Productivity versus Efficiency:
The Effect of Incentive Focus on Target Setting in Participative Budgets

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ABSTRACT

Firms typically design incentive systems to motivate employees and advance firm objectives. Two prominent objectives driving firm profitability are productivity (i.e., maximizing output) and efficiency (i.e., minimizing input). However, there remains little empirical research on the potential psychological effects of adopting a productivity versus efficiency focus on employee risk perceptions and decision-making. To address this important gap, we examine how different incentive foci (productivity versus efficiency) affect employee target setting under participative budgets. We predict and find that employees perceive an efficiency incentive that rewards input minimization as riskier than an economically equivalent productivity incentive that rewards output maximization, and this heightened risk perception leads to lower target setting. Furthermore, we find this effect is robust across production environments with different levels of outcome uncertainty. In additional analyses, we also observe that employees are significantly more likely to achieve their target and have lower error rates under productivity incentives relative to efficiency incentives, despite setting more challenging targets. Our findings have important implications for organizations, as utilizing productivity incentives instead of efficiency incentives may lead to lower levels of risk-reducing budgetary slack and higher target-setting.

Keywords: incentive focus; risk; budgeting; performance targets

Data Availability: Contact the authors.

1. INTRODUCTION

Firms often use budget-based incentives to motivate employees to set and achieve ambitious performance targets (Zimmerman 2019). In a participative budgeting system, employees are able to provide input to their performance targets, allowing them to influence the difficulty and riskiness of their budget-based incentives. Employees often hedge against uncertainty in their production environment by creating risk-reducing budgetary slack in the form of overly conservative performance targets, which can lead to lower operational performance and lost profits (Penno 1984; Young 1985; Waller 1988). Notably, budget-based incentives can be structured to contain either a productivity or an efficiency focus (Sickles and Zelenyuk 2019; Castrillon 2023). A productivity incentive provides an employee with a given amount of resources and rewards them for maximizing the output produced using those resources. An efficiency incentive provides an employee with a required output level and rewards them for minimizing the amount of resources used to produce that output. In our study, we examine how the type of budget-based incentive focus (productivity versus efficiency) affects employees' perceptions of risk and the level of performance targets that they set in a participative budgeting process.

Both productivity and efficiency incentive contracts can be structured to maximize firm value (Jensen and Meckling 2009). That is, after determining the optimal level of total cost or total output, a firm can maximize its value either by tasking employees with maximizing total output (productivity) or minimizing total costs (efficiency), respectively. In practice, firms may utilize productivity and efficiency incentive foci for different reasons. For example, industry standards often lead automotive and electronics manufacturers to focus on productivity to meet customer demand, whereas logistics firms typically look to lower costs on predetermined routes. This focus can also shift depending on the current stage within the life cycle of a firm. For example, Tesla,

Inc. heavily emphasized productivity targets when it was growing its brand and has shifted towards more efficiency-focused goals within its "gigafactories" as it has matured within the electric car market (Sherman 2018; Baker 2023). Furthermore, other industries, such as the restaurant and food-service industry, inherently have substantial flexibility in selecting their contract focus (e.g., number of guests served versus average service time), regardless of life-cycle.

Given this variation in how firms implement productivity and efficiency objectives, it is important to consider the psychological effects of adopting productivity versus efficiency objectives on employee perceptions and decision-making. A study by Bain & Company, a major consulting firm, suggests that leaders who take a productivity (versus efficiency) mindset are better able to eliminate organizational drag, develop and utilize star talent, and tap into their employees' discretionary energy (Mankins 2017). This highlights how these different incentive foci might fundamentally affect employees' perceptions of their workplace goals and objectives. Because performance targets are both an integral part of a firm's managerial accounting system and very sensitive to employee perceptions and attitudes, it is important to understand how productivity versus efficiency incentive foci affect employee perceptions of risk and the performance targets that they set.

Drawing from literature in psychology and economics, we develop theory which predicts that the incentive focus of a budget-based contract will affect how employees perceive the risk associated with a performance target. Specifically, we posit that employees who work under a productivity incentive that rewards maximizing output will focus primarily on the potential *positive* outcomes of their efforts, but employees who work under an efficiency incentive that rewards minimizing inputs will focus more on potential *negative* outcomes (Liberman and Trope 1998; Sagristano, Trope and Lieberman 2002; Lermer, Streicher, Sachs, Raue and Frey 2015;

2016). Importantly, as individuals tend to be more risk averse when trying to avoid negative outcomes than when trying to achieve positive outcomes (Bryant and Dunford 2008; Lanaj, Chang and Johnson 2012; Dohmen, Quercia, and Willrodt 2023), we predict employees under an efficiency incentive will set lower performance targets than employees under an economically equivalent productivity incentive.

Prior research also indicates managers tend to create greater risk-reducing budgetary slack in settings with higher outcome uncertainty (Dunk and Nouri 1998; Kren 2003). As risk reduction is a key theoretical mechanism underlying our predictions, we also test whether the predicted effects of incentive focus are exclusive to environments with high levels of outcome uncertainty. In other words, does the negative effect of efficiency incentives persist under relatively low levels of uncertainty? If so, even low levels of outcome uncertainty may be sufficient to facilitate differential risk perceptions of the two incentive foci, which we expect mediate the relationship between incentive focus and target setting behavior.

To test our predictions, we conduct 2 × 2 between-subjects incentivized experiment in which participants assume the role of an employee in a fictional company engaged in participative budgeting. Employee-participants are responsible for setting their own budget-based performance targets, upon which they are evaluated via a subsequent real-effort task. We manipulate budget-based *incentive focus* at two levels (productivity versus efficiency) and *outcome uncertainty* at two levels (low versus high) between participants. Participants under the productivity incentive focus are given a set amount of time to complete as many units as possible, emphasizing the importance of productivity. Participants under the efficiency incentive focus are required to complete a set output requirement (i.e., quota) as quickly as possible, emphasizing the importance of efficiency.[1]

[1] Participants are rewarded based on their performance relative to their budgeted target. Because our primary construct of interest is target setting, both contracts utilize a truth-inducing incentive in which each manager maximizes their

It is important to note that we hold these two contracts economically equivalent in our operationalization, ensuring that all aspects of the design are carefully controlled such that the only difference to participants is with respect to the incentive focus. We manipulate outcome uncertainty via either relatively high or low measurement error in their production environment.

Consistent with expectations, we find that employees set lower budget-based performance targets under the efficiency incentive than under the productivity incentive. This finding is consistent with employees building greater risk-reducing slack into their budgets under an efficiency incentive than under a productivity incentive. We also confirm that employees set lower performance targets under higher outcome uncertainty than under lower outcome uncertainty. However, we find employees responded symmetrically to the two incentive foci under both levels of outcome uncertainty. This suggests that employees were sensitive to the difference in incentive focus even under relatively low levels of outcome uncertainty. Importantly, we also find that employees do perceive the efficiency contract to be riskier than the productivity contract, which significantly mediates the relationship between incentive focus and target level.

This study makes several important and timely contributions to literature and practice. First, we contribute to accounting research and practice by introducing an important but unexplored distinction between productivity and efficiency incentive foci. Prior research on incentives has focused on exploring the effects of different incentive types, such as piece-rate pay, budget-based bonuses, and tournaments (Fisher, Peffer, and Sprinkle 2003; Hannan, Krishnan, and Newman 2008; Sprinkle, Williamson, and Upton 2008), as well as incentive framing with respect to gains or losses (e.g., bonus versus penalty contracts) (Luft 1994; Hannan, Hoffman, and Moser 2005; Burke, Towry, Young, and Zureich 2023). Our paper is the first, to our knowledge, to examine the

earnings by reporting their true performance capability (Young 1985; Chow, Cooper and Waller 1988; Waller 1988). Under this contract, the only incentive to select a lower target level is to hedge against outcome uncertainty.

distinction between incentivizing output maximization versus input minimization on target setting behavior. While foundational theory on incentive structure within firms (e.g., Jensen and Meckling 2009) notes that these incentive foci can be made economically equivalent in the sense that employees under both contracts are incentivized to produce as much output with as few resources as possible, the opposing directional foci themselves may play an important psychological role in managerial decision making. It is therefore significant that the mere choice of which part of an employee's objective function to place focus on (output versus input) can influence their perceptions of risk and related decision-making.

