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Working Paper 20-075



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**Working Paper 20-075**

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Funding for this research was provided in part by Harvard Business School.

## Nominal and Opportunity Effects of Managerial Discretion

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**Acknowledgments:** The authors gratefully acknowledge Jeremy Bentley, John Beshears, Jasmijn Bol (discussant), Willie Choi, Jeremy Douthit (discussant), Brian Hall, Paul Healy, Jonas Heese, Bob Kaplan, Matthias Mahlendorf, Asís Martínez-Jerez (discussant), Greg Sabin, and Tatiana Sandino; participants in the HBS Research Coaching Brownbag series, the 2018 AAA Management Accounting Section Meeting, the 2018 GMARS symposium, the HBS A&M Brownbag series, the 2018 AAA Annual Meeting, the research workshop series at the University of Trieste, and the 2019 Performance Management Research Symposium for their insightful comments and useful suggestions. We are sincerely thankful to the research site for providing the data for this project. The authors thank Laura Adler and Samantha Snyder for their valuable assistance in conducting our research. The authors are appreciative of Harvard Business School for financial support during the development of this study. All authors contributed equally to the research project.

**Human Subjects Research:** our study was reviewed and approved by the Harvard University Area Internal Review Board (HUA IRB). Detailed documentation is available upon request.

**Funding:** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

**Data availability:** The data used in this project are subject to a confidentiality agreement and cannot be shared without the express consent of the research site's legal representatives.

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## Nominal and Opportunity Effects of Managerial Discretion

### Abstract

We examine the performance consequences of managerial discretion when compensation payoffs are interdependent; that is, when rewards or penalties given to some employees cause others not to get them. Using proprietary data from a company that gives monthly rewards and penalties based on a combination of objective metrics and subjective performance assessments, we document both a *nominal* and an *opportunity* effect of managerial discretion. The former refers to performance consequences associated with workers who receive rewards or penalties due to managerial discretion (*actual* recipients). The latter refers to performance consequences associated with workers who would have received rewards or penalties had there been no managerial discretion (*would-be* recipients). Our study is, to our knowledge, the first to provide empirical evidence of performance consequences associated with the opportunity effect of managerial discretion. In additional tests, we explore theory-consistent explanations of our results. Our findings contribute to the literature on subjectivity in performance evaluations and have important practical implications for the design of incentive systems.

**Keywords:** compensation interdependence; nominal and opportunity effects; managerial discretion; performance measurement.

**JEL codes:** J33, M41, M52, M54

## 1. Introduction

Many organizations incorporate managerial discretion in employee compensation decisions.<sup>1</sup> Prior research describes a number of potential benefits, especially when complete contracting is impeded by environmental unpredictability or by noise in the measurement of performance.<sup>2</sup> Nonetheless, managers use discretionary adjustments in performance evaluations less frequently than theory would predict (e.g. Höppe and Moers 2011; Woods 2012; Bol et al. 2015). Among the proposed reasons is the concern about the motivational effects of applying managerial discretion, especially when performance-related payoffs are interdependent – that is, when subjective adjustments giving rewards or penalties to some employees cause others not to get them (Bol et al. 2015).<sup>3</sup> In this study, we explore this possibility by examining whether and how the use of managerial discretion relates to future employee performance and show that compensation interdependence gives rise to two distinct performance effects of managerial discretion: a *nominal effect* and an *opportunity effect*.<sup>4</sup> The former refers to performance effects of discretionary adjustments associated with employees who directly gained (lost) by being given a reward (penalty) subjectively.<sup>5</sup> The latter relates to the performance effects associated with employees who, due to managerial discretion, did *not* receive a reward (penalty) which was given to someone else.

Our empirical inquiry leverages on data from a company that operates an incentive system whereby, in each month, the members of the department with the highest performance receive a monetary bonus,

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<sup>1</sup> The terms managerial discretion and subjectivity are used interchangeably in this study.

<sup>2</sup> See, for example, Baiman and Rajan (1995); Baker et al. (1994); Ittner et al. (2003); Gibbs et al. (2004); Ederhof (2010); Höppe and Moers (2011); Bol et al. (2015).

<sup>3</sup> For example, employee performance evaluations and compensation decisions are highly interdependent in the presence of bonus pools or forced rankings (or tournaments); positive discretionary adjustments to one employee's compensation automatically implies negative adjustments to someone else's. Bol et al. (2015) provide experimental evidence that supervisors are less likely to apply discretionary adjustments when a positive adjustment to one set of employees is experienced by others as a missed adjustment and, therefore, as a negative outcome. Their results suggest that supervisors operating in high-interdependence conditions consider potential demotivating effects arising from missing out on a potential reward due to the application of positive discretionary adjustments benefiting others.

<sup>4</sup> Prior studies document empirical evidence consistent with the use of managerial discretion being associated with future performance (e.g., Hayes and Schaefer 2000, Gibbs et al. 2004, Ederhof 2010, Abernethy et al. 2019). However, these studies do not address the effect of payoff interdependence on the relations they document.

<sup>5</sup> Prior empirical work, including studies focusing on discretionary components in the CEO compensation literature (e.g., Ederhof 2010) primarily examine the nominal effect, as it is difficult (or irrelevant) to identify potential stakeholders who were affected due to the use of subjectivity in rewarding CEOs.

while the members of the worst-performing department are penalized with pay deductions. As it is common to most organizations, objective performance of each department is disclosed internally to the organization via a dashboard of KPIs.<sup>6</sup> The reward/penalty decision, however, is made by top executives, who can integrate the objective performance information with subjective assessments. In many cases, these subjective evaluations lead management to assign the rewards (penalties) to departments that did *not* rank first (last) based on the disclosed operational dashboard.<sup>7</sup> The information about which department receives the reward or penalty is available to the whole organization. This setting allows us to measure both the nominal and opportunity effects resulting from managerial discretion. Examining changes in performance of workers who received a reward (penalty) without scoring the best (worst) operational performance (hereafter, *actual* recipients) sheds light on the nominal effect, whereas examining changes in performance subsequent to *not* receiving rewards (penalties) despite ranking first (last) based on objective metrics (hereafter, *would-be* recipients) allows us to observe the opportunity effect. We note that our setting is similar to any organization in which workers observe objective performance (e.g., via scorecards, dashboards of KPIs, etc.) and the allocation of performance-related payoffs is interdependent (e.g., bonus pool allocations) and based on a combination of objective and subjective evaluations.<sup>8</sup>

Our empirical analyses indicate that discretionary adjustments are indeed related to future performance. Specifically, we find evidence of the nominal effect in that actual recipients of subjective rewards (penalties) subsequently perform better (worse). We also document performance effects consistent

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<sup>6</sup> Key Performance Indicators.

<sup>7</sup> In this study, we focus on ex-post discretionary adjustments of objective performance measurement, whereby managers can decide whether and how they might use subjective assessments in determining performance-related payoffs for subordinates. Subjectivity in performance evaluations can assume different forms. Managers can include explicit subjective performance metrics in evaluating performance (e.g., formalized assessments of how effectively senior employees mentor junior ones), they can subjectively determine the distribution of relative weights within the mix of performance metrics, and they can adjust their objective measurement of performance ex-post on the basis of information about factors and events that were not predictable or contractible ex-ante (Bol 2007; Campbell 2008).

<sup>8</sup> Settings like these are very common in practice and have been described on prior research. For example, both Ederhof (2010) and Rajan and Reichelstein (2009) have assumed in their respective models that agents are evaluated on a combination of subjective and objective assessments. The interdependence between payoffs is common to all settings where there is a bonus pool. Scholars have included this institutional assumption in their models (e.g., Rajan and Reichelstein 2009) and acknowledged it as a characteristic of their empirical settings (Abernethy et al. 2019; Bol et al. 2015).

with the opportunity effect of managerial discretion. Specifically, performance of would-be recipients of a reward declines, while that of would-be recipients of a penalty improves. These findings can be interpreted by a number of theories, which propose information-based and/or motivation-based explanations. Information-based explanations refer to the notion that the use of managerial discretion may capture information about non-contractible factors that are subsequently reflected in future performance. Motivation-based explanations refer to the notion that the use of managerial discretion may *affect* employee future effort depending on how such adjustments are perceived by the employee.

Whereas prior empirical studies leverage on information-based explanations to describe the relation between the use of managerial discretion and subsequent performance (e.g., Hayes and Schaefer 2000; Ederhof 2010), we also document evidence consistent with motivation-based explanations. First, we examine the persistence of performance consequences associated with nominal and opportunity effects and show that, subsequent to discretionary adjustments in period  $t$ , nominal effects observed in period  $t+1$  reverse or disappear in period  $t+2$ , whereas opportunity effects persist. Second, we examine the variation in the intensity of the opportunity effect by expanding the definition of would-be recipients to *any* department that ranked higher (lower) than the actual recipient of the subjective reward (penalty) with respect to the observable metrics. We observe, on average, a significant opportunity effect for those departments that ranked below the punished one and were, therefore, “saved” from a potential penalty, whereas departments that were deprived of a potential reward do not exhibit significant changes in performance unless they ranked first. Taken together, these asymmetries with respect to the performance effects of managerial discretion are difficult to explain solely based on the information-based explanation, whereby the use of managerial discretion relates to non-contractible factors that are reflected in future performance.

We conduct additional tests to address concerns about possible alternative explanations for our results. First, we show that subjective adjustments are not correlated with observable departmental characteristics, alleviating concerns that management’s discretion might reflect discrimination toward certain functions or groups of workers (Prendergast and Topel 1993, Woods 2012). Another concern is the

possibility that management might use discretionary adjustments to make up for having set excessively difficult (easy) targets. In our setting, monthly targets are set annually and are not renegotiated during the year. If discretion was used simply to correct for unrealistic targets, we should observe different trends in its use at particular times of the year, especially in the late months. We find no evidence of such trends. Next, we explore whether performance changes associated with the nominal effect of subjectivity might be driven simply by the wealth effect of receiving a reward (penalty), independent of its subjective or objective allocation by management. Our tests show that subsequent performance effects are observed only in the presence of subjectively assigned rewards and penalties, while the allocation of rewards and penalties based on the objective rankings alone does not appear to drive changes in subsequent performance. Lastly, we examine whether the opportunity effects of subjectivity might simply depend on being ranked at the top or at the bottom. If that were the case, observed performance effects might be due to mean reversion or, alternatively, to relative performance information, independent of not receiving an expected reward or penalty. Results of our analyses are inconsistent with this alternative explanation.

In an effort to further examine motivation-based explanations for performance consequences of managerial discretion, we also design a randomized controlled experiment creating a laboratory setting that is not confounded by the information-based explanation. In particular, we recruit participants through Amazon's Mechanical Turk (M-Turk) and expose them to a workplace scenario in which the incentive system closely reproduces the one in our field setting. Participants are randomly assigned to conditions reflecting different performance evaluation outcomes. In each condition, they learn how their team ranked in the month that just ended based on objective performance metrics and whether their team had received a reward or a penalty. Each participant then indicates how much they would change their effort in the upcoming month and provides reasons that motivate their choice using free-text answers. The results of the experiment provide corroborating evidence of motivational effects of managerial discretion in the presence of payoff interdependence, and that such effects are predominantly due to the perceived credibility of the incentive system (Lawler 1971; Folger and Konovsky 1989; Baker et al. 1994; Gibbs et al. 2004).



