Compensation Interdependence and Performance Consequences of Managerial Discretion

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Abstract:
We examine the performance consequences of managerial discretion when compensation payoffs are interdependent – that is, rewards or penalties awarded to some employees cause others to miss out on them. Using proprietary data from a company that awards monthly rewards and penalties, we find evidence of a *nominal* and an *opportunity* effect associated with managerial discretion overriding objective performance measures. The former refers to performance consequences associated with workers that received rewards or penalties due to managerial discretion. The latter refers to performance consequences associated with workers that would have received rewards or penalties in absence of managerial discretion. In further tests, we examine two potential explanations for these performance consequences. Our findings provide important insights for the design of incentive systems involving managerial discretion.

Keywords: Informativeness, Managerial Discretion, Motivation, Performance Effects, Reciprocity, Rewards and Penalties.

JEL Codes: M12, M41, M52

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I. INTRODUCTION

Many organizations incorporate managerial discretion[1] in employee compensation decisions. Prior research describes a number of potential benefits of using managerial discretion as part of the design of compensation systems, especially in settings where effective complete contracting is impeded by environmental unpredictability, or noise in the measurement of performance (Baker et al 1994; Ittner et al. 2003; Gibbs et al. 2004; Ederhof 2010; Hoppe and Moers 2011; Bol et al. 2015). Nonetheless, managers use discretionary adjustments in performance evaluations less frequently than theory would predict (Höppe and Moers 2011; Bol et al. 2015). Among the proposed reasons hindering the use of managerial discretion in practice is the concern about how it might influence future performance (Gibbs et al. 2004; Moers 2005; Bol et al. 2015; Abernethy et al. 2018). Prior literature shows that managers consider the interdependence of performance rewarding systems when applying managerial discretion (Bol et al. 2015). Performance-related payoffs are interdependent when subjective adjustments awarding rewards or penalties to some employees cause others to miss out on them.[2] In this study, we explore whether and how the use of managerial discretion influences future performance when compensation outcomes are interdependent.[3]

[1] The terms managerial discretion and subjectivity are used interchangeably in this study.

[2] For example, employee performance evaluations and compensation decisions are highly interdependent in the presence of bonus pools or forced rankings (or tournaments) when positive discretionary adjustments to an employee's compensation automatically implies negative adjustments to another employee's compensation. 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 de-motivating effects arising from missing out on a potential reward due to the application of positive discretionary adjustments benefiting others.

[3] Empirical evidence on the relation between the use of managerial discretion and future performance is scant in the literature. Exceptions include Gibbs et al. (2004) which, based on data from car dealerships, shows that subjective bonuses are associated with pay satisfaction, productivity, and profitability. Ederhof (2010) studies a hand-collected sample of CEO compensation contracts, and documents a positive association between CEO discretionary bonus payouts and the change in the following periods' accounting performance after controlling for observable financial performance. Abernethy et al (2018) find that higher departmental performance associated with managers that voluntarily share their bonus with their subordinates and distribute their bonus in a way that reflects actual cooperation.

We posit that compensation interdependence gives rise to two distinct performance effects of managerial discretion: a *nominal effect* and an *opportunity effect*. The former refers to performance effects of discretionary adjustments associated with employees that directly gained (lost) by being awarded a reward (penalty) subjectively.[4] The latter relates to the performance effects associated with employees who did *not* receive an expected reward (penalty) that was subjectively awarded to someone else.

We obtain data from a company where management has discretion to override objective performance outcomes to assign monetary rewards and penalties. In each month of production, members of the department with the highest performance receive a monetary bonus, while members of the worst performing department are penalized with deductions from their pay. The reward/penalty decision is made by top executives of the firm. While the company utilizes a set of objective performance metrics to assess operational performance, management has the ability to subjectively override the rankings and assign the rewards (penalties) to departments that did *not* rank first (last) in the distribution of the objective metrics. Subjective criteria informing the decision or the weights assigned to objective and subjective elements of performance are not predetermined.[5] At the end of each month, management discloses to all members of the organization both the objective performance of each department and the ultimate awardees of the reward and penalty.

Our research setting allows us to obtain empirical measures for the nominal and opportunity effect resulting from managerial discretion. Examining the subsequent performance

[4] 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 that were affected due to the use of subjectivity in rewarding CEOs.

[5] Interviews with members of the management team indicated that subjective evaluations generally take into consideration the attitude, morale, and the influence of uncontrollable factors that might have impacted objective performance. We provide more details in Section 3.

of workers that are awarded a reward or a penalty through subjective overriding of the observable performance ranking (hereafter, *actual* awardees) sheds light on the nominal effect, whereas examining the subsequent performance of those that fail to receive rewards and penalties due to subjective adjustments (hereafter, *would-be* awardees) allows us to observe the opportunity effect.[6]

Results of statistical tests indicate that discretionary adjustments are indeed related to future performance. In particular, we find evidence of the nominal effect in that actual awardees of subjective rewards (penalties) exhibit subsequent performance improvements (declines). Ederhof (2010) documents that CEO discretionary bonus payouts are associated with improvements in firms' accounting performance in the following period. Our findings extend this result to rank-and-file employees and to cases in which the outcome of the subjective performance evaluation is a penalty and not a bonus. We also document performance consequences associated with the opportunity effect of managerial discretion. Specifically, performance of would-be awardees of a reward declines, while would-be awardees of a penalty exhibit significant subsequent performance improvements.

We posit that there are two plausible explanations for why the use of subjectivity may be associated with subsequent performance. First, observed changes in objective performance could be an artifact of subjectivity correcting noisy performance measures to reflect the actual effort of the agents. Prior literature posits that integrating objective performance measures with ex-post assessments of non-contractible performance information improves the alignment between agent effort and payoff (Ederhof 2010; Gibbs et al 2004; Baker et al 1994; Baiman and Rajan 1995). To the extent that the use of subjectivity is informative of the agent's actual present performance, it

[6] We will refer to cases in which there is no subjective adjustment and the awardees of the reward (penalty) rank at the top (bottom) based on objective performance as *objective* awardees.

would likely predict future performance (i.e. the *informativeness channel*).[7] Second, the use of subjectivity in the determination of performance-related payoffs may trigger agents' psychological responses if they interpret discrepancies between actual payoffs and objective performance rankings as favorable (unfavorable) treatment (Akerlof, 1984; Fehr and Gachter 1995; Falk and Fischbacher 2006). To the extent that agents assign significant weight to objective measures of performance when forming expectations, they may experience subjective adjustments as gains (losses) (Koszegi and Rabin 2006). If so, consistent with predictions of reciprocity and equity theory (Akerlof 1982, 1984; Falk and Fischbacher 2006), agents adjust future effort (and, consequently, impact performance) in an attempt to rebalance the relation between effort and expected payoff in future periods (i.e. the *motivation channel*).