We also contribute to the literature on participative budgeting in accounting (e.g., Heinle, Ross, and Saouma 2014; Brown, Fisher, Peffer, and Sprinkle 2017), particularly with respect to our understanding of the drivers of risk-reducing slack (Young 1985; Chow, Cooper, and Waller 1988; Waller 1988). Because risk is a significant and pervasive factor that motivates slack creation in participative budgeting, it is important to understand the factors that affect employees' perceptions of budget-related risk. Our findings suggest that employees perceive efficiency incentives to be riskier than productivity incentives, and therefore set lower performance targets when subject to an efficiency incentive. Further, supplementary analyses suggest performance is higher and error rates are lower under productivity incentives relative to efficiency incentives, despite setting higher targets under productivity incentives.

Finally, our results have important implications for practitioners as well. Our results indicate that a productivity focus may be more beneficial than an efficiency focus with respect to both target setting and subsequent performance. That is, firms might be able to reduce risk-related slack in their participative budgeting process and improve employee performance by adopting incentives and objectives focused on productivity rather than efficiency. Further, firms focused on

efficiency for strategic reasons may also benefit from further investment in managerial control systems to detect and mitigate excessive risk-related slack created by risk-averse employees.

We organize the remainder of this paper as follows. Section 2 summarizes the relevant literature and develops our hypotheses. Section 3 describes our experimental method and design. Sections 4 and 5 present our findings and conclude the paper.

2. THEORY DEVELOPMENT AND HYPOTHESIS

2.1 Setting

Target setting is a key management accounting activity that fulfills both planning and control purposes within an organization. From a planning perspective, targets establish expectations about important performance outcomes, such as sales forecasts and production schedules, that facilitate efficient coordination of resources within a firm (Merchant and Van der Stede 2012). From a control perspective, targets motivate managers and employees to achieve desired outcomes by attaching incentives (both economic and social) to attainment of such targets (Locke and Latham 1990; 2019).

However, information asymmetries exist within firms such that lower-level managers typically hold superior information regarding future operations, potentially limiting the effectiveness of a centralized target setting system. To address this issue, firms often adopt participative systems in which targets are set using the private information provided by lower-level managers for formal budgeting (Young 1985; Fisher, Frederickson, and Peffer 2000; Fisher, Frederickson and Peffer 2002; Fisher, Maines, Peffer, and Sprinkle 2002) and operational target setting purposes (Webb, Jeffrey, and Schulz 2010; Presslee, Vance, and Webb 2013; Chen, Yin, and Zhang 2022). The benefits of involving lower-level managers in the target setting process are twofold. First, participative target setting systems have the potential to produce more accurate

performance targets than non-participative systems (Anderson, Dekker, and Sedatole 2010), consistent with resolution of the information asymmetry issue. Second, under certain conditions, participative target setting can motivate employee commitment to achieve specific performance targets (Locke, Latham, and Erez 1988).

However, because a participative system allows lower-level managers to influence their performance targets, there is also an opportunity and incentive for such managers to build slack into the budget. It is important to differentiate between two types of slack. The first type is referred to as "rent-seeking" slack, which occurs when managers misrepresent their private information to extract rents from their organization. To address this incentive misalignment, firms can design contracts that incentivize truth-telling (Young 1985; Waller 1988; Chow, Cooper, and Waller 1988). For example, if the amount of the bonus that an employee receives for attaining a performance target increases with the difficulty of the target, the employee's incentive is to set their target as high as they can achieve (Webb, Jeffrey, and Schulz 2010; Presslee, Vance, and Webb 2013).

The second type is referred to as "risk-reducing" slack, which occurs when managers set lower targets to manage uncertainty inherent in their operating environment that might prevent them from achieving their target. While truth-inducing contracts can mitigate the rent-seeking slack, risk-reducing slack can persist due to managers' perceptions of risk in their contract and operating environment (Young 1985; Hirst 1987; Waller 1988; Dunk and Nouri 1998; Kren 2003). In this setting, motivation to avoid risk causes managers to set overly conservative performance targets. Overly conservative performance targets can have significant negative implications for an organization, most obviously through inefficient planning and lost profits. As such, it is important to understand the drivers of risk-reducing slack, including how different types of target-based incentives might affect it.

2.2 Productivity versus Efficiency Incentive Focus

Productivity refers to the level of output that a firm produces using a given amount of resources, and efficiency refers to the level of resources that a firm uses to produce a given amount of output (Sickles and Zelenyuk 2019; Castrillon 2023). A productivity incentive rewards maximizing the amount of usable output that an employee produces using a fixed amount of resources, and an efficiency incentive rewards minimizing the amount of costly resources used to produce a fixed quota of usable output. Importantly, the same production task can be organized under either a productivity or an efficiency incentive focus. For example, consider a factory that produces automobiles. If the plant manager wishes to focus their employees on productivity, they might set performance targets with the goal of maximizing the number of cars produced within a certain time (or with a certain amount of other costly resources). If the plant manager wishes to focus their employees on efficiency, they would set performance targets with the goal of minimizing the amount of time (or other costly resources) it takes to produce a set number of cars.

Managers may wish to emphasize productivity or efficiency for a variety of reasons. For example, if a manufacturer is supplying a relatively new market in which current demand exceeds their firm's current productive capacity, as is often the case with new technologies such as electronic vehicles, the firm will likely place a high premium on producing as many units as possible, with less of a focus on cutting costs. On the other hand, if a manufacturer is supplying a mature market in which current demand is proportional to the firm's current productive capacity, as is often the case with older technologies such as vehicles with combustion engines, the firm will likely focus primarily on cutting costs, with less of an emphasis on producing as much as possible. Regardless of the reasoning, firms always have the discretion to adapt their performance measures

and incentives to fit the current needs of their firm and the changes in their competitive or operational environments.

Under both productivity and efficiency incentives, the basic objective of the employee remains the same (e.g., produce cars with minimal waste), but the psychological focus of the employees' efforts will differ significantly. Specifically, these two incentive foci emphasize very different dimensions of performance. While a productivity incentive emphasizes *maximizing* useful future output, an efficiency incentive emphasizes *minimizing* current inefficiencies in the production process. As such, we propose that a productivity incentive focuses an employee's attention on the abstract positive future outcome of maximized output, while an efficiency incentive focuses an employee's attention on more concrete inefficiencies currently present in the production process.

This tendency for employees to focus on future positive outcomes versus more immediate process inefficiencies will have significant effects on how employees process and respond to risk in their operating environment. A focus on abstract future outcomes leads individuals to primarily consider the desirability of potential outcomes, while a focus on more concrete aspects of a process leads individuals to primarily consider the feasibility that potential outcomes will be obtained (Liberman and Trope 1998; Sagristano et al. 2002; Lermer et al. 2015; 2016). As such, we expect employees under a productivity incentive are likely to focus on the desirable, positive outcomes of risk, while employees under an efficiency incentive are likely to focus on the negative outcomes of risk that would prevent them from reaching their goals. Individuals who focus on avoiding potential negative outcomes of risk-taking tend to perceive greater risk and make less risky decisions than individuals who focus on attaining potential positive outcomes (Bryant and Dunford 2008; Lanaj et al. 2012; Dohmen et al. 2023). Therefore, the emphasis on minimizing negative

inefficiencies versus maximizing positive output should cause employees under an efficiency incentive to set more conservative performance targets than employees under a productivity incentive. As such, we predict the following hypothesis:

> HYPOTHESIS 1. *Employees will set lower budget-based performance targets under an efficiency incentive than under a productivity incentive.*

The theoretical mechanism underlying this prediction is that employee perceptions of compensation risk will differ under the two incentive foci. Specifically, employees will perceive greater risk under an efficiency incentive than under a productivity incentive and this is what drives the negative effect of efficiency incentives on target setting. As such, we predict that risk perceptions mediate the relationship between incentive focus and target setting as follows:

> HYPOTHESIS 2a*: Employees perceive efficiency incentives as riskier than productivity incentives.*

> HYPOTHESIS 2b*: The relationship between incentive focus and performance target level is mediated by employee risk perceptions.*

2.3 Outcome Uncertainty

As discussed above, risk-averse employees are motivated to set lower targets to hedge against uncertainty in the production process, and the presence of such uncertainty is required for risk-reducing slack to occur (Young 1985; Waller 1988). Therefore, in addition to our primary tests, we explore whether the effects of incentive foci on target setting differ according to the level of outcome uncertainty present in the production process. We define outcome uncertainty as unpredictable variability in the outcome of a production process that is outside of the employee's control, such as measurement error, changes in market conditions, unpredictable efficiencies or slowdowns in the production process, or various weather conditions. Prior research has found that increases in outcome uncertainty increase the propensity of managers to create slack in their performance targets (Hirst 1987; Dunk and Nouri 1998; Kren 2003). As such, before we examine

the effects of our incentive foci under differing levels of outcome uncertainty, we begin with the following baseline (maintained) hypothesis informed by prior research:

> HYPOTHESIS 3a. *Employees will set lower budget-based performance targets under high outcome uncertainty relative to low outcome uncertainty.*

Recall that our primary hypotheses posit that employees will set lower performance targets under an efficiency incentive to avoid the greater perceived risk under this contract. The motivation to create risk-reducing slack requires the perception of some risk to avoid, and our hypotheses assume there is a sufficient level of outcome uncertainty in the employee's operating environment to activate meaningful risk perceptions. As such, the differences in risk perceptions induced by the two contract types may be weaker under lower levels of objective outcome uncertainty. That is, operating environments with low outcome uncertainty may represent a potential boundary condition to the effect of incentive focus on target setting. As such, we predict the following hypothesis:

> HYPOTHESIS 3b. *The negative effect of an efficiency incentive compared to a productivity incentive on performance target level will be weaker under low outcome uncertainty relative to high outcome uncertainty.*

Note that there is significant tension in Hypothesis 3b. In practice, there is almost always some level of outcome uncertainty in production environments. Hence the development of theory under relatively low versus relatively high outcome uncertainty. However, even low levels of outcome uncertainty may be sufficient to induce employees to hedge against risk. While higher uncertainty may pose a greater threat to an employees' performance, employees may be more sensitive to the *presence* of uncertainty as opposed to the *magnitude* of it.[2] Thus, we may find similar effects of incentive focus on target setting when any uncertainty is present.

[2] This is consistent with the general tenets of prospect theory, which asserts that people tend to overweight probabilities close to zero such that "the marginal value of both gains and losses generally decreases with their magnitude" (Kahneman and Tversky 1979, 278). Thus, individuals may react more strongly to a shift from no uncertainty to some

3. RESEARCH DESIGN AND METHODOLOGY

We test our predictions using an incentivized laboratory experiment where participants take on the role of employees engaged in a participative budgeting task for three periods. We employ a 2 × 2 between-subjects design, where we manipulate incentive focus at two levels (productivity or efficiency) and outcome uncertainty at two levels (high or low). We also measure participant risk perceptions as part of our post-experimental questionnaire. Participant compensation is based on meeting or exceeding performance targets that participants set for themselves at the start of each period, consistent with participative budgeting practices. We then measure subsequent performance using a real-effort letter search task. This study was programmed and administered using z-Tree (Fischbacher 2007).

3.1 Experimental task

Upon arriving in the lab, participants were directed to a random computer station and provided their informed consent.[3] Each station had a paper copy of the on-screen instructions, which included information relevant to their condition for their reference throughout the session. All participants in a session were subject to the same condition.

Participants assumed the role of an employee working at a manufacturing firm, where their job is to accurately count the number of times a given letter appears in a grid of letters. We utilized a letter-search task as it requires low skill and is a well-established method of eliciting effortful performance in prior literature (e.g., Sprinkle et al. 2008; Choi, Clark, and Presslee 2019). More specifically, in our letter-search task, participants were shown a series of 5×5 grids containing a randomized combination of two different letters and had to accurately report the number of times

uncertainty than they would otherwise. As some uncertainty is a necessary condition for our hypotheses and zero uncertainty would reflect a compound manipulation of both the presence and amount of uncertainty, we explore the robustness of the proposed incentive focus effects under relatively low and high levels of uncertainty.

[3] This study was reviewed and approved by the relevant institution's IRB.

a given search letter appeared in each grid. See Appendix 1 for a sample of various grids shown to participants. Incorrect guesses resulted in a minor time penalty that locked participants screens for 3 seconds before they could continue. Participants were informed there would be multiple grids each period and they would perform the task for three periods. They were also informed about the level of uncertainty—high or low—in their firm's production environment, which we discuss in more detail below.

Next, participants learned of their firm's compensation structure and their participation in setting performance targets. Each period, participants could select one of ten available performance target levels, where higher levels equate to more difficult targets. If their performance meets or exceeds the selected target, they earn a bonus equal to $1.50 multiplied by their selected target level, otherwise they do not earn any bonus. For example, setting and achieving a Level 5 target would result in a $7.50 bonus that period (i.e., $1.50 × 5 = $7.50 bonus).[4] As such, participants are rewarded for setting and achieving more difficult budgets, which is consistent with the general incentives observed in practice aimed at aligning the incentives of effort-averse employees with those of the firm as part of truth inducing contracts (Jensen and Meckling 1976; Lambert 2001; Fuhrmans 2024; Jansen 2024).

Participants completed one practice period of the letter-search task without setting any targets. After the practice period, participants received feedback on their performance and completed a brief quiz to ensure their comprehension of the instructions and manipulations. Participants then selected their target level for the first period and began the first period of the letter-search task. Participants received feedback after each period, then selected a new target for

[4] It is important to note that if performance exceeds a more difficult target, the participant does *not* earn the bonus associated with the higher target as that would effectively create a piece-rate incentive. That is, the bonus available each period is limited to the bonus associated with the selected target. For example, if a participant selected a level 6 target, but performed well enough to earn a bonus associated with level 8, they would still earn the level 6 bonus.

the upcoming period. After the final period, participants completed a post experimental questionnaire and received their earnings from one randomly selected period in cash.

3.2 Incentive focus manipulation

Our primary manipulation in this study is incentive focus, whereby the bonus compensation described above is either focused on productivity or efficiency. Under the productivity focus, participants were told that the letter-search task will last for 120 seconds each period, and their objective is to complete as many grids as possible each period. Participant incentives in this condition are thereby structured such that the focus is on increasing *productivity* over a set period of time. Conversely, in the efficiency conditions, participants were told they must complete 12 grids each period, and their objective is to complete those grids in as little time as possible. Thus, their incentives focus on increasing *efficiency* over a set number of units.

To establish equivalent monetary incentives across the two incentive focus conditions, we first calibrated our letter-search task using an out-of-sample pilot (N = 14) in which pilot participants received a piece-rate bonus of $0.20 for each grid completed. Results from the pilot indicate the average time to complete one grid is approximately 10 seconds. We used this average time per grid to calibrate the target levels for both the productivity and efficiency conditions.

3.2.1 Productivity targets

Recall that in the productivity conditions, participants were told that the letter-search task will last for 120 seconds, and their objective is to complete as many grids as possible each period. Based on the average time per grid from the pilot, average performance should be approximately 12 grids per period (i.e., 120 seconds ÷ 10 seconds). As such we set Levels 5 and 6 (i.e., the midpoints) equal to 11 and 12 grids, respectively. The remaining target levels reflect an increment

or decrement of one, such that the target level schedule ranges from seven to 16. See Figure 1 for the exact schedule shown to participants, by condition.

[INSERT FIGURE 1 HERE]

3.2.2 Efficiency targets

In the efficiency conditions, participants were told they must complete 12 grids each period, and their objective is to complete those grids in as little time as possible. We calibrated our ten target levels for the efficiency conditions based on targets equivalent to each of the corresponding productivity conditions. This ensures that the difficulty of each target level is held constant across incentive focus conditions. Specifically, as the average time to complete each grid is approximately 10 seconds and Level 6 was set at 12 grids in the productivity conditions, we set the Level 6 target to 120 seconds in the efficiency conditions with every target level above (below) reflecting a decrease (increase) of 10 seconds. As such, the possible range of targets in the efficiency conditions is from 170 seconds (easiest) to 80 seconds (hardest).

There are a few elements of this design that warrant further discussion. First, this operationalization ensures the two incentive contracts are held economically equivalent between conditions. Second, it is important to note that by having the participants set target *levels* as opposed to the targets themselves (i.e., grids or seconds) we have carefully controlled for (1) the precision of the target, (2) the directionality (+/−) of the target as difficulty increases, and (3) the bonus measurement across conditions. Thus, any differences in target setting across conditions can be attributed to the effect of the differential *focus* (i.e., productivity or efficiency).

Furthermore, based on the pilot data, our calibration of the target levels ensures that at least 90% of participants could achieve the easiest target, while less than 10% could achieve the hardest target across either condition. We verified this calibration was consistent in the main experiment

based on practice period performance. That is, at least 90% of participants were able to meet or exceed the minimum threshold (i.e., 7 grids or 170 seconds) and less than 10% of participants were able to meet or exceed the maximum threshold (i.e., 16 grids or 80 seconds).

3.3 Uncertainty manipulation

To test for a potential boundary condition of the effect of incentive focus, we also varied the magnitude of outcome uncertainty between participants. Specifically, participants were informed that their firm has either a relatively low or high amount of outcome uncertainty (described to participants as "measurement error").[5] In the productivity conditions, this is stated in terms of the number of grids that will be added or subtracted to the participant's final production output. In the efficiency conditions, it is stated in terms of the number of seconds that will be added or subtracted to the participant's final production time.