Our study contributes to the literature and to the practice of designing incentives involving managerial discretion. We extend prior research on the relation between subjective allocations of performance-related payoffs and subsequent performance (e.g. Hayes and Schaefer 2000, Ederhof 2010) by showing that the documented relation is not entirely explained by managers accounting for non-contractible performance factors then reflected in future performance (information-based explanation) but also by a motivation effect (i.e., a change in effort associated with belief revisions with respect to the strength of the relation between effort and payoffs). Additionally, while prior empirical research (e.g., Ederhof 2010; Abernethy et al. 2019) has primarily focused on incentive effects related to members of the organization who are *directly* affected by managerial discretion—that is, who *receive* a reward (penalty) subjectively—we explore the consequences of managerial discretion for workers who are *indirectly* affected by the subjective decision via opportunity effects—that is, who *fail to receive* a reward (penalty) as a result of managerial discretion (i.e., opportunity gains and losses). While the possibility of these effects has been discussed in the literature (e.g., Moers 2005; Bol et al. 2015), our study is the first, to the best of our knowledge, to provide empirical evidence of the opportunity effect of the use of subjectivity in performance evaluation and rewarding practices.

The paper proceeds as follows: in Section 2, we review relevant literature and formulate our predictions. Section 3 describes the field setting and data. Section 4 details the research design and reports the results of statistical tests. In Section 5, we present the results of our tests of possible alternative explanations. In Section 6, we provide additional results from our randomized controlled experiment. Section 7 concludes.

## **2. Literature Review**

### **2.1 Nominal and Opportunity Effects of Managerial Discretion**

Prior studies exploring the relation between subjective evaluations and future employee performance pay little (if any) attention to the interdependence among employees' payoffs. Analytical models (Hayes and Schaefer 2000; Ederhof 2010) assume that the manager commits to paying a pre-determined total bonus amount (i.e., bonus pool) regardless of the performance of the individual employee

(credibility assumption), whereby performance evaluation will determine the allocation of a commensurate portion of the bonus pool to the employee, while the remainder will be paid off to a third party, which operates as a residual claimant.

However, in most empirical settings where performance pay is based on a bonus pool, there is no residual claimant. Instead, the bonus pool is allocated among a certain number of employees based on the distribution of their performance. Given the finite nature of the pre-determined bonus pool, greater allocation of the bonus pool to one particular employee reduces the amount available to others. This has been described in the literature as *compensation interdependence* and bears relevance for the operation of incentive systems involving both objective and subjective evaluations. In particular, Bol et al. (2015) find that managers are less likely to apply discretionary adjustments when a positive adjustment to one set of employees results in a negative adjustment to others—that is, when there is high compensation interdependence. Examining responses to post-experimental questions, they find that supervisors operating in high-compensation-interdependence conditions were particularly concerned about demotivating workers who would miss out on a reward due to managerial discretion.

In our study, we are less interested in the drivers of managerial use of discretion and more in how the use of discretion relates to understanding subsequent performance. Therefore, we examine the relation between discretionary adjustments and subsequent performance of (a) employees who receive a discretionary bonus or penalty due to subjective evaluations (hereafter, *actual* recipients) and (b) employees who fail to receive a bonus or a penalty that they would have otherwise been assigned in absence of managerial discretion (hereafter, *would-be* recipients). The former refers to a *nominal* effect of managerial discretion, in that the targeted employees experience an actual change in their wealth, above and beyond any recurrent fixed pay. This effect has been documented in the literature. In fact, most of the empirical evidence on the relation between the use of managerial discretion and subsequent performance in prior literature relates to the nominal effect of receiving discretionary bonuses (e.g., Hayes and Schaefer 2000; Ederhof 2010). The latter represents an *opportunity* effect of managerial discretion, because, in this case, the employees experience no change in actual wealth (other than receiving the recurrent fixed pay) but any

expectation of receiving a reward or penalty they may have formed based on their objective performance fails to materialize due to managerial discretion. To the best of our knowledge, ours is the first study to empirically explore the opportunity effect of managerial discretion.

## **2.2 Use of Managerial Discretion and Subsequent Performance**

Several theories motivate directional predictions about the nominal and the opportunity effects of managerial discretion. We group these theories into two groups based on the different assumptions with respect to the mechanism explaining the relation between managerial discretion and subsequent performance. Information-based explanations refer to the notion that managerial discretion captures current information about non-contractible factors that are subsequently reflected in future performance. Motivation-based explanations refer to the notion that the use of managerial discretion may trigger employee reactions affecting subsequent effort, based on how the use of managerial discretion is perceived by the employee.

### ***2.2.1. Information-based Explanation***

Prior research posits that when objective performance metrics are subject to contracting limitations, the use of managerial discretion can mitigate such imperfections and lead to superior contracting compared to objective measurement alone (Baker et al. 1994; Baiman and Rajan 1995; Ittner et al. 2003; Gibbs et al. 2004; Ederhof 2010). For example, performance-based incentive schemes are limited to the extent that they are only confined to a number of observable performance metrics, while management desires additional employee behaviors (e.g., that are related to worker attitudes, or to employee creativity in solving problems unforeseeable ex-ante, or stewardship behaviors that benefit the organization above and beyond the workers' main responsibilities) that are non-contractible but relate positively to performance. By allowing managers to consider non-contractible aspects of performance (Hayes and Schaefer 2000; Rajan and Reichelstein 2009), managerial discretion can correct for many shortcomings of objective performance measurements. Ederhof (2010) shows empirically that managerial discretion exercised in the payout of bonuses reflects performance assessments based on non-contractible measures. Specifically, she finds that discretionary bonuses paid to CEOs explain future financial performance improvements beyond the

explanatory power of current financial performance trends. She concludes that discretionary bonuses are paid to reward non-contractible elements of current performance (i.e., actions and behaviors enacted in the present period) that are then reflected in future financial performance.

Moreover, to the extent that ex-post discretionary adjustments are informed by non-contractible signals representing the workers' *actual* effort, managerial discretion can improve upon objective measures by taking into account exceptional environmental and uncontrollable factors impacting measurable performance. For example, if a machine breakdown or an unexpected delay in the delivery of a critical component led to a significant drop in production volumes, integrating the objective performance metric with a discretionary adjustment to account for such uncontrollable events would allow credit to be given to the workers for their actual effort.<sup>9</sup> Accordingly, the subjective decision to reward (penalize) performance might entail information reflected in the objective performance of subsequent periods, where such uncontrollable events are unlikely to repeat.

In sum, the information-based explanation suggests that the use of managerial discretion is informative about such non-contractible aspects of current agent effort that are likely to be reflected in future performance. If so, actual recipients of a subjective reward (penalty) should exhibit subsequent objective performance improvements (declines). Similarly, would-be recipients of a reward (penalty) should exhibit objective performance declines (improvements).<sup>10</sup>

### ***2.2.2. Motivation-based Explanation***

Whereas the information-based explanation links managerial discretion and subsequent performance through the informativeness of signals of current effort reflected in future performance, the motivation-based explanation posits that the use of managerial discretion may *affect* future effort through Bayesian revisions of the mapping between effort and payoffs associated with the incentive system

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<sup>9</sup> Bol and Smith (2011) find that managers are more likely to subjectively correct performance results to account for unfavorable events that hindered employees' objective performance than to correct for events that favored employees' performance. In other words, managers are more likely to use subjectivity to account for bad luck than to account for good luck. The cited experimental study, however, did not involve compensation interdependence.

<sup>10</sup> Definitions of actual and would-be recipients were given in the introduction section.

(Prendergast and Topel 1993; Ittner et al. 2003; Gibbs et al. 2004; Moers 2005). The direction and magnitude of such changes in effort depend on how employees interpret the use of managerial discretion and influence their motivation to perform in the subsequent period. Research proposes a number of different mechanisms that may influence employees' reactions to the use of managerial discretion.

**Credibility.** If managerial discretion is used for reasons that are credible in the eyes of the employees (e.g., correcting for unforeseeable events, accounting for current non-contractible aspects of performance, etc.), it could sustain the credibility of the incentive system by portraying an intact link between effort and payoffs (Lawler 1971; Folger and Konovsky 1989; Baker et al. 1994; Gibbs et al. 2004). Perceptions of the incentive system as a fair and trustworthy process should, therefore, lead to greater future effort and, thus, performance, independently from the outcome (i.e., reward or penalty). If management's subjective judgments are, instead, interpreted as bias, then they might communicate a broken link between effort and payoffs and give rise to negative effort adjustments (Prendergast and Topel 1993; Baker et al. 1994; Baker et al. 1998; Ittner et al. 2003; Gibbs et al. 2004; Moers 2005). Uncertainty in the relation between effort and payoffs increases the risk associated with effort (even for employees that might have been unduly favored by managerial discretion), thus discouraging incremental effort in the future or leading to decreased levels (Prendergast and Topel 1993; Woods 2012). Therefore, if managerial discretion is interpreted as bias, we expect to see a deterioration of subsequent effort, especially for those employees that experience a negative outcome (actual recipients of penalties and would-be recipients of rewards), while employees experiencing positive outcomes (actual recipients of rewards and would-be recipients of penalties) may maintain their current level of effort, but are unlikely to increase it.

**Self-serving Bias.** Social psychology theory predicts that employees will interpret positive and negative outcomes differently. In particular, research shows that people are prone to self-serving bias, whereby they attribute positive outcomes to their own abilities and negative ones to external factors outside of their control (Heider 1958; Miller and Ross 1975; Bradley and Greenwald 1978). These studies suggest that employees would trust an incentive system *selectively* depending on whether the outcome they experience is positive or negative. That is, actual recipients of subjective rewards and would-be recipients

of penalties may interpret the discretionary adjustment as an intact link between pay and actual effort and should exhibit increased subsequent effort as a testament of a trustworthy incentive system. Conversely, actual recipients of penalties and would-be recipients of rewards may attribute the unfavorable outcome to a biased incentive system and to procedural injustice, which would result in subsequent performance declines.

**Reciprocity.** Objective performance metrics signal a worker's effort to managers and fellow workers alike. While the signal might be imperfect, it contributes to a worker's expectations with respect to performance-related payoffs (in our study, rewards or penalties). Koszegi and Rabin (2006), posit that individuals interpret any favorable or unfavorable deviations from their rational outcome expectations as gains or losses. To the extent that workers experience subjectively determined rewards (penalties) as deviations from rational expectations based on objective metrics, they are likely to interpret management's discretion as favorable (unfavorable) treatment. Reciprocity theory predicts that workers receiving favorable treatment will respond with greater-than-expected effort, while those subject to unfavorable treatment will respond with undesired behaviors, ranging from lower-than-expected effort to retaliation that may damage profitability (Fehr and Schmidt 1995; Falk and Fischbacher 2006; Krueger and Mas 2009). Managerial discretion resulting in deviations from expected payoffs should then lead to positive employee reactions (more effort and better performance) to subjectively assigned rewards and negative reactions to subjectively assigned penalties, as workers attempt to rebalance the economic exchange with their organization (Akerlof 1984; Falk and Fischbacher 2006).

Differently from the literature on the information effect of managerial discretion, the aforementioned studies do not point toward a consistent expectation with respect to the relation between managerial discretion and future employee performance. The hypothesized directional predictions based on the theories discussed in this section are summarized in Figure 1.

----- Insert Figure 1 here -----

### 3. Research Setting

We obtained data from a Chinese manufacturing firm that uses monetary rewards and penalties to incentivize performance in its 11 departments.<sup>11</sup> At the end of each month, the members of the department with the highest performance receive a bonus (hereafter: reward), while the members of the worst-performing department are penalized with a pay deduction (hereafter: penalty).<sup>12</sup> Department operational performance is evaluated based on a scorecard that aggregates multiple objective metrics. Management, however, has the option to integrate subjective performance assessments into their reward and penalty allocation decisions. Interviews with company executives reveal that their subjective considerations generally include assessments of employee attitude and morale. However, there are no company guidelines for these considerations and the rationale behind them is not disclosed ex-ante. Employees know that the allocation of rewards and penalties depends on the combination of objective performance and subjective assessments. Monetary rewards and penalties are fixed equivalent amounts—about 12% of the average monthly salary. For the most part, department teams are fixed across months and each team continues to perform the same activities throughout our sample period.

