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*The Effects of Communication of Causal Linkages and Incentives on Employees' Construal Level  
Mindsets*

BY

*Bei Shi*

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree

Of

Doctor of Philosophy

In the Robinson College of Business

Of

Georgia State University

GEORGIA STATE UNIVERSITY  
ROBINSON COLLEGE OF BUSINESS  
2019

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## ACCEPTANCE

This dissertation was prepared under the direction of the *Bei Shi's* Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Business Administration in the J. Mack Robinson College of Business of Georgia State University.

Richard Phillips, Dean

## DISSERTATION COMMITTEE

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## ABSTRACT

*The Effects of Communication of Causal Linkages and Incentives on Employees' Construal Level Mindsets*

BY

*Bei Shi*

*November 19, 2019*

Committee Chair: *Dr. Ivo D. Tafkov and Dr. Flora (Hailan) Zhou*

Major Academic Unit: *School of Accountancy*

This study investigates how two management controls, communication of the causal linkages between employees' current actions and future outcomes and incentives that tie employees' future-period compensation to their current actions, affect employees' construal level mindsets. A construal level mindset refers to the abstractness of an individual's mental representation of an object, event, or action. A high-level construal has been shown to benefit various types of decisions and behaviors, such as creative performance, negotiation, and knowledge transfer. Using an experiment, I find that communication of the causal linkages increases employees' construal levels regardless of whether incentives tie employees' future-period compensation to their current actions. The findings suggest that firms can use the communication of the causal linkages, a relatively low-cost management control compared with incentives, to capitalize on the various decisional and behavioral benefits of high-level construal mindsets.

Key words: construal level mindsets; management control; communication of the causal linkages; incentives.

## **ACKNOWLEDGEMENT**

I would like to thank my committee members, Ivo Tafkov (Co-Chair), Flora Zhou (Co-Chair), Michael Majerczyk and Michael Williamson (External) for their generous support and helpful guidance in the dissertation process. I also would like to thank all my colleagues in the School of Accountancy at Georgia State University for their valuable feedback. I gratefully acknowledge the financial support from IMA Doctoral Student Grant. Lastly, I would like to thank my family for their company and unconditional support through the Ph.D. program.

## I. Introduction

Nowadays, an increasing number of firms realize the importance of engaging employees in strategy development and implementation and encourage employees at all hierarchies to see the big picture at work (Galunic and Hermreck 2012, Hoque 2014). One way to promote the desired big-picture thinking is to induce high-level construal mindsets from employees. A construal level mindset refers to how abstractly or concretely an individual mentally represents an object, event, or action (Trope and Liberman 2010). With a high-level construal mindset, individuals mentally represent an object in an abstract and coherent way and pay more attention to the essential features of the object; with a low-level construal mindset, individuals mentally represent an object in a concrete and unstructured way and pay more attention to the incidental features of the object (Trope and Liberman 2010)<sup>1</sup>. Research from psychology and organizational behavior has shown that construal level mindsets can influence representation, evaluation, prediction, judgment, and behavior (Trope and Liberman 2010), which are all important variables of interest to accounting researchers. In particular, prior literature has shown that a high-level construal mindset has various decisional and behavioral benefits. For example, high-level construal mindsets can promote creativity (e.g., Förster et al. 2004), enhance self-regulation (e.g., Fujita et al. 2006), produce greater outcomes in negotiations (e.g., Henderson et al. 2006), and facilitate knowledge transfer (e.g., Reyt et al. 2016).

Despite the potentially broad implications of construal level mindsets to accounting settings, accounting researchers only recently started to study construal level mindsets (Weisner 2015). The existing accounting studies have provided some insights on the behavioral and judgmental consequences of construal level mindsets (e.g., Elliot et al. 2015, Choi et al. 2016,

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<sup>1</sup> I use “object” here and in the following discussions of construal level mindsets to avoid repeating “object, event, or action” every time.

