to coordinate and help one another is problematic when task interdependence is present because team members must do so in order to achieve high team performance. Moreover, the higher task interdependence is, the more serious the problem becomes because the importance of coordinating actions and helping one another increases when task interdependence increases.

In summary, due to decreased coordination and the weaker link between contribution to team output and reward, the effect of managerial discretion over compensation will be less positive when task interdependence is present. In fact, when task interdependence is present, it is even possible that the effect of managerial discretion over compensation is actually negative. We state this prediction formally as H2b:

*H2b: The effect of managerial discretion over compensation on team performance will be less positive (and potentially negative) when task interdependence is present than when task interdependence is absent.*

## III. METHOD

### Experiment Design and Task Overview

We vary (between-subjects) managerial discretion over team members' compensation (present vs. absent) and task interdependence (present vs. absent). Nested within the task interdependence present condition, we vary (also between-subjects) the source of task interdependence by using two types of team tasks: conjunctive or disjunctive. In the task interdependence absent condition, we use an additive team task. This design results in six experimental conditions depicted in Figure 1. A third (within-subjects) factor is period as teams interact over six periods. The primary dependent variables are the relationship between team member contribution to team output and their rewards (H1a and H1b) as well as team output, which is our measure of team performance (H2a and H2b).

*--- Insert Figure 1 about here ---*

We use two task types in which task interdependence is present to capture the different types of team tasks (Steiner 1972), which are commonly used by prior research on task interdependence (Wagner and Hollenbeck 2009), and to ensure that our results are robust to different types of task interdependence. Moreover, this allows us to better test our underlying theory, according to which the predicted effects of task interdependence will be more pronounced when task interdependence increases. As will be explained below, it is unclear from an *ex ante* perspective which of the two team tasks leads to a higher level of task interdependence in our setting. The use of both tasks, however, increases the likelihood of testing different levels of task interdependence.

Participants are randomly assigned to four-person teams comprised of one manager and three employees (Employee A, B and C). Participants' roles and team composition remain constant throughout the experiment. Employees perform a real effort task that consists of decoding numbers into letters. The task is often used in management accounting research (Arnold 2015; Chow 1983;

Fisher et al. 2005). It was performed on a computer using z-Tree software (see Appendix A for sample screen shots) (Fischbacher 2007).

Our setting and employee task enable coordination and helping behaviors in the team while also giving employees the opportunity to shirk. Within each period, while working on the decoding task, employees can choose to either contribute to their *own* task output, to the task output of the *other employees* in their team (i.e., to help other employees) or to finish decoding early and earn a time bonus for every second saved. The time bonus is used to model employees' effort costs and, as detailed below, was chosen such that incentives to free ride exist when discretion over compensation is absent. While decoding, employees receive real-time feedback about the current task outputs of each employee to coordinate their efforts. They are allotted 240 seconds per period, and a clock appears on the screen to help them keep track of the time remaining in the period.

The *task output of each employee* is the sum of items decoded by each of the three employees while working for this task output plus a random noise term.[6] As detailed below, we manipulate task interdependence through the way in which the employees' task outputs are used for calculating the team output. Every task output is given as follows:

$$\textit{Task output } i = \textit{decoded items}_{Ai} + \textit{decoded items}_{Bi} + \textit{decoded items}_{Ci} + \tilde{\varepsilon}_i \qquad (1)$$

where $\textit{Decoded items}_{ji}$ = *number of items decoded by employee j for task output i*

$\tilde{\varepsilon}_i$ = *random noise term of task output i*

$i, j \in \{A, B, C\}$.

In contrast, the *total employee performance* of employee j is the sum of the items decoded by employee j for the task outputs of *all* employees. As explained below, total employee performance enters into our measure of employee effort. Figure 2 illustrates how task output and total employee performance are calculated.

[6] The random noise term is added to the employees' task output for two reasons: First, in practice individual outputs are often noisy and non-verifiable signals about individual efforts. Second, it prevents managers from inferring the exact number of items decoded by the employees.

*--- Insert Figure 2 about here ---*

**Managerial Information**

To create *ceteris paribus* conditions, we hold managerial information constant across conditions. We also hold the level of noise in the manager's information about employee efforts constant across all employee contributions. Before making her decision about the discretionary bonus allocation (or before the bonus pool is allocated equally), the manager receives information about the team output and the team bonus pool as well as noisy non-verifiable private signals about how much each employee contributed to his *own output* and how much each employee contributed to the *output of the other employees* in his team (i.e. how much he helped others with their tasks). Importantly, the level of noise does not differ according to whether an employee contributed to his own task or another employee's task, which eliminates the possibility that helping behavior is avoided because it results in a noisier signal to the manager.

Thus, when allocating the team bonus to the three employees, the manager has noisy private signals about how *hard* each employee worked and how *smart* (i.e. effort towards coordination) he worked. These signals allow the manager to differentiate the bonuses according to the employees' contributions to team output. Neither the manager nor any other team member, however, is informed about individual employees' time bonuses and total earnings. This precludes them from inferring the time each employee has worked on the decoding task.

**Managerial Discretion over Compensation Manipulation**

We manipulate managerial discretion over compensation at two levels: discretion absent vs. discretion present. In the discretion absent condition, each of the three employees receives 1/3 of the team bonus pool. In the discretion present condition, managers have discretion in determining the bonus allocation among the employees of her team as long as the entire team bonus pool is allocated to the employees and no employee receives less than zero. Our operationalization thus captures the

endpoints of the continuum of discretionary pay. Moreover, when individual contributions to team output are non-verifiable, equal bonus allocation represents a natural benchmark for discretionary pay as it is commonly used in practice (De Matteo et al. 1997; Weinberger 1998) and alternatives of formal incentive systems are very limited.[7]

Each period, managers receive a bonus equal to ten percent of team output plus an endowment of 120 points. Because the manager's bonus increases in team output, managers have an incentive to allocate the team bonus pool so as to motivate employees to choose high effort levels in future periods.

In summary, employees' and managers' earnings are computed each period as follows:

$$\textbf{\textit{Employee's earnings for the period}} = \textit{Employee's share of team bonus pool} + \textit{Time bonus} \quad (2)$$

$$\textbf{\textit{Manager's earnings for the period}} = \textit{Endowment (120 points)} + \textit{10\% } \times \textit{ Team output} \quad (3)$$

Where $\textit{Team bonus pool} = 30\% \times \textit{team output}$

$\textit{Time bonus} = 240 - \textit{seconds used for decoding}$

and in the discretion absent conditions:

$\textit{Employee's share of team bonus pool} = 1/3 \times \textit{Team bonus pool}$

whereas in the discretion present conditions:

*Employee's share of team bonus pool = discretionary choice of the manager.*

**Task Interdependence Manipulation**

We manipulate task interdependence by varying the way employees' task outputs are transformed into team output as extant research identifies the way in which the team members' outputs map into team performance as the crucial factor for task interdependence (McGrath 1984; Barrick et al. 1998). In the task interdependence-absent condition, which serves as our baseline

[7] Even if an employee's task output (i.e., the sum of his and the other's employees' decoded items for his task) was verifiable individual incentives attached to this task output would not improve the situation as they would set strong disincentives against any coordination and helping behavior (e.g., Rosenbaum et al. 1980; Wageman and Baker 1997).

condition, employees' task outputs additively enter into the team output, i.e., any item decoded by an employee for the task output of any team member increases team output. Following Steiner's (1972) typology of team tasks, we use two types of team tasks in the task interdependence-present conditions: conjunctive or disjunctive. In both team tasks, the effect of additional effort from an employee on team output depends on whether and where the other employees provide efforts. However, both types differ in *how* the employees' efforts depend on each other. Thus, while keeping the employees' decoding task constant in the experiment, we vary the way the employees' outputs map into team output according to the type of the task interdependence. This choice enables us to measure individual efforts and team performance for all types of task interdependence and all managerial discretion conditions.

The manipulation of the team production function creates team tasks that represent "prototypes" of different types of task interdependence. These prototypes, although not meant to capture all aspects of real world conjunctive and disjunctive tasks, capture the one that is necessary for testing our theory—the need for coordination among employees in order to increase team output in the presence of task interdependence.

The team output for the different types of team tasks is calculated as follows:

***Task interdependence absent—Additive team task:***

$$\textit{Team output} = 20 \times (\textit{Task output A} + \textit{Task output B} + \textit{Task output C}) \quad (4)$$

***Task interdependence present—Conjunctive team task:***

$$\textit{Team output} = 60 \times \min\{\textit{Task output A, Task output B, Task output C}\} \quad (5)$$

***Task interdependence present—Disjunctive team task:***

$$\textit{Team output} = 20 \times \max\{\textit{Task output A, Task output B, Task output C}\} \quad (6)$$

If employees coordinated their efforts optimally, all types of team tasks lead to equally high team outputs when abilities and efforts remain constant across conditions. We did not allow

communication among the team members for experimental control purposes. However, to coordinate their efforts employees receive real-time feedback on the current task outputs of all team members while working on the decoding task. Specifically, (a) the displayed output of each task is updated immediately if any employee correctly decodes a number while working on this task and (b) employees can switch back and forth between different task outputs in the course of the period.[8]

In the conjunctive task, a way for employees to coordinate would be to provide one third of their total performance to each output. In this case, if all employees provided full effort, team output would be *60× 1/3 × (Capability A + Capability B + Capability C) = 20 × (Capability A + Capability B + Capability C)*, which is equal to the team output in the additive task. In the disjunctive task, if employees coordinated optimally, they would provide all their efforts to only one task output. In this case, if the employees provided full effort, team output would be *20 × Task Output i = 20 × (Capability A + Capability B + Capability C)*, which also equals the team output of the additive task.

