The Effects of Compensation Mechanism Variation on Team-Members' Effort and Performance

Gary Hecht
University of Illinois at Urbana-Champaign
ghecht@illinois.edu

Jeremy Lill
The University of Kansas
jeremylill@ku.edu

September 2022

Acknowledgements

We thank Jordan Bable, Bradley Pomeroy, Adam Presslee, Alan Webb, Michael Williamson, and participants at workshops and discussion groups at Georgia State University, RMIT, University of South Carolina, University of Waterloo for their comments and suggestions. We also thank anonymous reviewers and participants from the Management Accounting Section of the AAA for their comments and suggestions. This research has benefited from the generous support of the Center for the Economic Analysis of Risk (CEAR) in the J. Mack Robinson College of Business at Georgia State University. We also thank Nat and Ramona Thompson for programming expertise.

The Effects of Compensation Mechanism Variation on Team-Members' Effort and Performance

ABSTRACT

Significant variation occurs within organizations as to *how* employees are compensated. That is, employees' total compensation often varies in the extent to which it is fixed (e.g., salary-based) versus variable (e.g., performance-based). This study examines the behavioral implications of intra-team differences in compensation mechanism. Via an experiment, we find that knowledge about *how* other employees are paid influences employees' response to their own compensation mechanism. Further, we find that the effect of compensation mechanism variation among team-members depends on the employee's role and on the similarity of compensation mechanism with employees who play similar or different roles within the team. Our study highlights the inherently social nature of firms' incentive systems and extends academics' understanding of the implications of common control system design choices. Our study is important to practitioners, as well, as our study highlights a nonlinear effect of broader implementation of performance-based incentives on team performance.

Keywords: *compensation mechanism variation; fixed pay versus variable pay; teammates' compensation; interdependence*

1. Introduction

A firm's incentive system is inherently a social one. Some literature addresses this social "side" of incentives, investigating the use and reactions to variation in incentive design features across individuals. For instance, a significant body of research in management and organizational behavior investigates the implications of differential pay level (i.e., when employees who perform similar jobs receive different compensation amounts) (Shaw et al. 2002; Conroy et al. 2014). However, less attention is focused on variation in other dimensions of the incentive system, including variation across employees' compensation *mechanism*; specifically, variation in the extent to which employees receive performance-based pay. This lack of research on what we label *compensation mechanism variation* (hereafter: CMV) is surprising, given significant variation in the extent to which CMV occurs within and across organizational settings. The purpose of this study is to address this gap in the literature and examine the effect of CMV on peer employees' performance within a team.

CMV can stem from multiple sources. One source involves a firm's incentive system design choices. Examples from practice suggest variation in the extent of performance-based pay across employees, as directed exogenously (with respect to the employee) by firm management (Roberge 2015). Specifically, some firms target individual team-members with greater incentive intensity (i.e., a relatively higher proportion of pay-for-performance incentives) to motivate these employees not only to exhibit higher performance themselves, but also to exhibit greater leadership and inspire change in other team-members' performance (see discussion in Hall et al. (2000)). Some effects of these choices on individual employees can potentially be inferred from prior research on compensation type (see Bonner and Sprinkle (2002) for a review of literature on the effect of different types of incentives). However, very little is known from prior research about the spillover-related implications of these choices, and thus how the compensation mechanism of one's peers influences an individual's response to his/her own compensation mechanism.

Another source of such variation relates to inherent differences among the employees themselves. For example, peer employees differ in terms of their existing wealth and thus are differentially sensitive to existing compensation opportunities. Peer employees may be at different stages of their career and/or

have different time horizons in terms of working for the firm. Other differences among peer employees are exacerbated by team settings, especially when a team is comprised of heterogeneous employees (e.g., cross-functional teams). Under these circumstances, peer employees may be differentially sensitive to a given goal or task, how performance is measured, and/or performance-based compensation itself.[1] Understanding the implications of these more endogenous sources of CMV is important, especially given they are driven by inherent differences among employees and thus difficult to identify and control.

We develop theory regarding the effects of CMV on peer employees' performance within teams. Our fundamental premise is that knowledge (or perceptions) of differences between an employee's own compensation mechanism and that of their peers' compensation mechanism makes salient (1) alternative compensation mechanisms for themselves and (2) peer employees' potential responses to CMV. Following this premise, we posit that the response to CMV is different depending on an employee's own compensation mechanism within the team. Specifically, we predict that employees who receive relatively more fixed pay will focus more on the potential missed opportunity of the "upside" of the alternative mechanism of variable pay than variable pay's potential "downside." Thus, fixed-pay employees aware of CMV resent their own mechanism and thus will perform worse (relative to a scenario in which the employee receives fixed pay but CMV is absent). In contrast to our prediction related to fixed-pay employees, we predict that CMV *increases* the performance of employees who receive relatively more variable pay. This increase in performance is due to variable-pay employees' realization that fixed-pay employees will respond negatively to CMV, and thus must perform better to offset this negative effect on team performance.

We complement these hypotheses with consideration of how these effects vary with employees' roles within the team. While roles can vary on many dimensions, we generalize role difference along the

[1] Our focus is on CMV among peer teammates working toward a collective goal. As an example, consider an academic research team comprised of researchers at different stages of their career. In such settings, it is likely that these individuals have different incentives related to the outcome of a single research study. While the "explicit compensation" in this setting (i.e., a publication) is equal across team-members, it may differ in terms of relative importance to each team-member, thereby creating a difference in implicit incentives.

dimension of proximity to team-level output (e.g., research and development versus production employee; accountant versus sales employee). Some team-members' roles are input-oriented whereas others are more output-oriented. A team-member's role (at least partially) determines the extent to which the team-member can influence team-level performance. Thus, we investigate whether an individual team-member's role mitigates or exacerbates their reaction to CMV. Further, to complement our investigation of individual team-member behavior, we also investigate the effect of CMV on team-level performance.

Importantly, the implications of CMV are difficult to measure in practice. Hence, we leverage the advantages of an experiment to observe and measure the consequences of CMV in a rich, but controlled setting. In our experiment, three-person teams complete two-stage word puzzles, in which the fundamental task is to identify a word from a set of scrambled letters. The first stage involves multiple individual puzzles, a subset of which are required to complete a single second-stage puzzle. All three team-members can complete stage-1 puzzles, while a single team-member can complete the stage-2 puzzle. Thus, via this team structure, we differentiate team-members' role as either an input-employee or an output-employee. The number of stage-2 puzzles completed is the key measure of team-level performance and the basis for participants' compensation, if they receive variable pay. Those who do not receive variable-pay receive a fixed amount of compensation no matter the team's performance.

We use a six-cell, nested experiment design. We manipulate CMV at two levels: *absent* vs. *present*. Two variation-absent conditions involve all team-members receiving pay via the same mechanism: either all variable pay or all fixed pay. Four conditions involve the presence of CMV. In two of these variation-present conditions, the output-employee is unique in their compensation mechanism, such that they are the only one to receive variable pay (fixed pay), while the other two input-employee team-members receive fixed pay (variable pay). In the other two variation-present conditions, the output-employee's compensation mechanism is similar to one of the input-employees, while the other input-employee receives compensation via a different mechanism.

We highlight the following results from our experiment. One, as hypothesized, we find that fixed-pay team-members react negatively to CMV. Also as hypothesized, we find that variable-pay team-members

react positively to CMV, but only when they are the only team-member to receive variable pay. Two, we find evidence that team-members' role influences their reaction to CMV. Specifically, we find that input-employees, as opposed to output-employees, drive our hypothesized result for fixed-pay team-members. That is, output-employees who receive fixed pay perform the same regardless of the presence or absence of CMV, whereas fixed-pay input-employees react negatively to CMV. In contrast to this result, we do not find evidence that role influences variable-pay team-members' reaction to CMV. Finally, we note that the nature of CMV influences team-level performance. Specifically, our results suggest that the effect of increasing the number of team-members receiving variable pay is non-linear. For example, contrary to the assumption that more widespread performance-based pay will increase overall performance, team performance is actually lower with two variable-pay team-members compared to teams with one variable-pay team-member. In fact, we find the highest performance across all conditions is by teams in which only the output-employee receives variable pay (and all other team-members receive fixed pay).

Our study contributes to management and accounting literature on compensation-based controls and incentives. Specifically, we introduce and investigate the effects of CMV, which prior literature has not addressed despite CMV's prevalence in many settings (i.e., intentionally implemented by firms, endogenously arising from variation in employees' perspectives, characteristics, etc.). Leveraging key advantages of an experiment, our setting allows us to isolate CMV from its multiple sources and explore its consequences for performance at both the individual and team level. By doing so, our study provides a foundation on which future research can build to further investigate this construct and its implications for employees and teams, as well as for firms and their performance evaluation and compensation systems.

More generally, our study highlights the inherently social nature of incentive systems. Specifically, we demonstrate that ex ante knowledge about *how* others are paid influences employees' reactions to their own compensation mechanism, and that this effect occurs before compensation outcomes are determined. Essentially, we highlight an important spillover effect of which organizations need to be aware: peers' compensation mechanisms provide a "frame" through which employees view, and respond to, their own compensation mechanism. Our results inform firms' intentional implementation of CMV, especially when

employees have specific roles within interdependent teams. Further, our results suggest that firms may wish to identify and monitor endogenously-sourced CMV when forming teams, groups, etc.

Finally, our results highlight a non-linear effect of introducing performance-based incentives to individual team-members. Thus, firms should be aware that increasing variable pay for employees may not have the desired effects, as the intended increase in effort and performance, even if attained, could be offset by the reactions of other employees sensitive to variation in how team-members are compensated.

2. Background, hypotheses and research questions

2.1. Background

Historically, research on the effects of incentives considers an individual employee's response to their own compensation mechanism, often considering the effect of performance-based incentives on an individual employee's effort and performance. More recent research extends beyond this economic view, and considers more social factors, including fairness, reciprocity, broader social norms and related implications (e.g., Fehr and Schmidt 2000; Fehr and Gächter 1998). Related to this more "social" perspective, a vast literature in management and organizational behavior considers the antecedents and consequences of differential pay *level* (Shaw et al. 2002; Conroy et al. 2014). Recent accounting research investigates related factors, including explanations for employees' responses to being relatively overpaid or underpaid (LaViers 2021) and employees' responses to "corrections" to pay dispersion (Brown et al. 2021).