Backof et al. 2017). However, to capitalize on the benefits of high-level construal mindsets, it is important for firms to know how the management controls they implement influence employees' construal level mindsets. Therefore, in this paper, I examine how two management controls, communication of the causal linkages and incentives, affect employees' construal level mindsets.

Firms commonly implement management controls to influence behavior, facilitate decisions, and enhance performance (Chenhall 2003). In practice, firms increasingly use internal communication, a non-compensation-based control, to convey strategies and help employees see how their work matters to the firm (e.g., Gallo 2010, Galunic and Hermreck 2012).

Communication of the causal linkages, as an important part of The Balanced Scorecard (BSC), is aimed to help employees see the causal linkages among different performance measures, for example, lagging and leading performance measures (Kaplan and Norton 1996, 2001, Nørreklit 2000, Hoque and James 2000). Such causal communication makes employees realize the cause-and-effect links between their current actions and future outcomes (Farrell et al. 2012). Both practitioner and academic literature have shown that the communication of the causal linkages has important implications for employees' behavior and firm performance (e.g., Malina and Selto 2001, Ittner and Larcker 2003, Speckbacher et al. 2003, Tayler 2010, Cheng and Humphreys 2012, Farrell et al. 2012). One common theme of these studies is that they show how the communication benefits decisions and performance on specific tasks. However, drawing from research on construal level mindsets in psychology, I argue that the causal communication will not only affect the performance on the tasks that it is designed for but also influence employees' construal level mindsets, which can then influence employees' decisions and behaviors in various domains.



The second control I study is incentives. In particular, because of the temporal feature of the communication control that I am interested in (e.g., the communication of the causal linkages between employees' current actions and future outcomes), I also study the temporal feature of incentives. Specifically, I am interested in how static and dynamic incentives affect construal level mindsets differently. A static incentive is an incentive under which employees' current actions only affect their current-period compensation while a dynamic incentive is an incentive under which employees' current actions affect not only their current-period compensation but also their compensation in future periods.

The reasons for studying these two controls together are twofold. First, firms often implement management control systems that contain both compensation-based controls such as financial incentives and non-compensation-based controls such as communication (Malmi and Brown 2008, Christ et al. 2016). Prior studies show that these two types of controls can interact in influencing employees' judgments and behaviors (e.g., Chen et al. 2015, Chen et al. 2017). Thus, in this study, I am also interested in whether the causal communication and incentives can interact to influence construal level mindsets. Second, the two controls are both aimed to influence the time horizon that employees consider at work and are both related to the temporal focus of management controls. Therefore, I believe that studying how the two controls separately and also interactively influence employees' construal level mindsets can provide insights on firms' design of the temporal focus of their management control systems.

I predict that the firm's communication of the causal linkages will promote high-level construal mindsets from employees. Specifically, I argue that the causal communication makes employees see the more distant future consequences of their current actions, which then lead to a higher level of construal. In addition, the communication makes employees think about the

causality in their working environment and conveys to employees that their work matters to the organization, making employees view their work from a broad perspective (i.e., with a high-level construal mindset). I also predict that dynamic incentives, compared with static incentives, will lead to higher levels of construal. This is because dynamic incentives motivate employees to consider how their current actions affect their future compensation and considerations of more distant future will increase employees' construal levels. Finally, I predict that the effect of the causal communication on construal level mindsets is stronger under static incentives than under dynamic incentives. The intuition is that dynamic incentives should have already raised construal levels to some extent, so the causal communication is expected to increase construal levels to a lesser extent under dynamic incentives than under static incentives.

To test my hypotheses, I conduct a 2 x 2 between-subjects experiment with participants recruited from the Amazon Mechanical Turk (MTurk). Participants are randomly assigned to one of the four experimental conditions. In the experiment, participants first perform a hypothetical production task in which they allocate effort points between quantity and quality in multiple periods. In the task, I manipulate whether participants receive the communication of the causal linkages (yes or no) and their incentives (static or dynamic). By design, in all conditions, the quality of the products in one period will influence the selling price in subsequent periods. After the production task, construal level mindsets are measured using an atypical example task. Participants are presented with three categories of common objects and nine examples of each category. Participants rate to what extent they think each example belongs to the corresponding category. Among the nine examples of each category, three are atypical examples. The higher a participant rates the atypical examples, the broader the participant sees a category, and hence the higher the construal level of the participant.