Our parameter values are chosen to construct a social dilemma setting for the additive task with equal pay. In this condition, if an employee increases the team output by 1, his bonus will increase by 20 (productivity parameter) × 30% (of the team output) × 1/3 (of the team bonus) = 2, while the team bonus pool will increase by 20 × 30% = 6. As we set the time bonus to 1 point per second, any participant who needs more than two but less than six seconds to decode a number faces the social dilemma that decoding an additional number increases the team bonus pool by more than the foregone time bonus but, simultaneously, decreases his individual earnings. In a pretest, we find

[8] The lack of communication among team members may hurt performance more under disjunctive task than under additive or conjunctive tasks. The reason is that in the disjunctive task, some effort may be wasted at the beginning of each period until employees coordinate their efforts toward one specific task output. Although this may result in lower performance in the disjunctive task than in the additive or conjunctive tasks, it is of minor importance in our setting as we are not interested in performance comparisons across task types. We are only interested in performance comparisons across compensation schemes *within a given task type*.

that the criteria for a social dilemma under the parameter values of our experiment are satisfied as all participants needed between 2.5 and 4.5 seconds to decode one number.[9]

It is important to highlight two features of our design. These features are driven by our understanding of task interdependence as a continuum. Via our manipulation, we capture different points of this continuum, including the end point of no task interdependence, to test our theory. First, we operationalize the additive task as one in which team members do not need to coordinate their actions and help one another in order to achieve team's objectives. As explained above, we acknowledge, however, that in the real world such need may exist even for an additive task. For example, consider the early mentioned setting of physical therapists working for one medical. In this setting, helping others with treatment methods and coordination among the therapists when organizing patients can help minimize costs and increase sales. Our operationalization of additive tasks in its 'pure' form as devoid of any need for coordination or helping behavior, however, serves as a baseline condition and allows for a cleaner test of the underlying theory (see Libby et al. 2002).

Second, we are unable to determine *ex ante* whether the level of task interdependence is higher for the conjunctive or disjunctive task in our experimental setting. This depends on the distribution of capabilities and the level of effort expended by the team members. If, for example, Employees A, B and C decode a total number of 10, 20 and 30 items, respectively, team output under both the conjunctive and disjunctive task in our setting is 600 *without coordination* (conjunctive: $60 \times \min\{10; 20; 30\}$, disjunctive: $20 \times \max\{10; 20; 30\}$) and 1,200 *with optimal coordination* (conjunctive: $60 \times \min\{20; 20; 20\}$, disjunctive: $20 \times \max\{60; 0; 0\}$). In this case, the level of task interdependence is equal as for both team tasks, team output will double under optimal coordination vs. no coordination. However, whenever there is a risk that the performance of one employee is

[9] Note that for the conjunctive team task, there are multiple Nash equilibria that can lead to different levels of free-riding from a purely rational perspective (Harrison and Hirshleifer 1989; Hirshleifer 1983). Again, as we are not interested in comparisons across team tasks but only in the comparisons across compensation schemes within a *given team task*, this result is of minor importance in our setting.

close to zero (low capability or low effort), task interdependence is *higher* under the conjunctive task as zero performance of one team member implies complete failure of the team without coordination. In contrast, whenever team members' individual performances are rather equal, task interdependence is *lower* under the conjunctive task because the need for coordination is low when total employee performances do not vary a lot. The relative levels of task interdependence of the two team tasks will be measured ex post using the realized levels of total employee performance. Consequently, using two different types of task interdependence allows us to test whether the predicted effects of task interdependence on team performance become more pronounced when task interdependence increases and, thus, results in a more precise test of our theory.

**Participants and Procedures**

In total, 188 students from a large, public US university participated in the experiment. We conducted one session for each condition. The number of participants in each condition is included in Figure 1. The mean age of the participants is 21 years and 54 percent of participants are female. There are no significant differences across conditions for age or gender ($p > 0.10$ in both cases). Each session was conducted in a computer lab and lasted approximately 100 minutes on average. Participants' anonymity was preserved both during and after the experimental sessions.

At the beginning of each session, participants were provided with written instructions and were informed of their role, manager or employee A, B or C. Instructions were read aloud by one of the experimenters and the computer screens that participants had to use during the experiment were demonstrated. To ensure that all participants understood the experiment, they were required to complete a pre-experiment quiz and the experiment did not begin until all participants had answered all questions correctly.

Before the six experimental periods started, participants completed a one-minute practice period to become familiar with the decoding task and to ensure they understood the task. This

procedure follows prior research in this field (Fisher et al. 2005). Participants were not paid and did not receive feedback in the practice period. Then, they completed the six periods of the experiment.

After everyone had finished the decoding task, the computer randomly added the noise term to each task output and determined the team output. The noise term was uniformly distributed between [-7, 6,…, 6, 7] (Fisher et al. 2005). Then, the computer displayed to the employees the following information: 1) Task outputs A, B and C as defined in Equation (1); 2) the total team output; 3) the number of correctly decoded items by each employee for each task output; and 4) the team bonus pool. As described above, the manager received information about 1) task outputs A, B and C as defined in Equation (1); 2) the total team output; and 3) a 7-unit range for the number of items decoded by each employee for each task output (his own as well as those of the other employees). Managers were informed that the employee's actual number of decoded items for this task output could lie anywhere within this range with equal probability. Therefore, the range is a noisy signal about how many items each employee decoded for each task output. Importantly, the range was equally large independent of whether an employee decoded items for his own task output or the task output of other employees to exclude differences in the level of noise in manager information as an explanation for less helping behavior. The design choice to provide a range in order to model performance measure noise is consistent with extant research in this field (Hecht et al. 2014). Finally, the manager was also informed about her own bonus and the team bonus pool.

In the conditions with managerial discretion, the manager determined each employee's share of the team bonus pool. In the conditions without managerial discretion, each of the three employees received 1/3 of the team bonus pool. Next, in all conditions, each employee's screen displayed the amount allocated to each of the three employees. This screen was followed by one in which each participant saw his/her earnings for the period. Then the next period started. At the

conclusion of the six periods, participants completed a post-experiment questionnaire. Participants received their cash payments and were dismissed.

**Experimental earnings**

Participants' cash earnings are determined by summing the points earned in all six periods and converting them into cash at the rate of 120 points per $1. Participants also receive a $5.00 show-up fee. Participants earned an average of $22.22, including the show-up fee. Total compensation varied between $10.35 and $32.57.

**Measures**

To test H1a and H1b, we need to analyze the strength of the relationship between employees' contributions to team output and their reward. Therefore, we examine the relation between *employee bonus share* and employees' *relative output contribution.* Employee bonus share measures each employee's relative share in the team bonus pool (in percent). The relative output contribution measures each employee's efficient effort that he contributed to the team output (in percent of total team output). Thus, this measure ignores an employee's inefficient effort. We use relative measures for both dependent and independent variable in order make different bonus pool sizes and all conditions comparable. The more closely managers are able to link employees' bonuses to their team output contributions the more strongly the employee bonus share increases in the employees' relative output contribution.

In the additive task, the employees' relative output contributions are equal to the relative total employee performances as any contribution to any of the three tasks increases team output. In the conjunctive task, the relative output contributions include the total employee performance less the difference between each employee's "own" task output and the minimum task output of the team. The latter variable reflects inefficient effort if each employee mainly decodes items for his own

task output, which occurred in our experiment.[10] Finally, in the disjunctive task, the relative output contributions equal employees' relative contributions to the maximum task output as any item not decoded for the maximum task output is inefficient. For all tasks, we use the relative contributions as signaled to the manager.

Our primary dependent variable, used to test H2a and b, is *team output*, which is our measure of team performance. Team output is calculated as described above. In our analysis, we use the team output excluding the random noise term of each task output because this measure represents the team output that can be influenced by the employees.[11]

## IV. RESULTS

### Descriptive statistics

To estimate the level of task interdependence in the conjunctive and the disjunctive task for the actual efforts and capabilities of the employees in our experiment, we calculated the maximum team output (with optimal coordination) and the team output without any coordination that would have emerged for the *actual* levels of total employee performances. The results show that, relative to no coordination, optimal coordination would have increased team output by 40% for the conjunctive task and by 150% for the disjunctive task. This indicates that, in our experiment, coordination and helping behavior are more important for team performance when the task is disjunctive than when it is conjunctive. Therefore, task interdependence is higher in the disjunctive task, which leads us to expect that the effects of task interdependence on team output will be more pronounced for the disjunctive task.

[10] Specifically, we find that at least 88% of each task output was produced by the employee who "owned" the task. Thus, each employee seems to be responsible for his "own" task output. In such a case, managers should not reward decoded items for the employee's "own" output that exceed the team minimum.
[11] All statistical inferences remain the same when we use the team output with the noise term.

Table 1 reports descriptive statistics from the experiment.[12] As displayed in Table 1 and graphed in Panel A of Figure 3, team output increases under managerial discretion when task interdependence is absent (from 3,530.83 to 3,865.71) and this provides initial evidence in favor of H2a. In contrast, team output decreases when task interdependence is present (from 3,072.29 to 2,430.63). Specifically, as reported in Table 1 and displayed in Panel B of Figure 3, the effect of managerial discretion is negative for both types of task interdependence (conjunctive interdependence: from 3,341.25 to 2,991.25; disjunctive interdependence: from 2,803.33 to 1,870.00). These results are in line with H2b.

*--- Insert Table 1 and Figure 3 about here ---*

Table 1 also provides initial evidence that is consistent with the theory underlying our hypotheses. To quantify the effects of suboptimal coordination, we first calculate the maximum team output that could have been reached *given* the total employee performances and then calculate the *efficiency loss* as follows: 100 – (actual team output/maximum team output) × 100.[13] Thus, the efficiency loss is the percentage of team output lost due to coordination failures when task interdependence is present and, therefore, represents an aggregate measure of how smart the employees of a team worked. The table shows that the efficiency loss increases when managerial discretion is present relative to when it is absent for both the conjunctive (from 9.40% to 12.94%) and the disjunctive task (from 19.74% to 45.60%), indicating increased coordination failures when managerial discretion is present. Additionally, as a measure of how hard an employee worked during the time he spent on the decoding task, we measured *effort intensity* as the coefficient of the total employee performance in a period and the time spent on decoding in this period (240 – time bonus). Table 1 shows that managerial discretion increases effort intensity by 12% (from 0.2550 to

[12] We do not report descriptive statistics on the dependent and independent variables used to analyze H1a and H1b as, by definition, the mean of the employee bonus share and the relative output contribution is 33.33% in all conditions.
[13] Notably, in our measure, the total employee performance is kept constant and we use the maximum team output that could have been reached if all efforts had been perfectly coordinated for the *given* total employee performance.