At the beginning of each fiscal year, top corporate executives set quantifiable monthly targets and weights for every dimension of objective performance included in the scorecard for all departments.<sup>13</sup> Departments participate actively in the target-setting process; final targets reflect consensus between management and workers in terms of congruence with strategic goals, appropriateness, and level of difficulty across all departments. Based on the annual targets, goals are set for each of the 12 months and

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<sup>11</sup> We acknowledge that the cited theories refer to individual behavior, whereas our unit of analysis is a department. While, in our setting, we cannot control for intra-group dynamics, we follow Abernethy et al. (2019) and assume that the performance observed at the department level represents the average individual response to the use of managerial discretion in the allocation of performance-related payoffs.

<sup>12</sup> While, in the vast majority of cases, one department per month received the reward and one received the penalty, in four instances during our sample period, rewards were assigned to both the department ranked first based on objective evaluation and subjectively to another department and, in five instances, penalties were assigned to both the department ranked last based on objective evaluations and subjectively to another department. In 5 out of the 25 months, we did not observe any monetary reward at all, while monetary penalties were assigned in every month in our sample period. Our main inferences are not affected by these cases.

<sup>13</sup> Each department is assigned multiple monthly financial and nonfinancial goals, as well as goals for process improvement and human resources development.

are not renegotiated until the next annual target-setting cycle. Department goals take into consideration their different activities, interdependencies, and contribution to the firm's overall performance. While monthly goals are department-specific, the negotiation process ensures that they are all equally attainable. Departments then receive monthly scores based on their achievements relative to assigned goals. Departments meeting target expectations on every performance dimension earn 100 points and can score even more points by exceeding their targets. Monetary rewards and penalties are assigned at the end of each month. There is no performance carry-over; each month's evaluation concerns only that month's results.

As in most firms, department operational performance is publicly disclosed within the organization through a monthly performance scorecard. Since management also discloses which departments were rewarded and penalized each month, their use of subjective evaluations is visible to all employees and effectively equates to management overriding objective rankings. Monthly town hall meetings,<sup>14</sup> during which site performance is presented and discussed interactively, allow employees to inquire about the criteria used in the determination of the most recent rewards and penalties.

## 4. Methodology

### 4.1 Research Design

Our research setting allows us to obtain empirical measures of the nominal and opportunity effects because management discretion, when applied, results in observable discrepancies between the actual recipients of the reward and penalty and the distribution of objective performance accomplishments. Figure 2 illustrates our empirical proxies for the nominal and opportunity effects of managerial discretion, using a hypothetical example with six departments. The left column represents the objective rankings. If, as described in the right column, managerial discretion results in a reward for the second-ranked department and a penalty for the fifth-ranked department (i.e., the *actual* recipients of the reward and penalty), then the first- and last-ranked departments (i.e., the *would-be* recipients of the reward and penalty) experience an opportunity loss and an opportunity gain, respectively.

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<sup>14</sup> A town hall meeting in these settings refers to a site-wide meeting involving all employees.



----- Insert Figure 2 here -----

To examine the *nominal* effect of subjectivity, we study the subsequent performance of the *actual* recipients. To examine the *opportunity* effect of subjectivity, we examine the subsequent performance of the *would-be* recipients.<sup>15</sup> We estimate the following equation:

$$\begin{aligned} \Delta PerfScore_{i,t} = & \alpha + \beta_1 SubjRew_{i,(t-1)} + \beta_2 SubjPen_{i,(t-1)} + \beta_3 OppGain_{i,(t-1)} + \beta_4 OppLoss_{i,(t-1)} \\ & + \beta_5 BusyMonth_t + \beta_6 NEmpl_{i,t} + \beta_7 FPct_{i,t} + \beta_8 AgeLess30_{i,t} + \beta_9 \Delta PerfScore_{i,(t-1)} \\ & + \varepsilon \end{aligned} \quad (1)$$

where the dependent variable  $\Delta PerfScore_{i,t}$  captures the change in objective performance between months  $(t-1)$  and  $t$ .<sup>16</sup> Nominal effects of managerial discretion are captured by coefficients  $\beta_1$ , associated with  $SubjRew_{i,(t-1)}$ —an indicator variable equal to 1 if department  $i$  in month  $(t-1)$  was an actual recipient of a subjective reward, and 0 otherwise—and  $\beta_2$ , associated with  $SubjPen_{i,(t-1)}$ —an indicator variable equal to 1 if department  $i$  in month  $(t-1)$  was an actual recipient of a subjective penalty, and 0 otherwise. Opportunity effects of managerial discretion are captured by coefficients  $\beta_3$ , associated with  $OppGain_{i,(t-1)}$ —an indicator variable equal to 1 if department  $i$  in month  $(t-1)$  was a would-be recipient of a penalty, and 0 otherwise—and  $\beta_4$ , associated with  $OppLoss_{i,(t-1)}$ —an indicator variable equal to 1 if department  $i$  in month  $(t-1)$  was a would-be recipient of a reward, and 0 otherwise.

Our control variables include  $BusyMonth_t$ , an indicator variable equal to 1 if month  $t$  is considered a month of high production, and 0 otherwise;<sup>17</sup>  $NEmpl_{i,t}$ , the number of employees in department  $i$  in month  $t$ ;  $FPct_{i,t}$ , the percentage of women in department  $i$  in month  $t$ ;  $AgeLess30_{i,t}$ , the percentage of employees younger than 30 in department  $i$  in month  $t$ . We also control for possible pre-existing performance trends by including the lagged change in performance observed in the previous month ( $\Delta PerfScore_{(t-1)}$ ). All our variables are defined in Appendix 1.

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<sup>15</sup> Our empirical tests further distinguish between actual recipients of rewards and of penalties. We refer to the distinct cases with respect to the nominal effect as subjective rewards (Department 2 in Figure 2) and subjective penalties (Department 5 in Figure 2), respectively. Similarly, we distinguish between would-be recipients of rewards and penalties. We refer to the distinct cases with respect to the opportunity effect as opportunity losses (Department 1 in Figure 2) and opportunity gains (Department 6 in Figure 2), respectively.

<sup>16</sup> We focus on predicting *changes* because we are interested in estimating performance *reactions*. A levels analysis would not be appropriate for this type of inference.

<sup>17</sup> The factory experiences seasonal demand volume, with peaks concentrated in specific months.

## 4.2 Data

Our sample includes 25 monthly observations spanning three consecutive fiscal years for each of the firm's 11 departments. Table 1 reports the descriptive statistics. Our main dependent variable is the change in performance score ( $\Delta PerfScore_{i,t}$ ), which is slightly negative on average ( $\mu = -0.612$ ) and exhibits significant variation ( $\sigma = 16.103$ ). Although achieving all targets awards a department 100 points, departments can exceed expectations and earn scores greater than 100.<sup>18</sup> During our sample period, the average department received a reward (penalty) 2.182 (2.727) times. About half of the rewards and penalties in our sample period were assigned subjectively.

----- Insert Table 1 here -----

Table 2 reports pairwise correlation coefficients for our main variables. Departments with a greater percentage of women appear to perform worse ( $\rho = -0.154, p < 0.05$ ) and are more likely to be penalized ( $\rho = 0.149, p < 0.05$ ). Departments with a younger employee base (*AgeLess30*) also exhibit lower performance ( $\rho = -0.142, p < 0.05$ ), but are more likely to avoid being penalized when ranking at the bottom of objective rankings ( $\rho = 0.157, p < 0.01$ ). This is probably due to managers considering the inexperience of younger workers when evaluating their performance.

----- Insert Table 2 here -----

## 4.3 Empirical Results

Table 3 reports the results of our estimation of Equation (1) using heteroscedasticity-robust OLS. To account for idiosyncratic department-level characteristics, we included department fixed effects. To account for correlation in the behaviors of departments over time, we clustered standard errors by department.<sup>19</sup> Column (1) reports the results of estimating Equation (1) limited to the nominal effects. We find that the objective performance of actual recipients of subjective rewards exhibits significant

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<sup>18</sup> Objective performance measures in our setting are therefore not subject to ceiling effects.

<sup>19</sup> Panel data analyses often raise concerns about incidental parameter problems, which could bias the estimation of statistical models using OLS. The incidental parameter problem is typical of panels with large  $n$  and small  $t$  (respectively, a large number of subjects and a small number of periods). In our case, however,  $t$  is more than double  $n$ , thus rendering the concern about the incidental parameter problem negligible (Nickell 1981).

improvement in the following month ( $\beta_1 = 15.851$ ,  $p < 0.01$ ), while the objective performance of actual recipients of subjective penalties declines ( $\beta_2 = -11.301$ ,  $p < 0.01$ ). Column (2) reports the results of estimating Equation (1) limited to the opportunity effects. Opportunity gains are associated with performance improvements in the subsequent month ( $\beta_3 = 11.466$ ,  $p < 0.05$ ), while opportunity losses are associated with performance declines ( $\beta_4 = -12.750$ ,  $p < 0.05$ ). The estimation of the full specification of Equation (1), reported in Column (3), shows performance effects similar to those estimated in columns (1) and (2). We conclude that managerial discretion in the determination of performance-related payoffs is indeed associated with future performance. Our results pertaining to the nominal effect of managerial discretion are consistent with prior literature documenting a positive relation between subjective allocation of performance related payoffs and subsequent performance. We add to this literature by providing empirical evidence supporting our prediction that, in the presence of high compensation interdependence, this relation extends to the opportunity effect of managerial discretion, in that we observe a significant, theory-consistent performance effect associated with workers for whom managerial discretion results in gains or losses that are defined only in opportunity terms.<sup>20</sup>

----- Insert Table 3 here -----

#### **4.4 Information- and Motivation-based Explanations**

The empirical results of the analyses of our field data are consistent with theoretical predictions related to the information-based explanation, but also with some of the motivation-based explanations (i.e., self-serving bias and reciprocity). Therefore, our main results are not sufficient to determine whether the observed relation represents a manifestation of managerial discretion accounting for non-contractible signals that are then reflected in future performance or if there is also an actual change in effort (motivation effect) driven by workers' Bayesian revisions of the mapping between effort and payoffs.

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<sup>20</sup> All our results are robust to the influence of outliers. Repeating all our tests winsorizing the dependent variables at the 1st and 99th, 5th and 95th, and 10th and 90th percentiles in each month, the results (untabulated) are consistent with those reported in this manuscript.

In order to further explore possible reasons for our findings, we perform two additional tests. First, we examine whether the nominal and opportunity effects differ in their persistence. Recall that the information-based explanation of managerial discretion rests on the assumption that non-contractible elements of performance taken into account to determine the allocation of the reward or penalty are then reflected in subsequent performance. That is, managers' discretionary adjustments operate as a correction of inadequacies of objective performance metrics to capture actual employee effort. As such, managerial discretion should correct the relation between effort and payoff for actual and would-be recipients simultaneously.<sup>21</sup> We augment the specification of Equation (1) with lagged values of subjective rewards/penalties and opportunity gains/losses and report the estimated coefficients in Table 4. Our results show that performance changes associated with the nominal effect of a reward (penalty) subjectively assigned in month  $t$  reverse or disappear in month  $(t+2)$ , whereas those associated with the opportunity effect persist.<sup>22</sup> Because of the opportunity effect being the "other side of the coin" of the nominal effect of managerial discretion (that is, one decision by managers gives rise to both effects), it seems improbable that managers systematically capture non-contractible elements of performance that are reflected in longer future periods when associated with the opportunity effect compared to when they are associated with the nominal effect. Therefore, we infer that the asymmetry in persistence indicates that the information effect alone is not sufficient to explain the observed changes in performance subsequent to the use of managerial discretion.