For low uncertainty, measurement error is uniformly distributed within the possible range of [-1, 1] grid or [-10, +10] seconds, depending on the incentive focus. In the high uncertainty conditions, it is uniformly distributed within the range of [-3, +3] grids or [-30, +30] seconds.[6] Note that the incentive focus conditions are once again equivalent, based on the average time to complete each grid per the pilot (i.e., 10 seconds per grid). An example was provided to participants as part of the instructions to clarify the effects of measurement error on their performance. Participants were also informed that their bonus qualification would be determined based on the total production output (time), inclusive of the measurement error each period.

[5] We manipulate production environment uncertainty with *low* measurement error as opposed to *no* measurement error to avoid a compound manipulation of the presence versus absence of measurement error. This is also more generalizable to practice, where most environments have some level of uncertainty.

[6] We randomly determined measurement error ex-ante so that every participant would experience the same valence of the effects to their performance. We first randomly determined the measurement error in the high uncertainty conditions, then applied a linear transformation for the low uncertainty conditions.

3.4 Dependent variables

Our primary dependent variable of interest is the target level set by participants, measured as an integer within the range of [1, 10] according to the available set of options as part of the experimental instrument. Regardless of condition, target levels are increasing in target achievement difficulty (i.e., higher number of grids or fewer number of seconds, depending on the incentive focus). This variable allows us to examine risk-reducing slack creation where lower targets are indicative of greater slack relative to higher targets.

3.5 Independent variables

Our primary independent variables of interest in this study reflect indicator variables for our manipulations described above. Specifically, we define *Efficiency* as equal to 1 for participants subject to the efficiency incentive focus and 0 otherwise (i.e., those subject to the productivity focus). *Uncertainty* is equal to 1 when uncertainty is high and 0 otherwise. For our mediation tests, we measure the perceived riskiness of the bonus (*PerceivedRisk*) as our mediator, which reflects participants' agreement with the following statement, using a 7-pt Likert scale (from 1 "*Strongly Disagree*" to 7 "*Strongly Agree*"): "I found the bonus to be risky."

We also measure participant skill at the letter-search task in various ways, as well as their trait risk attitude. Our main measure of participant skill (*PracticeRate*) is based on participants' performance in the practice period as this is not confounded with any target-setting effects. *PracticeRate* is equal to each participant's average number of seconds per grid completed during the practice period. We confirmed that there was no significant difference in *PracticeRate* between any of our conditions (all p-values ≥ 0.163) and that the overall average (10.91 seconds) was consistent with that of the pilot study ($p = 0.159$). For trait risk attitude, we asked participants the following question based on prior literature (Dohmen et al. 2011): "In general, would you consider

yourself someone who is fully prepared to take risks or do you try to avoid taking risks?" We measure *RiskTaker* as participants' response about their willingness to take risks using a 7-pt Likert scale from 1 ("*Not at all willing*") to 7 ("*Very willing*"). Again, we verified there was no significant difference in *RiskTaker* between any of our conditions (all p-values ≥ 0.201).

4. RESULTS

4.1 Participants

Across our four conditions, we collected a total of 171 participant observations using undergraduate business students in the United States. As the tasks in this study require no institutional knowledge or specific skills, undergraduate business students are an appropriate participant pool (Libby, Bloomfield, and Nelson 2002). The average age was 20.35 years old and 74% were male. Participants received a $5 show-up fee plus their experimental earnings. Average pay was $9.26, ranging from $5.00 to $20.00. The experiment lasted approximately 30 minutes. Refer to Table 1 for a summary of our participant descriptive statistics across each condition. We also verified in untabulated tests that there were no concerns regarding multicollinearity in any of our models using any combination of variables defined in Section 3 across the full sample.

[INSERT TABLE 1 HERE]

As shown in the descriptive statistics, overall we find participants selected a target level of 5.87 on average, which is near the midpoint of available targets (i.e., within the range 1 to 10). In the Efficiency condition, the raw average was 5.67, which is lower than that observed in the Productivity condition (i.e., raw average of 6.06). Additionally, we find that participants perceived the bonus to be "somewhat" risky (4.58 average overall), with those in the Efficiency condition reporting higher levels of agreement on this measure than those in the Productivity condition (i.e., raw means of 4.88 and 4.29, respectively). Descriptive results also indicate that target levels were

generally lower under higher outcome uncertainty. That is, there appears to be roughly a 5 percent decrease in target level under high (versus low) uncertainty in both the Efficiency condition (High: 5.51; Low: 5.81) and the Productivity condition (High: 5.89; Low: 6.23).

4.2 Test of H1

Our first hypothesis predicts that participants will set lower budget-based performance targets under an efficiency incentive than under a productivity incentive. To test this hypothesis, we first examine the visual pattern of results in Figure 2, which plots the estimated marginal means of a Tobit regression with *TargetLevel* as the dependent variable and *Efficiency* as the primary independent variable of interest, controlling for the level of outcome uncertainty (*Uncertainty*) as well as participant skill (*PracticeRate*), risk attitude (*RiskTaker*), and period fixed effects, while clustering robust standard errors at the individual level.[7] H1 predicts a negative effect of *Efficiency* on *TargetLevel* in this model, which is consistent with the observed pattern of results. That is, the estimated marginal mean *TargetLevel* under the efficiency incentive is 5.498, compared to 6.244 under the productivity incentive. This reflects a 12 percent decrease in the target level set by participants under the efficiency contract. We further confirm that this negative effect of *Efficiency* on *TargetLevel* is significant as reported in Table 2 (coeff. -0.745, $t = -3.38$, $p < 0.001$).[8]

[INSERT FIGURE 2 HERE]

[INSERT TABLE 2 HERE]

We also report the results of a period-specific analysis in Table 3, showing the effects of incentive focus on target levels on average and in each period. Therein we note the significant

[7] Given the constrained range of our dependent variable (*TargetLevel*), we perform all our primary tests in Section 4 using Tobit regressions, censored at the lower bound of 1 and upper bound of 10. However, we do note that there is minimal censoring occurring throughout our tests and our dependent variable appears to be normally distributed based on the Shapiro–Wilk test ($W = 0.996$, $z = 0.477$, $p = 0.317$). As such, we also verified that all our results are consistent in sign, significance, and inference when using OLS regressions as well.

[8] All results are reported based on one-tailed tests as appropriate, consistent with our directional predictions. Results of our hypothesis tests are inferentially consistent using two-tailed tests, regardless.

negative effect of *Efficiency* (coeff. -0.693, t = -3.15, p = 0.001) on target setting is robust to an average measure (*Avg_TargetLevel*) across all three periods. We also find that the negative effect of incentive focus on target level was consistent across each of the three periods separately, as disclosed in Panel B (all p-values ≤ 0.01).

[INSERT TABLE 3 HERE]

4.3 Tests of H2a and H2b

Collectively, our second hypothesis reflects a direct test of the theoretical mechanism underlying our first hypothesis: risk perceptions. We expect that productivity and efficiency incentives induce a difference in risk focus among employees such that they are likely to perceive efficiency incentives as riskier than economically equivalent productivity incentives (H2a). Accordingly, employees under an efficiency incentive should create more risk-reducing budgetary slack due to their heightened risk perceptions. That is, the negative effect of efficiency (versus productivity) incentive focus on target setting under participative budgeting should be mediated by an increase in the perceived riskiness of the incentive (H2b). See Figure 3 for this predicted mediation and the results of our analysis.

[INSERT FIGURE 3 HERE]

Overall, we find support for both H2a and H2b in the expected directions. Participants subject to the efficiency incentive perceived their bonus to be riskier than those under the productivity incentive (*PerceivedRisk* means of 4.88 and 4.29, respectively). More specifically, we find a significant direct effect of *Efficiency* on *PerceivedRisk* (coeff. 0.722, t = 3.08, p = 0.001), while controlling for uncertainty, participant skill, and risk attitude, supporting H2a.[9] Turning to

[9] As *PerceivedRisk* is a self-reported measure elicited once during the PEQ, we run all our analyses for H2a and H2b at the aggregate level (N = 171). Thus, the dependent variable for our mediation analysis (H2b) is *AvgTargetLevel*, which reflects the average target level chosen per participant across all three periods.

our mediation tests for H2b, we confirm that *PerceivedRisk* has a significant negative direct effect on *AvgTargetLevel* (coeff. -0.157, t = -1.83, p = 0.034). We also observe a marginally significant negative indirect effect of *Efficiency* on *AvgTargetLevel* via *PerceivedRisk* (coeff. -0.113, t = -1.58, p = 0.058), supporting H2b. Collectively, these results indicate employees do perceive an efficiency contract that rewards input minimization to be riskier than an equivalent productivity contract that rewards output maximization, and that this heightened risk perception leads to greater risk-reducing behavior in their target setting.