0.2851) when task interdependence is absent, but slightly decreases effort intensity by 3% (from 0.2639 to 0.2558) when task interdependence is present, indicating that managerial discretion affects employee motivation less positively when task interdependence is present. Specifically, for disjunctive interdependence, managerial discretion increases effort intensity by less than 3% (from 0.2552 to 0.2622) whereas for conjunctive interdependence, managerial discretion even decreases effort intensity by 9% (from 0.2726 to 0.2476).

**Hypotheses Tests**

H1a predicts that managers are able to enhance the link between employees' rewards and their contributions to team output when task interdependence is absent. H1b predicts that managers are less able to enhance this link when task interdependence is present. To test H1a and H1b, we ran three regressions with *employee bonus share* as the dependent variable.[14] In the first regression, we use all conditions with managerial discretion. In the second (third) regression, we combine the managerial discretion under the additive task only with managerial discretion under the conjunctive (disjunctive) task. As the independent variables, we use employees' *relative output contributions*, an indicator variable *task interdependence* (equal to 1 when task interdependence was present) and the interaction of these two variables. Because in the treatments without managerial discretion, an employee's relative bonus share is always one third independent of his contribution to team output, a positive relation between relative employee bonus shares and the relative output contributions implies that the manager is able to link employees' bonus more closely to their team output contribution than in the equal pay conditions.

Table 2 reports the results of our regressions. The first regression (Model 1) uses all conditions with managerial discretion. As the additive task without task interdependence serves as

[14] All regressions in the paper using period-by-period data include clustered standard errors to account for multiple observations within subject and period-fixed effects to control for time effects. For robustness, we re-ran all regressions in the paper using period-by-period data, including a period variable to control for time effects. All statistical inferences remain the same.

a baseline condition for this regression, the coefficient of relative output contribution reflects the link between relative output contribution and employee bonus share when there is no task interdependence. As reported in Table 2, this coefficient is significantly positive ($\beta$=0.7567, $p<0.01$, one-tailed), indicating that in the additive task, managers are able to link higher relative employee contributions to the team output to higher relative bonuses. This supports H1a.

*--- Insert Table 2 about here ---*

Additionally, the regression reveals that the interaction effect is significantly negative ($\beta$=-0.6507, $p<0.01$, one-tailed). This implies that when task interdependence is present the link between an employee's bonus share and his relative contribution to team output is weaker. This finding supports H1b. Consistent with this, the positive coefficient of task interdependence ($\beta$=21.69, $p=0.01$) indicates that when their relative output contribution was zero, employees would receive higher bonus shares under task interdependence. However, a subsequent Wald test reveals that even with task interdependence, managers are able to install some positive link between the employees' relative contributions to team output and their relative bonuses (0.7567 – 0.6507 = 0.1060, $p<0.01$, two-tailed). The additional regressions included in Table 2 (Model (2) and Model (3)) compare the additive task separately with both types of task interdependence we used. The results confirm the significantly positive reward-contribution link when task interdependence is absent. They also reveal that managers are less able to improve the link between employee bonus and contribution to the team output independent of type of task interdependence, as evidenced by the negative interaction coefficients. These results further support H1a and H1b.

H2a predicts that managerial discretion over compensation increases team output when task interdependence is absent. H2b predicts an interaction between managerial discretion and task interdependence as it predicts that the effect of managerial discretion over compensation on team output will be less positive (and potentially negative) when task interdependence is present. As a

conservative test for these two hypotheses, we conduct regressions using mean team output over all six periods as the dependent variable, i.e., we use only one observation per team. We use regressions instead of ANOVAs because a Levene test indicates a violation of the homogeneity of variances ($t = 12.00$, $p < 0.01$). To control for heteroscedasticity in the regressions, we calculate robust standard errors using the Huber-White (sandwich) estimator.

In the first regression, we test the effect of managerial discretion when task interdependence is absent. The independent variable is an indicator variable for discretion (equal to 1 when managerial discretion is present). The results of this regression are reported in Table 3 (Model (1)). Consistent with H2a, the results show that when task interdependence is absent, managerial discretion increases team output significantly (334.9, $p = 0.05$, one-tailed).

*--- Insert Table 3 about here ---*

The second regression shown in Table 3 includes all conditions (Model (2)). The independent variables used are the indicator variable for discretion, an indicator variable for task interdependence (equal to 1 when task interdependence is present) and the interaction of the two variables. As the baseline condition of this regression is no task interdependence/no discretion, the coefficient of the discretion variable reflects the effect of managerial discretion when task interdependence is absent. It again supports the significantly positive effect of managerial discretion predicted in H2a (334.9, $p = 0.04$, one-tailed). Additionally, the interaction effect of the regression is significantly negative (-976.6, $p < 0.01$, one-tailed), indicating that the effect of managerial discretion is significantly smaller when task interdependence present than when it is absent. This result supports H2b. Moreover, a Wald test reveals that the effect of managerial discretion under task interdependence is significantly negative ($334.9 – 976.6 = -641.7$, $F = 6.32$, $p = 0.01$, two-tailed).

Finally, we run two regressions testing the effect of managerial discretion separately for conjunctive and disjunctive task interdependence. The results are displayed in Table 3 (Models (3)

and (4)). They provide evidence that managerial discretion not only has a smaller positive effect on team output when task interdependence exists but also *decreases* team output in both cases albeit significantly so only for the disjunctive task (conjunctive interdependence: -350.0, p = 0.14, two-tailed; disjunctive interdependence: -933.3, p = 0.01, two-tailed). As outlined above, in our experimental setting, the level of task interdependence is higher in the disjunctive task than in the conjunctive task. Thus, consistent with our expectations, the predicted effects of task interdependence on team output are more pronounced when task interdependence increases.

**Supplemental analysis**

***Discretionary Bonus Allocation***

In our theory development, we argued that managers will be less successful in using their discretion over compensation to enhance the link between contribution and reward when task interdependence is present. The reason is that managers may not fully ignore inefficient effort as it may be driven by good intentions (Weiner and Kukla 1970; Weiner 2000). Our evidence on H1a and H1b was consistent with a lower link between contribution to team output and reward when task interdependence is present. In this section, we explore whether managers in the task interdependence conditions did not fully ignore inefficient effort when allocating the team bonus pool.

We ran two regressions. In both regressions, we use employee bonus as the dependent variable and the levels of efficient and inefficient efforts as the independent variables. The first regression explores managers' bonus allocations in the conjunctive task. As we explained above, in this task, we used an employee's contributions to his "own" task above the minimum task output of the team as inefficient effort and his total employee performance less this difference as efficient effort. In the disjunctive task, we used an employee's contribution to the maximum task output as efficient effort and his contributions to any other task output as inefficient effort. Table 4 displays our results.

*--- Insert Table 4 about here ---*

The first regression (Model (1)) shows that in the conjunctive task, employees' bonus increases significantly not only when the efficient effort increases ($\beta$=4.0814, $p<0.01$, one-tailed) but also when the inefficient effort increases ($\beta$=1.5813, $p<0.01$, two-tailed). Similarly, as reported in the second regression (Model (2)) employees' bonus in the disjunctive task also increases both with efficient ($\beta$=2.4465, $p<0.01$, one-tailed) and with inefficient effort ($\beta$=1.6379, $p=0.02$, two-tailed). In both cases, Wald tests reveal that the bonus increase for more efficient effort is higher than for more inefficient effort (conjunctive task: 4.0814 – 1.5813 = 2.5001, $p=0.01$; disjunctive task: 2.4465 – 1.6379 = 0.8086, $p=0.01$). These results indicate that managers reward inefficient effort at a lower rate than efficient effort. However, the findings also provide strong evidence that, consistent with our underlying theory, managers do not fully ignore inefficient effort.

***Employee Motivation***

The prior section concentrated on whether managers' bonus allocations motivated employees to work *smart*. However, the weaker link between team output contributions and reward when task interdependence is present also increases employees' motivation to work *hard* less when task interdependence is present than when it is absent. As reported in Table 1, descriptive statistics on effort intensity are consistent with this argument. To test whether the effect of managerial discretion on effort intensity depends on task interdependence, we regressed mean effort intensity over all periods on three independent variables: an indicator variable for discretion (equal to 1 when managerial discretion is present), an indicator variable for task interdependence (equal to 1 when task interdependence is present) and the interaction of the two variables. Results (untabulated) reveal that the effect of managerial discretion is significantly positive when task interdependence is absent ($\beta$ = 0.0301, $p$ = 0.01, one-tailed), but significantly lower when task interdependence is present (interaction term: $\beta$ = -0.0385, $p$ = 0.01, one-tailed).

As effort intensity is based on total employee performance that takes into account all employee effort independent of its efficiency we rerun this regression using an alternative measure for effort intensity that only takes efficient employee efforts into account. Results (untabulated) show again that efficient effort intensity increases when task interdependence is absent ($\beta = 0.0301$, $p = 0.01$, one-tailed) and is significantly lower when it is present ($\beta = -0.0846$, $p < 0.01$, one-tailed). An additional Wald test reveals that the effect of discretion on efficient effort intensity under task interdependence is even significantly negative ($0.0301 - 0.0846 = -0.0545$, $p = 0.02$, two-tailed). These findings are consistent with our underlying theory and suggest that manager's discretionary bonus allocation also increases employees' motivation to work *hard* less when task interdependence is present than when it is absent.

***Team cohesion***

In our theory section, we argue that managerial discretion negatively affects team cohesion, thereby reducing employees' motivation to coordinate their actions. We measured team cohesion in the post experimental questionnaire by adapting four items from the team cohesion measure of Chen et al. (2012). Panel A of Table 5 summarizes the statements used to measure team cohesion and the descriptive statistics by condition. Participants answered these questions on a 7-point Likert-scale from 1 (not at all) to 7 (very much).

*--- Insert Table 5 about here ---*

We use the four items to run a factor analysis. As reported in Panel B of Table 5, all items load on one factor (all factor loadings > 0.75).[15] Thus, all items support our construct. We use the weights of the four items in an exploratory factor analysis to construct the team cohesion factor. Consistent with our expectations, t-tests show that in all cases, team cohesion decreases

[15] To assess measurement quality, we compute Cronbach's alpha, the construct's composite reliability (Fornell and Larcker 1981), and the average variance extracted (AVE). This procedure results in values of 0.89 for Cronbach's alpha, 0.92 for composite reliability, and 0.75 for the AVE. All reliability measures exceed established empirical thresholds: 0.70 for alpha, 0.70 for composite reliability, and 0.50 for AVE (Bagozzi and Baumgartner 1994; Nunnally 1978).

significantly when managerial discretion is present (additive task: from 0.19 to -0.69; conjunctive task: from 0.41 to -0.33; disjunctive task: from 0.58 to -0.24, all p's<0.01, one-tailed).