We conduct several tests to examine the informativeness and motivation explanations of the relation between managerial discretion and subsequent performance. 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 considering *any* department that ranked higher (lower) than the actual awardee of the subjective reward (penalty) with respect to the observable metrics. We observe, on average, a significant opportunity effect for those department 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, the lack of symmetry with respect to (1) the

[7] For example, subjectivity could be used to compensate for the influence of stochastic events impacting objective performance that are not likely to repeat in the following period. Alternatively, managers could subjectively assess and reward employees for their effort on soft elements of performance (such as initiatives aiming at improving employee's morale, satisfaction, or organizational commitment) that may produce results in the long term.

persistence between the nominal and opportunity effect, and (2) with respect to the performance effect among departments experiencing opportunity gains or losses indicates that the informativeness channel alone does not fully explain the relation between the use of managerial discretion in the determination of performance-related payoffs and subsequent performance. Finally, we design a randomized controlled experiment to directly test the motivation channel. Participants recruited through Amazon's Mechanical Turk (M-Turk) were exposed to a workplace scenario where the incentive system closely reproduced the one in place in our field setting. We find evidence of a motivating effect of managerial discretion for actual awardees of rewards, and a de-motivating effect for would-be awardees of rewards. Additionally, free-text answers provide further evidence of psychological reactions in line with our theory-based predictions. Collectively, our findings suggest that both the informativeness and the motivation channels operate simultaneously.

We conduct additional tests to address concerns about possible alternative explanations. First, we show that subjective adjustments are not correlated with observable departmental characteristics alleviating concerns that management's discretion might reflect bias toward certain functions or groups of workers (Prendergast and Topel 1993). Another concern relates to the possibility that management might utilize discretionary adjustments to make up for having set excessively difficult (easy) targets. In our setting, 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 the use of management discretion in particular times of the year, especially in the late months. Our statistical tests show no evidence of such trends. Next, we explore whether performance changes associated with the nominal effect of subjectivity might be driven simply by receiving a reward (penalty) independently from its subjective or objective allocation by

management. Our tests rule out this alternative explanation by showing that subsequent performance effects are observed only in 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 opportunity effects of subjectivity might be simply due to being ranked at the top or at the bottom of the objective performance rankings. These performance effects might be due to mean reversion or, alternatively, to relative performance information, independently from missing out on a reward or a penalty. Our tests show that this alternative explanation is inconsistent with our findings.

Our study offers several contributions to the literature and the practice of incentive design. First, our study provides empirical evidence of the influence of subjective allocations of performance-related payoffs on *subsequent* performance. Prior literature has focused for the most part on incentive effects that operate ex-ante, where the individual makes effort choices *in view* of a promised reward or penalty (Campbell 2008; Hannan et al. 2005; Libby and Lipe 1992; Lazear and Rosen 1981). Additionally, while prior research has primarily focused on incentive effects related to members of the organization that are *directly* affected by managerial discretion – that is, workers who *receive* a subjective reward (penalty), we explore the consequences of managerial discretion for workers that are *indirectly* impacted by the subjective decision via opportunity effects – that is, those that *fail to receive* a reward (penalty) as a result of managerial discretion. The possibility of these effects was discussed in prior literature (e.g. Bol et al 2015; Moers 2005), but no formal empirical tests has been insofar performed. Second, we extend the empirical literature on penalties. Extant research has addressed subjectivity predominantly from a bonus-allocation standpoint, limiting the consideration of subjective penalties to a minimum (Rajan and Reichelstein 2009; McLeod 2003). Important research stemming from the seminal work of

Kahneman and Tversky (1979) and Thaler (1980) has shown that individuals do not experience rewards and penalties as symmetrical changes in utility (Luft 1994; Franciosi et al. 1996; Kahneman et al. 1990). Therefore, the effects of subjective allocation of rewards on workers' effort documented by the literature may not be directly extended to the case of penalties. Our study provides insights into the consequences of using discretionary adjustments associated with respect to both rewards and penalties. Finally, our findings are relevant to the practice of incentive systems design. Even though prior research documents individual preferences for incentive systems framed in positive terms over systems associated with penalties (Luft 1994; Kahneman and Tversky 1979; Lazear 1991; Christ et al. 2012), incentive systems including both reward and penalty mechanisms continue to be observed and to include important elements of subjective evaluation.[8] Our study sheds light on important consequences that might influence the overall effectiveness of these types of incentives.

The remainder of this paper proceeds as follows. In Section II, we review the prior literature and develop our main hypotheses. In Section III, we describe the field setting and the data. Section IV describes the research design and reports the results of statistical tests of our main hypotheses. Section V presents the results of our tests of possible alternative explanations. The last section concludes.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Analytical work on performance evaluation systems posits that, in settings where objective performance metrics are imperfect signals of the worker's effort, incentive systems integrating objective metrics with subjective assessments are superior to those based on objective measures

[8] Recent examples include GE's vitality curve, whereby bottom ranked performers were demoted or dismissed from the organization, "up-or-out" systems commonly observed in the military or in academia, or forced rankings systems by which the bottom performers are precluded from promotion opportunities or salary increases.

alone (Gibbs et al. 2004; Baker et al. 1994; Baiman and Rajan 1995). Objective performance metrics, albeit informative of workers' effort and therefore useful for incentive contracting (Holmstrom 1979), are imperfect to the extent that they lack sensitivity, precision, or congruence with organizational goals (Feltham and Xie 1994; Banker and Datar 1989), that they allow for gaming (Hopwood 1972; Baker et al. 1994), or that they provide distorted incentives focused excessively on certain aspects of performance and/or the short term (Bol 2007; Baker et al. 1994; Kaplan and Norton 1992; Holmstrom and Milgrom 1991). Subjective assessments of performance can correct many of these shortcomings.

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 ex-ante (Bol 2007; Campbell 2008). Prior research finds that managers use discretionary adjustments in performance evaluations less frequently than theory would predict (Höppe and Moers 2011; 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), considerations of how subjective adjustments may have an impact on multiple employees simultaneously (Bol et al. 2015), or concerns with respect to the impact of managerial discretion on future performance (Moers 2005; Bol et al 2015; Abernethy et al 2018).

In this study we examine how the use of subjectivity is associated with future performance by focusing on ex-post discretionary adjustments of objective performance measurement, whereby

managers can decide whether and how they might utilize subjective assessments in the determination of performance-related payoffs for their subordinates. Our study builds on experimental evidence provided by Bol et al. (2015), who find that supervisors are less likely to apply discretionary adjustments when a positive adjustment to one set of employees results in a negative adjustment to other employees (i.e. high compensation interdependence). Examining responses to post-experimental questions, they find that supervisors operating in high compensation interdependence conditions were concerned about demotivating workers who would miss out on a reward subjectively assigned. To explore this possibility empirically, we examine the performance subsequent to discretionary adjustments for (1) employees directly targeted by the discretionary adjustments (*nominal* effect), and (2) employees impacted through indirect effects of managerial discretion (*opportunity* effect).

The relation between managers' discretionary adjustments and future performance may operate through an *informativeness* channel. To the extent that ex-post discretionary adjustments are informed by signals representing the workers' *actual* effort, subjectivity can operate as a simple correction of the shortcomings of objective measures to render more accurate representations of workers' performance. For example, if stochastic environmental factors led to a significant drop (increase) in performance, a reward (penalty) could be assigned subjectively to account for such uncontrollable events.[9] In addition, subjective evaluations might reward workers for effort exerted in the current period to perform activities that might pay off at an undetermined future time (e.g. initiatives to improve employee safety, satisfaction or well-being). Accordingly, the subjective

[9] 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 tend to use subjectivity to account for bad luck more often than they do to account for good luck. The cited experimental study, however, did not involve compensation interdependence between the subordinates.

decision to reward (penalize) performance might entail information reflected in the objective performance of subsequent periods. In sum, the informativeness explanation suggests that actual awardees of a reward (penalty) should exhibit objective performance improvements (declines), and would-be awardees of a reward (penalty) – should exhibit objective performance declines (improvements).[10]