Consistent with my prediction, I find that participants who receive the communication of the causal linkages show higher levels of construal than participants who do not receive the communication. Supplemental analysis of the performance on the production task shows that the causal communication also leads to higher firm profits. However, the results of hypothesis testing show no main effect of incentives on construal level mindsets and no interaction between the two management controls. Analysis of a post-experimental question shows that, compared with the static incentive, the dynamic incentive does lead to more considerations of future impacts of current actions but does not increase construal levels. Further analysis shows that participants working under the dynamic incentive have more difficulties in choosing their task strategies and focus too much on the detailed quantity-quality tradeoff. This focus on details offsets the effect dynamic incentives have on considerations of future impacts, and as a result, leads to a null effect of incentives on construal level mindsets.

My study contributes to the literature on BSC, in general, and to the research on the communication of causal linkages, in particular. I show that the benefits of the communication of the causal linkages are broader than previously documented. Specifically, my findings show that such communication can increase employees' construal levels, in addition to improving their judgments and performance at specific tasks that the communication is designed for. The communication of casual linkages, as a management control, makes employees consider temporally distant consequences of their actions, which is oftentimes a desired behavior (e.g., Farrell et al. 2008). In addition, this study finds that incentives tying employees' future-period compensation to their current actions (i.e., dynamic incentives) do not increase construal levels as expected. This result suggests that financial incentives, which are widely used to motivate

desired behaviors (Bonner and Sprinkle 2002), may not as effective in influencing construal level mindsets.

From a broader perspective, my study documents a spillover effect of management controls. Specifically, my findings show that the effect of the communication control designed for one specific performance goal (e.g., to help employees see the causal linkages) can spill over to affect employees' construal level mindsets, which are not explicitly incentivized or controlled. Prior managerial accounting literature has documented some spillover effects, such as the incentive on one task (or one dimension of a task) can spill over to influence performance on another task (or another dimension of the task) (e.g., Hecht et al. 2012, Brügger et al. 2017, Harris et al. 2018, Newman et al. 2019). My study adds to this stream of literature and shows that control system designs can have consequences beyond the focal tasks they are designed for and influences employees' construal level mindsets.

The findings of this study can also help practitioners make better management control design decisions. Management accountants often participate in the design of management controls, so it is important for them to know the implications of their design choices. My findings show that firms can increase employees' construal levels using the communication of the causal linkages, a management control with relatively low cost compared with incentives. In addition, the lack of evidence for an interaction between the two management controls in influencing construal level mindsets implies that firms can implement this communication control to induce high-level construal mindsets no matter whether employees are working under static or dynamic incentives. These findings provide management accountants a way to capitalize on the decisional and behavioral benefits of high-level construal mindsets documented in prior studies.

I discuss the background literature and develop the hypotheses in Section II. Section III describes the method. Section IV presents the results, and Section V concludes.

## **II. Theory and Hypotheses**

### **Construal level mindsets**

An individual's construal level mindset refers to how abstractly he or she mentally represents an object, event, or action. People can represent the same object at different abstraction levels in their minds (Trope and Liberman 2003). With a low-level construal mindset, an individual's mental representation of an object is concrete, subordinate, unstructured, and specific, and the individual will pay more attention to the incidental features of the object. With a high-level construal mindset, an individual's mental representation of an object is abstract, superordinate, coherent, and schematic, and the individual will pay more attention to the essential features of the object (Trope and Liberman 2010). As an example, an individual can mentally represent the event of "taking a test" as either "answering questions" or "showing one's knowledge" (Vallacher and Wegner 1989). As another example, an individual can construe the activity of two children throwing a ball in the backyard as either "playing ball" or "having fun" (Trope and Liberman 2010). In the two examples, the former representations indicate a low-level construal mindset while the latter representations indicate a high-level construal mindset.