However, even though managerial discretion always decreases team cohesion, the effect of managerial discretion on team output is only negative in the presence of task interdependence. The reason is that, as stated in our hypotheses development for H2b, team cohesion influences team output via its effect on coordination. This is evidenced by the mediation analysis we ran with efficiency loss as the mediating variable. We conduct our analysis separately for the conjunctive and the disjunctive tasks. For both tasks, the indirect link from team cohesion to team output via efficiency loss is significant. Specifically, both the effect of team cohesion on efficiency loss (conjunctive task: -3.92, p<0.01; disjunctive task: -7.99, p<0.01) and the effect of efficiency loss on team output (conjunctive task: -41.02, p<0.01; disjunctive task: -31.52, p<0.01) are significant. Simultaneously, the direct effect of team cohesion on team output becomes insignificant for the conjunctive task (47.76, p=0.45) but remains significantly positive for the disjunctive task (95.30, p=0.06) which indicates that the efficiency loss fully mediates the effect of team cohesion on team output for the conjunctive task and partially mediates it for the disjunctive task.[16] Finally, we test these mediations using a bootstrapping procedure with 5,000 replications (Preacher and Hayes 2008). For both tasks, these tests confirm that the mediation is significant (both p's <0.01).

## V. CONCLUSION

In this study we investigate whether task interdependence mitigates managers' ability to use discretion over compensation to improve team performance and, therefore, decreases the positive effect of managerial discretion on team performance documented by prior research (Fisher et al.

[16] We re-run the mediation analysis with effort intensity as a second potential mediating variable in addition to the efficiency loss. Whereas the statistical inferences about team cohesion as an independent variable and efficiency loss as a mediating variable remain unaffected, the results of this analysis show that effort intensity does not represent an additional mediating variable for the effect of team cohesion on team output for either the conjunctive or the disjunctive tasks because effort intensity is not affected by team cohesion.

2005; Arnold et al. 2015). Consistent with our predictions, we find that managers are able to use their discretion over compensation to enhance the relation between contributions to team output and reward to a lower degree when task interdependence is present than when it is absent. Also consistent with our predictions, we find that the effect of discretion over compensation on team performance depends on task interdependence. Specifically, our results show that managerial discretion over compensation has a *positive* effect on team performance relative to equal bonus allocations when task interdependence is absent and a *negative* effect on team performance when task interdependence is present. The results also suggest that the predicted effects of task interdependence become more pronounced under the task which exhibits the highest level of task interdependence in our experiment. Supplemental analyses reveal that managers do not ignore inefficient effort and that differentiating compensation among team members hurts coordination and helping behaviors among them. This does not harm team performance when task interdependence is absent but does so when task interdependence is present.

Our results have practical implications for firms, which have flexibility in designing their incentive systems in a team environment because we identify conditions under which the effectiveness of granting managers discretion over team compensation is likely to vary. Ironically, the results suggest that managerial discretion is *most* useful for improving team performance when the potential benefits from team work in terms of coordination and helping behavior are the lowest (i.e., without task interdependence) and *least* useful when these potential benefits are highest (i.e., with task interdependence). Our results indicate that the positive effects from discretion over compensation found for team tasks without task interdependence may not carry over to team tasks with task interdependence. These results suggest that, firms should consider withholding such discretion when task interdependence is present in order to avoid its harmful effect on coordination and helping behaviors among team members. These results are important as task interdependence

is likely to be present in many team settings in practice (Wagner and Hollenbeck 2009). Our results also help explain why firms often avoid granting discretion over compensation to their managers who have private information about individual team members' contributions to the team.

We chose to manipulate task interdependence by varying the need for coordination among team members in order to increase the team's performance because team tasks often require team members to coordinate with each other in order to achieve the team objective (Wagner and Hollenbeck 2009). However, we expect our results to generalize to settings that require cooperation among team members, as prior research suggests that team cohesion affects team-members' willingness to cooperate in a similar way it affects their willingness to coordinate (Ellemers et al. 2004; Friedkin 2004). Additionally, we created three stylized prototypes of additive, conjunctive, and disjunctive tasks by varying the way employees' task outputs are transformed into team output. This design choice allows us to manipulate the task characteristic that is necessary for testing our theory, i.e., the need for coordination among employees, while controlling for the influences of other task characteristics beyond the scope of our study. Additive, conjunctive, and disjunctive tasks, however, may also differ with respect to role similarity because conjunctive and disjunctive tasks may require performance of different roles by different team members. Importantly, the existence of such role differences does not diminish the need for coordination and helping behavior among team members but, simultaneously, requires team members to be *able* to perform different roles (Wagner and Hollenbeck 2009). Although we have no clear reason to expect our theory not to hold when such role differences exists, it remains an empirical question whether our findings generalize to such settings. Finally, future research could investigate whether our results generalize to other task types in which task interdependence is present, like sequential tasks in which the output of one team member becomes the input of another team member and reciprocal tasks in which the output of each team member becomes the output for another team member (Thompson 1967).

## References


Andreoni, J. and L. Vesterlund. 2001. Which is the fair sex? Gender differences in altruism. *Quarterly Journal of Economics* 116 (1): 293-312.

Arnold, M. C. 2015. The Effect of Superiors' Exogenous Constraints on Budget Negotiations. *The Accounting Review* 90 (1): 31-57.

Arnold, M. C., R. L. Hannan, and I. D. Tafkov. 2015. Non-Verifiable Communication in Homogeneous and Heterogeneous Teams. Working Paper.

Bagozzi, R. P. and H. Baumgartner. 1994. The evaluation of structural equation models and hypothesis testing. *Principles of Marketing Research,* 386-422.

Bailey, W. J., G. Hecht, and K. L. Towry. 2011. Dividing the pie: the influence of managerial discretion extent on bonus pool allocation. *Contemporary Accounting Research.* 28 (5): 1562-1584.

Baiman, S. and M. V. Rajan. 1995. The Informational Advantages of Discretionary Bonus Schemes. *The Accounting Review* 70 (4): 557-579.

Barnes, C. M., J. R. Hollenbeck, D. K. Jundt, D. S. DeRue, and S. J. Harmon. 2011. Mixing Individual and Group Incentives: Best of Both Worlds or Social Dilemma? *Journal of Management* 37 (6): 1611-1635.

Barrick, M., G. Stewart, M. Neubert, and M. Mount. 1998. Relating member ability and personality to work-team processes and team effectiveness. *Journal of Applied Psychology* 83(3): 377-391.

Bol, J. 2008. Subjectivity in compensation contracting. *Journal of Accounting Literature* 27: 1-24.

Bol, J. 2011. The determinants and performance effects of managers' performance evaluations biases. *The Accounting Review* 86(5): 1549-1575.

Camerer, C. 2003. *Behavioral Game Theory: Experiments in Strategic Interaction*. Princeton, NJ: Princeton University Press.

Chen, C. X., M. G. Williamson, and F. H. Zhou. 2012. Reward System Design and Group Creativity: An Experimental Investigation. *The Accounting Review,* 87 (6): 1885-1911.

Chow, C. W. 1983. The effects of job standard tightness and compensation schemes on performance: An exploration of linkages. *The Accounting Review,* 58 (4): 667-685.

Day, E., W. Arthur, B. Miyashiro, B. Edwards, T. Tubre, and A. Tubre. 2004. Criterion-related validity of statistical operationalizations of group general cognitive ability as a function of task type: Comparing the mean, maximum, and minimum. *Journal of Applied Social Psychology* 34(7): 1521-1549.

DeMatteo, J. M. Rush, E. Sundstrom, and L. Eby. 1997. Factors related to the successful implementation of team-based rewards. *ACA Journal* 6(4): 16-28.

Ellemers, N., D. Gilder, and S. Haslam. 2004. Motivating individuals and groups at work: A social identity perspective on leadership and group performance. *Academy of Management Review*, 29(3): 459-478.

Fan, E. and D. Gruenfeld. 1998. When Needs Outweigh Desires: The Effects of Resource Interdependence and Reward Interdependence on Group Problem Solving. *Basic and Applied Social* Psychology, 20(1): 45-56.

Fehr, E. and K. M. Schmidt. 1999. A Theory of Fairness, Competition, and Cooperation. *The Quarterly Journal of Economics,* 114 (3): 817-868.

Fehr, E., and U. Fischbacher. 2004. Third-party punishment and social norms. *Evolution and Human Behavior,* 25 (2): 63–87.

Fischbacher, U. 2007. z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics,* 10: 171-178.

Fisher, J., L. Maines, S. Peffer, and G. Sprinkle. 2005. An experimental investigation of employer discretion in employee performance evaluation and compensation. *The Accounting Review,* 80 (2): 563-583.

Fornell, C. and D. F. Larcker. 1981. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research* 18 (1): 39-50.

Friedkin, N. 2004. Social cohesion. *Annual Review of Sociology*, 30: 409-425.

Hecht, G., Newman, A., and I. D. Tafkov. 2014. Managerial Discretion in Teams: The Implications of Discretion Type for Manager and Employee Behavior. Working Paper.

Heneman, R. and C. von Hippel. 1995. Balancing group and individual rewards: Rewarding individual contributions to the team. *Compensation and Benefits Review* 27(4): 63-68.

Libby, R., R. Bloomfield, and M. Nelson. 2002. Experimental research in financial accounting. *Accounting, Organizations and Society,* 27 (8): 775-810.

Maas, V. S., M. van Rinsum, and K. L. Towry. 2012. In search of informed discretion: An experimental investigation of fairness and trust reciprocity. *The Accounting Review,* 87 (2): 617-644.

McGrath, J. 1984. *Groups: Interaction and Performance*. Englewood Cliffs, NJ: Prentice-Hall.

Nunnally, J. C. 1978. *Psychometric theory*. New York.

Pearce, J. and E. Ravlin. 1987. The design and activation of self-regulating work groups. *Human Relations* 40(11): 751-782.