----- Insert Table 4 here -----

Second, we examine the intensity of the opportunity effect by adopting a broader definition of would-be recipients. Whereas, in our research setting, subjective performance evaluations generally give rise to a single actual recipient of a reward or penalty, *any* department that ranked higher (lower) than the

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<sup>21</sup> In our setting, we cannot determine with certainty if a reward (penalty) was subjectively assigned to a department ranking lower (higher) than the top (bottom) spot to reward (punish) the actual recipient or to punish (reward) the would-be recipient.

<sup>22</sup> Perusal of our data does not indicate serial correlation between receiving awards (penalties) at the department level. In addition, no department received a discretionary reward or penalty for two months in a row.

actual recipient of the reward (penalty) in the objective rankings can be classified as a would-be recipient. This expanded definition is graphically illustrated in Figure 3, which relates to the previously discussed hypothetical example of a company with six departments. If managerial discretion results in a subjective reward (penalty) for department 3 (4), then departments 1 and 2 (5 and 6) may both experience an opportunity loss (gain) because each of them scored higher (lower) objective performance compared to the actual recipient.

----- Insert Figure 3 here -----

If subsequent performance were to be explained uniquely by the information effect, we should observe performance effects associated with the opportunity effect even with the expanded definition. To examine this possibility, we estimate Equation (1) replacing *OppGain* and *OppLoss* with indicator variables capturing the expanded definition. The variable *OppGainExp<sub>i,(t-1)</sub>* (*OppLossExp<sub>i,(t-1)</sub>*) is equal to 1 if department *i* is ranked below (above) the department receiving the actual penalty (reward), and 0 otherwise. The estimation reported in Column 1 of Table 5 focuses on the expanded opportunity effects alone, while in Column (2) we also control for the nominal effects of subjectivity. In both estimations, the performance effect associated with the expanded definition of opportunity gain is positive and significant ( $\beta_1 = 11.710$ ,  $p < 0.01$ , in the more conservative estimation), in line with our main results. In contrast, the performance effect associated with the expanded definition of opportunity loss is not significant. We infer that while an opportunity gain has broad influence for all the workers who were spared from a penalty, an opportunity loss seems to matter only to those who scored the highest objective performance but failed to receive the reward. These asymmetries are incompatible with the information-based explanation being the sole driver of the relation between managerial discretion and subsequent performance.

----- Insert Table 5 here -----

## **5. Alternative Explanations**

### **5.1 Predictable Determinants of Managerial Discretion**

In this section, we explore potential determinants of the use of discretionary adjustments to assign rewards and penalties in our field setting. Because in this study we adopt the perspective of the employee,

examining the determinants of managerial discretion is relevant only to the extent that, if these factors were to predict the allocation of discretionary rewards and penalties in a way that is uncorrelated with department performance, workers might incorporate such patterns into their rational expectations. For example, managers could use discretionary adjustments to correct for performance effects stemming from targets that were set too high or too low for a particular department as a way to *unofficially* rebalance the relation between actual effort and the aggressiveness of the targets. Additionally, management could be consciously or unconsciously biased toward certain groups based on their individual characteristics, such as gender or age, or based on their particular function in the operations.

To examine whether management's discretionary selection of recipients is influenced by any of these factors, we examine the likelihood of subjective assignments of rewards and penalties based on department characteristics and on particular times in the year when management might be more or less likely than usual to assign subjective rewards or penalties to sustain workers' motivation. In our setting, monthly targets are set annually and are not renegotiated during the year. Moreover, it may require several months before it becomes evident whether targets are too aggressive or too easy. Therefore, in earlier months of the performance cycle, management would be less inclined to use discretionary adjustments of objective performance to assign rewards and penalties to unofficially revise targets. Instead, should an annual target result to be too aggressive (easy), management would be more likely to use discretion to rebalance the relation between actual effort and payoff toward the end of the year by becoming more lenient (demanding). We use the following model specification to test whether any of these explanations may lead workers to predict the use of managerial discretion:

$$\begin{aligned}
 \text{SubjOutcome}_{i,t} = & \alpha + \beta_1 \text{StartYear}_t + \beta_2 \text{EndYear}_t \\
 & + \beta_3 \text{NEmpl}_{i,t} + \beta_4 \text{FPct}_{i,t} + \beta_5 \text{AgeLess30}_{i,t} + \beta_6 \text{BusyMonth}_{i,t} + \varepsilon.
 \end{aligned} \tag{2}$$

In Equation (2), the dependent variable  $\text{SubjOutcome}_{i,t}$  is replaced by either  $\text{SubjRew}_{i,t}$  or  $\text{SubjPen}_{i,t}$ .  $\text{StartYear}_t$  is an indicator variable equal to 1 if month  $t$  is one of the first two months of the year and  $\text{EndYear}_t$  is an indicator variable equal to 1 if month  $t$  is one of the last two months of the year. All other variables are as previously defined. We estimate the model using logistic regression, including department

fixed effects and clustering errors at the department level. The results, reported in Table 6, indicate no evidence of subjective rewards (penalties) being given during times in the planning cycle when management's target readjustment efforts would be more evident. Among the department characteristics, we find that departments with a higher percentage of women are more likely to be penalized even when they are not ranked last, consistent with the correlation coefficient reported in Table 2.

----- Insert Table 6 here -----

## 5.2 Favoritism in Managerial Discretion

Another concern associated with our setting is that a particular department might be consistently favored (unfavored) by management. Reasons might include undue influence on management by department team members, perhaps through personal connections or political affiliations. We analyzed the sequence of assignments of subjective rewards and penalties and found no cases of departments receiving a discretionary reward (penalty) twice in a row.

## 5.3 Alternative Explanation of Nominal Effects: Reward (Penalty) Effects

The changes in performance we documented in association with the allocation of a subjective reward (penalty) might be due to a wealth effect associated with the reward (penalty) itself, independent of whether the allocation was ultimately determined by management's discretion or by objective rankings. Therefore, we compare changes in performance associated with actual recipients of rewards (penalties) with those associated with departments that received rewards (penalties) in the absence of any discretionary adjustments. We estimate the following equation:

$$\begin{aligned} \Delta PerfScore_{i,t} = & \alpha + \beta_1 Reward_{i,(t-1)} + \beta_2 Reward_{i,(t-1)} * SubjRew_{i,(t-1)} + \beta_3 Penalty_{i,(t-1)} \\ & + \beta_4 Penalty_{i,(t-1)} * SubjPen_{i,(t-1)} + \beta_5 BusyMonth_t + \beta_6 NEmpl_{i,t} + \beta_7 FPct_{i,t} \\ & + \beta_8 AgeLess30_{i,t} + \beta_9 \Delta PerfScore_{i,(t-1)} + \varepsilon, \end{aligned} \quad (3)$$

where  $Reward_{i,(t-1)}$  is an indicator variable equal to 1 if department  $i$  received a reward (without the use of discretion) in month  $(t-1)$ , and 0 otherwise;  $Penalty_{i,(t-1)}$  is an indicator variable equal to 1 if department  $i$  received a penalty (without the use of discretion) in month  $(t-1)$ , and 0 otherwise. In this specification, the interpretation of the coefficient associated with  $Reward$  ( $Penalty$ ) is the effect on subsequent performance

of receiving a reward (penalty) based on objective rankings alone, while the coefficient associated with the interaction term is the incremental effect of subjectivity in determining the reward (penalty).<sup>23</sup>

As summarized in Table 7, the coefficients associated with subjective rewards and penalties continue to be consistent with our main results and we find no significant objective performance effects associated with receiving a reward (penalty) in the absence of managerial discretion. Taken together, our results suggest that the nominal effect of managerial discretion hinges on the process used by management to determine the recipients of rewards and penalties and not simply on the changes in wealth caused by the bonuses or pay cuts.

----- Insert Table 7 here -----

#### **5.4 Alternative Explanation of Opportunity Effects: Rank-first and Rank-last Effects**

An alternative explanation for the opportunity effects of managerial discretion documented above might simply be the propensity to improve (diminish) performance after being ranked last (first) and might therefore be independent of not getting a reward or a penalty due to management discretion. Changes in performance associated with being ranked first or last might derive from regression to the mean. Top-ranked (bottom-ranked) performance might be unlikely to persist for a long time due to fluctuations in favorable (unfavorable) stochastic events influencing objective performance. Additionally, reactions to *relative* performance information may explain a reversal of performance for top- and bottom-ranked departments. For example, top-ranked workers might become overconfident and reduce effort due to complacency (Casas-Arce and Martinez-Jerez 2009), while being ranked at the bottom might trigger social comparison mechanisms (Fredrickson 1992), which in turn might lead to performance improvements to preserve reputation. Bottom ranking might also represent salient information for the workers about the likelihood of

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<sup>23</sup> In this specification, we represent the event of a subjective reward (penalty) as the interaction between the assignment of a reward (penalty) and the fact that it originated from management's discretion. While the interaction term is equivalent to the variable *SubjRew* (*SubjPen*), we specify our variables in this way to highlight the interpretation of the interaction term as the *incremental* effect of receiving a reward (penalty) as a result of subjective evaluations, as opposed to simply receiving a reward (penalty) based on objective performance.



receiving a penalty in the future if their performance does not improve. To test whether this might be the case, we estimate the following model:

$$\begin{aligned} \Delta PerfScore_{i,t} = & \alpha + \beta_1 RankLast_{i,(t-1)} + \beta_2 RankLast_{i,(t-1)} * OppGain_{i,(t-1)} + \beta_3 RankFirst_{i,(t-1)} \\ & + \beta_4 RankFirst_{i,(t-1)} * OppLoss_{i,(t-1)} + \beta_5 BusyMonth_t + \beta_6 NEmpl_{i,t} + \beta_7 FPct_{i,t} \\ & + \beta_8 AgeLess30_{i,t} + \beta_9 \Delta PerfScore_{i,(t-1)} + \varepsilon . \end{aligned} \quad (4)$$

Estimation results are reported in Table 8.  $RankLast_{i,(t-1)}$  ( $RankFirst_{i,(t-1)}$ ) is defined as an indicator variable equal to 1 if department  $i$  is ranked last (first) based on objective performance in month  $t$ , and 0 otherwise. In estimating Equation (4), we compare subsequent performance across departments that ranked last (first) and did not get a penalty (reward) and departments that were ranked last (first) and did. The coefficients associated with the interaction terms represent the incremental effect of not getting a reward (penalty) while ranking first (last).<sup>24</sup> When we examine the opportunity effect of subjective penalties (opportunity gain), controlling for being ranked last, we continue to find a significant incremental effect on subsequent performance ( $\beta_2=10.426$ ,  $p<0.01$ ), which confirms our prior conclusions about the opportunity effect of managerial discretion on workers' subsequent performance. However, when we control for being ranked first, we find no additional effect of opportunity loss on subsequent performance. While we cannot conclusively rule out this alternative explanation for the performance effects of opportunity loss, our results further support our findings with respect to opportunity gain.

----- Insert Table 8 here -----

## 6. Additional Test: Experimental Evidence of Motivation Effects

Our main tests support our conjecture that the informativeness-based explanation is not sufficient to explain the entirety of the relation between the use of managerial discretion and subsequent employee performance. We acknowledge that, in our field setting, we cannot disentangle the different motivation-based explanations described in Section 2.2.2. Therefore, we conduct an additional randomized controlled experiment to explicitly test for the motivation effect of managerial discretion. In the experiment, we

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<sup>24</sup> As in our previous test of reward (penalty) effects, we specify our model in a way that highlights the incremental effect of not getting a reward (penalty) while ranking first (last). The interaction term is equivalent to the variable  $OppLoss$  ( $OppGain$ ).

directly ask participants about their willingness to exert *effort* instead of examining their future period performance, thus ruling out the information-based explanation by construction. While we could not run this inquiry in our field setting, the purpose of our analysis is to provide empirical evidence of motivation-based explanations in a controlled environment, which could contribute to explain our field-based results.