In contrast to differential pay *level*, in this study, we focus on intra-team compensation mechanism *variation* and how this variation affects employees' perceptions and behavior. CMV occurs when multiple, inter-related employees earn compensation differently (i.e., via different combinations of flat-wage versus pay-for-performance or variable pay). In practice, this variation is likely continuous. For example, suppose that two employees have individual performance thresholds that they each expect to achieve, in which case they receive the variable portion of their compensation. Also suppose that one employee's overall compensation is comprised of 90% fixed pay and 10% variable pay, while another employee's pay is comprised of 80% fixed pay and 20% variable pay. In this case, the two employees'

compensation mechanism varies in terms of the proportion of their compensation that is fixed versus variable.[2] Notably, in this study, we simplify our setting, and differentiate between fixed and variable pay on a discrete basis (discussed further subsequently).

2.2. Setting Features

Our study is inspired by – and generalizes to – scenarios that have the following features. First, as implied in the previous sub-section, we assume that employees can develop reasonably accurate expectations about their own pay, such that they understand the extent to which their pay is fixed versus variable. To exemplify, suppose an employee potentially receives a bonus of 15%, 25%, or 35% of salary for reaching a low, moderate, and high difficulty target, respectively. If the employee earns an $80,000 salary and believes she will achieve the moderately difficult goal, then she perceives her compensation to be 80% fixed and 20% variable (i.e., a total of $100,000, comprised of $80,000 in fixed salary and $20,000 in bonus).[3] Second, we assume that employees have some knowledge about other employees' compensation mechanism. Of course, it is unlikely that employees are as informed about others' compensation as they are about their own compensation. Nonetheless, we consider scenarios in which employees can and will (at least generally) compare other employees' compensation mechanism to their own and can identify or perceive instances in which differences in compensation mechanism exist (cf. Merriman 2009).

Notably, we also assume that employees consider other employees' compensation mechanism – and differences with their own mechanism – as relevant. This is likely the case in our setting of interest, in which peer employees are team-members. Beyond formal teams, our study extends to scenarios in which peer employees' compensation mechanism is a relevant comparison, assuming the performance on which compensation is based involves some interdependence. Our study is not intended to generalize to

[2] Importantly, CMV can exist even when employees receive the same total compensation. As discussed in Section 3, we model a scenario in which employees' expected compensation is equivalent, thereby allowing us to draw conclusions about variation in pay mechanism, as opposed to pay level.

[3] Of course, this expectation is informed by one's initial assessment, as well as ongoing experience. Regardless, we assume that employees have at least an implicit pay expectation at the start of each performance and compensation cycle.

scenarios characterized by vertical CMV. For instance, a low-level employee may not consider the firm's CEO compensation mechanism to be a relevant comparison.[4]

Finally, we are primarily interested in settings in which multiple employees comprise an interdependent group. Importantly, prior literature identifies multiple types of interdependence, including pooled interdependence, cyclical (or reciprocal) interdependence, and sequential interdependence. Pooled interdependence refers to a scenario in which multiple units (i.e., employees, departments, divisions, etc.) form a group that collectively produces output, but does not interact directly. Cyclical (or reciprocal) interdependence refers to multiple units performing symbiotically (one unit produces output the other uses, and vice versa). In this study, we focus on sequential interdependence. When a group of employees are sequentially interdependent, a subset of employees is responsible for upstream tasks, while another subset of employees is responsible for downstream tasks (i.e., where downstream tasks are relatively closer to the team's ultimate output). Both upstream and downstream tasks are required for production to occur and influence the team's overall performance (e.g., effectiveness, quality, etc.). Our focus on this type of interdependence enables (but is not necessary for) CMV to occur as there is specialty and task variation among employees working together.[5]

2.3. Hypotheses

2.3.1. Implications of CMV

In this sub-section, we develop our theory and hypotheses related to employees' reactions to CMV and the implications of these reactions for effort and performance. In practice, CMV exists on a continuum such that most employees receive a combination of fixed and variable pay, but the "mix" of these two compensation types (e.g., incentive intensity) varies across employees. For the purposes of simplicity and

[4] Fisher et al. (2019) highlights employees' potential negative reaction to a manager's compensation mechanism. In Section 5, we further distinguish between horizontal and vertical CMV as it relates to the generalizability of our study and potential future research.

[5] Another factor that influences our choice is the aforementioned setting described by Hall et al. (2000), which entailed sequentially interdependent tasks performed by multiple employees, only a subset of whom received performance-based pay. We discuss the implications of interdependence type for our study's generalizability in Section 5.

clarity in our discussion, we focus on a setting in which two employees work together and one employee receives purely fixed pay while the other receives purely variable pay. Importantly, our theory requires that CMV is sufficient to be meaningful, but does not require employees to receive "pure" forms of compensation, as described subsequently, again for the purposes of demonstration and clarity.[6]

We develop hypotheses related to employees' reactions to CMV. The fundamental premise underlying our hypotheses is that knowledge (or perception) of differences between employees' own compensation mechanism and their peers' compensation mechanism makes salient (1) alternative compensation mechanisms for themselves and (2) peer employees' potential responses to CMV.

Fixed-Pay Perspective. We first consider the perspective of a team-member who receives fixed pay, whom we label employee F. Absent all other considerations, we assume that employee F responds favorably to the receipt of fixed pay, and thus exerts more effort and performs better relative to a scenario in which he receives no compensation. Put another way, we assume that employee F does not "zero out" his effort and performance simply because his compensation is not contingent on such performance. Such behavior is in line with prior research that establishes that employees' pay-for-performance is not necessary for employees to exert effort (e.g., Bryson et al. 2011).

Suppose that employee F has information that another team-member, employee V, receives variable pay. Awareness of employee V's variable pay leads employee F to consider his own compensation mechanism in light of this alternative mechanism. When comparing his current fixed-pay compensation to that of variable-pay, employee F considers differences on the dimension of potential upside and downside risk associated with variable pay. Prior research suggests that employee F's consideration of these differences will be asymmetric, such that individuals are overly optimistic, overly confident and maintain

[6] We focus on a setting in which CMV is present, while employees' expected pay is equal. This operationalization follows from our focus on CMV, as opposed to compensation *level* dispersion. While equal expected pay is not a necessary condition for the generalizability of our study, we do implicitly assume that employees can "separate" differences in compensation mechanism and compensation level, as our study focuses on the former and ignores (i.e., controls for) the latter. In Section 3, we discuss how we operationalize this setting. In Section 5, we discuss potential future research that investigates the joint influence of these two drivers of differences in compensation across employees.

a favorable view of their abilities and performance (Svenson 1981; Kurger and Dunning 1999; Windschitl et al. 2008), thereby underestimating risk (Simon and Houghton 2003). Given this tendency toward self-efficacy and optimism, employee F will likely view his compensation mechanism as imposing limits, relative to the opportunities provided via variable pay. That is, the limitation of fixed pay in the form of suppressed potential upside will be more salient to employee F than will the relative benefits of fixed pay reflected by suppressed potential downside. As a result, employee F will be de-motivated by and reduce effort in response to CMV (relative to a scenario where employee F receives fixed pay, but CMV is absent).

As mentioned above, an employee's response to CMV is also potentially affected by the employee's consideration of his or her peers' potential reaction to CMV. Following this, employee F will consider how employee V potentially reacts to CMV. Given employee V's variable pay, employee F likely anticipates that employee V will exert effort to optimize her compensation, and will do so regardless of knowledge that employee F receives compensation via a different mechanism. That is, employee F likely concludes that employee V won't change her effort in response to CMV. But, because employee V's variable-pay compensation does allow her to benefit from higher effort (i.e., via higher pay), employee F's choice to reduce effort is further justified.

Based on these two inter-related effects, we posit that employees who receive relatively more fixed pay will respond to CMV with lower effort and (thus) performance, relative to a scenario in which CMV is absent:

> HYPOTHESIS 1. *Compensation mechanism variation decreases performance of employees paid via fixed pay.*

Variable-Pay Perspective. We now consider the perspective of employee V, the team-member who receives variable pay. In a scenario in which CMV is absent, employee V responds to her compensation mechanism inasmuch variable pay motivates effort and performance. Various theories speak to how incentive-based pay affects employees' motivation, effort, and performance, including expectancy theory (Vroom 1964), agency theory (Baiman 1982, 1990), reinforcement theory (Komaki et al. 1996) (see

discussion in Bonner and Sprinkle (2002), pp. 305-311). As discussed earlier, CMV increases the salience of the potential for alternative methods of compensation. Thus, for employee V, the presence of CMV makes the potential alternative mechanism of fixed pay more salient. The greater salience of fixed pay as an alternative highlights the greater potential for upside and downside risk associated with variable pay. Given this greater focus, employee V's natural response to her variable pay – to exert effort to attain the upside and avoid the downside – is likely sustained, and potentially exacerbated. That is, employee V may work harder in the presence of CMV, as the downside risk she faces via variable pay is made even more salient by the lack of such downside inherent to the alternative compensation mechanism of fixed pay.

Next, we consider the second key dimension of CMV's effect in the form of employee V's consideration of employee F's response to such variation. Specifically, employee V likely realizes that employee F's compensation mechanism creates less incentive for employee F to exert effort, relative to employee V's own mechanism. Based on this, employee V anticipates that, consistent with the development of H1, the presence of CMV will de-motivate employee F.

Prior research establishes social compensation intention (Goethals and Darley 1987; Tajfel and Turner 1986), which highlights individuals' perceived need for a team or group to perform well, and implications of this need for one's own behavior. More specifically, social compensation intention theory suggests that an individual will compensate for the effects of a low-performing team-member, so as to mitigate the negative implications of that team-member for team performance, in line with the individual's own need to be associated with a successful team or outcome (Williams and Karau 1991). In our context, given that employee V will anticipate employee F's lower effort in response to CMV, social compensation intention theory suggests that employee V will increase effort to offset the de-motivating effect of CMV on employee F's effort (LePine and van Dyne 2001; Jackson and LePine 2003). While any individual can exhibit social compensation behavior, the propensity for employee V to engage in such behavior is likely exacerbated by her own variable-pay compensation mechanism.