Pearsal, M. M. Christian, and A. Ellis. 2010. Motivating Interdependent Teams: Indivdual Rewards, Shared Rewards, or Something in Between? *Journal of Applied Psychology*, 95(1): 183-191.

Pizzini, M. 2010. Group-based compensation in professional service firms: An empirical analysis of medical group practices. *The Accounting Review*, 85(1): 343-380.

Plott, C. and V. Smith. 2008. *Handbook of Experimental Economics Results (Volume 1).* Amsterdam: Elsevier.

Preacher, K. J., and A. F. Hayes. 2008. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods* 40 (3): 879-91.

Prendergast, C. 1999. The provision of incentives in firms. *Journal of Economic Literature* 37 (1): 7-63.

Rosenbaum, M. E., D. L. Moore, J. L. Cotton, M. S. Cook, R. A. Hieser, M. N. Shovar, and M. J. Gray. 1980. Group Productivity and Process: Pure and Mixed Reward Structures and Task Interdependence. *Journal of Personality and Social Psychology* 39 (4): 626-642.

Selten, R. 1998. Axiomatic characterization of the quadratic scoring rule. *Experimental Economics*, 1(1): 43-62.

Sprinkle, G. 2003. Perspectives on experimental research in managerial accounting. *Accounting, Organizations and Society*, 28: 287-318.

Steiner, I. 1972. Group process and productivity. New York, NY: Academic Press.

Thompson, J. 1967. Organizations in action. New York: McGraw-Hill.

Towry, K. L. 2003. Control in a teamwork environment--the impact of social ties on the effectiveness of mutual monitoring contracts. *The Accounting Review,* 78 (4): 1069-1095.

Wageman, R. 1995. Interdependence and Group Effectiveness. *Administrative Science Quarterly* 40 (1): 145-180.

Wageman, R. and G. Baker. 1997. Incentives and cooperation: the joint effects of task and reward interdependence on group performance. Journal of Organizational Behavior 18(2): 139-157.

Wagner, J. and J. Hollenbeck. 2009. Organizational behavior: Securing competitive advantage. Routledge, New York, NY.

Weinberger, T. 1998. A Method for Determining the Equitable Allocation of Team-Based Pay: Rewarding Members of a Cross-Functional Account Team. *Compensation & Benefits Management*, 14(4): 18-26.

Weiner, B. and A. Kukla. 1970. An Attributional Analysis of Achievement Motivation. *Journal of Personality and Social Psychology*, Vol. 15(1): 1-20.

Weiner, B. 2000. Intrapersonal and Interpersonal Theories of Motivation from an Attributional Perspective. *Educational Psychology Review*, Vol. 12(1): 1-14.

Wheelan, S. 2009. *Creating Effective Teams: A Guide for Members and Leaders*. London: SAGE Publications, Inc.

**Figure 1**

**Experimental Design and Number of Participants**

| | | Task interdependence absent | Task interdependence present | |
|---|---|---|---|---|
| | | | Conjunctive task interdependence | Disjunctive task interdependence |
| Managerial discretion over compensation | Absent | n = 32 | n = 32 | n = 32 |
| | Present | n = 28 | n = 32 | n = 32 |

Note: n = number of participants.

Managerial discretion over compensation is manipulated (between participants) at two levels: present vs. absent. In the managerial discretion-absent condition, the objectively-determined bonus pool based on team output is distributed equally among team members. In the managerial discretion-present condition, the manager discretionarily allocates the bonus pool based on team output to the three employees of the team.

Task interdependence is manipulated (between participants) at two levels: absent vs. present. Nested within task interdependence present, the source of task interdependence is either conjunctive or disjunctive.

**Figure 2**

**Task Output and Total Employee Performance**

| | | | | **Total** |
|---|---|---|---|---|
| **Employee A** | *decoded items*$_{AA}$ | *decoded items*$_{AB}$ | *decoded items*$_{AC}$ | *Total employee performance A* |
| **Employee B** | *decoded items*$_{BA}$ | *decoded items*$_{BB}$ | *decoded items*$_{BC}$ | *Total employee performance B* |
| **Employee C** | *decoded items*$_{CA}$ | *decoded items*$_{CB}$ | *decoded items*$_{CC}$ | *Total employee performance C* |
| **Noise term** | $\tilde{\varepsilon}_A$ | $\tilde{\varepsilon}_B$ | $\tilde{\varepsilon}_C$ | |
| | *Task output A* | *Task output B* | *Task output C* | |

*Decoded items*$_{ji}$ is the number of decoded items of employee j for task output i*; i, j* $\in$ *{A, B, C}*

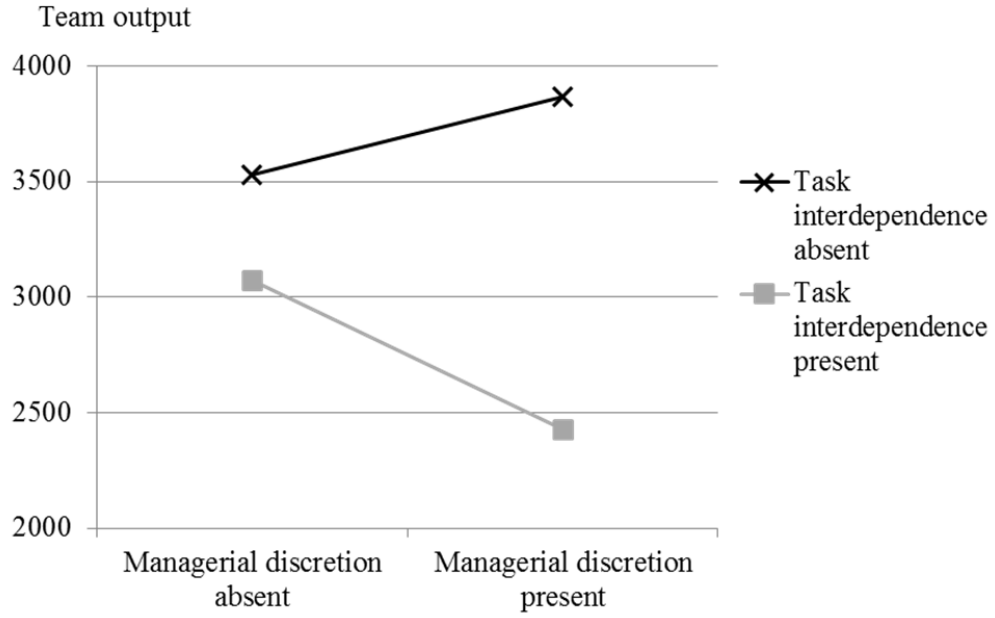
*Task output i* is the sum of the items decoded by all employees while working on employee i's task. It also includes a noise term $\tilde{\varepsilon}_i$ and is calculated as follows: *Task output i = decoded items*$_{Ai}$ + *decoded items*$_{Bi}$ + *decoded items*$_{Ci}$ + $\tilde{\varepsilon}_i$ where $\tilde{\varepsilon}_i$ is the random noise term of task output i.

*Total employee performance i* is the sum of the items decoded by employee j for the task outputs of *all* employees. It is calculated as follows: *Total employee performance j = decoded items*$_{jA}$ + *decoded items*$_{jB}$ + *decoded items*$_{jC}$

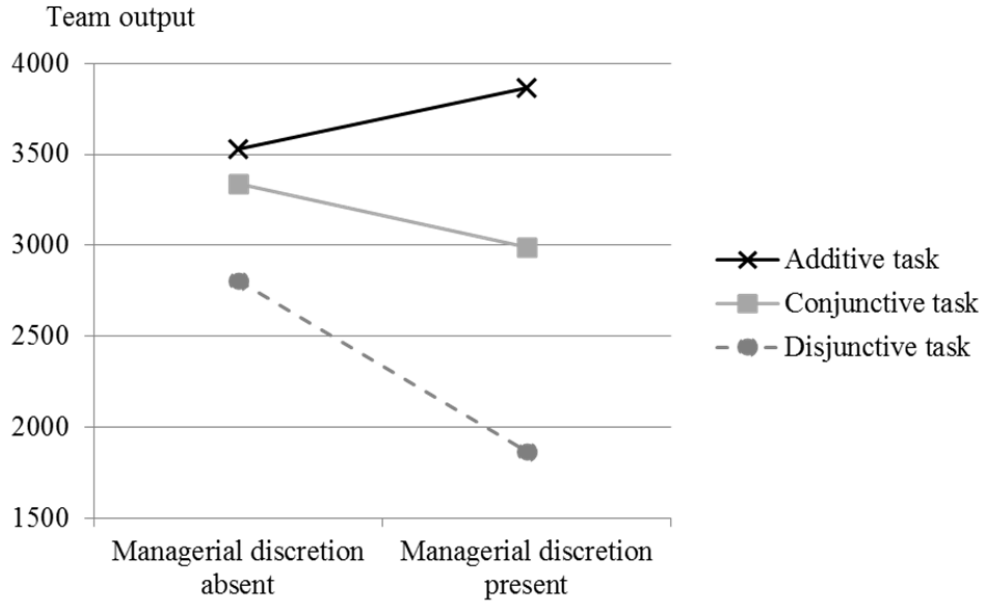
## Figure 3

### Effects of Task Interdependence and Managerial Discretion on Team Output

**Panel A**: Effect of managerial discretion contingent on task interdependence present vs. absent




**Panel B**: Effect of managerial discretion for additive, conjunctive, and disjunctive tasks




Managerial discretion over compensation is manipulated (between participants) at two levels: present vs. absent. In the managerial discretion-absent condition, the objectively-determined bonus pool based on team output is distributed equally among team members. In the managerial discretion-present condition, the manager discretionarily allocates the bonus pool based on team output to the three employees of the team.

Task interdependence is manipulated (between participants) at two levels: absent vs. present. Nested within task interdependence present, the source of task interdependence is either conjunctive or disjunctive.

Team output measures team performance and is computed in the following way: (i) task interdependence absent: team output = 20 × (Task output A + Task output B + Task output C); task interdependence present: (ii) conjunctive task: team output = 60 × min{Task output A, Task output B, Task output C}; (iii) disjunctive task: team output = 20 × max{Task output A, Task output B, Task output C}. In the task interdependence-present condition displayed in the figure, team output combines the team output for both the conjunctive and the disjunctive task.