We recruited 505 participants using Amazon’s Mechanical Turk (M-Turk). Each was presented with a brief description of the purpose of the experiment and asked to sign an informed consent.<sup>25</sup> All who opted to participate read the same description of an incentive system mirroring the one in our research setting. Participants would assume the role of a member of a team whose performance was evaluated based on a combination of objective and subjective factors. Members of the best-performing (worst-performing) team would receive a monetary award (penalty) equal to 10% of their monthly salary. Next, participants learned about their team’s objective performance and relative performance rankings in a certain month and whether management had decided to give them a reward (penalty) after considering their objective performance and subjective assessments. Participants were randomly assigned to one of 10 conditions representing the following scenarios: (a) objective rewards (penalties);<sup>26</sup> (b) subjective rewards (penalties) for workers ranking second (second to last); (c) subjective rewards (penalties) for workers ranking far from the top (bottom); (d) not receiving a reward (penalty) while ranking at the top (bottom); and (e) not receiving a reward (penalty) while ranking far from the top (bottom). Participants were then asked to indicate how much more or less effort they would be willing to apply to their work in the subsequent month using a seven-point scale ranging from -3 (“a lot less”) to +3 (“a lot more”), where the midpoint 0 represented the status quo (“same effort”). They could also add free-text comments motivating their choice.<sup>27</sup> Lastly, they were asked a number of post-experiment questions to collect demographic information. Participants were rewarded for their time in accordance with Amazon M-Turk guidelines.<sup>28</sup>

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<sup>25</sup> See Appendix 2 for details about the experiment materials.

<sup>26</sup> We refer to instances of rewards and penalties assigned without subjective adjustments – i.e., cases when workers ranked at the top (bottom) based on objective performance receive the reward (penalty) – as objective rewards (penalties).

<sup>27</sup> Appendix 3 shows a sample of those responses.

<sup>28</sup> The average duration of the experiment was 3 minutes and 57 seconds. Each participant was paid \$0.50.

We estimate the following equation:

$$\Delta Effort_{i,t} = \alpha + \beta_1 SubjRew_{i,(t-1)} + \beta_2 SubjPen_{i,(t-1)} + \beta_3 OppGain_{i,(t-1)} + \beta_4 OppLoss_{i,(t-1)} + \beta_5 Female_i + \beta_6 Age_i + \beta_7 Manager_i + \varepsilon, \quad (5)$$

where  $\Delta Effort$  is the individual participant's response indicated in the experiment; *Female* is an indicator variable equal to 1 if the participant identified as a female and 0 otherwise; *Age* is the participant's age in years, and *Manager* is an indicator variable equal to 1 if the participant declared himself or herself to have had managerial experience.<sup>29</sup> Our variables of interest (*SubjRew*, *SubjPen*, *OppRew*, and *OppPen*) are defined consistently with the variables used in our main tests.

Table 9, Panel A, reports the results of our OLS estimation of Equation (5). We find significant performance effects associated with actual and would-be recipients of subjective rewards. These experimental findings provide evidence in support of motivation effects explaining the observed relation between managerial discretion and subsequent performance. In particular, we find that receiving a subjective reward or a subjective penalty leads to greater effort in the subsequent month; opportunity losses drive negative subsequent performance; and opportunity gains have no significant effect on participants' effort choices.<sup>30</sup>

To reconcile our results with individual motivation theories described earlier (see Section 2.2.2), we explore potential moderators that might shed light on the observed dynamics. We leverage on the free-text justifications to glean insights into participants' interpretations of managerial discretion. We define an indicator variable *NegInt* that is equal to 1 if the participants communicated distrust in the incentive system or interpreted the system as biased, and zero otherwise.<sup>31</sup> We then perform a cross-sectional analysis of changes in effort based on the positive versus negative interpretations by estimating the following equation:

$$\Delta Effort_{i,t} = \alpha + \beta_1 SubjRew_{i,(t-1)} + \beta_2 SubjPen_{i,(t-1)} + \beta_3 OppGain_{i,(t-1)} + \beta_4 OppLoss_{i,(t-1)}$$

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<sup>29</sup> We control for managerial experience in order to take into account the differences between our pool of experimental subjects and the workers included in our field sample, who are mostly line workers with no managerial responsibilities.

<sup>30</sup> Adopting the expanded definition of subjective rewards and penalties yields results similar to those in Table 9.

<sup>31</sup> The coding of the indicator variable was based on the consensus of the members of the research team with respect to the content of the text-based responses. Missing responses and responses that could not be interpreted as a manifestation of the participant's opinion of the incentive system were coded as missing values. Examples for negative and non-negative interpretations based on the text-based responses are provided in Appendix 3.

$$\begin{aligned}
& +\beta_5\text{SubjRew}_{i,(t-1)} * \text{NegInt}_i + \beta_6\text{SubPen}_{i,(t-1)} * \text{NegInt}_i + \beta_7\text{OppGain}_{i,(t-1)} * \\
& \text{NegInt}_i + \beta_8\text{OppLoss}_{i,(t-1)} * \text{NegInt}_i + \beta_9\text{Female}_i + \beta_{10}\text{Age}_i + \beta_{11}\text{Manager}_i + \varepsilon \quad (6)
\end{aligned}$$

The results are reported in Table 9, Panel B, and show that the coefficients estimated for the interaction terms are negative and significant, which suggests that applying managerial discretion drives unfavorable nominal and opportunity motivation effects when participants interpret the incentive system as biased.<sup>32</sup> These results hold regardless of whether participants gain or lose due to the discretionary adjustments. In sum, we find evidence of nominal and opportunity effects consistent with the theoretical prediction associated with incentive credibility as articulated in Section 2.2.1 and summarized in Figure 1.

----- Insert Table 9 here -----

Our experimental results show that motivation effects contribute to influencing the performance of employees that experience managerial discretion, and the direction of these effects depends on the worker's interpretation of managers' motivations to use their discretion in determining performance-based payoffs. The direct applicability of our experimental results to the field setting is subject to important limitations. A key difference between the employees in our field setting and the participants in our experiment relates to *how* their judgement for the credibility of the use of managerial discretion is formed. Whereas employees in our field setting base their judgment on potential unobservable factors arising in the work environment, experimental participants can only rely on observable performance metrics to evaluate the use of managerial discretion as fair/unfair. Additionally, perceptions about the use of managerial discretion are shaped dynamically over a longer period of time—an institutional feature that we could not reproduce in the lab. Nevertheless, we believe that our experimental evidence sheds light on one potential mechanism that might

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<sup>32</sup> The coefficient associated with each interaction term in Equation (6) provides a direct estimation of the difference in effort change between participants with negative versus non-negative interpretations pertaining to each of the four distinct cases. In an alternative model specification that would additionally include the main effect of *NegInt*, the coefficient on the interaction term would estimate a difference-in-differences for the effect of using managerial discretion (versus not) and the effect of interpreting the incentive system negatively (versus not). With that specification, we would need to use post-estimation tests (i.e., Wald tests) to validate the significance of the difference between negative and non-negative interpretations of the applied discretionary adjustments. For ease of interpretation, we chose to report the estimation results of Equation (6), but our results are robust to using the alternative model specification.

interact with the information-based explanation of the relation between managerial discretion and subsequent performance. We encourage future research to address this phenomenon in greater depth.

## 7. Conclusions

This study explores the relation between discretionary adjustments of objective performance evaluations and subsequent employee performance in a setting with high compensation interdependence, and in which the incentive system involves both rewards and penalties. In such settings, using subjectivity to assign monetary payoffs to some workers mechanically impacts other workers, who miss out on a reward or are spared from a penalty as a result of management's discretion. We predict and find that the use of subjectivity to determine performance-related payoffs in the presence of high compensation interdependence gives rise to a *nominal* performance effect (associated with workers who receive the reward (penalty) subjectively—the *actual* recipients) and an *opportunity* performance effect (associated with workers who fail to receive the reward (penalty) due to management's discretion—the *would-be* recipients). We then analyze the mechanisms that might explain the documented relation.

We use field data from a Chinese manufacturing company that operates an incentive system whereby monthly monetary rewards and penalties are allocated to the best- and worst-performing of 11 departments in a particular production site. We show that the use of managerial discretion to assign performance-related monetary rewards and penalties is associated with changes in subsequent performance. Specifically, we document that workers experiencing managerial discretion either through the *nominal* effect or the *opportunity* effect exhibit similar performance changes. That is, both actual rewards (penalties) and opportunity gains (losses) are associated with higher (lower) objective performance in the following month. To the best of our knowledge, we believe that our study is the first to show empirically that managerial discretion impacts not only those workers who are *directly* affected by managerial discretion (that is, those who *receive* a subjective reward or penalty) but also those who are *indirectly* affected by the subjective decision via opportunity effects (that is, workers who *fail to receive* a reward or a penalty as a result of managerial discretion).

We further explore different explanations for our empirical results. Prior research posits that the use of managerial discretion is an informative signal of non-contractible aspects that are related to future performance. This view suggests that the observed empirical relation is explained by the exercise of managerial discretion in the current period to reward effort that will then materialize into future performance. This view, however, exhibits important limitations with respect to the following two factors documented in the literature with respect to the use of managerial discretion. First, empirical research finds that managers apply discretion in evaluating subordinates' performance less frequently than theory would predict (Höppe and Moers 2011; Woods 2012; Bol et al. 2015). Proposed explanations include low trust between the supervisor and the employee, which can impair the effectiveness of subjective evaluations by confounding them with bias (Gibbs et al. 2004); the possible impact of subjective adjustments on multiple employees simultaneously (Bol et al. 2015); and the possibility that managerial discretion might *affect* future performance (Moers 2005; Bol et al. 2015; Abernethy et al. 2019). To the extent that subjective payoffs are based on non-contractible performance factors observable by both the principal and the agent (Hayes and Schaefer 2000; Rajan and Reichelstein 2009; Ederhof 2010), they should not be subject to interpretation or to concerns about bias. Second, managers' consideration that their discretion in evaluating current employee performance might *impact* future performance (and not simply *predict* the effect of current actions) is in line with behavioral theories stating that the use of managerial discretion may cause employees to correct their beliefs with respect to the mapping between effort and payoff and *change* the level of effort they are willing to provide in the future (motivation effect). The direction of that change depends on how they interpret the exercised discretionary adjustments. Therefore, we explore the possibility that the relation between managerial discretion and future performance might be explained by a combination of information-based explanations and motivation-based explanations. A battery of additional tests provide evidence in line with this prediction.

Whereas our research site is ideal to explore our phenomenon of interest, our work is subject to some limitations common to field-based research. In particular, since our study is based on a single Chinese manufacturing organization, the generalizability of our results to other industries and cultures is limited.

Additionally, our findings—especially those relative to opportunity gains and losses—depend on workers having sufficient information on their objective performance to detect the application of discretionary adjustments to the compensation outcomes. Nonetheless, we stress that most companies in most industries document objective performance via scorecards and KPI dashboards that are widely disseminated within the organization. Additionally, many firms allow managers to include subjective evaluations in the assessments of their subordinates and disclose the identity of recipients of rewards and penalties within the organization (e.g., engraved plaques, “employee-of-the-month” posters, etc.). Our specific advantage in this study arises from the possibility to detect and measure empirically the application of managerial discretion in our field setting. Finally, difficulties to capture workers’ perceptions of the incentive system in place in our field setting preclude us from examining cross-sectional variations that could shed light on the specific behavioral mechanisms underlying the observed changes in performance associated with managerial discretion.