Based on the above, we posit that employees who receive relatively more variable pay will respond to CMV with higher effort and (thus) performance, relative to a scenario in which CMV is absent::

HYPOTHESIS 2. *Compensation mechanism variation increases performance of employees paid via variable-pay.*

Notably, H1 and H2 are not without tension. In regards to H1, employees who receive more fixed pay may focus on the potential downside associated with other employees' variable pay, as opposed to the potential upside of such variable pay. In addition, fixed-pay employees may respond to CMV compassionately, altruistically increasing effort (relative to when CMV is absent) to help variable-pay employees avoid the downside of variable pay. This suggests that fixed-pay employees may not react as negatively to CMV as predicted in H1.

In regards to H2, CMV may not influence variable-pay employees' performance. That is, variable pay may create sufficient incentives for employees to exert high levels of effort and thus perform well, regardless of the presence of CMV. Another source of tension stems from variable-pay employees' potential *negative* reaction to CMV. For example, in response to CMV, employee V could perceive less benefit from her own pay, as having to work harder to offset employee F's lower effort involves higher personal cost. This higher marginal cost of effort may lead variable-pay employees to reduce effort in response to CMV (again, relative to scenarios in which CMV is absent). Put another way, employee V may perceive a sense of hopelessness, believing their effort is inconsequential in the face of employee F's reduced effort (LePine and van Dyne 2001).

2.3.2. Implications of Employees' Role

Another source of variation across team-members – potentially inter-related with CMV – is the *role* employees play within a group. As discussed earlier, we focus on differences in team-members' roles in terms of their relation to the team's output. For simplicity and clarity, we identify team-members' roles as one of two types. *Output*-employees are those team-members who are responsible for tasks that are proximally close to the team's output (i.e., downstream employees). *Input*-employees perform tasks that are relatively less close in proximity to the team's output (i.e., upstream employees). Similar to our

development of H1 and H2, the following discussion focuses on discrete, two-person settings, despite the continuous nature of CMV and team-members' role.

Input-Fixed-Pay, Output-Variable-Pay. We first consider a scenario in which input-employees receive fixed pay while output-employees receive variable pay. As established in H1, fixed-pay employees are generally hypothesized to react negatively to CMV, exhibiting lower effort and performance (relative to a scenario in which CMV is absent). Employee F's role as an input-employee likely affects his reaction to CMV, though this effect is difficult to predict. For instance, input-employee F may perceive output-employee V's output status as having more control over the team output. More specifically, as an input-employee, employee F's role within the team may lead him to consider the potential risk that his effort is wasted if employee V does not perform the output task sufficiently. As a result, employee F's hypothesized negative reaction to CMV may be exacerbated when in an input-oriented role.

Alternatively, employee F may anticipate employee V's positive response to her own compensation mechanism, and how this positive response is enhanced via employee V's output role. This anticipation may increase employee F's perceived pressure to exert effort to perform well, as poor team performance is more potentially attributed to him (again, given employee V's positive reaction to her variable pay in the form of relatively high effort). This perceived pressure may incentivize employee F to perform better (despite a lack of such incentives in his own compensation mechanism), mitigating the hypothesized negative effect of CMV on employee F reflected in H1.

Turning to employee V, recall that H2 predicts that variable-pay employees respond positively to CMV (relative to when CMV is absent). When employee V has an output-oriented role, her reaction to CMV is also difficult to predict. As an output-employee, employee V may perceive an even greater need to exert effort to carry the team. This reaction may come from employee V's anticipation of employee F's exacerbated negative response to CMV (i.e., exacerbated by employee F's input-related role). Alternatively, if employee V anticipates that employee F feels pressure to exert higher effort in response

to CMV, the effect predicted in H2 is mitigated, as employee V will not feel as much pressure to carry the workload.[7]

Input-Variable-Pay, Output-Fixed-Pay. We next consider a scenario in which the input-employee receives variable pay while the output-employee receives fixed pay. Again, H1 establishes that fixed-pay employees generally respond negatively to CMV. An output role for fixed-pay employees, however, may influence the degree to which this negative response occurs. Employee F's output role may lead him to react more negatively to CMV, as he may feel that his closer proximity to output warrants a higher degree of incentive-based pay, especially given that his effort enables (i.e., "makes or breaks") team-level success. The lack of such "control" over his compensation, despite this perceived greater responsibility, may lead the employee to withhold or reduce effort even further, thereby exacerbating employee F's negative response to CMV. On the other hand, employee F's output-role may shine a brighter light on employee F's reduced effort. As a result, employee F may be hesitant to reduce effort in response to CMV, thereby offsetting the hypothesized negative response to CMV.

Turning to employee V, her input-related role likely also affects her hypothesized positive reaction to CMV. Employee V's propensity toward a positive reaction may be tempered, as employee V anticipates employee F's negative response to CMV as a fixed-pay employee in an output-related role. As an input-related employee, employee V may anticipate having less control over the team output, and that her increased effort and performance may be futile (i.e., employee F's negative response to CMV may "waste" employee V's own effort and performance). In this scenario, input-employee V may simply focus on her own compensation, respond the same to receiving variable pay, thereby mitigating the hypothesized positive reaction to CMV. Alternatively, employee V may anticipate and take into consideration output-employee F's lower-effort response to CMV. Anticipating employee F's lower

[7] Complicating the potential response further, employee V's anticipation that employee F negatively reacts to CMV may "tip" employee V toward lower effort, in line with the "hopelessness" reaction established in our discussion of the tension underlying H2.

effort, input-employee V may increase or decrease her own effort, depending on whether she is optimistic or pessimistic about her own effort's capacity to positively influence group performance.

Summary. The preceding discussion leads to an open empirical question regarding the effect of team-based role on employees' responses to CMV. As a result, we forego establishing formal hypotheses related to these effects and present the following research question:

> RESEARCH QUESTION 1: *How do employees' role within a team affect employees' response to compensation mechanism variation?*

2.3.3. Implications for Team-Level Performance

Our focus on team-based scenarios in this study naturally begs questions related to the implications of CMV – as well as how CMV spans different team-members' roles – for team-level performance. While our theory regarding individual employees' responses to CMV allows for some baseline predictions, the immediate preceding discussion related to the implications of employees' role within the team precludes a directional prediction related to team-level performance. Thus, similar to our approach related to employees' roles, we present the following research question related to team-level performance:

> RESEARCH QUESTION 2: *Does variation in employees' compensation mechanism affect team-level performance?*

3. Method

3.1. Research Design and Participants

We conducted an experiment in a computer laboratory, using customized software. We did not use deception of any kind in the experiment. The experiment task involves solving word-scramble puzzles, which entails identifying a seeded English-language word from a series of scrambled letters. These puzzles were hierarchical in that certain letters from a group of solved stage-1 puzzles provided scrambled letters for an additional, stage-2 puzzle. Thus, stage-1 puzzles are akin to input tasks and stage-2 puzzles are akin to output tasks.[8]

[8] For purposes of communication to participants, we referred to the stage-1 puzzles as "open" puzzles. and the stage-2 puzzles as "closed" puzzles. These labels communicated the availability of each type of puzzle to participants in different conditions (discussed further subsequently).

3.2. Procedures and Task

Participants arrived in the laboratory, were randomly assigned to a computer-workstation, experimental conditions, and fixed three-person teams. Participants independently read condition-specific, paper-based instructions. The instructions privately informed each participant of their role, their compensation mechanism (variable or fixed), and the role and compensation mechanism for the other two team-members. The Appendix contains excerpts of the information provided to participants in two example conditions. Participants answered various quiz questions throughout the instructions phase to ensure their understanding. The session continued as soon as all participants successfully completed the instructions and successfully answered quiz questions. Participants remained anonymous throughout the session, and the instructions referred to them using non-descript labels (i.e., Player 1, Player 2, and Player 3).

Participants' roles determined their ability to solve different puzzles. Input-employees could view all puzzles, but could only attempt stage-1 puzzles. Output-employees could view and solve any type of puzzle (i.e., stage-1 or stage-2), and thus were unique in their ability to solve stage-2 puzzles. Team-members were not able to communicate.

As the main task began, each team-member's screen displayed the first in a series of sets. Each set was comprised of six individual stage-1 puzzles, and a single stage-2 puzzle. Stage-1 puzzles were either five or six letters. All stage-2 puzzles were six letters. Completing a subset of stage-1 puzzles provided input-letters for the stage-2 puzzle. Groups had three minutes to complete the set by solving the stage-2 puzzle. If the group completed a set, the next set would appear to all participants within the group after a 30-second break. If the group did not complete a set within three minutes, the round ended, and the next set would appear after a 30-second break. All teams attempted to solve eight total puzzle sets. To ensure comparability, all teams saw the same sets in the same order.

Figure 1 provides a screenshot from a stage-1 puzzle. The scrambled letters appear in the middle of the screen and participants submitted guesses directly below. The yellow squares highlight letters that become inputs into the stage-2 puzzle. Participants were able to navigate through the different puzzles in

a set using the previous and next buttons. They were also able to see how much time remained in the round and what puzzles the other team-members were viewing in real-time.

The relationship between individual stage-1 puzzles and the stage-2 puzzle within a set varied. In particular, a solved stage-1 puzzle provided zero, one, two, or three input-letters for the stage-2 puzzle within the same set.[9] Once a stage-1 puzzle was solved, input-letters were immediately available and displayed for the stage-2 puzzle. The number and placement of input-letters within individual stage-1 puzzles were clearly highlighted. Thus, all participants were aware of the relationship between each stage-1 puzzle and the stage-2 puzzle within a set. Once all stage-1 puzzles that had more than zero input-letters were solved, the entire letter set for the stage-2 puzzle was available. Stage-1 puzzles that provided zero input-letters did not need to be solved for the stage-2 puzzle to be solved.[10] Figure 2 provides an example of a puzzle set.