Alternatively, the relation between managers' discretionary adjustments and future performance may operate through a *motivation* channel. The informativeness channel articulated above simply views subjectivity as the use of information available to the manager – albeit not reflected in the objective measure of performance – as a way to correct the imperfection of objective measures. Yet, prior research posits that management's subjective judgment may be interpreted as bias and give rise to psychological reactions impacting workers' subsequent effort allocation choices (Baker et al 1994; Baker et al 1998; Prendergast and Topel 1993; Gibbs et al 2004; Ittner et al 2003; Moers 2005). Objective performance metrics signal the worker's effort to managers and worker alike. While the signal might be imperfect, it contributes to the worker's expectations with respect to performance-related payoffs (i.e. a reward or a penalty). In their theory of reference-dependent preferences, Koszegi and Rabin (2006) posit that individuals interpret any favorable or unfavorable deviations from their rational outcomes' 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 exhibit future undesired behaviors, ranging from lower than expected

[10] Definitions of actual and would-be awardees were described in the introduction section (see page 3).

effort to retaliatory actions that may damage the profitability of the firm (Fehr and Schmidt 1995; Falk and Fischbacher 2006; Krueger and Mas 2009). If subjective rewards and penalties that override objective rankings are respectively perceived as a "gift" and as "injustice", then we should observe positive reactions (i.e. increases in subsequent effort and performance) to the former and negative reactions to the latter as workers attempt to rebalance the economic exchange with their organization (Akerlof 1984; Falk and Fischbacher 2006).

Both theoretical explanations (i.e. the informativeness explanation and the motivation explanation), yield similar empirical predictions with regards to the nominal effect and opportunity effect associated with discretionary adjustments. Therefore, we state our hypotheses as follows:

H1: Nominal Effect: Actual awardees of rewards (penalties) resulting from discretionary adjustments exhibit subsequent performance improvements (declines).

H2: Opportunity Effect: Would-be awardees of rewards (penalties) resulting from discretionary adjustments exhibit subsequent performance declines (improvements).

III. RESEARCH SETTING

To test our hypotheses, we use data from a Chinese manufacturing firm that operates an incentive system based on rewards and penalties to incentivize performance of its 11 departments.[11] In each month of production, the members of the department with highest performance receive a monetary bonus ("reward"), while the members of the worst performing department are penalized with deductions from their pay ("penalty"). Department performance is evaluated based on a scorecard that aggregates multiple objective metrics. Management, however, has the option to override objective performance rankings and to integrate their evaluation with subjective performance assessments to make the final decision about awarding rewards and

[11] We acknowledge that the cited theories refer to individual behavior, whereas our unit of analysis is a collection of individuals (i.e. a department). While in our settings we cannot control for intra-group dynamics, we follow Abernethy et al (2018) 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.

penalties. Interviews with company executives reveal that their subjective considerations generally include assessments of overall attitude and employee morale. However, there are no company guidelines on what these considerations should be and the rationale behind them is not disclosed ex-ante. Monetary rewards and penalties are fixed equivalent amounts, corresponding to about 12% of the average monthly salary. Each month, one department receives a reward and one department receives a penalty.[12] 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.[13] Departments are represented and participate actively in the target setting process. Final targets reflect consensus between management and workers in terms of congruence with strategic goals and appropriateness across all departments. Based on the annual targets, monthly goals are set for each of the 12 months and are not renegotiated until the next annual target setting cycle. Department goals take into consideration their different activities, interdependencies, and contribution to the overall performance of the firm. While monthly goals are department-specific, the negotiation process ensures that they are equally attainable by each department. 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 greater

[12] 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 monetary rewards were assigned subjectively to more than one department in the same month (that is, both the department ranked first based on objective evaluation and another department received a reward), and in five instances monetary penalties were assigned subjectively to more than one department in the same month (that is, both the department ranked last based on objective evaluations and another department were inflicted a penalty). In 5 out of the 25 months, we did not observe any monetary reward (either subjective or otherwise), while monetary penalties were assigned in every month in our sample period. Our main inferences are not impacted by these cases (Refer to footnote 20 for further details).

[13] Each department is assigned multiple monthly goals relative to financial and nonfinancial aspects of performance, as well as goals related to process improvement and human resources development.

amounts of points when they exceed their targets. Every month, aggregate performance scores for each department are publicly disclosed within the firm.

Monetary rewards and penalties are assigned at the end of each month of production. There is no carry-over of performance between months. That is, performance evaluations in each month relate exclusively to the results achieved by each department in that month, with no consideration of prior performance. However, management can choose to integrate subjective assessments in selecting departments to reward and penalize. Management publicly discloses what departments are awarded rewards or penalties. Therefore, when subjective evaluations override the objective performance ranking, all employees may observe discrepancies between the quantitative rankings and the ultimate reward (penalty) receivers. Periodic town hall meetings,[14] during which department performance is presented and discussed interactively, allow employees to inquire about the criteria used in the most recent determination of the ultimate awardees of rewards and penalties.

IV. RESEARCH DESIGN AND HYPOTHESES TESTING

Research Design

Our research setting allows us to obtain empirical measures of the nominal and opportunity effect as management discretion results in observable discrepancies between the actual recipients of the reward and penalty and the distribution based on objective performance metrics. Figure 1 provides a graphical illustration of our empirical proxies for the nominal and opportunity effects of managerial discretion. Figure 1 illustrates a hypothetical example of an organization including 6 departments. The ordering in the left column represents the ranking based on objective rankings. If, as described in the right column of the diagram, managerial discretion results in a reward for the second-ranked department (actual awardee of the reward), and a penalty for the fifth-ranked

[14] A town hall meeting in these settings refers to a site-wide meeting involving all members of the organization.

department (actual awardee of the penalty), the first-ranked department experiences an opportunity loss whereas the last-ranked department experiences and opportunity gain. To examine the nominal effect of subjectivity, we study the subsequent performance of actual awardees – i.e. departments 2 and 5 in the example in Figure 1. To examine the opportunity effect of subjectivity, we examine the subsequent performance of would-be awardees – i.e. departments 1 and 6 in the illustrative example in Figure 1.[15]

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

To test our main hypotheses (*H1* and *H2*), 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 month *(t-1)* and month *t*.[16] Nominal effects of managerial discretion are captured by coefficients β_1, associated with $SubjRew_{i,(t-1)}$, an indicator variable assuming value 1 if department *i* in month *(t-1)* was an actual awardee of a subjective reward, and zero otherwise, and β_2, associated with $SubjPen_{i,(t-1)}$, an indicator variable assuming value 1 if department *i* in month *(t-1)* was an actual awardee of a subjective penalty, and zero otherwise. Opportunity effects of managerial discretion are captured by coefficients β_3, associated with $OppGain_{i,(t-1)}$, an indicator variable assuming value 1 if department *i* in month *(t-1)* was a would-be awardee of a penalty, and zero otherwise, and β_4,

[15] In our empirical tests we further distinguish between actual awardees of rewards and penalties. We refer to the distinct cases with respect to the nominal effect as subjective rewards (i.e. department 2 in the illustrative example in Figure 1) and subjective penalties (i.e. department 5 in the illustrative example in Figure 1), respectively. Similarly, we also distinguish between would-be awardees of rewards and penalties. We refer to the distinct cases with respect to the opportunity effect as opportunity losses (i.e. department 1 in the illustrative example in Figure 1) and opportunity gains (i.e. department 6 in the illustrative example in Figure 1), respectively.

[16] 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.

associated with $OppLoss_{i,(t-1)}$, an indicator variable assuming value 1 if department *i* in month *(t-1)* was a would-be awardee of a reward, and zero otherwise.