4.4 Test of H3a and H3b

We now examine the robustness of our results across various levels of outcome uncertainty. First, we examine whether there is a main effect of *Uncertainty* on *TargetLevel*. H3a predicts that outcome uncertainty will have a negative effect on performance targets regardless of incentive focus. Consistent with this expectation, we find a negative and significant effect of *Uncertainty* on *TargetLevel* in Panel A of Table 2 (coeff. -0.405, t = -1.74, p = 0.041).

Having confirmed the main effect of *Uncertainty* is consistent with prior research, we are now able to test H3b and examine whether the negative effect of efficiency incentives on performance target level is weaker in production environments with low outcome uncertainty compared to high outcome uncertainty. Overall, we do not observe a significant interaction between *Efficiency* × *Uncertainty* in Panel A of Table 4 (coeff. 0.078, t = 0.17, p = 0.863). Instead, as shown in Figure 4, the observed pattern of results indicates incentive focus (H1) and outcome uncertainty (H3a) each carry significant main effects but do not significantly interact (H3b).

[INSERT TABLE 4 HERE]

[INSERT FIGURE 4 HERE]

The effect of incentive focus (productivity versus efficiency) appears to be similarly significant across both low and high outcome uncertainty, highlighting the robustness of this effect even when relatively low outcome uncertainty exists in the production environment. The estimated marginal means reported in Figure 4 are based on the Tobit regression model reported in Table 4. Furthermore, the simple effects reported in Panel B of Table 4 indicate that the effect of an efficiency focus is robustly negative to each level of outcome uncertainty (Low: coeff. -0.854, t = -2.78; High: coeff. -0.679, t = -2.11). Consistent with our discussion in theoretical development, one explanation for this lack of interaction is that the presence of any outcome uncertainty is sufficient to induce employees to hedge against that risk, causing them to respond similarly to incentive focus regardless of the level of objective outcome uncertainty.

4.5 Supplemental analyses

4.5.1 Robustness tests

We also measure several other potential covariates in our PEQ such as dispositional optimism and participant demographics (i.e., age, gender, work experience). In untabulated tests, we ensure that the effect of incentive focus is robust to each of these controls, as well as alternative measures of participant effort and/or skill as evidenced during the practice period and/or the live periods, as well as lagged target setting decisions from the prior periods. All our results are robust in sign, significance, and inference to controlling for these potential covariates.

4.5.2 Time trends

In addition to the multivariate tests performed in Table 3 regarding effects across periods, we also visually examine the pattern of results for time trends in incentive focus across all three periods. See Figure 5 for a graphical depiction of the estimated marginal means of target level by incentive focus per period. Therein we note greater risk-reducing behavior (i.e., lower *TargetLevel*)

for participants subject to the efficiency incentive versus the productivity incentive in all three periods, consistent with the results reported in Panel B of Table 3.

[INSERT FIGURE 5 HERE]

We also see that participants do appear to react to the observed measurement error after the results of each period are revealed, particularly between Periods 2 and 3. That is, in untabulated tests there was a significant increase in the overall estimated marginal means between Periods 2 and 3 (diff. 1.023, $z = 9.32$, $p < 0.001$ two-tailed), while the difference was not significant between Periods 1 and 2 (diff. -0.136, $z = 1.37$, $p = 0.171$ two-tailed). Recall that the measurement error in the second period was beneficial to participants (i.e., in the productivity (efficiency) condition it was equal to +1 or +3 grids (-10 or -30 seconds) for low and high uncertainty, respectively), such that the measurement error made bonus attainment easier. It appears participants across all conditions increased their target level in the final period in response to this result from Period 2. Regardless, we still observe a significant negative effect *Efficiency* on *TargetLevel* in the third period, as noted in Panel B of Table 3 discussed above.

4.5.3 Performance effects

While performance effects are not the primary focus of this study and we do not predict the effects of performance across incentive focus, we do perform several supplemental analyses exploring the effects of incentive focus on participants' performance as task performance is important in many firm environments. First, we note that 64.8 percent of participants in the productivity condition were able to achieve their selected target on average across the three periods (Low: 69.8 percent; High: 59.8 percent); whereas just 58.3 percent did so in the efficiency condition (Low: 59.1 percent; High: 57.5 percent). In untabulated tests, we confirm the likelihood

of achieving one's target is significantly different between incentive focus conditions (coeff. -0.803, z-stat -2.73, p-value 0.006 two-tailed).[10]

We also compare the time it took participants to complete the first five grids each period, which was the minimum number of grids solved in any period. Participants took an average of 43.70 seconds in the productivity condition (Low: 43.67; High: 43.74), while those in the efficiency condition took longer with an average of 47.00 seconds (Low: 46.70; High: 47.31). As indicated in Figure 6, we find this difference is statistically significant overall (diff: 3.30; p-value 0.010 two-tailed).

[INSERT FIGURE 6 HERE]

Similarly, we compare the number of grids solved in the first 65 seconds each period, as all participants spent at least that long on the task each period. Again, we found those in the productivity conditions outperformed those in the efficiency conditions using this alternate measure. Participants completed an average of 7.49 grids in the first 65 seconds in the productivity condition (Low: 7.49; High: 7.48), while those in the efficiency condition were only able to complete an average of 6.99 (Low: 7.07; High: 6.90), which is significantly different (diff: -0.50; p-value 0.005 two-tailed).[11] Collectively, these supplemental results indicate that those operating under the efficiency contract performed worse at the task than those in the productivity contract, despite no significant difference in their skill in the practice period.

[10] Untabulated analyses are based on Logit regressions where the dependent variable is an indicator variable equal to one in a period where the participant achieved their bonus and zero otherwise. The independent variable of interest is *Efficiency*, as previously defined, and the model controls for *Uncertainty*, *PracticeRate*, *TargetLevel*, *Lag_Bonus*, period fixed effects and clustered robust standard errors. Results are robust to excluding any of these controls as well as measuring the dependent variable with or without the effects of outcome uncertainty on performance.

[11] Comparisons of (a) the average time to complete five grids and (b) the number of grids completed in 65 seconds are based on the estimated marginal means for each respective dependent variable using an OLS regression that interacts *Efficiency* and *Uncertainty*, controlling for *PracticeRate*, *TargetLevel*, *Lag_Bonus*, period fixed effects, and clustered robust standard errors. Results are robust to excluding any of these controls. Refer to Figure 6 for the plotted means.

This difference could, at least in part, be driven by participants rushing more under the efficiency focus, as evidenced by more mistakes in those conditions. In untabulated tests, we found that participants overall made an average of 1.16 incorrect attempts per period, which is an error rate of about 10% (i.e., misses scaled by the number correctly completed). Both measures (scaled and unscaled) were significantly higher in the efficiency conditions compared to the productivity conditions. That is, after controlling for the relevant covariates (i.e., uncertainty, skill, the chosen target level, period fixed effects, and clustered robust standard errors) we observed a 40.4 percent increase in the number of misses—or a 2.7 percentage-point increase to the error rate—for participants focused on efficiency compared productivity. In summary, participants under a productivity incentive not only selected higher targets, but also achieved their targets more frequently and made fewer mistakes compared to participants under an efficiency incentive.

5. CONCLUSION

In this study, we investigate how a productivity versus an efficiency incentive focus affects employee target setting under participative budgeting. Consistent with our predictions, we find employees perceive an efficiency contract that rewards input minimization as riskier than an equivalent productivity contract that rewards output maximization, and this heightened risk perception leads to lower performance targets to hedge against risk. We also find that this effect of incentive focus is robust even in production environments with relatively low outcome uncertainty.

Our study provides several important contributions to the literature on incentive contracting in management accounting. Specifically, we introduce a new and critical dimension to this literature: incentive focus. By demonstrating that efficiency and productivity incentive foci have significant differential effects on risk perceptions and target setting, we underline the importance of further investigation into this dimension of incentive contracting. We also expand the literature

on participative budgeting. While Evans et al. (2001) sparked a substantial stream of research focused on *rent-seeking* budgetary slack in participative budgeting, we expand the literature on *risk-reducing* budgetary slack by highlighting that different incentive foci can affect an employees' perception of risk in their operating environment. Moreover, we show that these risk perceptions can actually be harmful to firms through lower target setting and lower employee performance.