All team-members could work on the set of stage-1 puzzles simultaneously. Once solved and entered, a puzzle's answer was present on all team-members' screens when they navigated to that puzzle. Participants could work on unsolved stage-1 puzzles until the stage-2 puzzle was solved. After the stage-2 puzzle was solved, participants received feedback that included the number of puzzles solved by each team-member. After viewing the feedback screen for thirty seconds (which also provided a break from active puzzle-solving) the time allotted for the next puzzle set began. After all teams in the session completed the last round, participants answered post-experiment questions. At the end of the questionnaire, participants' compensation was calculated and paid, and the session concluded.

3.3. Variables

[9] Within each set, there were three stage-1 puzzles that provided zero input-letters, and one stage-1 puzzle that provided one, two, and three input-letters.

[10] The inspiration for the task was the widely-published *Jumble* activity, in which the analog for the stage-2 puzzle is the "final answer." Unlike the *Jumble*, however, no clues or cartoons are provided for the stage-2 puzzle in our experiment. Thus, it is highly likely – though not absolutely required – that all stage-1 puzzles with one or more input-letters needed to be solved before the stage-2 puzzle could be solved, as no additional cues related to the stage-2 solution were available.

We manipulated participants' compensation mechanism via a nested design, resulting in six conditions. In two conditions, all team-members were compensated via the same mechanism, meaning that CMV is absent. Within these two *variation-absent* conditions, all team-members received variable pay or fixed pay. In four other *variation-present* conditions, team-members received compensation via different mechanisms. Within these four conditions, there were always two team-members who were compensated via the same mechanism, and a third team-member who was compensated via a different mechanism than the other team-members. This approach resulted in conditions that we can differentiate – for discussion purposes – based on the output-employee's compensation mechanism, and whether that was unique or similar among team-members. In two *unique* conditions, the output-employee was the only team-member to receive compensation via their mechanism. In the two *similar* conditions, the output-employee received compensation via the same mechanism as one of the input-employees on the team.[11]

Ultimately, our experiment involves six conditions that vary in terms of CMV and how this variation corresponds to team-members with different roles. We describe and label our conditions, as follows, with our notation signaling compensation mechanism by team-member with the output-employee listed last and capitalized:

- vv-V = All team-members receive variable pay (variation-absent)
- ff-F = All team-members receive fixed pay (variation-absent)
- ff-V = Inputs receive fixed pay; output receives variable pay (Output-V-Unique)
- vv-F = Inputs receive variable pay; output receives fixed pay (Output-F-Unique)
- fv-V= One input receives fixed pay; one input and the output receive variable pay (Output-V-Similar)
- vf-F = One input receives variable pay; one input and the output receive fixed pay (Output-F-Similar)

[11] In these two *similar* conditions, one of the input-employees received compensation via a unique mechanism. However, for communication purposes, our *similar* versus *unique* distinction references the output-employee's scenario.

Our analysis focuses on two key dependent variables. For individual-level analyses, we focus on the most granular measure of individual team-members' performance that contributes to the team's well-being: the number of *relevant* input-letters from stage-1 puzzles contributed by each team-member (i.e., relevant input-letters are those that contribute to solving the stage-2 puzzle). For team-level analysis, we measure the number of puzzle sets solved throughout the experimental session by the team (i.e., out of the 8 possible puzzle sets).

3.4. Additional Discussion of Design Features

The following design choices warrant additional discussion.

Puzzle Characteristics. We created our original sample of individual word puzzles by first finding common five- and six-letter English words and testing them with an anagram solver (http://www.wordfinders.com/solver/) to ensure that only one word could be created with the set of letters. We then manually matched stage-1 puzzles with the necessary letters to generate corresponding stage-2 puzzles. We ran multiple pilot tests using the Amazon mTurk platform to assess the difficulty of individual puzzles. In our main pilot test, fifty-four participants worked through randomly selected samples of puzzles. We compiled and evaluated the percentage of pilot-participants who solved each puzzle, and the average time-to-solution for each puzzle. We eliminated extremely easy and extremely difficult puzzles from the original sample, resulting in a relatively balanced collection of puzzles. We then created individual puzzle-sets that ensured variation in difficulty across puzzles and provided the specified pattern of input-letters provided by stage-1 puzzles in each set. Further, in our main experiment, all teams saw puzzle-sets in the same order, and could not advance to the next set until the current one was solved or allotted time expired. Ultimately, this avoided confounds created by variations in puzzle-difficulty and input-letter status.

Compensation. Another important dimension of our study relates to participants' expectations regarding compensation. We ran a series of pilot tests in which participants completed puzzles for various levels of performance-based pay. Based on the average performance in these conditions, we set a per-set compensation rate and a total fixed wage so that participants' expected pay was the same across

conditions.[12] Specifically, variable-pay team-members received $2 per puzzle-set completed and fixed-pay team-members received a flat-wage of $6.25 for completing the experiment.[13]

Stage-1 Puzzles. All team-members were able to work individually on stage-1 puzzles. Notably, only three of the six stage-1 puzzles serve as direct inputs for the corresponding stage-2 puzzle, as the other three stage-1 puzzles provided zero letters for the stage-2 puzzle. Thus, team-members could direct effort toward tasks that varied in relevance for team-level performance. If a participant did not want to contribute to team-level performance, they could still exert effort on the task (i.e., to engage in the task, satisfy intrinsic motivation, suggest competence, achieve personal goals, etc.). This task feature also provides the opportunity to observe different preferences toward achieving higher team-level performance and the resulting behavior of these preferences.[14]

Number of Team-Members. While a simpler experimental design would have been to use two-person teams, we intentionally used three-person teams to enable certain advantages. One advantage is that it allows for simultaneous uniqueness and similarity in compensation mechanism within a team, and for this uniqueness to vary across the roles. Further, the inclusion of multiple input-only team-members allows for variation in compensation mechanism and likely variation in effort and performance among members of the same team responsible for the same task. Finally, a single output-employee ensured that differential perceptions of control over the output could exist within teams.

4. Results

4.1. Participants and Descriptive Statistics

Three hundred and eighty-four students from a public university in the Southeastern United States

[12] Note that this tactic reflects *average* expected pay. Participants' self-efficacy related to word puzzles likely influences individuals' expectations (i.e., the probability of earning more or less total variable pay, relative to the fixed wage earned by others). Random assignment to roles, compensation mechanisms, and experimental conditions mitigates the effect of differences in participants' expectations.
[13] We discuss compensation further in our supplemental analysis sub-section.
[14] An alternative mechanism that would allow for variation in effort toward team-level performance would be an opportunity for participants to engage in different tasks or leisurely activities (e.g., using an internet browser, leaving the session, etc.). However, the potential observability of such tasks in an experimental lab often influences participants' willingness to engage in them. Our design allows participants to continuously engage in the main task, but also allows them to vary the direction and intensity of their effort toward team-level performance.

participated in the experiment. The participants are primarily undergraduates (98.7 percent), spanning forty-six different majors with the dominant major, Biology, comprising 10.9 percent of participants. Approximately 60 percent of participants are female (60.4 percent) and a majority are native English speakers (85.9 percent).[15]

Table 1 and Figure 3 provide detail related to our main measure of individual performance: the number of relevant (i.e., "useful") input letters provided via stage-1 puzzles. Recall that a relevant letter is one that contributes toward stage-2 puzzle, and that stage-1 puzzles varied in the number of letters each provided toward stage-2 puzzles (i.e., zero, one, two, or three letters). Our focus on relevant letters reflects the most granular measure of an individual's contribution toward team-level performance. Table 1 and Figure 3 categorizes participants on multiple dimensions, including condition, uniqueness in compensation mechanism, and role within the team.

4.1.2. Test of Hypothesis 1 and Hypothesis 2

Recall that our Hypotheses 1 and 2 predict individual team-members' responses to CMV, and that these responses vary depending on a team-member's compensation. Specifically, H1 predicts that team-members who receive fixed pay will respond to CMV with lower effort and performance, while H2 predicts that team-members who receive variable pay will respond to CMV with higher effort and performance.

To test H1, we rely on participants who received fixed pay, and thus only include conditions in which at least one team-member received fixed pay. We compare the average performance of participants in the *All Fixed* condition to the average performance of participants who received fixed pay in conditions with some form of CMV. As presented in Panel A of Table 2, we find an effect of CMV ($F = 3.78$; $p = 0.03$, one-tailed). This result supports H1.

[15] We examine whether gender and language are similar across conditions using a one-way ANOVA. We find no difference in gender across conditions ($p = 0.22$). We do find that the percentage of native English speakers differs across conditions ($p = 0.02$). Specifically, we find that our All-F condition has a higher percentage of non-native English speakers (29.2 percent) compared to all other conditions (mean 11.9 percent). When comparing the four variation-present conditions, we find no difference in language across conditions ($p = 0.52$). We return to this issue in our "Supplemental Analyses" sub-section.

We run a similar test for H2. To test H2, we rely on participants who received variable pay, and thus only include conditions in which at least one team-member received variable pay. We compare the average performance of participants in the *All Variable* condition to the average performance of participants who received variable pay in conditions with some form of CMV. As presented in Panel B of Table 2, we find that the effect of CMV is not significant ($F = 1.43$; $p = 0.12$, one-tailed). This result does not support H2

To further investigate H2, we control for the "extent" of CMV. Specifically, we include a variable in our ANOVA in which we classify variable-pay participants in this analysis as *unique* or *similar* to other team-members in terms of their compensation mechanism. Thus, there are two independent factors. The first factor is coded 1 (0) if CMV is present (absent). The second factor is coded 1 (0) if the participant was unique (not unique) to other team-members' compensation mechanism. That is, for this latter factor, participants who received variable pay are coded 1 when the participant was the only team-member to receive variable pay, and coded 0 when more than one team-member received variable pay.

As presented in Panel C of Table 2, we do not find an effect of our main CMV variable ($F = 0.04$; $p = 0.85$), but do find an effect for uniqueness ($F = 8.29$; $p < 0.01$), such that participants who are the only team-members who receive variable pay perform better (mean = 18.97) than variable-pay participants who have another team-member who also receive variable pay (mean = 14.37). Given that the existence of variable-pay participants who receive compensation in a unique manner is synonymous with a specific form of CMV, this result provides qualified support for H2.[16] More specifically, the nature of CMV on a team appears to influence individual team-member effort and performance; when the variable-pay team-member is the only team-member to receive variable-pay compensation, they exert greater effort and thus perform better (relative to when there is another team-member that also receives variable-pay).