Our control variables include $BusyMonth_t$, an indicator variable assuming value 1 if month *t* is considered to be a month of high production, and zero otherwise;[17] $NEmpl_{i,t}$, representing the number of employees working in department *i* in month *t*; $FPct_{i,t}$, which measures the percentage of female employees working in department *i* in month *t*; $AgeLess30_{i,t}$, which captures the percentage of employees younger than 30 years of age working 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 ($\Delta PerfScore_{(t-1)}$). Appendix 1 contains a description of all variables of interest for this study.

Data

Our sample includes 25 monthly observations spanning three consecutive fiscal years for each of the 11 departments of the firm. 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 (μ = -0.612) but exhibits significant variation (σ = 16.103). Although targets for each department are set in a way that achieving all goals awards the department 100 points, departments can exceed expectations and obtain a performance score greater than 100.[18] During our sample period, the average department received a reward (penalty) 2.182 (2.727) times. Monetary rewards and penalties were assigned subjectively about half of the times in our sample period.[19]

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

[17] The factory experiences seasonal volumes of demand with peaks of orders concentrated in specific months of the year.
[18] Because of this characteristic, objective performance measures in our setting are not subject to ceiling effects.
[19] Perusal of our data indicated no significant differences in the documented relations associated with cases where no rewards (penalties) or more than one reward (penalty) were awarded.

Pairwise correlation coefficients between our main variables of interest are reported in Table 2. Departments with a greater percentage of female employees exhibit worse performance scores ($\rho = -0.154$, $p < 0.05$) and higher likelihood of receiving a penalty ($\rho = 0.149$, $p < 0.05$). Departments with a high percentage of young employees (*AgeLess30*) are more likely to perform at a lower level ($\rho = -0.142$, $p < 0.05$) but are also more likely to avoid being penalized despite scoring the lowest objective performance ($\rho = 0.157$, $p < 0.01$). This is probably due to managers' consideration of young workers having lower expertise and being in the steeper portion of their learning curve.

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

Tests of Main Hypotheses

Table 3 reports the results of our main tests of *H1* and *H2*. Our first hypothesis (*H1*) relates to the nominal effect of managerial discretion, and predicts that subjective rewards and penalties are associated with future performance. Our second hypothesis (*H2*) relates to the opportunity effect of managerial discretion, and predicts that opportunity gains and losses are associated with future performance. We estimated Eq. (1) using heteroskedasticity robust OLS. To account for idiosyncratic department level characteristics, we included department fixed effects. To account for correlation in the behaviors of department teams over time, we clustered standard errors by department.[20] Column (1) reports the results of estimating Eq. (1) limited to the nominal effects (*H1*). In line with our predictions, we find that actual awardees of subjective rewards exhibit a significant subsequent improvement in objective performance ($\beta_1 = 15.851$, $p<0.01$), while the objective performance of actual awardees of subjective penalties declines in the following month

[20] Panel data analyses often raise concerns associated with 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, large number of subjects and small number of periods) In our case, however, *t* is more than double *n*, thus reducing the incidental parameter concern to negligible levels (Nickell 1981).

(β_2= -11.301, p<0.01). Column (2) reports the results of estimating Eq. (1) limited to the opportunity effects (*H2*). As predicted, opportunity gains exhibit performance improvements in the period subsequent to the discretionary adjustment (β_3= 11.466, p<0.05), while opportunity losses exhibit subsequent performance declines (β_4= -12.750, p<0.05). The estimation of the full specification of Eq. (1) is reported in column (3), which continues to support both our main hypotheses. We conclude that managerial discretion in the determination of performance-related payoffs is indeed associated with future performance, independently from whether the gain (loss) comprises of actual changes in workers' wealth or is defined only in opportunity terms.[21]

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

While supporting our predictions with respect to the directional effects of managerial discretion on subsequent performance, our results reported in Table 3 do not shed any light on what the underlying mechanism might be. Next, we perform a battery of tests to examine the role of the informativeness and motivation channels in explaining the observed performance effects from managerial discretion.

Informativeness and Motivation Channel

In section II, we proposed two potential theoretical explanations – the *informativeness* and *motivation* channel – for our predictions. To explore the role of these channels in explaining our reported performance effects, we conduct three additional tests. First, we examine whether the nominal effect and the opportunity effect differ with respect to their persistence. To do so, we augment the specification of Eq. (1) with lagged values of subjective rewards/penalties and opportunity gains/losses. Based on the informativeness explanation, the performance effects

[21] All our results are robust to the influence of outliers. We repeated all our tests winsorizing the dependent variables at the 1st and 99th, 5th and 95th, and at the 10th and 90th percentile in each month and found results (untabulated) that are consistent with those reported in this manuscript.

associated with the nominal effect should mirror those of the opportunity effect as the discretionary adjustment entails information correcting for the performance of actual and would-be awardees simultaneously. However, estimation results reported in Table 4 show that performance changes associated with the nominal effect reverse or disappear in month (*t+2*), whereas performance changes associated with the opportunity effect persist.[22] This asymmetry in the persistence of nominal and opportunity effects suggests that the informativeness channel is not sufficient to explain the observed changes in performance due to managerial discretion.

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

Second, we further examine the intensity of the opportunity effect by adopting a broader definition of opportunity gains and losses. Whereas, in our research setting, subjective performance evaluations generally give rise to a single actual awardee of the reward or penalty, *any* department that ranked higher (lower) than the actual awardee of the reward (penalty) in the objective performance rankings can be classified as a would-be awardee. This expanded definition of opportunity gains and losses is graphically illustrated in Figure 2, which relates to the same hypothetical example based on 6 departments previously discussed. If managerial discretion results in a subjective reward (penalty) to department 3 (4), then departments 1 and 2 (5 and 6) experience an opportunity loss (gain) because each of them scored higher (lower) points with respect to objective performance compared with the actual awardee.

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

Based on the informativeness explanation, the decision to override a particular distribution of objective rankings should reflect a correction for its shortcomings. Therefore, we should observe

[22] Perusal of our data does not indicate serial correlation between receiving awards or penalties at the department level. In addition, there are no cases in which a department received a discretionary reward or penalty for two months in a row.

performance effects associated with the opportunity effect even with the expanded definition. On the other hand, based on the motivation explanation, departments that are ranked first (last) should experience the strongest opportunity loss (gain), as their top (bottom) ranking informs their rational expectation to receive a monetary reward (penalty). The opportunity effect should be weaker for those that were not ranked first (last) but still ranked higher (lower) than the actual awardee of the reward (penalty). Therefore, the motivation channel suggests that the performance effects associated with opportunity gains and losses using the expanded definition should be weaker than those associated with the previously used narrower definition.

We estimate Eq. (1) replacing *OppGain* and *OppLoss* with indicator variables capturing the expanded definition. The variable $OppGainExp_{i,(t-1)}$ ($OppLossExp_{i,(t-1)}$) is defined as an indicator variable assuming value 1 if department *i* is ranked below (above) the department receiving the actual penalty (reward), and zero otherwise. Estimations reported in column 1 of Table 5 focus on the expanded opportunity effects alone, while those in column (2) 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 (β_1= 11.710, p<0.01) 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 that were saved from a penalty, the opportunity loss effect seems to matter only to those that were ranked at the top and failed to receive the reward. Moreover, the lack of symmetry between the opportunity effect associated with gains and losses points to individuals experiencing gains and losses in different ways, in line with the prediction of behavioral economics theory (Luft 1994; Franciosi et al. 1996; Kahneman et al. 1990). Taken together, these results further suggest that the informativeness channel is not the only mechanism operating in the relation

between subjectivity and subsequent performance, as asymmetric outcomes associated with the use of subjectivity to assign a reward or a penalty would be incompatible with the informativeness explanation.