Our study also has important implications for organizations that use budget-based incentives and participative budgeting systems. To the extent that an organization has the flexibility to do so (e.g., automotive industry, food-service industry, etc.), utilizing productivity incentives instead of efficiency incentives may lead to lower levels of budgetary slack, higher performance targets, and greater performance. Alternatively, among organizations focused on efficiency for strategic reasons, our results suggest they may benefit from investment in managerial control systems to detect and mitigate excessive ex-ante slack in their budgets.

The distinction between productivity and efficiency objectives is a core design choice central to any firm's system of incentives and control. However, this distinction is relatively unexplored in managerial accounting research. Our study therefore suggests several fruitful avenues for further research. While we explore target setting as our primary construct of interest in this study as it is central to a firm's control system and prevalent in practice, further research is needed to empirically test the effects of incentive focus on other important organizational outcomes and dimensions of employee performance, such as honesty, cooperation, and creativity. Second, while the abstract experimental design implemented in this study provided a clean test of theory, affording us with strong internal validity, future research can explore the effect of different incentive foci in environments with more contextual elements and longer production periods, such as through a field experiment or utilizing natural field data.

APPENDIX 1

Letter-search Grid Screenshots

B	A	B	A	A
A	B	A	A	A
B	A	B	B	A
A	B	A	A	B
B	B	B	B	A

H	H	H	H	G
H	G	H	H	H
H	H	H	H	H
H	G	G	G	H
G	H	H	H	H

Q	Q	R	R	Q
Q	Q	Q	Q	Q
Q	R	R	Q	R
Q	R	R	R	Q
Q	R	Q	R	Q

Z	Z	Z	Y	Z
Z	Y	Z	Z	Z
Y	Y	Z	Z	Z
Z	Z	Z	Z	Z
Z	Y	Z	Z	Y

The images above depict a sample of the 5×5 grids shown to participants. Participants saw one grid at a time, in randomized order, and had to accurately report the number of times a given search letter (e.g., A, H, Y, etc.) appeared in each grid before moving on to the next grid.

APPENDIX 2
Variable Definitions

Variable Name	Definition
Dependent variable	
TargetLevel	Participants' selected target level within the possible range [1, 10], set ex-ante before the letter-search task each period.
AvgTargetLevel	Equal to the simple average of *TargetLevel* across all three periods.
Independent variables	
Efficiency	Equal to 1 for conditions with the efficiency incentive focus, 0 otherwise.
Uncertainty	Equal to 1 for conditions with high uncertainty, 0 otherwise.
Control variables	
PracticeRate	Participants' average time (in seconds) per grid completed during the practice period of the letter-search task.
RiskTaker	Participants' response about their general willingness to take risks using a 7-pt Likert scale from 1 ("Not at all willing") to 7 ("Very willing").
Optimism	The average of participant responses to the six-question optimism scale described in (Scheier, Carver, and Bridges 1994).
PerceivedRisk	Participants' level of agreement (on a 7-pt Likert scale) to the following statement: "I found the bonus to be risky".
Age	Participants' reported age in years.
Male	Equal to 1 if participants reported their gender as "Male"; 0 otherwise.
Experience	Participants' reported number of months of work experience.

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FIGURE 1
Target level schedule by condition

Productivity focus

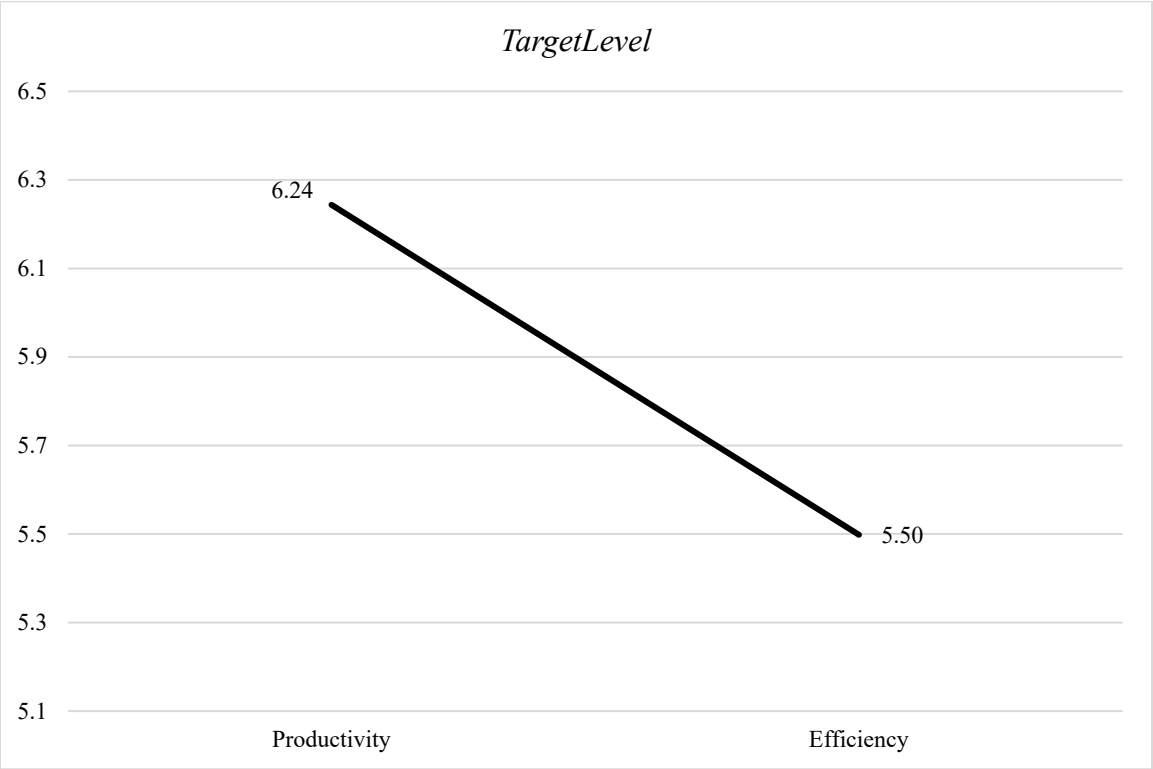
Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10
7 grids	8 grids	9 grids	10 grids	11 grids	12 grids	13 grids	14 grids	15 grids	16 grids

Efficiency focus

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10
170 seconds	160 seconds	150 seconds	140 seconds	130 seconds	120 seconds	110 seconds	100 seconds	90 seconds	80 seconds

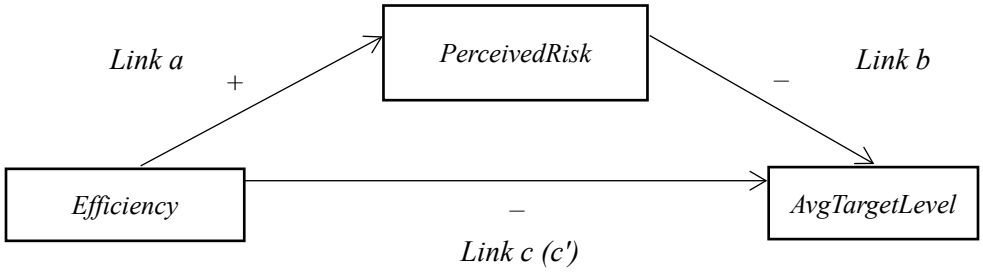
This figure depicts the target level schedule shown to participants, depending on their assigned condition. Participants only saw the portion of this figure relevant to their incentive focus condition.

FIGURE 2
Observed pattern of results by incentive focus



This figure plots the estimated marginal means of *TargetLevel* across the two incentive focus conditions, controlling for outcome uncertainty, participant skill, risk attitude, period fixed effects and clustered robust SE at the participant level. *Efficiency* reflects the condition where incentives are focused on performance efficiency (i.e., completing a set number of grids in as little time as possible). *Productivity* reflects the condition where incentives are focused on performance productivity (i.e., completing as many units as possible in a set time).