Despite these limitations, our study contributes to the literature on subjectivity in incentive contracting by providing empirical evidence of performance effects associated with the use of managerial discretion that were only theorized in prior research. Specifically, while prior work has explored the nominal effects of subjective rewards, we are the first to document empirically that, if payoffs are interdependent, managerial discretion also generates opportunity performance effects. Our results provide important insights to the practitioner community by highlighting how subjective performance evaluations impact subjects who are not the immediate target of managers’ discretionary decisions and how that may significantly influence an incentive system’s overall effectiveness. We encourage future research to further explore underlying mechanisms for the nominal and opportunity effects of managerial discretion.

## Appendix 1: Variables Definition

Variable	Description
$PerfScore_{i,t}$	Total performance score by department $i$ in month $t$
$Reward_{i,t}$	Indicator variable equal to 1 if department $i$ receives a reward in month $t$ , and 0 otherwise
$Penalty_{i,t}$	Indicator variable equal to 1 if department $i$ receives a penalty in month $t$ , and 0 otherwise
$SubjRew_{i,t}$	Indicator variable equal to 1 if department $i$ receives a subjective reward in month $t$ , and 0 otherwise
$SubjPen_{i,t}$	Indicator variable equal to 1 if department $i$ receives a subjective penalty in month $t$ , and 0 otherwise
$OppGain_{i,t}$	Indicator variable equal to 1 if department $i$ is ranked at the bottom of the objective performance rankings in month $t$ but does not receive a penalty, and 0 otherwise
$OppLoss_{i,t}$	Indicator variable equal to 1 if department $i$ is ranked at the top of the objective performance rankings in month $t$ but does not receive a reward, and 0 otherwise
$OppGainExp_{i,t}$	Indicator variable equal to 1 if department $i$ is ranked below the department receiving a penalty in the objective performance rankings in month $t$ but does not receive a penalty, and 0 otherwise
$OppLossExp_{i,t}$	Indicator variable equal to 1 if department $i$ is ranked above the department receiving a reward in the objective performance rankings in month $t$ but does not receive a reward, and 0 otherwise
$RankFirst_{i,t}$	Indicator variable equal to 1 if department $i$ ranks at the top of the objective performance rankings in month $t$ , and 0 otherwise
$RankLast_{i,t}$	Indicator variable equal to 1 if department $i$ ranks at the bottom of the objective performance rankings in month $t$ , and 0 otherwise
$BusyMonth_t$	Indicator variable equal to 1 if month $t$ is considered to be a busy month for production, and 0 otherwise
$StartYear$	Indicator variable equal to 1 if month $t$ is one of the first two months of the year, and 0 otherwise
$EndYear$	Indicator variable equal to 1 if month $t$ is one of the last two months of the year, and 0 otherwise
$NEmpl_{i,t}$	Number of employees in department $i$ in month $t$
$Fpct_{i,t}$	Percentage of female employees in department $i$ in month $t$
$AgeLess30_{i,t}$	Percentage of employees younger than 30 in department $i$ in month $t$



## Appendix 2: Experimental Material

We recruited 503 participants via Amazon Mechanical Turk (M-Turk). Participants were provided with a link to an electronic survey (Qualtrics) administered by a person not involved in the research project or familiar with the purpose of the simulation.

After reading and electronically signing an informed consent, each participant was asked to read a description of the task he or she was required to perform and the description of the workplace scenario as reported in Panel A below. All participants were shown the same description of the task and the same workplace scenario.

Next, each participant was asked to answer a single question, as reported in Panel B. Each participant was assigned to one of the 10 conditions reported in the table in Panel C. Each condition included a different manipulation of the text of the question in Panel B, rendered by substituting the text “CONDITION FIRST PART” and “CONDITION SECOND PART” with the corresponding details described in the table (Panel C).

### Panel A: Task Definition and Workplace Scenario

#### Task definition:

Researchers are studying how people respond to rewards and penalties in the workplace. You will be given a scenario describing a work environment and performance review process. In light of this description, you will be asked to describe how hard you would work under the given conditions. You may be shown a different description than others who take this survey.

#### Workplace scenario:

You work as part of a team for a company that rewards its workers based on team performance. Each month, management assigns each member of the best performing team a monetary bonus equal to 10% of their salary, and an equivalent monetary penalty to each member of the worst performing team.

Team performance is measured based on quantifiable aspects, such as number of units produced, number of orders processed, number of quality defects, etc. However, management can also observe other aspects of performance, such as workers’ attitude, good citizenship behaviors, and favorable or unfavorable unpredictable events (examples might include unexpected mechanical problems to the production equipment, or unexpected large sales orders). Management can take into consideration all aspects of performance to make the ultimate decision about giving rewards and penalties.

### Panel B: Experimental Instrument

Q: It is now the end of October. Based on the quantifiable measures of performance, **CONDITION FIRST PART**. Taking into consideration all aspects of performance, **CONDITION SECOND PART**. How much effort would you apply to your job in November compared to the effort you applied in October?

(-3)	(-2)	(-1)	(0)	(1)	(2)	(3)
a lot less	significantly less	slightly less	same effort	slightly more	significantly more	a lot more

Why?

---

**Panel C: Experimental Cells**

Condition #	CONDITION FIRST PART	CONDITION SECOND PART
1	your team ranked at the top	management assigned the reward to your team
2	your team ranked at the bottom	management assigned the penalty to your team
3	your team ranked second from the top	management assigned the reward to your team
4	your team ranked fourth from the top	management assigned the reward to your team
5	your team ranked second from the bottom	management assigned the penalty to your team
6	your team ranked fourth from the bottom	management assigned the penalty to your team
7	your team ranked at the top	management assigned the reward to a team that ranked below yours
8	your team ranked second from the top	management assigned the reward to a team that ranked below yours
9	your team ranked at the bottom	management assigned the penalty to a team that ranked above yours
10	your team ranked second from the bottom	management assigned the penalty to a team that ranked above yours

**Panel D: Post-Experimental Questions**

What is your gender:

M:  F:  Prefer to self-describe: \_\_\_\_\_ Prefer not to answer:

What is your age? \_\_\_\_\_

What is the highest education degree you completed?

High School or Below:  Undergraduate:  Graduate:

What is your employment status?

Currently Employed, Full Time:

Currently Employed, Part Time:

Currently Self Employed:

Currently Unemployed, Previously Employed:

Currently Unemployed, Never Employed:

Retired:

Other (please describe): \_\_\_\_\_

How many years of work experience do you have?

Less than 2:  Between 2 and 5:  More than 5:

In what industry are you currently employed or have been previously employed? Please check all that apply:

Banking & Financial Services

Education

Food & Beverage

Government & Non-Profit

Healthcare

Manufacturing

Media & Entertainment

- Retail, Wholesale & Distribution
- Software & IT Services
- Non-Profit

Have you ever been a manager?

Yes:  No:

If yes, how many people did you supervise?

Less than 5:  Between 5 and 10:  More than 10:

**Appendix 3: Selected Quotes from the Experiment's Text-based Answers**

	<b>Response to the "Why?" question</b>	<b>Negative interpretation (NegInt=1)</b>
<b>Subjective reward (nominal effect)</b>	It will motivate me to work harder.	0
	Being at the top of the board is a great honor and we should strive to make the top of the list every month.	0
	This is a great motivator for me.	0
	My hard work was recognized and rewarded. That would encourage more hard work from me. Not that lack of immediate reward would discourage hard work from me. Lack of pay would. There has to be incentive for me to work.	0
	That the other "non-quantifiable" aspects of performance propelled our team from fourth place to first place is important knowledge. That means we're doing a lot of things right. But if we work significantly harder and move our quantifiable measures of performance closer to the top, we can presumably greatly increase our chances of continuing to get the bonus (or at the least, guarantee that we do not end up with the monetary penalty).	0
	I think the reward structure is miserable and would not like working there. I'd continue to work as hard as I need to have job security.	1
	Working on 'rewards and penalties' for the entire team is rarely motivating, because it's not concrete and specific to outcomes. There is a lot of subjective consideration for management in the above description, and not a lot of objective specifics (example: unpredictable events, citizenship behaviors, attitude) that I, personally could control.	1
<b>Subjective penalty (nominal effect)</b>	I would feel unfairly penalized. My team wasn't the worst, but was assigned the penalty due a holistic view, which honestly seems a bit arbitrary. It would be hard to care about doing a good job in this situation.	1
	I was assigned a penalty despite giving good effort. Now, I could care less. I'll give the absolute minimum effort possible to keep my job. I may even try to bring down morale with co-workers out of spite.	1
	I would feel very discouraged, and this practice of penalizing groups that perform worse than others wouldn't make me feel wanted by the company. I would probably feel like putting less effort in at work.	1
	This is a very disheartening scenario. If it's understood that I performed well during this period, then I am being penalized for the failure of another team member. This offers me no incentive to try as hard, because I cannot be assured that the team member will increase their performance. Why put forth extra effort if I will still be penalized ultimately?	1

*This table continues on the next page*

Appendix 3 (cont'd)

<b>Subjective penalty (nominal effect) cont'd</b>	I'd try a bit harder so we would not get the penalty again. Maybe our attitude or other more subjective things brought us to the bottom so I'd work on that.	0
	There must be a reason why my team was ranked so low in October. From November I must do more to raise my team's status and it starts with my performance.	0
<b>Opportunity gain (opportunity effect)</b>	I feel like my team lucked out this time but we have to improve our performance.	0
	I feel our team came up short this time, and we were very lucky to not be penalized the 10%, but everyone has to be on the same page and want to do better; it helps with camaraderie as well.	0
	Well, based off my work ethic I always try to put the most into my job. It appears from this scenario that while we had the worst performance as far as numbers go we were spared this based off another factor. I could imagine one of these factors could be our positive outlook and hard work. I would choose to continue and build upon this.	0
	I would do everything I could to prevent my team from ranking at, or near, the poorest performers. I would make sure that I was performing at my best in all controllable aspects of my work. Losing more than a month's salary could greatly impact all aspects of my life and I would be incredibly motivated to avoid that.	0
	Because I'd be worried that next time I might get the penalty, but not much more because I'm confused as to why the manager penalized the team above us instead of us, and would also worry that doing better could actually hurt me.	1
I don't think it's fair that those that couldn't perform their best this month get punished when there are a lot of factors that sometimes you can't control.	1	
<b>Opportunity loss (opportunity effect)</b>	We didn't get the reward we deserved, so why work harder when it doesn't matter?	1
	I couldn't consciously bring myself to apply less effort, but given my disappointment in the outcome it would be hard to motivate myself to apply more. Unfortunately using the quantifiable data is the only way to know the decision is being made fairly. Despite what management said, there could be favoritism at play in which case I would be fighting a losing battle.	1
	The system is too easily corrupted by playing favorites. I wouldn't work for the company at all.	1
	I would not feel as motivated due to the reward going to a team ranked lower in October.	1
	Meritocracy is key to a democratic and just society and decent existence. This flies in the face of the importance of meritocracy and unfairly deprives me of my deserved reward. Thus, the reason I would not work as hard as I did.	1

This table continues on the next page

*Appendix 3 (cont'd)*

<b>Opportunity loss (opportunity effect) cont'd</b>	I would feel like we weren't rewarded because of things that weren't quantifiable such as our team's attitude, etc. It would make me want to work harder for the reward next month.	0
	I would usually apply a high level of effort regardless, but I would try to add a bit more so that it counted toward those aspects which aren't measurable for my team the next month.	0