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

Third, we designed a randomized controlled experiment to isolate the performance effects associated uniquely with the motivation channel. We recruited 505 participants using Amazon's Mechanical Turk (M-Turk). Each participant was presented with a brief description of the purpose of the experiment and asked to sign an informed consent form (see Appendix 2 for details about the experiment materials). All participants that opted into participating to the simulation read the same description of an incentive system mirroring the one in place in our research setting. Participants would assume the role of a member of a team whose performance would be evaluated based on a combination of objective and subjective factors. The best (worst) performing team would be awarded 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 award them a reward (penalty) after considering their objective performance and subjective assessments. Participants were randomly assigned to one of ten conditions representing the following scenarios: (objective rewards (penalties); subjective rewards (penalties) for workers ranking second (second to the last); subjective rewards (penalties) for workers ranking far from the top (bottom); missing out on a reward (penalty) while ranking at the top (bottom); missing out on 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 7-point scale ranging from -3 ("a lot less") to +3 ("a lot more"), where the midpoint 0 represented the status quo ("same

effort"). Each participant had the possibility to add free-text comments to provide a justification for their decision. 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.[23]

To examine the performance effects explained by the motivation channel, we estimate the following equation:

$$\Delta Effort_{i,t} = \alpha + \beta_1 SubjRew_{i,(t-1)} + \beta_2 SubjPen_{i,(t-1)} + \beta_3 OppGain_{i,(t-1)} + \beta_4 OppLoss_{i,(t-1)} + \beta_5 Female_i + \beta_5 Age_i + \beta_5 Manager_i + \varepsilon \quad (2)$$

where $\Delta Effort$ represents the individual participant's response indicated in the simulation; *Female* is an indicator variable assuming value 1 if the participant identified as a female, and 0 otherwise; *Age* captures the age of the participant in years, and *Manager* is an indicator variable assuming value 1 if the participant declared to have had managerial experience with supervision responsibilities.[24] Our variables of interest (*SubjRew*, *SubjPen*, *OppRew*, *OppPen*) are defined consistently with the variables used in our main tests.

Table 6 reports the results of our OLS estimation of Eq. (2). We find significant motivation effects associated with actual and would-be awardees of subjective rewards. In particular, our experimental results corroborate our field-based findings with respect to positive performance effects associated with actual awardees of subjective rewards, and negative performance effects associated with workers experiencing opportunity losses. Interestingly, however, the experiment yields different results with respect to the performance effects associated with actual awardees of subjective penalties, for which we find positive reactions, and workers experiencing opportunity

[23] The average duration of the experiment was 3 minutes and 57 seconds. Each participant was paid $0.50.
[24] 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.

gains, for which our estimated coefficients are not significant.[25] Our perusal of the free-text explanations indicates strong psychological reactions with respect to the subjective allocation of rewards and penalties. Appendix 3 shows a selected a subsample of participants' responses. Collectively, we interpret our findings from the experiment mainly as evidence of the motivation channel resulting from the discretionary adjustments to objective performance rankings. The discrepancy between our experiment results and our field results with respect to subjective penalties and opportunity gains could be evidence that in the field both channels operate simultaneously.

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

V. ALTERNATIVE EXPLANATIONS

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. 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 patterns related to the selection of awardees of discretionary rewards and penalties in their rational expectations. For example, managers could use discretionary adjustments to correct for performance effects stemming from targets that were set at a level that was too aggressive or too easy for a particular department as a way to *unofficially* rebalance the relation between actual effort and aggressiveness of the targets over time.[26] Additionally,

[25] Adopting the expanded definition of subjective rewards and penalties yields similar results to those reported in Table 6.

[26] In our setting, since targets are set annually through a negotiation process involving both management and the departments, whether targets are too aggressive or too easy may not be readily evident in the first few months of the planning cycle. Therefore, management might be less likely to use discretionary adjustments of objective performance to assign rewards and penalties in those months to unofficially revise targets. Instead, should an annual target result to be too aggressive (easy), management is 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) in assigning rewards to departments impacted by such an aggressive (easy) target.

management could be consciously or unconsciously biased toward certain groups of workers 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 awardees is influenced by any of these factors, we examine the likelihood of discretionary assignments of rewards and penalties based on department characteristics and on particular times in the year where management might be more or less likely than normal to assign subjective rewards or penalties to sustain workers' motivation. In our setting, targets are set annually and are not renegotiated during the year. If discretion in payoff allocations was used to correct for unrealistic targets, we should observe different trends in the use of management discretion around the end of the year when targets are negotiated. We use the following model specification to test whether any of these explanations may lead workers to predict the use of managerial discretion:

$$SubjOutcome_{i,t} = \alpha + \beta_1 StartYear_t + \beta_2 EndYear_t + \beta_3 NEmpl_{i,t} + \beta_4 FPct_{i,t} + \beta_5 AgeLess30_{i,t} + \beta_6 BusyMonth_{i,t} + \varepsilon \quad (3)$$

In Eq. (3), the dependent variable $SubjOutcome_{i,t}$ is substituted by either $SubjRew_{i,t}$ or $SubjPen_{i,t}$. $StartYear_t$ is an indicator variable assuming value 1 if month t falls in the first three months of the year, and $EndYear_t$ is an indicator variable assuming value 1 if month t falls in the last three months of the year. All other variables are defined as previously described. We estimate the model using logistic regression including department fixed effects and clustering errors at the department level. The results are reported in Table 7 and indicate no evidence of subjective rewards (penalties) being awarded during times within the planning cycle where management's target readjustment efforts would be more evident. Among the department characteristics, we find that departments with a higher percentage of female workers are more likely to be awarded penalties when they are not ranked last, consistent with the correlation coefficient reported in Table 2.

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

Favoritism in Managerial Discretion

Another concern associated with our setting relates to the possibility that a particular department might be favored (unfavored) by management on a consistent basis. Reasons might include undue influence on management by department team members (i.e. personal connections, political affiliations, etc.). We analyzed the sequence of assignments of subjective rewards and penalties and found no cases of departments receiving a discretionary reward (penalty) in two or more consecutive months.

Alternative Explanation of Nominal Effects: Reward (Penalty) Effects

It is possible that 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, independently from whether the allocation was determined by management's discretion or by reflecting the rankings determined by objective performance. Therefore, we compare changes in performance associated with actual awardees of rewards (penalties) with those associated with departments that received rewards (penalties) in absence of any discretionary adjustments. We estimate the following equation:

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

where $Reward_{i,(t-1)}$ is an indicator variable assuming value 1 if department *i* received a reward (independently from the use of discretion in determining the allocation) in month *(t-1)*, and zero otherwise; $Penalty_{i,(t-1)}$ is an indicator variable assuming value 1 if department *i* received a penalty (independently from the use of discretion in determining the allocation) in month *(t-1)*, and zero otherwise. In this specification, the interpretation of the coefficient associated with the variable

Reward (*Penalty*) represents the effect on subsequent performance of receiving a reward (penalty) based on objective rankings alone, while the coefficient associated with the interaction term represents the incremental effect of subjectivity in determining the award.[27]

As summarized in Table 8, 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 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 awardees of rewards and penalties and not simply from the changes in wealth caused by the monetary awards or pay cuts.