**Table 1**
**Descriptive Statistics**

Mean
(Standard Deviation)
*Number of Observations*

| | Task interdependence absent | | Task interdependence present | | | |
|---|---|---|---|---|---|---|
| | | | Conjunctive task interdependence | | Disjunctive task interdependence | |
| | Discretion absent | Discretion present | Discretion absent | Discretion present | Discretion absent | Discretion present |
| Team output | 3,530.83<br>(511.57)<br>*48* | 3,865.71<br>(409.08)<br>*42* | 3,341.25<br>(749.93)<br>*48* | 2,991.25<br>(553.38)<br>*48* | 2,803.33<br>(982.52)<br>*48* | 1,870.00<br>(729.13)<br>*48* |
| Efficiency loss | n/a | n/a | 9.40%<br>(12.35%)<br>*48* | 12.94%<br>(11.33%)<br>*48* | 19.74%<br>(22.85%)<br>*48* | 45.60%<br>(20.76%)<br>*48* |
| Total employee performance | 58.85<br>(13.05)<br>*144* | 64.43<br>(13.42)<br>*126* | 61.07<br>(14.21)<br>*144* | 57.06<br>(12.41)<br>*144* | 58.25<br>(18.64)<br>*144* | 59.10<br>(16.16)<br>*144* |
| Time bonus | 7.99<br>(28.64)<br>*144* | 11.88<br>(33.18)<br>*126* | 16.73<br>(46.04)<br>*144* | 9.82<br>(30.70)<br>*144* | 21.41<br>(57.87)<br>*144* | 17.44<br>(49.73)<br>*144* |
| Effort intensity | 0.2550<br>(0.0523)<br>*144* | 0.2851<br>(0.0536)<br>*126* | 0.2726<br>(0.0540)<br>*144* | 0.2476<br>(0.0408)<br>*144* | 0.2552<br>(0.0664)<br>*144* | 0.2622<br>(0.0643)<br>*144* |

Managerial discretion over compensation is manipulated (between participants) at two levels: present vs. absent. In the managerial discretion-absent condition, the objectively-determined bonus pool based on team output is distributed equally among team members. In the managerial discretion-present condition, the manager discretionarily allocates the bonus pool based on team output to the three employees of the team.

Task interdependence is manipulated (between participants) at two levels: absent vs. present. Nested within task interdependence present, the source of task interdependence is either conjunctive or disjunctive.

Team output measures team performance and is computed in the following way: (i) task interdependence absent: team output = 20 × (Task output A + Task output B + Task output C); task interdependence present: (ii) conjunctive task: team output = 60 × min{Task output A, Task output B, Task output C}; (iii) disjunctive task: team output = 20 × max{Task output A, Task output B, Task output C}.

Efficiency loss measures, for the *given* level of total employee performance, the percentage loss in team output owing to suboptimal coordination. It is calculated as follows: 100 – (actual team output/maximum team output) × 100.

Total employee performance measures the total number of items decoded by each employee.

Time bonus measures how early employees stopped working on the decoding task in every period. It is calculated in the following way: 240 – seconds used for decoding.

Effort intensity is measured by dividing total employee performance by the time spent on decoding in this period (240 – time bonus).

The number of observations corresponds to all observations made in each condition either at the team level (6 periods × 7 or 8 teams = 42 or 48 observations) or at the employee level (6 periods × 7 or 8 teams × 3 employees = 126 or 144 observations).

**Table 2**

**Effects of Differences in Employee Contributions on Managerial Discretion**

| Coeff.<br>(Standard error)<br>p-level | Employee bonus share<br>All tasks<br>Model (1) | Employee bonus share<br>Additive and conjunctive task<br>Model (2) | Employee bonus share<br>Additive and disjunctive task<br>Model (3) |
|---|---|---|---|
| Relative output contribution | 0.7567<br>(0.2003)<br><0.01*** | 0.7567<br>(0.2039)<br><0.01*** | 0.7567<br>(0.2039)<br><0.01*** |
| Task interdependence (1 = present) | 21.6904<br>(6.7649)<br><0.01*** | 20.8572<br>(8.4050)<br>0.03** | 21.0792<br>(6.8874)<br>0.01*** |
| Relative output contribution * Task interdependence | -0.6507<br>(0.2029)<br><0.01*** | -0.6257<br>(0.2522)<br>0.01*** | -0.6513<br>(0.2066)<br><0.01*** |
| Const. | 8.1105<br>(6.6779)<br>0.24 | 8.1105<br>(6.7964)<br>0.25 | 8.1105<br>(6.7964)<br>0.25 |
| Period fixed effects | included | included | included |
| $R^2$ | 0.10 | 0.22 | 0.11 |
| N | 414 | 270 | 270 |

Note: p-levels are one-tailed for directional predictions and two-tailed otherwise. * $p \leq 0.1$; ** $p \leq 0.05$; *** $p \leq 0.01$, respectively.

Employee bonus share is an employee's relative bonus share (in percent) in the team bonus pool.

Relative output contribution is a relative measure of an employee's efficient effort that he contributed to the team output. In the additive task, is equals the relative total employee performance. In the conjunctive task, it includes total employee performance less the difference between each employee's "own" task output and the minimum task output of the team. In the disjunctive task, it equals employees' relative contribution to the maximum task output. For all tasks, we use the relative contributions as signaled to the manager.

Task interdependence (1/0) is an indicator variable that is equal to 1 when task interdependence is present (conjunctive task interdependence and disjunctive task interdependence) and 0 when task interdependence is absent.

**Table 3**

**Effects of Managerial Discretion on Team Output**

| Coeff.<br>(Standard error)<br>p-level | Team output<br>No task interdependence<br>Model (1) | Team output<br>All conditions<br>Model (2) | Team output<br>Conjunctive task interdependence<br>Model (3) | Team output<br>Disjunctive task interdependence<br>Model (4) |
|---|---|---|---|---|
| Discretion<br>(1 = present) | 334.88<br>(190.95)<br>0.05** | 334.88<br>(185.85)<br>0.04** | -350.00<br>(224.98)<br>0.14 | -933.33<br>(334.06)<br>0.01*** |
| Task interdependence<br>(1 = present) | | -458.54<br>(243.44)<br>0.03** | | |
| Discretion * Task interdependence | | -976.55<br>(315.81)<br><0.01*** | | |
| Const. | 3,530.83<br>(173.45)<br><0.01*** | 3,530.83<br>(168.85)<br><0.01*** | 3,341.25<br>(187.77)<br><0.01*** | 2,803.33<br>(269.60)<br><0.01*** |
| $R^2$ | 0.18 | 0.42 | 0.15 | 0.36 |
| N | 15 | 47 | 16 | 16 |

Note: p-levels are one-tailed for directional predictions and two-tailed otherwise. * $p \leq 0.1$; ** $p \leq 0.05$; *** $p \leq 0.01$, respectively.

Discretion (1/0) is an indicator variable that is equal to 1 when managerial discretion over compensation is present and the compensation was distributed discretionarily by the manager and 0 when managerial discretion over compensation was absent and the compensation is equal for every employee.

Task interdependence (1/0) is an indicator variable that is equal to 1 when task interdependence is present (conjunctive task interdependence and disjunctive task interdependence) and 0 when task interdependence is absent.

Team output measures team performance and is computed in the following way: (i) task interdependence absent: team output = 20 × (Task output A + Task output B + Task output C); task interdependence present (ii) conjunctive task: team output = 60 × min{Task output A, Task output B, Task output C}; (iii) disjunctive task: team output = 20 × max{Task output A, Task output B, Task output C}.

**Table 4**

**Effects of Efficient and Inefficient Efforts on Employee Bonuses**

| Coeff.<br>(Standard error)<br>p-level | Bonus<br>Conjunctive task interdependence<br>(2) | Bonus<br>Disjunctive task interdependence<br>(3) |
|---|---|---|
| Efficient effort | 4.0814<br>(0.4220)<br><0.01*** | 2.4465<br>(0.5751)<br><0.01*** |
| Inefficient effort | 1.5813<br>(0.3832)<br><0.01*** | 1.6379<br>(0.5348)<br>0.02** |
| Const. | 60.5206<br>(22.6478)<br>0.03** | 20.0957<br>(33.4888)<br>0.57 |
| Period fixed effects | included | included |
| $R^2$ | 0.39 | 0.13 |
| N | 144 | 144 |

Note: p-levels are one-tailed for directional predictions and two-tailed otherwise. * $p \leq 0.1$; ** $p \leq 0.05$; *** $p \leq 0.01$, respectively.

Bonus represents the bonus allocated to an employee in a given period.

Efficient effort measures an employee's contribution to team output. In the conjunctive task, it includes total employee performance less the difference between each employee's "own" task output and the minimum task output of the team. In the disjunctive task, it equals employees' contribution to the maximum task output.

Inefficient effort measures an employee's decoded items that do not increase team output. In the conjunctive task, it equals the difference between each employee's "own" task output and the minimum task output of the team. In the disjunctive task, it equals the items decoded by each employee to task outputs other than the maximum task output.

**Table 5**

**Descriptive Statistics and Factor Analysis of Team Cohesion Measure**

**Panel A**: Descriptive Statistics of Team Cohesion Items
Mean (Standard Deviation)

| | Task interdependence absent | | Task interdependence present | | | |
|---|---|---|---|---|---|---|
| | | | Conjunctive task interdependence | | Disjunctive task interdependence | |
| | Discre-tion absent | Discre-tion present | Discre tion absent | Discre-tion present | Discre tion absent | Discre-tion present |
| 1) Were the other employees in your team good team players? | 5.25 (1.35) | 3.81 (1.63) | 5.71 (1.30) | 4.04 (1.98) | 5.66 (1.69) | 4.29 (2.51) |
| 2) Did you feel attached to your team? | 3.33 (2.01) | 2.14 (1.24) | 4.54 (1.25) | 2.88 (2.27) | 4.88 (1.96) | 3.13 (2.46) |
| 3) Was your team united in trying to generate a high team output? | 5.08 (1.93) | 3.09 (1.04) | 5.00 (1.22) | 4.17 (2.35) | 5.54 (1.84) | 4.08 (2.64) |
| 4) Would you trust the other employees in your team if asked to work together again? | 4.91 (1.84) | 3.33 (1.39) | 5.00 (1.41) | 3.92 (2.04) | 5.42 (1.79) | 4.13 (2.58) |
| Average | 4.64 | 3.10 | 5.06 | 3.75 | 5.38 | 3.91 |

**Panel B**: Factor Analysis of Team Cohesion Items

| Item | Loading |
|---|---|
| 1 | 0.8764 |
| 2 | 0.7941 |
| 3 | 0.8925 |
| 4 | 0.9272 |

Managerial discretion is manipulated (between participants) at two levels: present vs. absent. In the managerial discretion-absent condition, the objectively-determined bonus pool based on team output is distributed equally among team members. In the managerial discretion-present condition, the manager discretionarily allocates the bonus pool based on team output to the three employees of the team.