4.1.3. Investigation of Research Question 1

[16] For completeness, we also run a similar test in which we include a variable reflecting fixed-pay participants' status as unique or not unique (i.e., an additional analysis of H1). The effect of fixed-pay participants' uniqueness in compensation mechanism is not significant ($F = 0.09$; $p = 0.77$). In this additional analysis, the effect of CMV itself is significant ($F = 3.72$; $p = 0.02$, one-tailed), consistent with our original test of H1.

In line with RQ1, we examine the effect that CMV has on the performance of participants playing different roles within a team. Thus, our main tests of RQ1 involve comparisons of participants' behavior in settings *with* versus *without* CMV. As we did for H1 and H2, for this analysis, we perform separate analyses for participants who receive fixed pay and variable pay.

We control for role by designating participants as input-employees or output-employees, which comprise the difference in the role played: input-employees could only complete stage-1 puzzles while output-employees were responsible for stage-2 puzzle completion, but could also complete stage-1 puzzles.

Fixed-Pay Participants. We first consider fixed-pay team-members, and thus include only participants who receive fixed-pay. We run an ANOVA which includes two factors. One factor relates to the presence of CMV, which is coded as 1 (0) if a fixed-pay participant was in a condition in which CMV was present (absent). Given our focus on fixed-pay participants in these analyses, the condition used for the CMV-*absent* observations is our *All-Fixed* condition. The second factor controls for participants' role, which is coded as 1 (0) if the participant was an output-employee (input-employee). The dependent variable is the number of relevant stage-1 inputs provided by the participant.

As presented in Panel A of Table 3, we find that the interaction term is significant ($F = 4.45$; $p = 0.04$). The nature of the interaction suggests that fixed-pay participants in different roles respond to CMV differently. Specifically, given fixed-pay, output-employees' performance does not vary across conditions in which CMV is present versus absent. In contrast, given fixed-pay, input-employees' performance does differ. In particular, input-employees who received fixed pay perform worse when some other team-members (but not themselves) receive variable pay than when no team-members receive variable pay. This result is in line with our findings related to H1, and establishes an important result: the negative effect of CMV on fixed-pay team-members' performance stems from input-employees', as opposed to output-employees', reaction to CMV.

Variable-Pay Participants. We next consider variable-pay participants. For these analyses, we include only participants who receive variable-pay, and we rely on the *All-Variable* condition for our

CMV-absent comparison. We run an ANOVA with CMV presence and role as the independent variables and relevant stage-1 inputs as the dependent variable. As presented in Panel B of Table 3, we find a significant main effect of role ($F = 6.64$; $p = 0.01$). Consistent with the results of our initial test of H2, we do not find an effect for CMV ($F = 1.42$; $p = 0.23$), or the interaction term ($F = 0.02$; $p = 0.90$). These results suggest that given variable-pay, a participant's role within the group influences their performance, such that the performance of output-employees is greater than that of input-employees (i.e., in line with output-employees perceiving more control over their variable-pay compensation than input-employees). However, the difference in performance by role is not associated with participants' reaction to CMV.

Given these results, as well as those of our follow-up analysis for H2, we extend our investigation of the effect of role by considering the effect of the "extent" of CMV on team-members' behavior. Thus, we run an ANOVA with the following independent variables: CMV-presence, role, and uniqueness, in which the latter is coded as 1 (0) if an individual is the only team-member to receive variable pay. The dependent variable is relevant input letters contributed. As presented in Panel C of Table 3, we find that role has a significant main effect ($F = 7.15$; $p < 0.01$), such that output-employees perform better than input-employees. We also find that uniqueness has a significant main effect ($F = 5.81$; $p = 0.02$), such that team-members who are the only ones to receive variable pay perform better than team-members who receive variable pay along with others in the group. The interaction between role and uniqueness is not significant ($F = 0.85$; $p = 0.36$).[17]

4.1.4. Investigation of Research Question 2

We now consider team-level performance. We focus on the number of puzzle sets (i.e., stage-2 puzzles) solved by the team. Table 4 provides the mean number of sets solved by teams, by condition. Panel A of Table 4 suggests that variation across our six conditions does exist. Specifically, we observe that teams in the condition where the output-employee was the only team-member to receive variable pay solved the most sets (mean = 3.75), while teams in the condition in which the output-employee was the only team-

[17] For completeness, we run a similar analysis for fixed-pay participants. We find that only the effect of CMV is significant ($F = 3.85$, $p = 0.05$). Role, uniqueness, and the joint effect are all non-significant (all $p > 0.38$).

member to receive fixed pay solved the fewest sets (mean = 2.13). A one-way ANOVA with team-level performance as the dependent variable and indicator variables for the conditions confirms there is variation between conditions (non-tabulated; $F = 2.28$; $p = 0.05$).

Given these observations, we further explore team-level performance in conditions in which CMV is present. We distinguish teams according to compensation mechanism received by specific team-members. Specifically, we code each team according to the output-employee's compensation mechanism: *output-fixed* versus *output-variable*. We also code each team according to whether the output-employee was the only team-member to receive compensation according to their mechanism: *output-unique* versus *output-similar*. Panel B of Table 4 provides the results from a 2x2 ANOVA with the number of puzzle sets solved as the dependent variable, and output-employee compensation mechanism type and output-employee compensation mechanism uniqueness as the independent factors. Figure 4 presents a graphical representation of these four conditions.

As presented in Panel B of Table 4, we observe that compensating output-employees using variable pay results in more sets solved compared to compensating output-employees via fixed pay ($F = 7.31$; $p < 0.01$). This main effect is not easily interpreted, however, as the interaction between the two independent factors is significant ($F = 4.36$; $p = 0.04$). The interaction suggests that the effect of fixed versus variable output-employee pay is contingent upon the compensation type that the input-employees receive. Specifically, when the output-employee's compensation is *unique* within the team (i.e., the input-employee team-members *both* are paid via a mechanism different than the output-employee), the effect of paying the output-employee variable versus fixed compensation is greater than when the output-employee's compensation mechanism is *similar* to one of the two input-employees. The simple effect tests presented in Panel C of Table 4 support this interpretation. When the output-employee's compensation mechanism is *unique*, the effect of variable versus fixed output-employee pay is significant ($F = 11.48$; $p < 0.01$). When the output-employee's compensation mechanism is *similar* to one of the input-employees, the effect of variable versus fixed output-employee pay is not significant ($F = 0.19$; $p =$

0.67).[18]

Looking more broadly, we compare team performance across all conditions in which output-employees receive variable pay. The only setting difference across these conditions is the extent to which input-employees also receive variable pay. As discussed earlier, teams in which the output-employee was the only team-member to receive variable pay outperformed teams in which both the output-employee and one of the input-employees received variable pay (i.e., a single input-employee was the only team-member to receive fixed pay). Remarkably, as presented in Panel D of Table 4, the performance of groups in the *output-variable-unique* condition – again, when the output-employee was the *only* team-member to receive variable-pay – was not statistically different than teams whose members *all* received variable pay ($t = 0.93$; $p = 0.36$). Further, not only is the difference between these conditions not significant, the mean team performance in the *output-variable-unique* condition (mean = 3.75) is directionally higher than the mean team performance in the *all-variable* (i.e., variation-absent) condition (mean = 3.13).

Ultimately, it is not surprising that teams with output-employees who receive variable pay outperform teams with output-employees who receive fixed pay, especially given the crucial role that output-employees play in our setting. However, our results also establish that this effect is contingent on the similarity of the output-employee's compensation mechanism to input-employees' compensation mechanism. That is, we only noted a differential effect of output-employees' compensation mechanism on team performance when the output-employee was the *only* participant on the team to receive variable pay. And this setting was no different than providing all team-members variable pay. Thus, our pattern of results suggests that the effect of increasing the number of team-members receiving performance-based pay is surprisingly non-linear.

[18] For completeness, Panel C of Table 4 presents the simple effects of mechanism-similarity, given the output-employee's compensation type. Specifically, when the output-employee's compensation is variable, the effect of pay similarity is significant, as the performance of teams in which the output-employee is compensated uniquely is marginally higher than when the output-employee is compensated similarly to one of the input-employees ($F = 3.02$; $p = 0.09$). In contrast, compensation-mechanism similarity does not affect team level performance when the output-employee receives fixed pay ($F = 1.48$; $p = 0.23$).

4.1.5. Supplemental Analyses

Control for Native English Speaking. Given the language-oriented nature of our task, one concern is whether participants' speaking and written language ability influences our results. As discussed earlier, we noted a difference across conditions – apparently resulting from our random assignment – in participants' reports of English as a native language. We re-run our individual-level analyses, controlling for participants' responses to a post-experimental question of whether English is their native language.

Our key results are robust to controlling for language. When including language as a covariate, the main effect for CMV for variable (fixed) pay participants (i.e., H1 (H2)) becomes significant at the 0.01 (0.09) level (one-tailed p-values). All results related to RQ1 are inferentially identical, with one exception. The CMV x role interaction for fixed-pay team-members (i.e., Panel A of Table 3) drops from $F = 4.45$; $p = 0.04$ to $F = 3.35$; $p = 0.07$. Thus, differences in English-language familiarity do not appear to be driving our key findings.

Performance over Time. We conduct our primary analyses using average performance over rounds. One concern with this approach is that it ignores trends in performance over time. As such, we re-run our individual- and team-level analyses using repeated-measure ANOVAs.

Over time, round-specific performance decreased, and thus round is significant in all the individual-level repeated measure ANOVAs (all round-indicator p-values < 0.06). With this alternative specification, we continue to find support for H1. In particular, CMV remains significant ($p = 0.04$, one-tailed) in our analysis of H1 involving fixed-pay team-members. We also continue to find qualified support for H2 as unique compensation remains significant ($p < 0.01$, one-tailed) in our analysis of H2 involving variable-pay team-members. Further, all inferences from our RQ1 investigation remain unchanged when using a repeated-measures ANOVA.