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

Alternative Explanation of Opportunity Effects: Rank-First and Rank-Last Effects

A potential alternative explanation for the opportunity effects of managerial discretion documented above might simply by the propensity to improve (diminish) performance after being ranked first or last, and thus, might be independent from missing out on 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 over extended periods of time due to fluctuations in favorable (unfavorable) stochastic events influencing objective performance. Additionally, psychological 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 in their abilities and

[27] In this specification we represent the event of a subjective reward (penalty) as the interaction between the award of a reward (penalty) and the fact that such award 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 earning a reward (penalty) based on objective performance.

reduce effort due to complacency (Casas-Arce and Martinez-Jerez 2009). At the other end of the spectrum, being ranked at the bottom might suffice to trigger social comparison mechanisms (Fredrickson 1992), which in turn might lead to performance improvements to preserve reputation. Bottom ranking might also represent meaningful information for the workers about the likelihood of 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:

$$\begin{aligned}\Delta PerfScore_{i,t} = {} & \alpha + \beta_1 RankLast_{i,(t-1)} + \beta_2 RankLast_{i,(t-1)} * OppGain_{i,(t-1)} + \beta_3 RankFirst_{i,(t-1)} \\ & + \beta_4 RankFirst_{i,(t-1)} * OppLoss_{i,(t-1)} + \beta_5 BusyMonth_t + \beta_6 NEmpl_{i,t} + \beta_7 FPct_{i,t} \\ & + \beta_8 AgeLess30_{i,t} + \beta_9 \Delta PerfScore_{i,(t-1)} + \varepsilon \end{aligned} \quad (5)$$

Estimation results are reported in Table 9. $RankLast_{i,(t-1)}$ ($RankFirst_{i,(t-1)}$) is defined as an indicator variable assuming value 1 id department *i* is ranked last (first) based on objective performance in month *t*, and zero otherwise. In estimating Eq. (5) 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 missing out on a reward (penalty) while ranking first (last).[28] 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 (β_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 do not find any additional effect of opportunity losses on subsequent performance. While we cannot conclusively rule out this alternative explanation for the

[28] Similar to our previous test of reward (penalty) effects, we specify our model in a way that highlights the incremental effect of missing out on a reward (penalty) while ranking first (last). The interaction term is equivalent to the variable *OppLoss* (*OppGain*).

performance effects of opportunity losses, our results further support our findings with respect to opportunity gains.

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

VI. CONCLUSIONS

This study explores the influence of discretionary adjustments of objective performance evaluations on subsequent performance in a setting with high compensation interdependence, where 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 posit that the use of subjectivity to determine performance-related payoffs in presence of high compensation interdependence gives rise to a *nominal* performance effect (i.e. a performance effect associated with workers that receive the actual reward (penalty) subjectively – actual awardees) and an *opportunity* performance effect (for those workers who fail to receive the reward (penalty) due to management's discretion – would-be awardees).

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 of eleven departments in a particular production site. We show that the use of managerial discretion to allocate performance-related monetary payoffs influences subsequent performance. Precisely, 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.

We further explore two underlying mechanisms that might explain our results. On the one hand, management could use subjectivity to simply integrate and correct the shortcomings of objective performance measures, thus improving the mapping between actual effort and payoff in a particular month of production (the *informativeness* channel). On the other hand, because subjective allocations of rewards and penalties, as well as the corresponding opportunity gains and losses, are the result of discretionary decisions of management, workers might perceive them as favorable or unfavorable treatment. Workers' psychological reactions to discretionary adjustments (the *motivation* channel) might, therefore, explain the observed changes in subsequent performance. A battery of statistical tests provide evidence of both channels operating in the relation between subjective performance evaluations and subsequent performance. We conclude that, in settings with high compensation interdependence, managerial discretion used to allocate performance-related monetary payoffs has important implications on future performance not only for the actual awardees, but also for the would-be awardees of subjective rewards and penalties.

Whereas our site is ideal to explore our phenomenon of interest, our work is subject to many limitations that are common to field research. In particular, since our study is based on a single manufacturing organization based in China, 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 in the determination of compensation outcomes. While explicit disclosure of both objective and subjective performance evaluation results is rarely observed, we argue, nonetheless, that our findings generalize to any situation in which workers receive objective signals about their objective performance, based on which they form rational expectations in terms of potential payoffs.

Our study contributes to the literature on subjectivity in incentive contracting by documenting performance effects associated with the use of managerial discretion that were only theorized in prior research. Our results provide important insights to the practitioner community by highlighting significant effects of subjective performance evaluations that impact subjects that are not the immediate target of the application of managerial discretion and that may significantly influence the overall effectiveness of incentive systems in organizations.

Appendix 1: Variables Definition

Variable	Description
$PerfScore_{i,t}$	Total performance score by department *i* in month *t*
$Reward_{i,t}$	Indicator variable assuming the value of 1 if department *i* receives an explicit reward in month *t*, and 0 otherwise
$Penalty_{i,t}$	Indicator variable assuming the value of 1 if department *i* receives an explicit penalty in month *t*, and 0 otherwise
$SubjRew_{i,t}$	Indicator variable assuming the value of 1 if department *i* receives a subjective reward in month *t*, and 0 otherwise
$SubjPen_{i,t}$	Indicator variable assuming the value of 1 if department *i* receives a subjective penalty in month *t*, and 0 otherwise
$OppGain_{i,t}$	Indicator variable assuming the value of 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 assuming the value of 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 assuming the value of 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 assuming the value of 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 assuming the value of 1 if department *i* ranks first in month *t*, and 0 otherwise
$RankLast_{i,t}$	Indicator variable assuming the value of 1 if department *i* ranks last in month *t*, and 0 otherwise
$BusyMonth_t$	Indicator variable assuming the value of 1 if month *t* is considered to be a busy month for production, and 0 otherwise
StartYear	Indicator variable assuming value 1 if month *t* is one of the first two months of the year, and zero otherwise
EndYear	Indicator variable assuming value 1 if month *t* is one of the last two months of the year, and zero 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 they were 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 ten 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 awarding 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

	Response to the "Why?" Question
Subjective Reward (nominal effect)	It will motivate me to work harder
	Being at the top of the board is a great honor and we should strive to make the top of the list every month
	This is a great motivator for me.
	I would feel motivated to keep going.
	Because we were rated fourth from the top, and I would strive to be rated at the top. Even though other considerations gave us the top prize, I think that being #1 is an important goal to work toward.
	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.
	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).
	I would try to show my gratitude for the bonus by working a little harder the following month. However I'm not sure I could or would keep it up all year....
	I would feel like we had been shown some mercy, being rewarded even though we were not the top group. It would be clear that attitude played a part, so I would want to show an even better attitude.
Subjective Penalty (nominal effect)	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.
	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.
	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.
	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?
	Because it seems like it doesn't really matter how much effort my team puts in when we might be penalized anyway. We were far from the worst performing team in the previous month and we were still penalized, so there is no reason to work extra hard when there is no guarantee that we won't be targeted again. Just penalizing the team that did the worst, no matter what the extenuating circumstances were, is the most fair thing to, but that isn't the way things are done around here.
	I would need to work harder to avoid any other penalties and to make sure my financial stand point would not be affected

Subjective Penalty (nominal effect) - Cont'd	I would work harder to try to avoid another penalty. Being penalized would make me angry, especially if the issue was the fault of someone else on my team, so I'd probably work myself sick to make up for everyone else.
	I wouldn't want to be near the bottom again for the coming month.
	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.
	I think I would try my best to significantly improve team performance so that we would not be near the bottom in the next month. If however after multiple months we remained at the bottom even after increased effort, it would probably demotivate me to work hard at all.
	I would be annoyed and might feel like it was unfair, but I would try a little harder.
	they took away 10% of my salary!!!! that is a huge chunk! I am going to work my butt off and make sure that management notices it, so even if my team isn't on the top, we wont be on the bottom. I hope.
Opportunity Gain	I feel like my team lucked out this time but we have to improve our performance.
	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 comraderie as well.
	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.
	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 months salary could greatly impact all aspects of my life and I would be incredibly motivated to avoid that.
	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.
Opportunity Loss	We didn't get the reward we deserved, so why work harder when it doesn't matter?
	I would not trust management to reward based on predictable metrics. There is no incentive for me to work harder toward a measurable goal.
	The system is too easily corrupted by playing favorites. I wouldn't work for the company at all.
	I would not feel as motivated due to the reward going to a team ranked lower in October.
	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
	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.
	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.