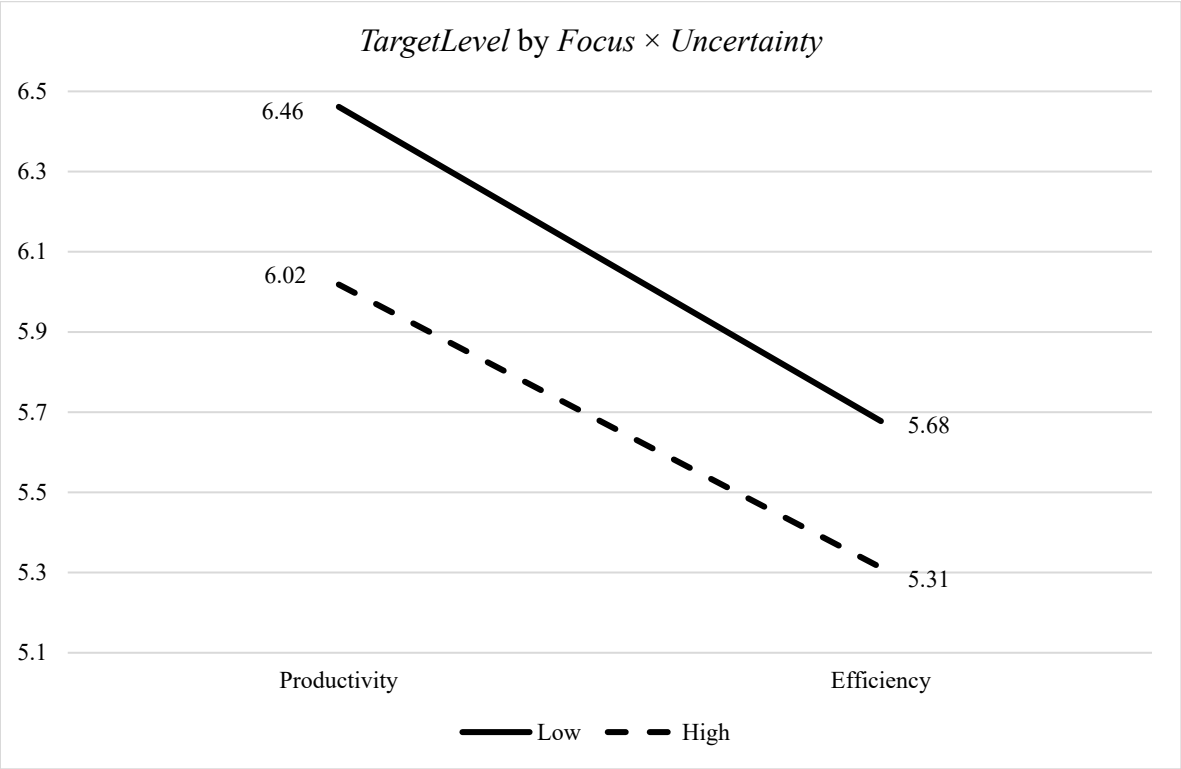
FIGURE 3
Tests of H2: Mediation analysis



Model Link	Coeff.	SE	z-stat	p-value	90% CI
a	0.722	0.234	3.08	**0.001**	[0.336, 1.107]
b	-0.157	0.085	-1.83	**0.034**	[-0.297, -0.016]
c	-0.411	0.272	-1.51	**0.066**	[-0.859, 0.037]
c'	-0.298	0.274	-1.09	**0.139**	[-0.749, 0.154]
Indirect effect:	-0.113	0.072	-1.58	**0.058**	[-0.231, 0.005]

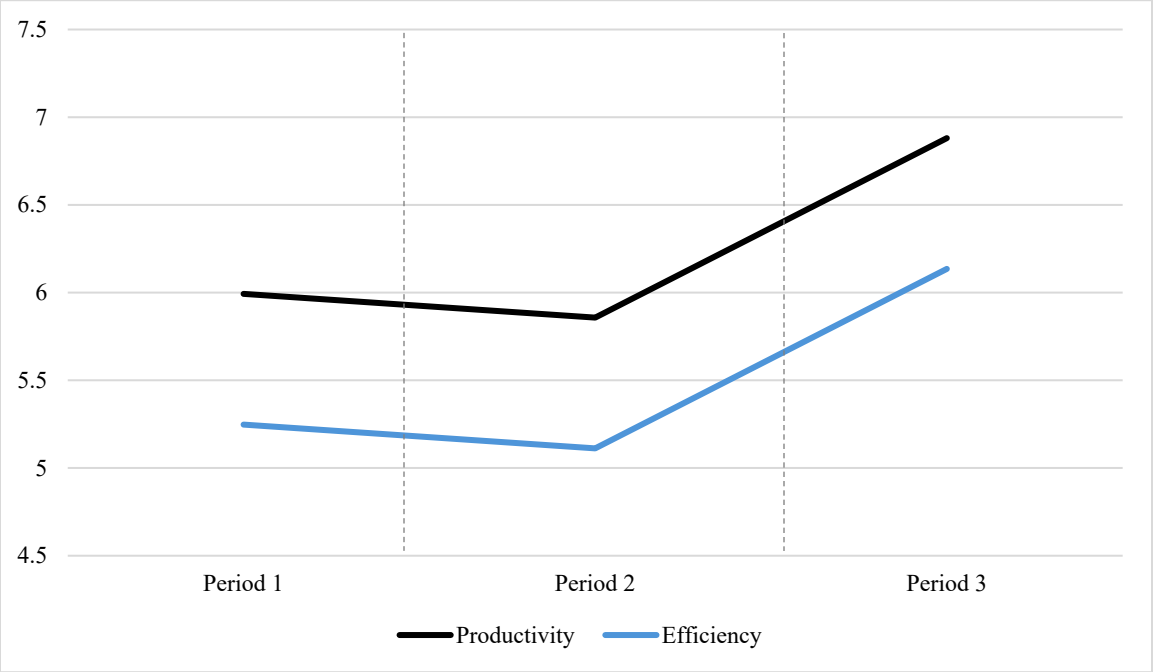
This figure reflects the predicted mediation model, whereby the negative effect of the efficiency focus on target setting should be mediated by participants' perceptions of risk regarding the bonus incentive. The reported results are based on a structural equation model (N = 171) with *AvgTargetLevel* as the dependent variable, *Efficiency* as the independent variable, and *PerceivedRisk* as the mediator, while controlling for uncertainty, participant skill, and risk attitude. Results are consistent when excluding these controls as well. Link a reflects the primary test of H2a. Link c reflects the total effect, while c′ is the direct effect of incentive focus on average target level. The indirect effect of link c reflects the primary test of H2b. Reported p-values are one-tailed consistent with the directional predictions of this mediation model, shown in **bold**. All other variables are as previously defined.

FIGURE 4
Pattern of results by outcome uncertainty



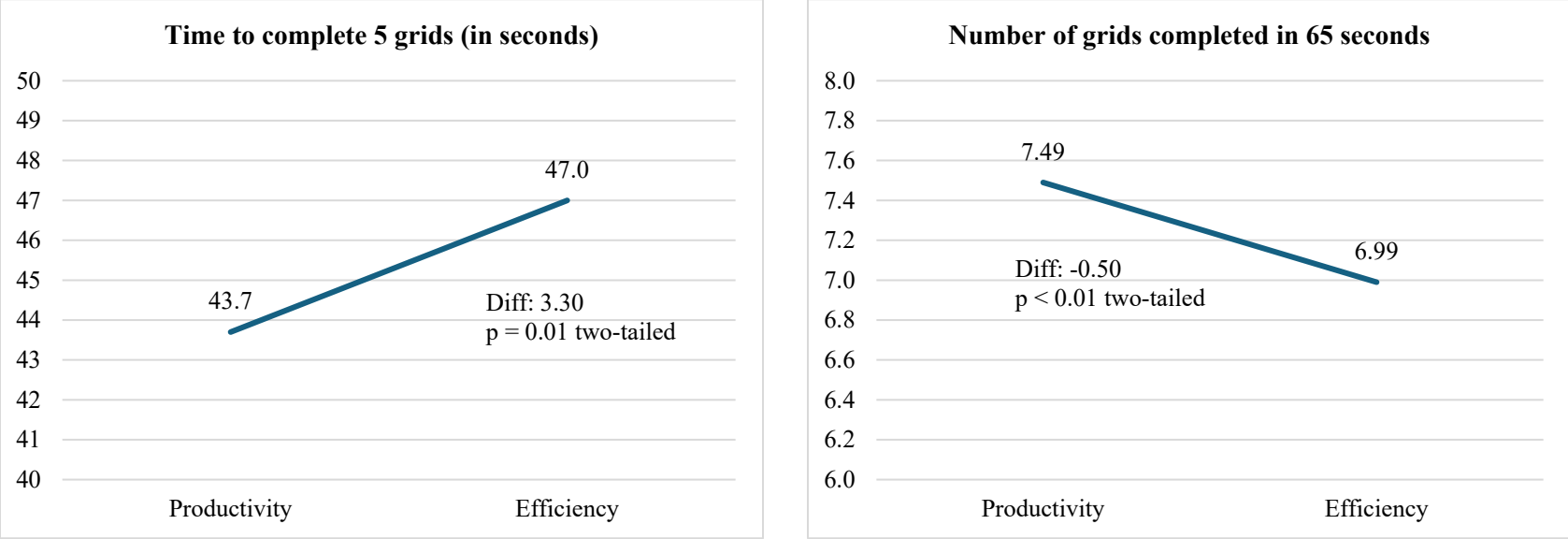
This figure plots the estimated marginal means of *TargetLevel* based on Tobit regression model presented in Panel A of Table 4, controlling for participant skill, risk attitude, period fixed effects and clustered robust SE at the participant level.