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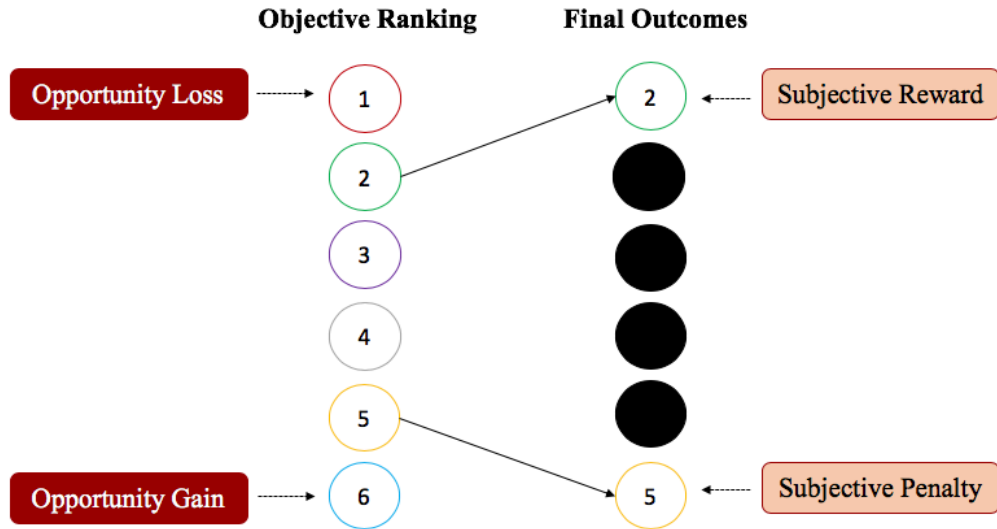
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**Figure 1: Summary of Theoretical Predictions for the Relation between Managerial Discretion and Subsequent Performance**

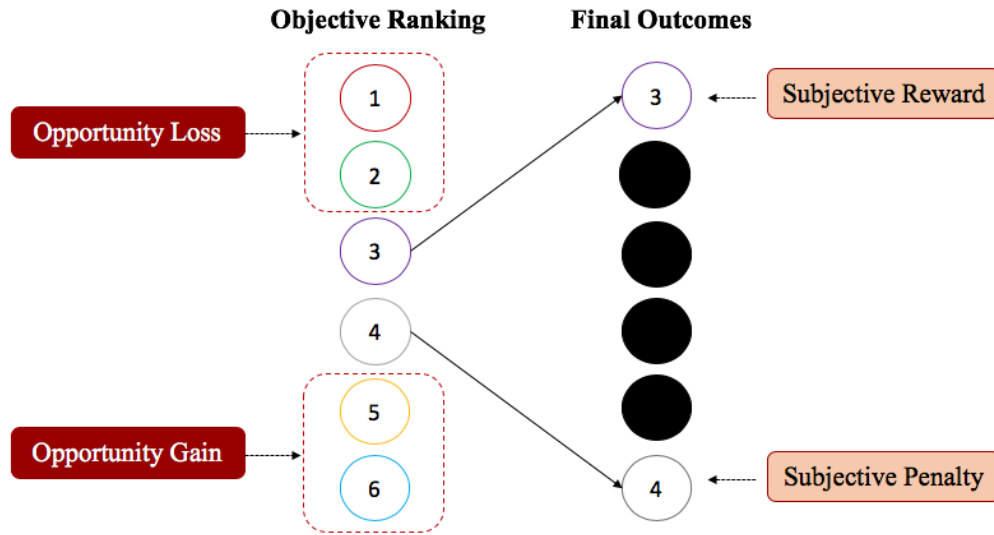
		Information-based Explanation	Motivation-based Explanations		
			Credibility (Yes/No)	Self-serving Bias	Reciprocity
Nominal Effect	Actual Recipient of Reward <i>(Subjective Reward)</i>	+	+/?	+	+
	Actual Recipient of Penalty <i>(Subjective Penalty)</i>	-	+/-	-	-
Opportunity Effect	Would-be Recipient of Penalty <i>(Opportunity Gain)</i>	+	+/?	+	+
	Would-be Recipient of Reward <i>(Opportunity Loss)</i>	-	+/-	-	-

**Figure 2: Empirical Measures for Nominal and Opportunity Effect**



*Notes:* Figure 2 illustrates how using discretionary ex-post overrides of objective performance results to assign rewards and penalties gives rise to *opportunity gains* and *losses*. The figure represents a hypothetical sample of 6 departments. We posit that managers use discretionary adjustments to assign the monetary reward (penalty) to Department 2 (5). Department 1 (6), which scored higher (lower) based on objective performance evaluations, experiences the subjective assignment as an opportunity loss (gain).

**Figure 3: Expanded Definitions of Opportunity Gains and Losses**



*Notes:* Figure 3 proposes a situation similar to that in Figure 2 (hypothetical sample of 6 departments), but using an extended definition of opportunity gains and losses, wherein we posit that *any* department scoring higher (lower) than the ultimate recipient of the actual reward (penalty) in month  $t$  experiences an opportunity loss (gain). The difference between this definition and the one described in Figure 2 is that the more restrictive definition considers only the top (bottom) performer's response to the discretionary ex-post adjustment, whereas the expanded definition includes *all* departments that were ranked above (below) the department receiving the actual reward (penalty).

**Table 1: Descriptive Statistics**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Std. dev.</b>	<b>Min</b>	<b>p25</b>	<b>p50</b>	<b>p75</b>	<b>Max</b>
<i>PerfScore</i>	275	63.479	17.001	23.000	52.000	65.000	75.000	107.000
<i>ΔPerfScore</i>	264	-0.612	16.103	-62.000	-9.500	0.500	9.250	45.000
<i>Reward</i>	275	0.087	0.283	0.000	0.000	0.000	0.000	1.000
<i>Penalty</i>	275	0.109	0.312	0.000	0.000	0.000	0.000	1.000
<i>SubjRew</i>	275	0.044	0.205	0.000	0.000	0.000	0.000	1.000
<i>SubjPen</i>	275	0.047	0.213	0.000	0.000	0.000	0.000	1.000
<i>OppGain</i>	275	0.029	0.168	0.000	0.000	0.000	0.000	1.000
<i>OppLoss</i>	275	0.047	0.213	0.000	0.000	0.000	0.000	1.000
<i>BusyMonth</i>	275	0.480	0.501	0.000	0.000	0.000	1.000	1.000
<i>NEmpl</i>	275	16.255	14.944	2.000	7.000	10.000	18.000	68.000
<i>Fpct</i>	275	0.412	0.274	0.034	0.200	0.333	0.667	1.000
<i>AgeLess30</i>	275	0.377	0.235	0.000	0.222	0.340	0.500	1.000

**Table 2: Correlation Matrix**

	1	2	3	4	5	6
1. PerfScore	1.0000					
2. Reward	0.3432***	1.0000				
3. Penalty	-0.4127***	-0.1082*	1.0000			
4. SubjRew	0.1392**	0.6908***	-0.0747	1.0000		
5. SubjPen	-0.1436**	-0.0689	0.6366***	-0.0476	1.0000	
6. OppGain	-0.3020***	-0.0535	-0.0606	-0.0370	-0.0386	1.0000
7. OppLoss	0.3198***	-0.0689	-0.0779	-0.0476	-0.0496	-0.0386
8. BusyMonth	0.0303	-0.0392	0.0374	-0.0271	-0.0082	-0.0797
9. NEmpl	-0.0306	-0.0847	-0.0560	-0.0550	0.0284	-0.0131
10. Fpct	-0.1537**	-0.0508	0.1485**	-0.0893	0.0725	0.0776
11. AgeLess30	-0.1423**	-0.0020	0.0920	0.0136	0.0080	0.1569***

	7	8	9	10	11
7. OppLoss	1.0000				
8. BusyMonth	0.0261	1.0000			
9. NEmpl	-0.0406	-0.0208	1.0000		
10. Fpct	-0.0435	-0.0131	-0.0307	1.0000	
11. AgeLess30	-0.0633	-0.0329	-0.2613***	0.1866***	1.0000

Notes: This table reports the Pearson correlation coefficients among all of our variables of interest for the estimation of our statistical models. Two-tail statistical significance of the correlation coefficients is indicated as follows: \* = (p<0.10), \*\* = (p<0.05), \*\*\* = (p<0.01).

**Table 3: Nominal and Opportunity Performance Effects of Managerial Discretion**

		(1)	(2)	(3)
		$\Delta PerfScore$	$\Delta PerfScore$	$\Delta PerfScore$
$SubjRew_{i,(t-1)}$	$b_1$	15.851*** (3.80)		15.136*** (3.44)
$SubjPen_{i,(t-1)}$	$b_2$	-11.301*** (-4.61)		-10.780*** (-4.55)
$OppGain_{i,(t-1)}$	$b_3$		11.466** (3.17)	10.846*** (3.39)
$OppLoss_{i,(t-1)}$	$b_4$		-12.750** (-3.01)	-11.643** (-2.64)
$BusyMonth_t$		3.687 (1.43)	4.073 (1.74)	3.733 (1.50)
$NEmpl_t$		0.155 (1.07)	0.117 (0.57)	0.148 (0.86)
$Fpct_t$		16.672 (1.31)	4.157 (0.37)	11.967 (1.18)
$AgeLess30_{i,t}$		3.673 (0.55)	3.450 (0.64)	3.066 (0.53)
$\Delta PerfScore_{i,(t-1)}$		-0.348*** (-7.18)	-0.279*** (-4.39)	-0.307*** (-5.31)
<i>Intercept</i>		-13.295** (-3.08)	-7.165 (-1.44)	-10.785** (-2.57)
<i>N</i>		253	253	253
<i>Adj. R-squared</i>		0.160	0.134	0.188
<i>Department fixed effects</i>		Yes	Yes	Yes
<i>Clustering</i>		Department	Department	Department
<i>Test if <math> b_1 = b_4 </math></i>				0.23 (0.641)
<i>Test if <math> b_2 = b_3 </math></i>				0.00 (0.989)

Notes: Table 3 reports the coefficients estimated for Eq. (1). Estimations are performed using OLS with heteroscedasticity-robust standard errors. For each coefficient, we report t-statistics in parentheses. The dependent variable,  $\Delta PerfScore$ , is calculated as  $PerfScore_{(t)} - PerfScore_{(t-1)}$ . We include department fixed effects and we cluster our standard errors at the department level. Two-tail statistical significance indicated by: \* = (p<0.10), \*\* = (p<0.05), \*\*\* = (p<0.01). The bottom row reports the results of Wald tests, with which we analyze the statistical significance between the indicated coefficients. The null hypothesis is that the difference between the absolute value of the coefficients is not statistically different from zero. A p-value (reported in brackets) below 0.10 (0.05) [0.01] would allow us to reject the null with confidence at the 90% (95%) [99%] level, two-tailed.