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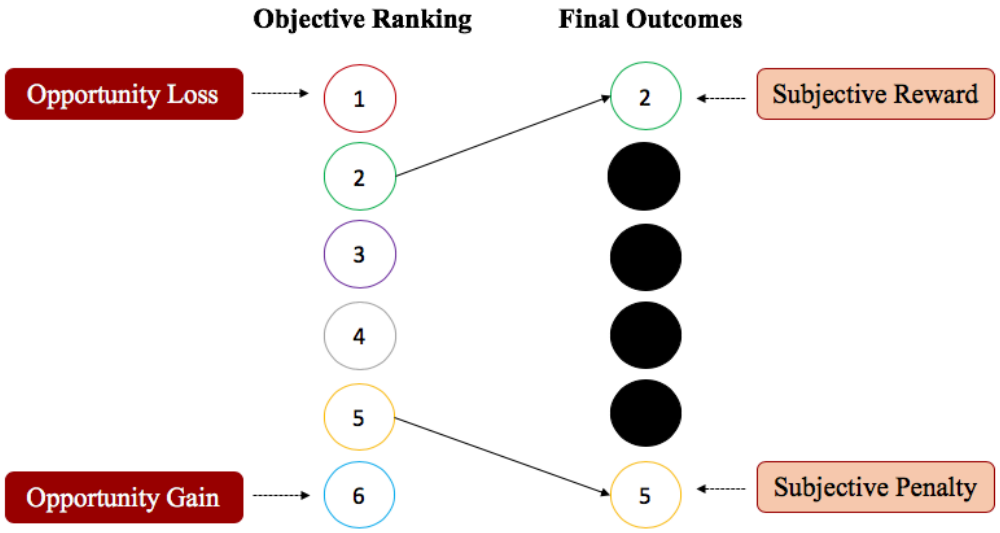
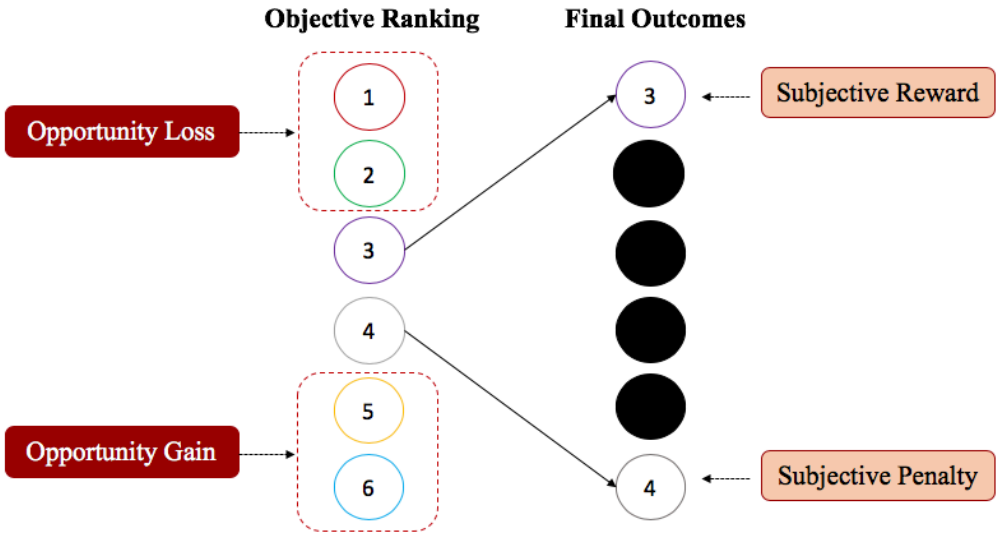
Figure 1: Empirical Measures for Nominal and Opportunity Effect



Notes: Figure 1 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) performance based on objective performance evaluations, experience the subjective assignment as an opportunity loss (gain).

Figure 2: Expanded Definitions of Opportunity Gains and Losses



Notes: Figure 2 proposes an illustration similar to that in Figure 1 (hypothetical sample of six departments) using, however, an extended definition of opportunity gains and losses, wherein we posit that *any* department scoring a higher (lower) number of total points than the ultimate awardee of the actual reward (penalty) in month t experiences an opportunity loss (gain). The difference between this definition and the one described in Figure 1 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

Variable	N	Mean	Std. Dev.	Min	p25	p50	p75	Max
PerfScore	275	63.479	17.001	23.000	52.000	65.000	75.000	107.000
ΔPerfScore	264	-0.612	16.103	-62.000	-9.500	0.500	9.250	45.000
Reward	275	0.087	0.283	0.000	0.000	0.000	0.000	1.000
Penalty	275	0.109	0.312	0.000	0.000	0.000	0.000	1.000
SubjRew	275	0.044	0.205	0.000	0.000	0.000	0.000	1.000
SubjPen	275	0.047	0.213	0.000	0.000	0.000	0.000	1.000
OppGain	275	0.029	0.168	0.000	0.000	0.000	0.000	1.000
OppLoss	275	0.047	0.213	0.000	0.000	0.000	0.000	1.000
BusyMonth	275	0.480	0.501	0.000	0.000	0.000	1.000	1.000
NEmpl	275	16.255	14.944	2.000	7.000	10.000	18.000	68.000
Fpct	275	0.412	0.274	0.034	0.200	0.333	0.667	1.000
AgeLess30	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*	*7*	*8*	*9*	*10*	*11*
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	1.0000				
8. BusyMonth	0.0303	-0.0392	0.0374	-0.0271	-0.0082	-0.0797	0.0261	1.0000			
9. NEmpl	-0.0306	-0.0847	-0.0560	-0.0550	0.0284	-0.0131	-0.0406	-0.0208	1.0000		
10. Fpct	-0.1537**	-0.0508	0.1485**	-0.0893	0.0725	0.0776	-0.0435	-0.0131	-0.0307	1.0000	
11. AgeLess30	-0.1423**	-0.0020	0.0920	0.0136	0.0080	0.1569***	-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: Test of H1 and H2: Nominal and Opportunity Effects of Subjectivity on Subsequent Performance