At the team level (i.e., RQ2), we code the dependent variable 1 (0) if a group solved (did not solve) a specific round's puzzle set and we repeat our analyses using a repeated-measures ANOVA. Again, we find that round is significant ($p < 0.01$). Additionally, we continue to find a main effect for output-employee compensation mechanism type ($p = 0.01$) and the interaction between output-employee

compensation mechanism type and output-employee mechanism uniqueness remains significant (p = 0.05). These tests suggest that our results are robust when controlling for performance trends over time.

Actual Compensation Differences. As discussed in Section 3, we designed the experiment to minimize the likelihood of significant differences in actual compensation. In this section, we examine whether within-team compensation differences drives our results.

We first calculate the average total pay that variable and fixed participants received. For variable-pay participants, this was equal to $2.00 * number of puzzle sets solved. For fixed-pay participants, this was equal to $6.25. We observe that, in general, fixed-pay participants received more compensation than variable pay participants did ($6.25 vs. $5.70; t = 2.06; p = 0.04). However, this difference is across all participants, all teams, and all conditions. The specific concern we hope to address is the issue of whether there were significant actual compensation differences *within* teams. To examine, we create a team-level variable that measures the pay premium the fixed participant(s) received within each team. This was calculated as $6.50 – ($2.00 * number of puzzles sets solved). Across the 96 teams where within-team differences in compensation is possible (i.e., groups with CMV present), we find that the average fixed-pay employee premium is $0.50 and that this difference is not statistically different from zero (t = 1.41; p = 0.16). This provides initial comfort that actual compensation differences within groups is likely not driving our results.

To further investigate, we re-run our individual-level analyses using an ANCOVA that includes the team-level fixed pay premium as a covariate. In untabulated tests, we find that our inferences are unchanged with this covariate. For H1, the effect of CMV is significant (p = 0.03, one-tailed). For H2, the effect of unique compensation is significant (p = 0.01). Notably, the effect of CMV reaches marginal significance (p = 0.07, one-tailed) when we re-run the original test of H2 (i.e., in which it was originally not significant). All findings related to RQ1 remain qualitatively the same.[19]

Post-Experiment Questions. We asked participants a series of post-experiment questions to gauge

[19] We are not able to use a pay premium covariate for the team-level analysis (i.e., RQ2) because the team-level dependent variable (i.e., puzzle sets solved) mechanically determines the compensation of variable-pay participants.

how CMV influences their perceptions of the task, roles, and compensation. We highlight some of the interesting findings in this sub-section.[20]

We asked participants to what extent they enjoyed the puzzle-solving task. The presence of CMV decreases enjoyment of the task for participants who received fixed pay (7.98 vs. 7.05; $F = 3.68$; $p = 0.06$). Similarly, the presence of CMV also decreases enjoyment of the task for participants who received variable pay, but there is also a significant interaction with role ($F = 3.85$, $p = 0.05$). In particular, for variable-pay output-employee participants, the difference in task enjoyment when CMV is present versus absent is significant (5.98 vs. 8.31; $F = 6.95$, $p < 0.01$); however, the difference is not significant for variable-pay input-employee participants (7.35 vs. 7.56; $F = 0.11$, $p = 0.74$).

We asked participants about the extent to which they felt their team was working towards a common goal and the extent to which they trusted the other team-members. For participants who received variable pay, we find that CMV decreases the feeling of working towards a common goal (8.69 vs. 7.66; $F = 4.86$; $p = 0.03$) and the perceived trust among team-members (7.18 vs. 6.17; $F = 3.79$; $p = 0.05$). There were no differences across conditions for either of these questions for fixed-pay participants.

We asked participants about the fairness of their compensation relative to others in the team. Interestingly, we find that the presence of CMV decreases the perceived fairness for both participants who received variable pay (7.10 vs. 5.76; $F = 7.31$; $p < 0.01$) and participants who received fixed pay (7.10 vs. 5.61; $F = 9.10$; $p < 0.01$).

Finally, we asked participants about the extent to which other team-members' compensation mechanism motivated them to solve puzzles. For participants who received fixed pay, we find that CMV (i.e., being on a team with participants receiving variable pay) increased the extent to which the fixed-pay participants were motivated to solve puzzles (4.71 vs. 6.52; $F = 10.99$; $p < 0.01$). For participants who received variable pay, we find that CMV (i.e., being on a team with participants receiving fixed pay) decreased the extent to which the variable-pay participants were motivated to solve puzzles (8.43 vs. 6.63;

[20] Participants answered all questions using an 11-point Likert Scale with higher numbers indicating higher agreement with a given statement.

$F = 11.94$; $p < 0.01$).

5. Conclusion

We investigate the implications of CMV, which occurs when there are actual or perceived differences in the mechanism by which peer employees within a team are compensated. Via an experiment, we find that CMV affects team-employees' performance, such that an individual employee's response to their own compensation mechanism is a function of knowledge of other team-members' compensation mechanism. We also find that the performance effects of CMV are a function of employees' role within the team. Our study highlights the inherently social nature of incentive systems, and establishes an important spillover effect that organizations need to be aware of: peers' and teammates' compensation mechanisms provide a "frame" through which employees view – and respond to – their own compensation mechanism. Our study also highlights the non-linear effect of introducing performance-based incentives to individual team-members, informing firms about the potential for intended benefits of incentive-based pay to fail to accrue, and even be offset by the reactions of other employees sensitive to variation in how team-members are compensated.

Our study has other limitations related to its scope and generalizability. For instance, we operationalize different roles of team-members in relation to team-level output, given these roles are sequentially interdependent. Related future research opportunities are multi-faceted. One line of research might consider the effects of different forms of interdependence (Arnold and Tafkov 2019) on employees' responses to CMV. Another line of research could compare the influence of "horizontal" versus "vertical" CMV. With regard to the latter, the extent to which employees' overall compensation is comprised of performance-based pay increases as an employee moves up the hierarchy, and employees' awareness of this may increase the salience of CMV (see Fisher et al. (2019) for a related study). However, whether the effects documented in this study transcend hierarchical levels is an empirical question.

Finally, in our study, we randomly selected participants to play different roles within the team, as well as receive compensation via different mechanisms. The purpose of our random assignment to these compensation mechanisms and roles – and our communication to participants as such – was to mitigate

noise likely introduced by participants' personality features, self-efficacy related to the experimental task, and perceptions of the extent to which they "deserved" different compensation mechanisms. Further, this approach is in line with our focus on the *consequences* or *implications* of CMV. Future research could explore the effects of actual or perceived *antecedents* or *sources* of such variation. For instance, employees might react differently to CMV when it arises endogenously from team-members' backgrounds, reference points, etc., versus when it is "implemented" by the firm or upper management. Further, reasoning underlying assigned compensation mechanisms might influence how employees react to CMV. For instance, employees who have "earned" pay-for-performance incentives likely would react to CMV differently than others, who are being "punished" by such incentives (i.e., a poor-performing employee who receives a variable-pay contract to as an attempt to shift risk and/or increase accountability).

Appendix

The following represents a sample of instructions provided to participants regarding their compensation, as well as that of others on their team.

The first example presented is from conditions in which one of the participants in the team received variable pay, while the others received fixed pay. The second example presented is from conditions in which two of the participants on the team received fixed pay, while the others received variable pay.

Example #1

Your compensation for today is as follows:

- You will receive $2.00 for each set of word scrambles your group solves.
- The compensation of the other members of your group is different than yours. Specifically, the two other members of your group receive $6.25 regardless of the number of sets of word scrambles your group solves.

Example #2

Your compensation for today is as follows:

- You will receive $6.25 regardless of the number of sets of word scrambles your group solves.
- The compensation of one of the two other members of your group is the same as yours. That is, this other individual receives $6.25 regardless of the number of sets of word scrambles your group solves.
- The compensation of the other of the two members of your group is different than yours. This individual receives $2.00 for each set of word scrambles your group solves.

References

Arnold M, Tafkov I (2019) Managerial discretion and task interdependence in teams. *Contemporary Accounting Research.* 36(4):2467-2493

Baiman S (1982) Agency research in managerial accounting: A survey. *Journal of Accounting Literature* 1:154-213.

Baiman S (1990) Agency research in managerial accounting: A second look. *Accounting, Organizations, & Society.* 15(4):341-371.

Bonner SE, Sprinkle GB (2002) The effects of monetary incentives on effort and task performance: theories, evidence, and a framework for research. *Accounting, Organizations and Society* 27(4-5):303-345.

Brown C, Evans III JH, Moser D, Presslee A (2021) Performance Measurement and Pay Dispersion. Working paper, University of Pittsburgh and University of Waterloo.

Bryson A, Buraimo B, Simmons R (2011) Do salaries improve worker performance? *Labour Economics* 18(4):424-433.

Conroy SA, Gupta N, Shaw JD, Park TY (2014) A multilevel approach to the effects of pay dispersion. *Research in Personnel and Human Resources Management* 32:1-64.

Fehr E, Gächter S (1998) Reciprocity and economics: The economic implications of homo reciprocans. *European Economic Review* 42(3-5):845-859.

Fehr E, Schmidt KM (2000) Fairness, incentives, and contractual choices. *European Economic Review* 44(4-6):1057-1068.

Fisher JG, Mitchell WT, Peffer SA, Webb A (2019) Inequity aversion, incentives and personal norms: The effects of budget preparation and use. *Journal of Management Accounting Research* 31(1):105-128.

Goethals GR, Darley JM (1987) Social comparison theory: Self-evaluation and group life. Mullen B, Goethals GR, eds. *Theories of Group Behavior* (Springer, New York), 21-47.

Hall BJ, Lazear E, Madigan C (2000) Performance pay at Safelite Auto Glass (A). *Harvard Business School Publishing.*

Jackson CL, LePine JA (2003) Peer Responses to a Team's Weakest Link: A Test and Extension of LePine and Van Dyne's Model. *Journal of Applied Psychology* 88(3):459-475.