Task interdependence is manipulated (between participants) at two levels: absent vs. present. Nested within task interdependence present, the source of task interdependence is either conjunctive or disjunctive.

## Appendix A

### Procedures, Instructions, and Screenshots

Participants first read (printed paper) informed consent forms and task instructions. Next, instructions are read aloud by one of the experimenters and the computer screens that participants have to use during the experiment are demonstrated. Next, a short quiz is given on a computer to check how well participants understand the instructions. The experiment does not begin until all participants have answered all questions correctly. Next, after all misunderstandings are resolved, participants complete a one-minute practice period to familiarize with the decoding task and to ensure they understand the task. Then participants complete a z-Tree-based computer task, sample screen shots from which are provided below.

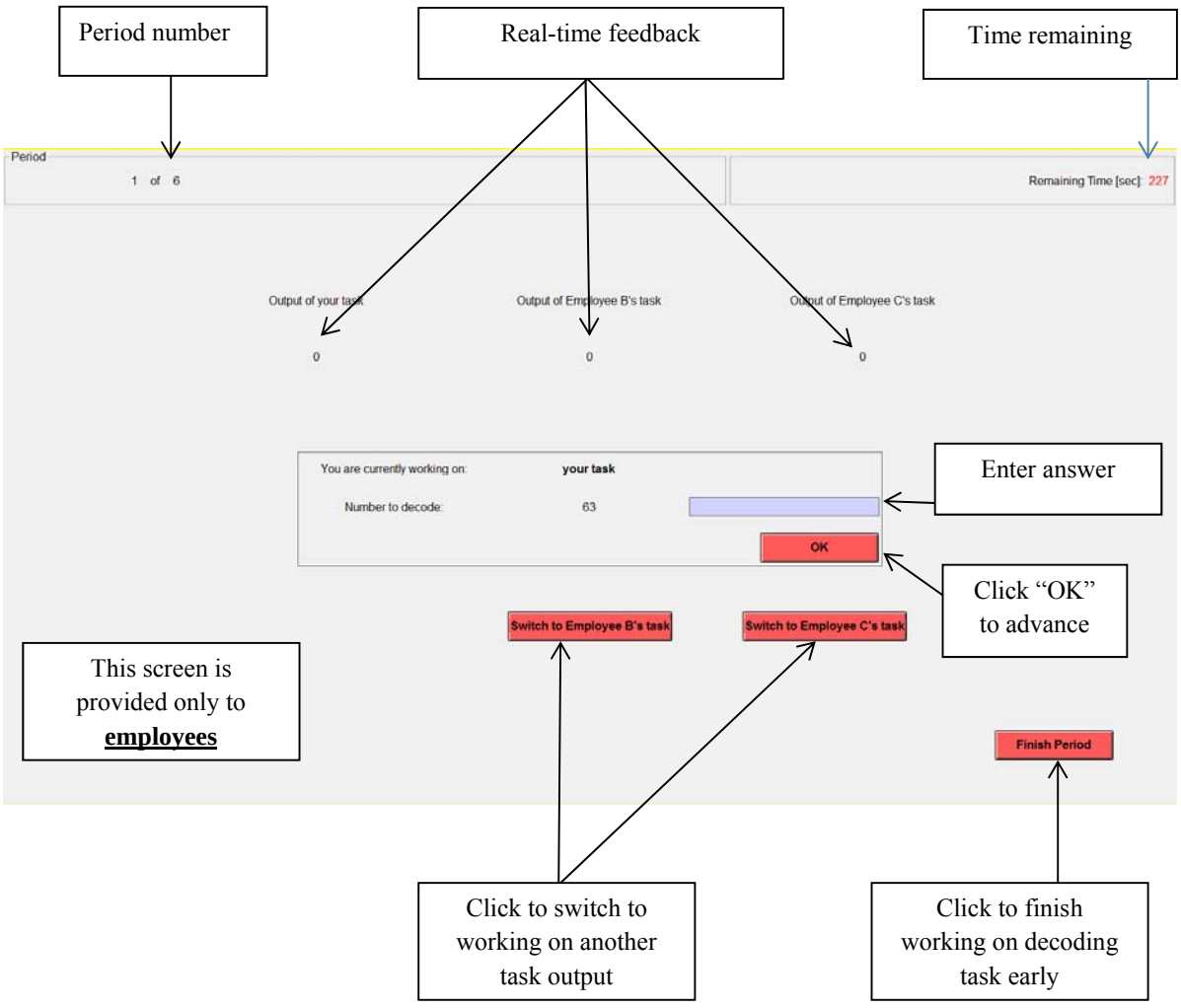
## Steps within a Period

Below is the first screen employees see once the decoding task begins. On this screen, employees are provided with the period number and time remaining within the current period.

To coordinate their efforts employees receive real-time feedback on the current task outputs of all team members while working on the decoding task. Specifically, (a) the displayed output of each task is updated immediately if any employee correctly decodes a number while working on this task and (b) employees can switch back and forth between different task outputs in the course of the period.

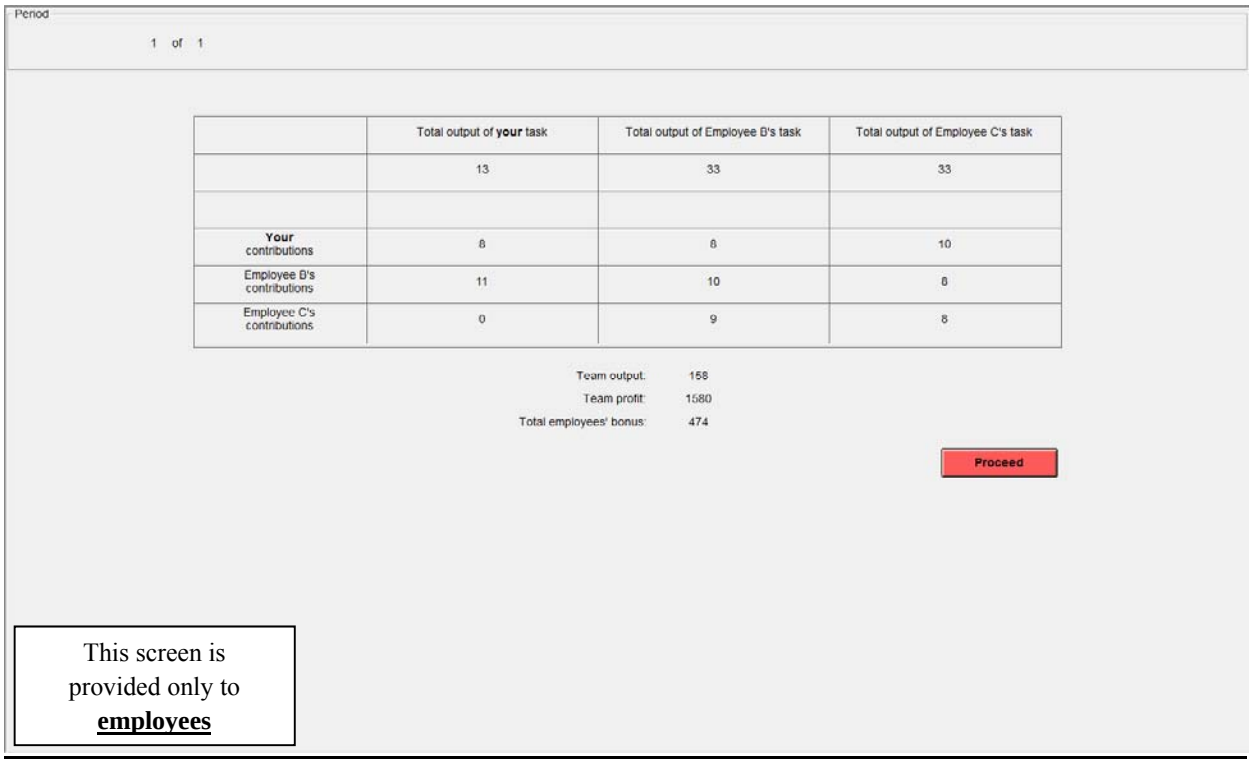
On the screen below, Employee A is working on her/his own task output. S/he can switch to working on Employee B or Employee C's task outputs by clicking the "*Switch to Employee B's task*" or "*Switch to Employee C's task*" button.

If employee wishes to finish working on decoding task early, s/he may click the "*Finish Period*" button.



At the end of each period, employees are provided feedback on the total outputs of Employee A, B, and C's tasks (which includes a random noise term) as well as Employee A, B, and C's contributions to these tasks. Specifically, a message appears on the computer that shows team output and total employees' bonus generated by this output. The message also shows the total outputs of Employee A, B, and C's tasks. It also shows the individual employees' contributions to each of the three tasks (i.e., how many numbers each employee has decoded correctly while working on each of the three tasks).

On the screen below is the feedback provided to Employee A.