FIGURE 5
Estimated marginal means of *TargetLevel* by incentive focus per period



This figure plots the estimated marginal means of *TargetLevel* based on the Tobit regression model presented in Table 2 for each period independently, controlling for participant skill and risk attitude. The grey dotted lines reflect the timing of the observation of ex-post measurement error between periods. Recall, there was no observed measurement error prior to Period 1. Ex-post measurement error observed in Period 1 (Period 2) decreased (increased) the likelihood participants qualified for their bonus that period.

FIGURE 6
Performance effects by incentive focus



This figure depicts the estimated marginal means of two different measures of performance by incentive focus based on Tobit regressions, controlling for measurement error, target level, participant skill, bonus achievement in the previous period, period fixed effects and clustered robust standard errors at the participant level. The first measure of performance is the amount of time (in seconds) that it took participants to correctly complete the first five grids each period, with lower numbers indicating better performance. The second measure of performance is the number of grids participants were able to correctly complete within the first 65 seconds of each period, with higher numbers indicating better performance.

TABLE 1
Participant descriptive statistics, by condition

	Efficiency			**Productivity**			**Full Sample**
	Low Uncertainty N = 44	High Uncertainty N = 40	Overall N = 84	Low Uncertainty N = 43	High Uncertainty N = 44	Overall N = 87	N = 171
TargetLevel	5.81 (1.64)	5.51 (1.65)	5.67 (1.64)	6.23 (2.01)	5.89 (1.85)	6.06 (1.93)	5.87 (1.80)
PracticeRate	10.56 (3.09)	10.34 (2.29)	10.45 (2.72)	11.53 (4.22)	11.17 (5.10)	11.34 (4.66)	10.91 (3.85)
RiskTaker	4.80 (1.37)	4.95 (1.13)	4.87 (1.26)	4.56 (1.44)	4.57 (1.56)	4.56 (1.49)	4.71 (1.39)
Optimism	4.56 (0.97)	4.71 (1.02)	4.63 (1.00)	4.75 (0.79)	4.64 (1.02)	4.69 (0.91)	4.66 (0.95)
PerceivedRisk	4.64 (1.69)	5.15 (1.23)	4.88 (1.50)	4.16 (1.77)	4.41 (1.57)	4.29 (1.67)	4.58 (1.61)
Age	20.41 (0.69)	20.43 (0.81)	20.42 (0.75)	20.28 (0.55)	20.30 (0.55)	20.29 (0.55)	20.35 (0.66)
Male	0.70 (0.46)	0.75 (0.44)	0.73 (0.45)	0.74 (0.44)	0.77 (0.42)	0.76 (0.43)	0.74 (0.44)
Experience	14.75 (13.93)	20.85 (17.63)	17.65 (16.00)	14.79 (13.80)	20.50 (17.26)	17.68 (15.82)	17.67 (15.86)

This table reports the mean (std. dev.) of participant descriptive statistics across our experimental conditions, as well as overall. *Efficiency* reflects the condition where incentives are focused on performance efficiency (i.e., completing a quota in as little time as possible). *Productivity* reflects the condition where incentives are focused on performance productivity (i.e., completing as many units as possible in a set time). In the Low (High) uncertainty conditions, there is relatively low (high) measurement error in participants' final production time (output). *TargetLevel* reflects participants' chosen target level within the possible range [1, 10]. *PraticeRate* is participants' time per grid in the practice period and reflects an inverse measure of participant skill such that lower numbers are indicative of higher skill. *RiskTaker* reflects participants' willingness to take risks. *Optimism* is measured based on the average of participant responses to the six-question optimism scale. *PerceivedRisk* reflects participants agreement (on a 7-pt Likert scale) to the following statement: "I found the bonus to be risky". *Age* is in years, *Male* is equal to one for participants that described themselves as male, 0 otherwise, and *Experience* reflects participants' work experience in months. All standard deviations reported herein are on a participant-level basis. See Appendix 2 for the list of variable definitions.

TABLE 2
The effects of incentive focus and uncertainty on target levels

DV: *TargetLevel*

	Coeff.	Robust SE	t-stat	p-value	90% CI	
Efficiency	-0.745	0.221	-3.38	**< 0.001**	-1.109	-0.382
Uncertainty	-0.405	0.232	-1.74	**0.041**	-0.787	-0.022
PracticeRate	-0.281	0.088	-3.20	0.001	-0.425	-0.136
RiskTaker	0.194	0.081	2.39	0.017	0.060	0.328
Intercept	8.337	1.065	7.83	0.000	6.582	10.093

One-tailed p-values for tests of directional predictions are in **bold**; all other p-values are two-tailed.

Reported results reflect Tobit regressions (N = 513) with *TargetLevel* as the dependent variable (censoring: left = 7, right = 20). The independent variable of interest is *Efficiency*. The model includes period fixed effects and clustered robust standard errors at the participant level. All variables are as previously defined.

TABLE 3
Incentive focus effect across periods

Panel A: Average effects (DV: *Avg_TargetLevel*)

	Coeff.	Robust SE	t-stat	p-value	90% CI	
Efficiency	-0.693	0.220	-3.15	**0.001**	-1.058	-0.329
Uncertainty	-0.415	0.218	-1.90	**0.030**	-0.775	-0.054
PracticeRate	-0.262	0.029	-8.92	< 0.001	-0.311	-0.214
RiskTaker	0.184	0.081	2.25	0.025	0.049	0.318
Intercept	8.403	0.584	14.38	< 0.001	7.437	9.370

Panel B: Effect of incentive focus by period (DV: *TargetLevel*)

	Coeff.	Robust SE	t-stat	p-value	90% CI	
Effect of *Efficiency* in Period 1	-0.619	0.262	-2.37	**0.010**	-1.052	-0.186
Effect of *Efficiency* in Period 2	-0.892	0.254	-3.51	**< 0.001**	-1.313	-0.471
Effect of *Efficiency* in Period 3	-0.724	0.268	-2.70	**0.004**	-1.168	-0.281

One-tailed p-values for tests of directional predictions are in **bold**; all other p-values are two-tailed.

Panel A reports the results of an OLS regression (N = 171) with the average of *TargetLevel* per participant across all three periods as the dependent variable. Panel B reports the condensed results of a series of Tobit regressions run separately by period with *TargetLevel* as the dependent variable in each period as noted, censored at the lower bound of 1 and upper bound of 10. These results are also robust in sign, significance, and inference to OLS regressions as well (untabulated). The independent variable of interest across both panels is *Efficiency*, as previously defined. Controls in all models across both panels include *Uncertainty*, *PracticeRate*, and *RiskTaker*.

TABLE 4
The effects of incentive focus across uncertainty levels

Panel A: DV: *TargetLevel*

	Coeff.	Robust SE	t-stat	p-value	90% CI	
Efficiency	-0.784	0.315	-2.49	**0.007**	-1.302	-0.265
Uncertainty	-0.443	0.350	-1.27	**0.103**	-1.020	0.134
Efficiency × *Uncertainty*	0.078	0.452	0.17	0.863	-0.667	0.822
PracticeRate	-0.281	0.088	-3.20	0.001	-0.425	-0.136
RiskTaker	0.194	0.081	2.38	0.017	0.060	0.327
Intercept	8.360	1.114	7.51	0.000	6.524	10.195

Panel B: Simple effects

	Coeff.	Robust SE	t-stat	p-value	90% CI	
Efficiency in Low Uncertainty	-0.854	0.307	-2.78	0.006	-1.361	-0.348
Efficiency in High Uncertainty	-0.679	0.322	-2.11	0.036	-1.210	-0.148
Uncertainty in Productivity focus	-0.433	0.351	-1.23	0.219	-1.013	0.147
Uncertainty in Efficiency focus	-0.382	0.283	-1.35	0.178	-0.850	0.085

One-tailed p-values for tests of directional predictions are in **bold**; all other p-values are two-tailed.

Panel A reports the results of a Tobit regression (N = 513) with *TargetLevel* as the dependent variable (censoring: left = 7, right = 20). The independent variables are *Efficiency*, *Uncertainty*, and their interaction. The model includes period fixed effects and clustered robust standard errors at the participant level. Panel B reports the simple effects. All variables are as previously defined.