Komaki JT, Coombs T, Schepman S (1996) Motivation and implications of reinforcement theory. Steers RM, Porter LW, Bigley GA, eds. *Motivation and leadership at work* (McGraw-Hill, New York), 34-52.

Kruger J, Dunning D (1999) Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology* 77(6):1121-1134.

LaViers L (2021) The effect of pay transparency on narcissists: Can personality type predict reciprocity? Working paper, Tulane University.

LePine JA, Van Dyne L (2001) Peer Responses to Low Performers: An Attributional Model of Helping in the Context of Groups. *Academy of Management Review* 26(1):67-84.

Merriman KK (2009) On the folly of rewarding team performance, while hoping for teamwork. *Compensation and Benefits Review* 41(1):61-66.

Roberge M (2015) The right way to use compensation. *Harvard Business Review* 93(4):70-75.

Shaw JD, Gupta N, Delery JE (2002) Pay Dispersion and Workforce Performance: Moderating Effects of Incentives and Interdependence. *Strategic Management Journal* 23:491-512.

Simon M, Houghton SM (2003) The Relationship between Overconfidence and the Introduction of Risky Products: Evidence from a Field Study. *The Academy of Management Journal* 46(2):139-149.

Svenson O (1981) Are We All Less Risky and More Skillful than our Fellow Drivers? *Acta Psychologica* 47:143-148.

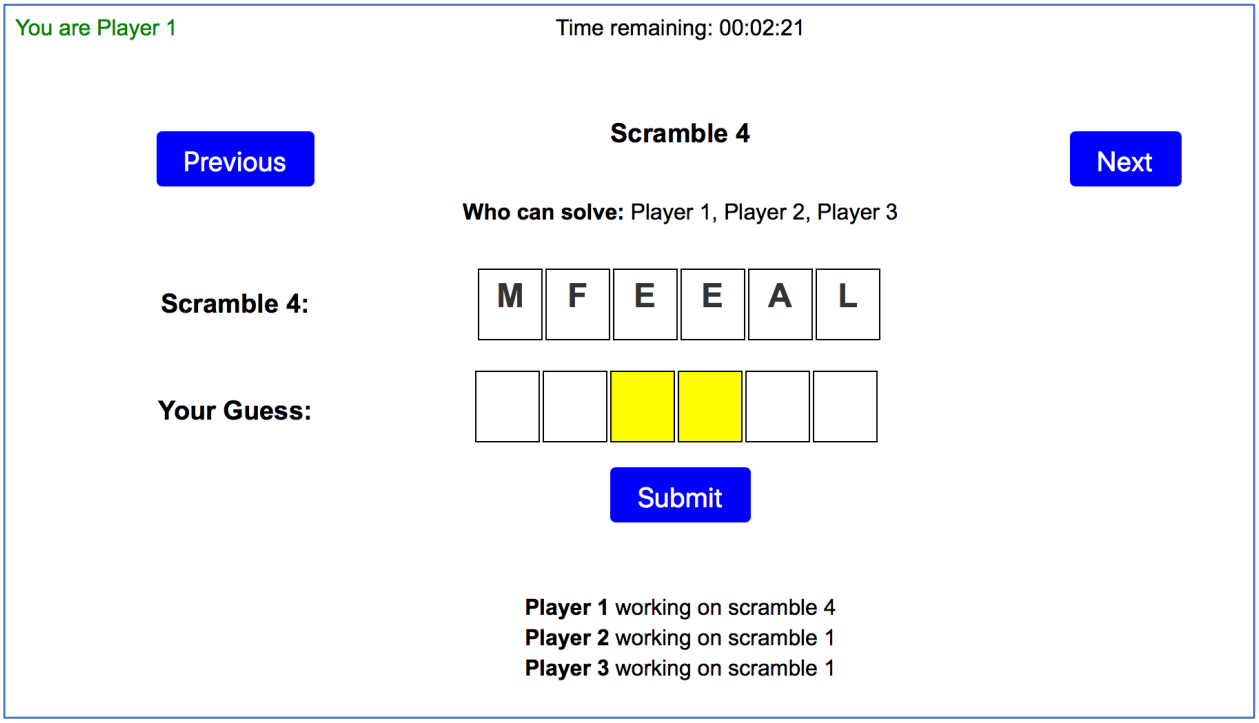
Tajfel H, Turner JC (1986) The social identity theory of intergroup behaviour. Worchel S, Austin WG, eds. *Psychology of Intergroup Relations* (Nelson-Hall, Illinois), 7-24.

Vroom V (1964) *Work and Motivation*. New York: Wiley.

Williams KD, Karau SJ (1991) Social loafing and social compensation: The effects of expectations of co-worker performance. *Journal of Personality and Social Psychology* 61(4):570–581.

Windschitl PD, Rose, JP, Stalkfleet MT, Smith AR (2008) Are people excessive or judicious in their egocentrism? A modeling approach to understanding bias and accuracy in people's optimism. *Journal of Personality and Social Psychology* 95(2):253-273.

Figure 1. Screenshot of Puzzle Task



Notes. This figure shows an example screen in which a participant has activated one of the stage-1 puzzles. In this case, Player 1 (denoted in the top left-hand corner) has activated puzzle #4 (labeled as "scrambles" for participants). The time remaining for the puzzle set was displayed at the top center of the screen. Participants could move to different puzzles by using the "Previous" and "Next" buttons. Once they input a solution, participants clicked the "Submit" button. If correct, the puzzle was considered complete, and displayed as such. All team-members could see which puzzle other team-members were working on. As displayed in the example, multiple team-members could work on the same puzzle simultaneously.