**Table 4: Persistence of the Nominal and Opportunity Effects**

		(1)	(2)	(3)
		$\Delta PerfScore$	$\Delta PerfScore$	$\Delta PerfScore$
$SubjRew_{i,(t-1)}$	b <sub>1</sub>	15.909*** (3.85)		15.698*** (3.36)
$SubjRew_{i,(t-2)}$	b <sub>2</sub>	-9.651*** (-3.34)		-4.738 (-1.10)
$SubjPen_{i,(t-1)}$	b <sub>3</sub>	-10.232*** (-4.28)		-8.630*** (-3.79)
$SubjPen_{i,(t-2)}$	b <sub>4</sub>	8.741** (2.63)		8.027** (2.96)
$OppGain_{i,(t-1)}$	b <sub>5</sub>		11.135** (2.88)	9.415** (3.05)
$OppGain_{i,(t-2)}$	b <sub>6</sub>		15.714** (2.30)	16.233** (2.23)
$OppLoss_{i,(t-1)}$	b <sub>7</sub>		-11.180** (-2.38)	-7.515 (-1.18)
$OppLoss_{i,(t-2)}$	b <sub>8</sub>		-9.542** (-2.29)	-8.352* (-2.01)
$BusyMonth$		3.810 (1.55)	3.854 (1.67)	3.613 (1.48)
$NEmpl$		0.136 (0.80)	0.138 (0.61)	0.168 (0.90)
$FPct$		9.780 (0.73)	2.603 (0.25)	5.567 (0.53)
$AgeLess30_{i,t}$		4.941 (0.83)	1.452 (0.26)	1.964 (0.34)
$\Delta PerfScore_{i,(t-1)}$		-0.305*** (-5.48)	-0.337*** (-4.71)	-0.338*** (-5.03)
$Intercept$		-10.706** (-2.36)	-6.123 (-1.17)	-8.593* (-1.88)
$N$		253	253	253
$Adj. R-squared$		0.181	0.169	0.228
$Department\ fixed\ effects$		Yes	Yes	Yes
$Clustering$		Department	Department	Department

Notes: Table 4 reports the coefficients estimated for Eq. (1) augmented with the inclusion of lagged variables for both the nominal effect (subjective rewards and penalties) and the opportunity effect (opportunity gains and losses) of managerial discretion. Estimations are performed using OLS with heteroscedasticity-robust standard errors. For each coefficient, we report t-statistics in parentheses. The dependent variable,  $\Delta PerfScore$ , is calculated as  $PerfScore_{(t)} - PerfScore_{(t-1)}$ . We include department fixed effects and we cluster our standard errors at the department level. Two-tail statistical significance indicated by: \* = (p<0.10), \*\* = (p<0.05), \*\*\* = (p<0.01).

**Table 5: Expanded Measure of Opportunity Gains and Losses**

	(1)	(2)
	$\Delta PerfScore$	$\Delta PerfScore$
$OppGainExp_{i,(t-1)}$	12.055*** (4.06)	11.710*** (4.32)
$OppLossExp_{i,(t-1)}$	-1.997 (-1.13)	-1.331 (-0.76)
$SubjRew_{i,(t-1)}$		14.950*** (3.48)
$SubjPen_{i,(t-1)}$		-9.487*** (-4.34)
$BusyMonth_t$	4.055 (1.71)	3.735 (1.47)
$NEmpl_t$	-0.023 (-1.11)	-0.007 (-0.28)
$FPct_t$	0.497 (0.29)	2.566 (1.49)
$AgeLess30_{i,t}$	-1.082 (-0.91)	-1.337 (-1.14)
$\Delta PerfScore_{i,(t-1)}$	-0.275*** (-4.74)	-0.300*** (-5.76)
<i>Intercept</i>	-2.048 (-1.59)	-3.320*** (-3.78)
<i>N</i>	253	253
<i>Adj. R-squared</i>	0.118	0.168
<i>Department fixed effects</i>	YES	YES
<i>Clustering</i>	Department	Department

Notes: Table 5 reports the results of the estimation of Eq. (1). However, in this model we use the expanded definition of opportunity gains (losses) as described in Figure 3. This expanded definition allows us to consider the reaction of *any* department that scored greater (lower) performance with respect to the objective metrics than the actual recipient of the reward (penalty) did. With this expanded definition, we analyze whether subsequent performance reactions are driven by having scored better (worse) than the recipient of the reward (penalty) independent of being ranked first (last) based on objective performance metrics. Estimations are performed using OLS with heteroscedasticity-robust standard errors. For each coefficient we reported t-statistics in parentheses. The dependent variable,  $\Delta PerfScore$ , is calculated as  $PerfScore_{(t)} - PerfScore_{(t-1)}$ . We include department fixed effects and we cluster our standard errors at the department level. Two-tail statistical significance indicated by: \* = (p<0.10), \*\* = (p<0.05), \*\*\* = (p<0.01).



**Table 6: Test of Alternative Explanations: Determinants of Use of Managerial Discretion**

	(A)	(B)
	<i>SubjPen</i>	<i>SubjRew</i>
<i>StartYear</i>	0.473 (0.37)	0.789 (1.00)
<i>EndYear</i>	0.610 (0.49)	-0.405 (-0.32)
<i>NEmpl</i>	-0.102 (-1.20)	-0.126 (-0.62)
<i>FPct</i>	16.125** (2.17)	-1.042 (-0.19)
<i>AgeLess30</i>	3.507 (0.92)	1.249 (0.29)
<i>BusyMonth</i>	0.191 (0.16)	0.290 (0.51)
<i>Intercept</i>	-9.968 (-1.61)	-1.998 (-0.71)
<i>N</i>	200	200
<i>Pseudo R-squared</i>	0.136	0.050
<i>Department fixed effects</i>	YES	YES

Notes: Table 6 reports the results of the estimation of Eq. (2). Estimations are performed using logit with heteroscedasticity-robust standard errors. For each coefficient, we report t-statistics in parentheses. We include department fixed effects and we cluster our standard errors at the department level. Two-tail statistical significance indicated by: \* = (p<0.10), \*\* = (p<0.05), \*\*\* = (p<0.01).

**Table 7: Test of Alternative Explanations: Reward (Penalty) Effects**

	$\Delta PerfScore$
$Reward_{i,(t-1)}$	-7.967 (-1.29)
$Reward*SubjRew_{i,(t-1)}$	23.216** (2.52)
$Penalty_{i,(t-1)}$	-0.396 (-0.18)
$Penalty*SubjPen_{i,(t-1)}$	-11.036*** (-4.57)
$BusyMonth_t$	3.720 (1.45)
$NEmpl_{i,t}$	0.147 (0.98)
$FPct_{i,t}$	17.740 (1.35)
$AgeLess30_{i,t}$	3.368 (0.51)
$\Delta PerfScore_{i,(t-1)}$	-0.331*** (-9.11)
<i>Intercept</i>	-13.110** (-3.10)
<i>N</i>	253
<i>Adj. R-squared</i>	0.162
<i>Department fixed effects</i>	Yes
<i>Clustering</i>	Department

Notes: Table 7 reports the results of the estimation of Eq. (3). Estimations are performed using OLS with heteroscedasticity-robust standard errors. For each coefficient, we report t-statistics in parentheses. The dependent variable,  $\Delta PerfScore$ , is calculated as  $PerfScore_{(t)} - PerfScore_{(t-1)}$ . We include department fixed effects and we cluster our standard errors at the department level. Two-tail statistical significance indicated by: \* = (p<0.10), \*\* = (p<0.05), \*\*\* = (p<0.01).

**Table 8: Test of Alternative Explanations: Rank-first and Rank-last Effects**

	$\Delta PerfScore$
$RankLast_{i,(t-1)}$	1.084 (0.32)
$RankLast*OppGain_{i,(t-1)}$	10.426*** (4.59)
$RankFirst_{i,(t-1)}$	-10.479 (-1.50)
$RankFirst*OppLoss_{i,(t-1)}$	-3.249 (-0.47)
$BusyMonth_t$	4.085 (1.78)
$NEmpl_{i,t}$	0.106 (0.49)
$FPct_{i,t}$	4.093 (0.33)
$AgeLess30_{i,t}$	3.629 (0.64)
$\Delta PerfScore_{i,(t-1)}$	-0.252*** (-4.53)
<i>Intercept</i>	-6.586 (-1.21)
<i>N</i>	253
<i>Adj. R-squared</i>	0.143
<i>Department fixed effects</i>	Yes
<i>Clustering</i>	Department

Notes: Table 8 reports the results of the estimation of Eq. (4). Estimations are performed using OLS with heteroscedasticity-robust standard errors. For each coefficient, we report t-statistics in parentheses. The dependent variable,  $\Delta PerfScore$ , is calculated as  $PerfScore_{(t)} - PerfScore_{(t-1)}$ . We include department fixed effects and we cluster our standard errors at the department level. Two-tail statistical significance indicated by: \* = (p<0.10), \*\* = (p<0.05), \*\*\* = (p<0.01).

**Table 9: Test of Motivation Effects: Experimental Evidence**

Panel A: Combined Effects

	(1)	(2)	(3)
	$\Delta Effort$	$\Delta Effort$	$\Delta Effort$
<i>SubjRew</i> <sub><i>i,t-1</i></sub>	0.421*** (2.64)		0.360** (2.14)
<i>SubjPen</i> <sub><i>i,t-1</i></sub>	0.437*** (2.80)		0.376** (2.28)
<i>OppGain</i> <sub><i>i,t-1</i></sub>		0.034 (0.17)	0.219 (1.05)
<i>OppLoss</i> <sub><i>i,t-1</i></sub>		-0.767*** (-3.81)	-0.582*** (-2.75)
<i>Female</i> <sub><i>i</i></sub>	0.327*** (2.68)	0.311** (2.55)	0.308** (2.54)
<i>Age</i> <sub><i>i</i></sub>	-0.009 (-1.54)	-0.009 (-1.62)	-0.009 (-1.52)
<i>Manager</i> <sub><i>i</i></sub>	0.016 (0.13)	0.034 (0.28)	0.026 (0.21)
<i>Intercept</i>	1.370*** (6.19)	1.629*** (7.49)	1.428*** (6.24)
<i>N</i>	505	505	505
<i>Adj. R-squared</i>	0.031	0.037	0.047

Panel B: Cross-sectional Variation Based on Interpretation of Managerial Discretion

	(1)	(2)	(3)
	$\Delta Effort$	$\Delta Effort$	$\Delta Effort$
<i>SubjRew</i> <sub><i>i,t-1</i></sub>	0.483*** (3.15)		0.426** (2.77)
<i>SubjPen</i> <sub><i>i,t-1</i></sub>	0.892*** (5.58)		0.838*** (5.25)
<i>OppGain</i> <sub><i>i,t-1</i></sub>		0.366 (1.79)	0.557 (2.78)
<i>OppLoss</i> <sub><i>i,t-1</i></sub>		-0.228 (-1.02)	-0.034 (-0.16)
<i>SubjRew</i> <sub><i>i,t-1</i></sub> * <i>NegInt</i> <sub><i>i</i></sub>	-1.468** (-2.22)		-1.462** (-2.34)
<i>SubjPen</i> <sub><i>i,t-1</i></sub> * <i>NegInt</i> <sub><i>i</i></sub>	-2.455*** (-7.44)		-2.468*** (-7.91)
<i>OppGain</i> <sub><i>i,t-1</i></sub> * <i>NegInt</i> <sub><i>i</i></sub>		-2.225*** (-4.43)	-2.230*** (-4.75)
<i>OppLoss</i> <sub><i>i,t-1</i></sub> * <i>NegInt</i> <sub><i>i</i></sub>		-2.005*** (-4.87)	-2.028*** (-5.28)
<i>Female</i> <sub><i>i</i></sub>	0.329*** (2.84)	0.280** (2.38)	0.278** (2.53)
<i>Age</i> <sub><i>i</i></sub>	-0.006 (-1.08)	-0.007 (-1.27)	-0.003 (-0.65)
<i>Manager</i> <sub><i>i</i></sub>	0.021 (0.18)	0.000 (0.00)	0.046 (0.41)
<i>Intercept</i>	1.279*** (6.10)	1.578*** (7.54)	1.283*** (6.20)
<i>N</i>	505	505	505
<i>Adj. R-squared</i>	0.133	0.111	0.225

Notes: Table 9, Panel A, reports the results of the estimation of Eq. (5). Panel B reports the estimation results of Eq. (6). The sample includes cross-sectional observations of a sample of 505 participants in our experiment. Estimations are performed using OLS. For each coefficient, we report t-statistics in parentheses. Two-tail statistical significance indicated by: \* = (p<0.10), \*\* = (p<0.05), \*\*\* = (p<0.01).