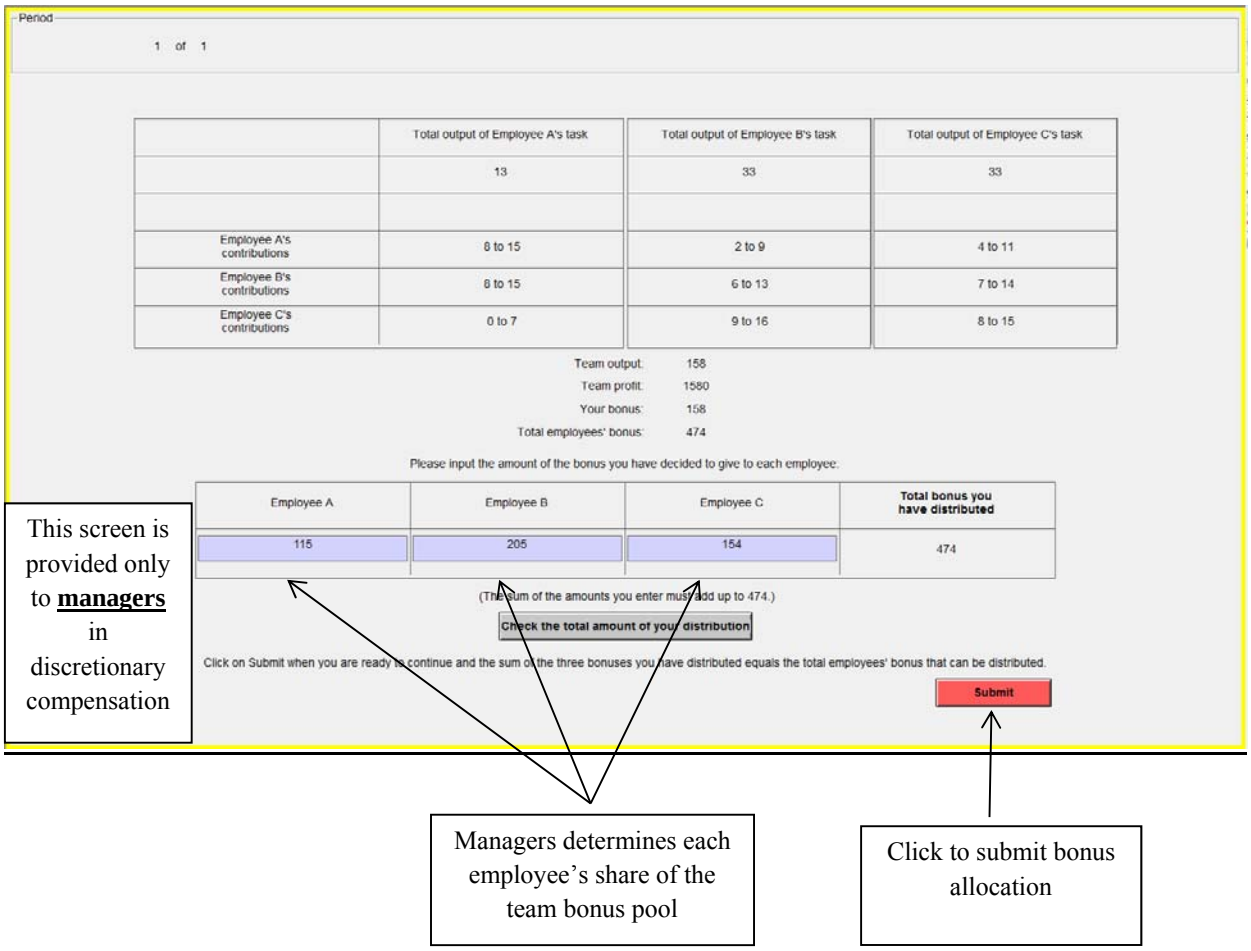

This screen is provided only to **employees**

At the end of each period, managers are provided a range of contributions for each employee that *includes* employees' actual contributions to this task. More specifically, for each of the three tasks, managers receive a range of possible contribution levels, and the employee's actual contribution to the task can lie at any point within this range. The range is randomly selected by the computer and will always be plus-or-minus 7 units from the actual employee's contribution to the task.

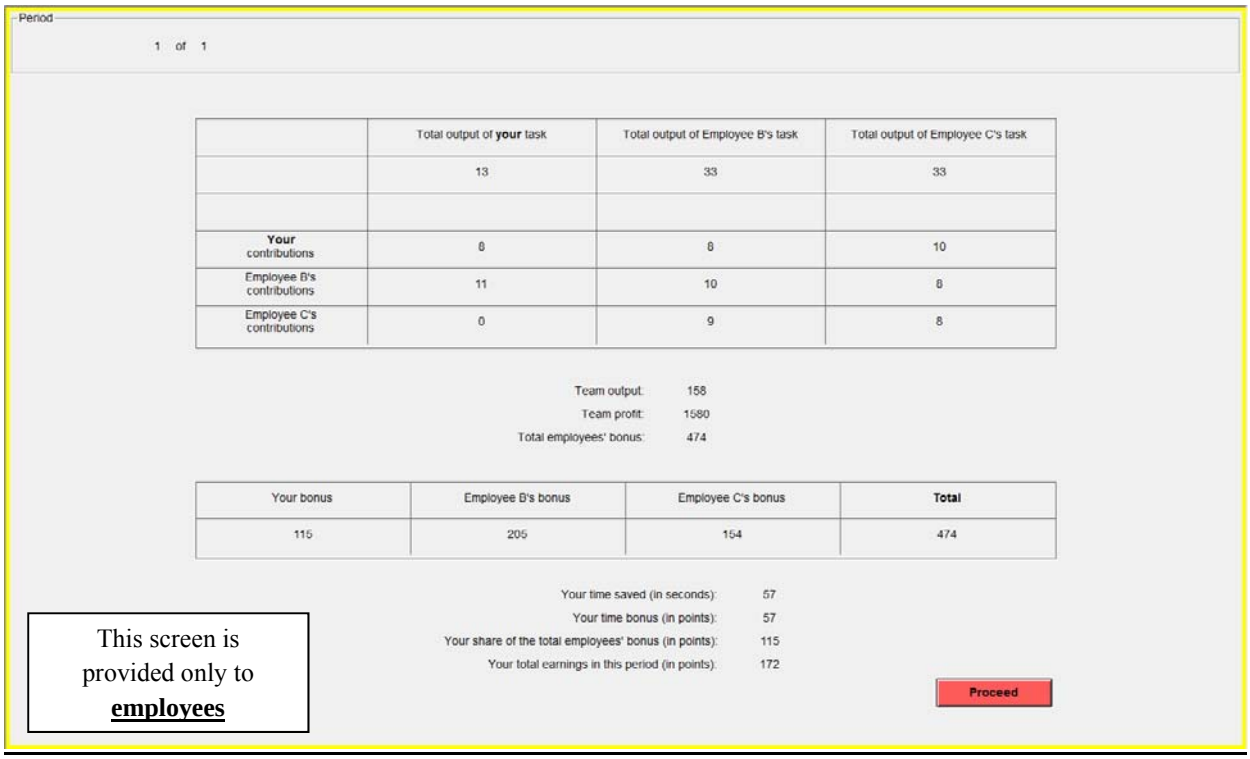
Manager is also informed about her/his own bonus and the team bonus pool.

On the screen below is the feedback provided to a manager in discretionary compensation condition.

In the discretion-absent conditions, managers only saw the upper part of the screen but not the lower part including the tool for the managers' bonus allocation.

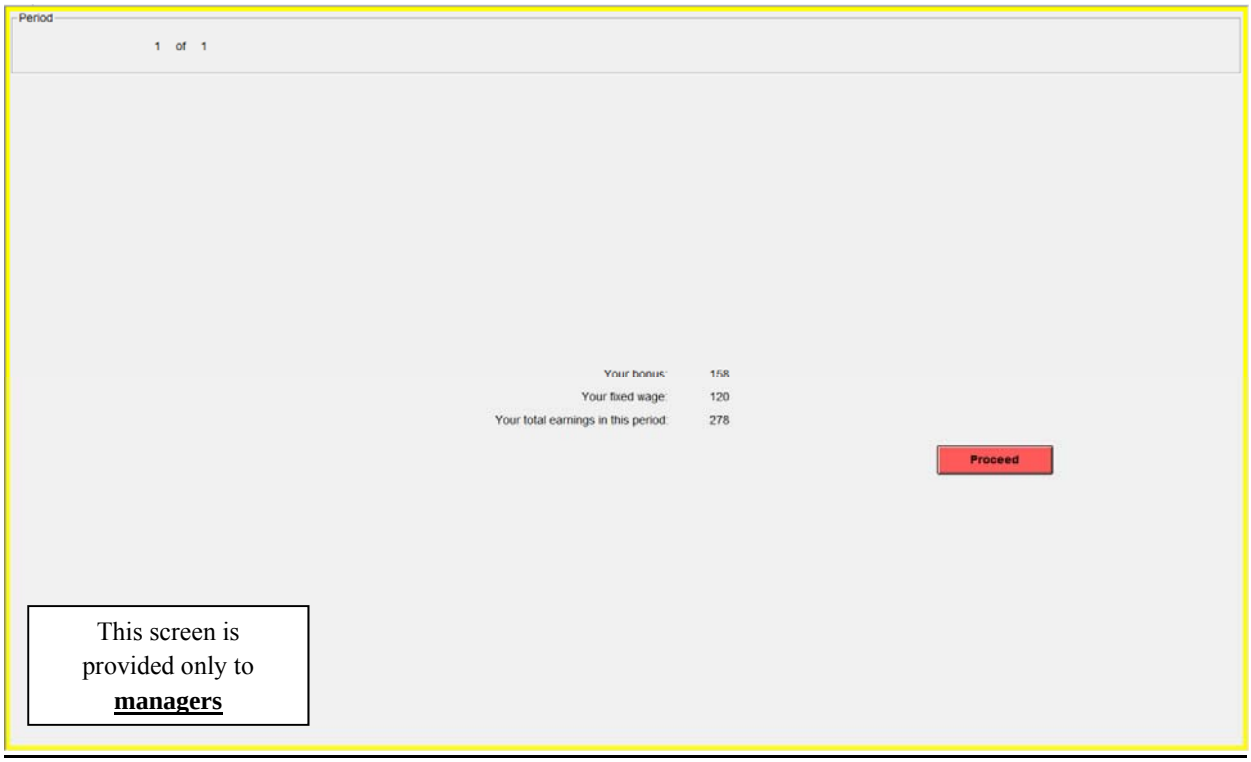


Next, in all conditions, each employee's screen displays the amount allocated to each of the three employees. This screen also displays to employees their earnings for the period.




This screen is provided only to **employees**

Managers are provided with a screen that displays their earnings for the period.




This screen is provided only to **managers**