Figure 2. Example Puzzle Set

Stage-1 Puzzles

P	T	O	A	D
A	D	O	P	T

R	I	E	R	V
R	I	V	E	R

D	O	B	O	L
B	L	O	O	D

M	F	E	E	A	L
F	E	M	A	L	E

A	D	T	W	O	R
T	O	W	A	R	D

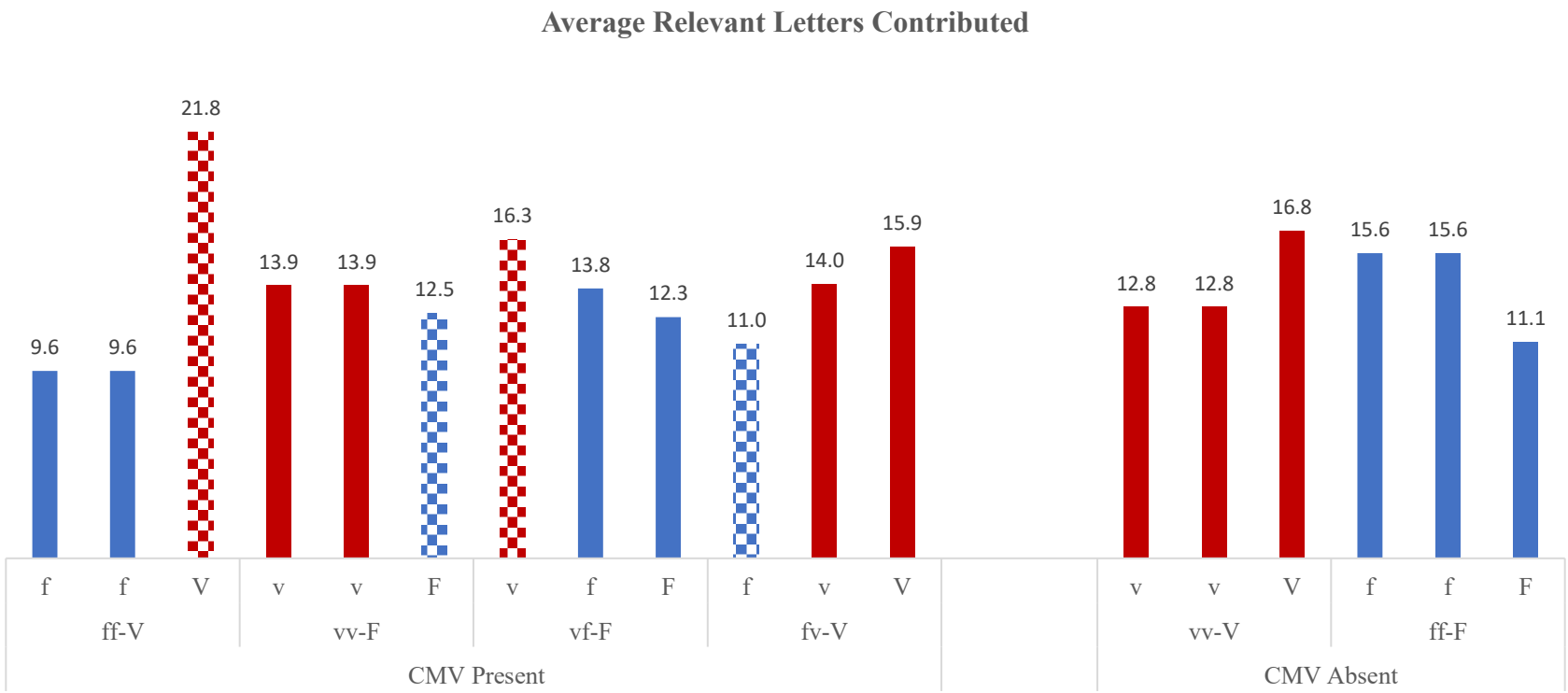
C	M	E	I	N	O
I	N	C	O	M	E

Stage-2 Puzzles

R	I	E	M	A	D
A	D	M	I	R	E

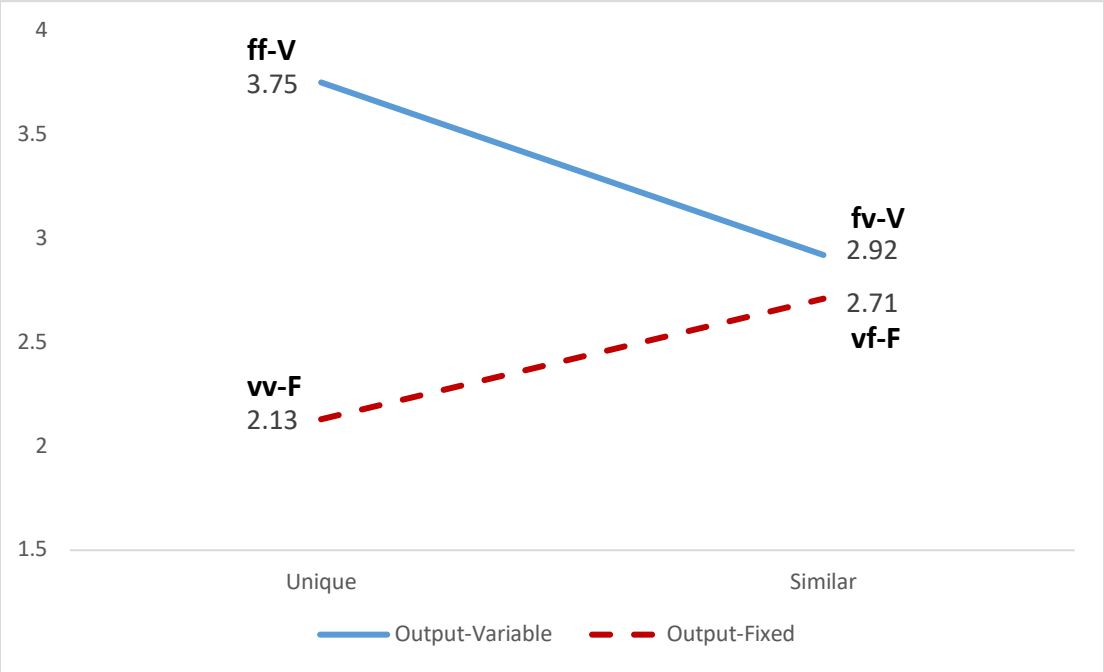
Notes. This figure provides an example of a solved puzzle set. The scrambled letters are in the top row, and the solution is in the bottom row. Each puzzle set contained six stage-1 puzzles and one stage-2 puzzle. In this puzzle set, the second, fourth, and fifth stage-1 puzzles provide letters, highlighted in yellow, that, when solved, populate the stage-2 puzzle. The puzzle set is completed when the output-employee solves the stage-2 puzzle.

Figure 3. Individual Performance by Condition – Full Detail



Notes. This figure provides individual performance, measured by the total number of helpful letters contributed, across conditions. The total helpful letters available (i.e., the maximum value) is 48. The first four conditions have variation in the compensation mechanism, the last two do not. Lower-case letters denote the compensation mechanism for input-employees, capital letters denote the compensation mechanism for output-employees (v = variable, f = fixed). Red (blue) bars denote the average helpful letters contributed for participants receiving variable (fixed) pay. The checkered (solid) bars denote employees who were unique (similar to at least one other group member) with respect to their compensation mechanism. In conditions where two input-employees received the same pay (e.g., ff-V), the two bars of the input-employees are the same height and this shows the average performance across both participants in that role.

Figure 4. Team Performance by CMV-Present Condition



Notes. This figure shows team performance – measured as puzzle sets solved across the entire session – by condition for the CMV Present Conditions. The total sets available (i.e., maximum performance) is 8. Lower-case letters denote the compensation mechanism for input-employees, capital letters denote the compensation mechanism for output-employees, (v = variable, f = fixed). Four conditions are represented: (1) Output-Variable-Unique, (2) Output-Fixed-Unique, (3) Output-Variable-Similar, and (4) Output-Fixed-Similar.

Output employees received variable (fixed) pay in Output-Variable (Output-Fixed) conditions. In the Output-Unique conditions, the output employee was the only team-member to receive compensation via their mechanism. The input-employees both received compensation via the alternative mechanism.

Table 1. Individual Performance – Average Relevant Letters Contributed, by Condition

CMV Present				CMV Absent	
Condition 1: ff-V	**Condition 2: vv-F**	**Condition 3: vf-F**	**Condition 4: fv-V**	**Condition 5: vv-V**	**Condition 6: ff-F**
13.65	13.47	14.14	13.63	14.15	14.08
(10.17)	(7.82)	(7.75)	(8.71)	(9.70)	(9.41)
n = 72	n = 72	n = 72	n = 72	n = 48	n = 48

Notes. This table provides mean (standard deviation) individual performance, measured by the number of relevant inputs to stage-2 puzzles, across conditions (n = number of individuals in each condition). The total helpful letters available (i.e., the maximum value) is 48. The first four conditions have variation in the compensation mechanism, the last two do not. Lower-case letters denote the compensation mechanism for input-employees, capital letters denote the compensation mechanism for output-employees, (v = variable, f = fixed).

Table 2. ANOVAs to Test Hypotheses

Panel A: Main Test of H1 (Fixed-Pay Group-Members Only)

Source	**df**	**MS**	**F-Stat**	**p-value**
CMV	1	246.75	3.78	**0.03****

Panel B: Main Test of H2 (Variable-Pay Group-Members Only)

Source	**df**	**MS**	**F-Stat**	**p-value**
CMV	1	121.00	1.43	**0.12**
Residual	190	84.57		

Panel C: Supplementary Test of H2 (Variable-Pay Group-Members Only)

Source	**df**	**MS**	**F-Stat**	**p-value**
CMV	1	2.92	0.04	0.85
Mechanism Uniqueness	1	675.28	8.29	< 0.01***
Residual	189	81.45		

, * indicates significance at the 0.05, and 0.01 level, respectively.

Notes. Bolded values are hypothesized relations, and thus, reported p-values are one-tailed. All other p-values are two-tailed.

Panels A through C provide the results of an ANOVA with average relevant inputs to stage-2 puzzles as the dependent variable and, as independent variables, an indicator variable for CMV present/absent (Panels A through C) and an indicator variable for compensation mechanism uniqueness (Panel C).

Table 3. ANOVAs to Examine Research Question 1

Panel A: Fixed-Pay Team-Members

Source	df	MS	F-Stat	p-value
CMV	1	83.96	1.30	0.26
Role	1	75.54	1.17	0.28
CMV x Role	1	287.00	4.45	0.04**
Residual	188	64.43		

Panel B: Variable-Pay Team-Members

Source	df	MS	F-Stat	p-value
CMV	1	115.65	1.42	0.23
Role	1	540.38	6.64	0.01***
CMV x Role	1	1.32	0.02	0.90
Residual	188	81.44		

Panel C: Variable-Pay Team-Members with Control for Uniqueness

Source	df	MS	F-Stat	p-value
CMV	1	8.77	0.11	0.74
Role	1	566.45	7.15	< 0.01***
Mechanism Uniqueness	1	460.35	5.81	0.02**
Role x Mechanism Uniqueness	1	67.12	0.85	0.36
Residual	187	72.27		

, * indicates significance at the 0.05, and 0.01 level, respectively. All reported p-values are two-tailed.

Notes. Panels A through C provide the results of an ANOVA with average relevant inputs to stage-2 puzzles as the dependent variable and, as independent variables, an indicator variables for CMV present / absent and role as output-employee / input-employee (Panels A through C) and an indicator variable for compensation mechanism uniqueness (Panel C).

Table 4. Team-Level Performance by Condition

Panel A: Mean (Std. Dev.) Stage 2 Puzzles Solved by Condition

Condition 1: Out-V-Unique (ff-V)	*Condition 2: Out-F-Unique* (vv-F)	*Condition 3: Out-V-Similar* (fv-V)	*Condition 4: Out-F-Similar* (vf-F)	*Condition 5: All-Variable* (vv-V)	*Condition 6: All-Fixed* (ff-F)
3.75	2.13	2.92	2.71	3.13	2.63
(1.87)	(1.36)	(1.61)	(1.76)	(2.36)	(1.45)
n = 24	n = 24	n = 24	n = 24	n = 16	n = 16

Panel B: Main Effects of ANOVA - Variation-Present Conditions (Grey Cells in Panel A)

Source	df	MS	*F*	*p-value*
Output-Employee Mechanism Type	1	20.17	7.31	< 0.01***
Output-Employee Mechanism Uniqueness	1	0.38	0.14	0.71
Interaction	1	12.04	4.36	0.04**
Residual	92	2.75		

Panel C: Simple Effects of ANOVA – Variation-Present Conditions (Grey Cells in Panel A)

Source	*F*	*p-value*
Output-Variable vs Output-Fixed (Unique Compensation) (ff-V vs vv-F)	11.48	< 0.01***
Output-Variable vs Output-Fixed (Similar Compensation) (fv-V vs vf-F)	0.19	0.67
Unique vs. Similar (Output-Variable) (ff-V vs fv-V)	3.02	0.09*
Unique vs. Similar (Ouput-Fixed) (vv-F vs vf-F)	1.48	0.23

Panel D: Selected Two-tailed T-Tests

Source	*t*	*p-value*
Condition 1 (ff-V) vs Condition 5 (vv-V)	0.93	0.36
Condition 2 (vv-F) vs Condition 6 (ff-F)	1.11	0.28

*, **, *** indicates significance at the 0.10, 0.05, and 0.01 level, respectively. Reported p-values are two-tailed

Notes. This table provides mean (standard deviation) team-level performance (n = number of teams in each condition).

Variable compensation (if available) was contingent on the number of puzzle sets solved by the team.

Panel A provides the average number of stage-2 puzzles solved by each team across conditions. The six conditions are: (1) Output-Variable-Unique, (2) Output-Fixed-Unique, (3) Output-Variable-Similar, (4) Output-Fixed-Similar, (5) All-Variable, and (6) All-Fixed.

Panels B and C provide the output from a 2x2 ANOVA examining the variation-present conditions (shaded grey in Panel A). In Panel B, the dependent variable is the number of puzzle-sets solved and the independent variables are (1) output-employee's pay type and (2) similarity in compensation type among the output employee and the input-employees. *Output-Employee Mechanism Type* is coded 1 (0) if a team's output-employee received variable (fixed) pay. *Output-Employee Mechanism Uniqueness* is coded 1 if the output-employee's pay is unique within the team (i.e., the two input-employees received the same pay type), and is coded 0 if the output-employee's pay is similar to one of the input-employees (i.e., the two input-employees received different pay types from one another).

Panel D provides the output from two t-tests (two-tailed) providing relevant comparisons described in Section 4.