		(1) *ΔPerfScore*	(2) *ΔPerfScore*	(3) *ΔPerfScore*
$SubjRew_{i,(t-1)}$	b_1	15.851***		15.136***
		(3.80)		(3.44)
$SubjPen_{i,(t-1)}$	b_2	-11.301***		-10.780***
		(-4.61)		(-4.55)
$OppGain_{i,(t-1)}$	b_3		11.466**	10.846***
			(3.17)	(3.39)
$OppLoss_{i,(t-1)}$	b_4		-12.750**	-11.643**
			(-3.01)	(-2.64)
$BusyMonth_t$		3.687	4.073	3.733
		(1.43)	(1.74)	(1.50)
$NEmpl_t$		0.155	0.117	0.148
		(1.07)	(0.57)	(0.86)
$Fpct_t$		16.672	4.157	11.967
		(1.31)	(0.37)	(1.18)
$AgeLess30_{i,t}$		3.673	3.450	3.066
		(0.55)	(0.64)	(0.53)
$\Delta PerfScore_{i,(t-1)}$		-0.348***	-0.279***	-0.307***
		(-7.18)	(-4.39)	(-5.31)
Intercept		-13.295**	-7.165	-10.785**
		(-3.08)	(-1.44)	(-2.57)
N		253	253	253
Adj. R-squared		0.160	0.134	0.188
Department Fixed Effects		Yes	Yes	Yes
Clustering		Department	Department	Department
Test if $\|b_1\|=\|b_4\|$				0.23
				(0.641)
Test if $\|b_2\|=\|b_3\|$				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 reported t-statistics in parentheses. The dependent variable *ΔPerfScore*, 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 than 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%], two-tailed.

Table 4: Persistence of the Nominal and Opportunity Effects

		(1) *ΔPerfScore*	(2) *ΔPerfScore*	(3) *ΔPerfScore*
$SubjRew_{i,(t-1)}$	b_1	15.909***		15.698***
		(3.85)		(3.36)
$SubjRew_{i,(t-2)}$	b_2	-9.651***		-4.738
		(-3.34)		(-1.10)
$SubjPen_{i,(t-1)}$	b_3	-10.232***		-8.630***
		(-4.28)		(-3.79)
$SubjPen_{i,(t-2)}$	b_4	8.741**		8.027**
		(2.63)		(2.96)
$OppGain_{i,(t-1)}$	b_5		11.135**	9.415**
			(2.88)	(3.05)
$OppGain_{i,(t-2)}$	b_6		15.714**	16.233**
			(2.30)	(2.23)
$OppLoss_{i,(t-1)}$	b_7		-11.180**	-7.515
			(-2.38)	(-1.18)
$OppLoss_{i,(t-2)}$	b_8		-9.542**	-8.352*
			(-2.29)	(-2.01)
BusyMonth		3.810	3.854	3.613
		(1.55)	(1.67)	(1.48)
NEmpl		0.136	0.138	0.168
		(0.80)	(0.61)	(0.90)
FPct		9.780	2.603	5.567
		(0.73)	(0.25)	(0.53)
$AgeLess30_{i,t}$		4.941	1.452	1.964
		(0.83)	(0.26)	(0.34)
$\Delta PerfScore_{i,(t-1)}$		-0.305***	-0.337***	-0.338***
		(-5.48)	(-4.71)	(-5.03)
Intercept		-10.706**	-6.123	-8.593*
		(-2.36)	(-1.17)	(-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 reported t-statistics in parentheses. The dependent variable *ΔPerfScore*, 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)
	ΔPerfScore	*ΔPerfScore*
$OppGainExp_{i,(t-1)}$	12.055***	11.710***
	(4.06)	(4.32)
$OppLossExp_{i,(t-1)}$	-1.997	-1.331
	(-1.13)	(-0.76)
$SubjRew_{i,(t-1)}$		14.950***
		(3.48)
$SubjPen_{i,(t-1)}$		-9.487***
		(-4.34)
$BusyMonth_t$	4.055	3.735
	(1.71)	(1.47)
$NEmpl_t$	-0.023	-0.007
	(-1.11)	(-0.28)
$FPct_t$	0.497	2.566
	(0.29)	(1.49)
$AgeLess30_{i,t}$	-1.082	-1.337
	(-0.91)	(-1.14)
$\Delta PerfScore_{i,(t-1)}$	-0.275***	-0.300***
	(-4.74)	(-5.76)
Intercept	-2.048	-3.320***
	(-1.59)	(-3.78)
N	253	253
Adj. R-squared	0.118	0.168
Department Fixed Effects	YES	YES
Clustering	Department	Department

Notes: Table 5 reports the results of the estimation of Eq. (1). However, in this model we utilize the expanded definition of opportunity gains (losses) as described in Figure 1, Panel B. This expanded definition allows us to consider the reaction of *any* department that scored greater (lower) performance with respect to the objective metrics compared to the actual awardee of the reward (penalty). With this expanded definition we analyze whether subsequent performance reactions are driven by having scored better (worse) performance points compared to the awardee of the reward (penalty) independently from 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 *ΔPerfScore*, 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: Experimental Evidence of the Motivation Channel

	(1) *ΔEffort*	(2) *ΔEffort*	(3) *ΔEffort*
$SubjRew_{i,(t-1)}$	0.421***		0.360**
	(2.64)		(2.14)
$SubjPen_{i,(t-1)}$	0.437***		0.376**
	(2.80)		(2.28)
$OppGain_{i,(t-1)}$		0.034	0.219
		(0.17)	(1.05)
$OppLoss_{i,(t-1)}$		-0.767***	-0.582***
		(-3.81)	(-2.75)
$Female_i$	0.327***	0.311**	0.308**
	(2.68)	(2.55)	(2.54)
Age_i	-0.009	-0.009	-0.009
	(-1.54)	(-1.62)	(-1.52)
$Manager_i$	0.016	0.034	0.026
	(0.13)	(0.28)	(0.21)
Intercept	1.370***	1.629***	1.428***
	(6.19)	(7.49)	(6.24)
N	505	505	505
Adj. R-squared	0.031	0.037	0.047

Notes: Table 6 reports the results of the estimation of Eq. (2). All variables are defined in Appendix 2. The sample includes cross-sectional observations of a sample of 505 participants to our experiment. Estimations are performed using OLS. For each coefficient we reported t-statistics in parentheses. Two-tail statistical significance indicated by: * = ($p<0.10$), ** = ($p<0.05$), *** = ($p<0.01$).

Table 7: Test of Alternative Explanations: Determinants of Use of Managerial Discretion

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

Notes: Table 7 reports the results of the estimation of Eq. (3). Estimations are performed using logit with heteroscedasticity robust standard errors. For each coefficient we reported 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 8: Test of Alternative Explanations: Reward (Penalty) Effects

	ΔPerfScore
$Reward_{i,(t-1)}$	-7.967
	(-1.29)
$Reward*SubjRew_{i,(t-1)}$	23.216**
	(2.52)
$Penalty_{i,(t-1)}$	-0.396
	(-0.18)
$Reward*SubjPen_{i,(t-1)}$	-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)
Intercept	-13.110**
	(-3.10)
N	253
Adj. R-squared	0.162
Department Fixed Effects	Yes
Clustering	Department

Notes: Table 8 reports the results of the estimation of Eq. (5). Estimations are performed using OLS with heteroscedasticity robust standard errors. For each coefficient we reported t-statistics in parentheses. The dependent variable *ΔPerfScore*, 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 Alternative Explanations: Rank-First and Rank-Last Effects

	ΔPerfScore
$RankLast_{i,(t-1)}$	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)
Intercept	-6.586
	(-1.21)
N	253
Adj. R-squared	0.143
Department Fixed Effects	Yes
Clustering	Department

Notes: Table 9 reports the results of the estimation of Eq. (4). Estimations are performed using OLS with heteroscedasticity robust standard errors. For each coefficient we reported t-statistics in parentheses. The dependent variable *ΔPerfScore*, 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).