Prior research shows that construal level mindsets can be influenced by situational factors (Trope and Liberman 2010) and are not task-specific (Fujita et al. 2006). Therefore, construal level mindsets induced at one task can be carried over to influence an individual's judgements and performance at subsequent tasks. Given this feature, many psychology studies manipulate construal level mindsets with one task and examine the effects of construal level mindsets with

an unrelated task (e.g., Förster et al. 2004, Freitas et al. 2004, Fujita and Roberts 2010). This non-task-specific feature of construal level mindsets is also important to the current study because I argue that management controls imposed on one task can influence employees' construal level mindsets in general, and the mindsets can subsequently affect a wide range of employees' decisions and behaviors at other tasks.

Early research on construal level mindsets started with temporal construal theory, which suggests that people construe distant future events in a relatively abstract way and near future events in a relatively concrete way (Liberman and Trope 1998, Liberman et al. 2002, Trope and Liberman 2003). With further development of the construal level theory, researchers argue that temporal construal theory is just one piece of the general construal level theory and elaborate the important connection between construal level mindsets and psychological distance (Trope and Liberman 2010). Psychological distance refers to the distance between an object, event, or action and the self in time (temporal distance), space (spatial distance), social (social distance), and hypotheticality.<sup>2</sup> Construal level theory suggests that as the psychological distance from an object increases, people adopt increasingly higher levels of construal to represent the object. That is, people tend to mentally represent psychologically distant objects with a high-level construal mindset and psychologically near objects with a low-level construal mindset (Liberman et al. 2002, Trope and Liberman 2010).

In recent years, the concept of construal level mindset has been introduced to the behavioral accounting literature, especially to financial accounting and auditing. In financial accounting, Lundholm et al. (2014) find that foreign firms that are more distant from the U.S. use

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<sup>2</sup> Research shows that the four dimensions of psychological distance are interrelated and the relationship between psychological distance and construal level is bi-directional (see Trope and Liberman 2010 as a review).

more readable text and more numbers in their disclosures, which lowers the construal levels of investors and lessens the psychological distance between the firms and the U.S. investors. Elliott et al. (2015) investigate a similar idea via two experiments and find that concrete language in disclosures increases investors' willingness to invest to a greater extent when the psychological distance between a firm and its investors is initially high. In auditing, Rasso (2015) shows that auditors who receive documentation instructions that promote a high-level construal mindset exert higher professional skepticism and process audit evidence more effectively when assessing a broad set of evidence. Audsabumrungrat et al. (2016) use construal level theory to predict and find that structured guidance puts auditors at a relatively low level of construal and leads to inferior materiality assessments. Backof et al. (2017) find that priming auditors with low-level construal mindsets increases auditors' sensitivity to contradictory audit evidence when assessing the assumptions made by the client on an individual basis. In managerial accounting, Choi et al. (2016) incorporate the insights from construal level theory to show that employees' interpretations and responses to managers' evaluations for their colleagues depend on their construal level mindsets. The existing accounting literature has provided some insights regarding the effects of construal level mindsets in accounting settings, but little is known about how management controls affect construal level mindsets. Therefore, this paper aims to contribute to the understanding of this important relationship.

### **Communication of the causal linkages**

Research on communication of the causal linkages is part of the literature on The Balanced Scorecard (BSC). BSC was first introduced by Kaplan and Norton in 1992 and has been widely used in practice (see Hoque 2014 for a review of the BSC literature). Initially, BSC was developed to address the concern that traditional performance measures are based merely on

financial metrics. By introducing measures of learning and growth, internal business process, and customer, BSC incorporates both lagging and leading, and financial and nonfinancial performance metrics into performance measurement system. Subsequently, researchers further developed the theory of BSC to show that the strategic objectives of the four perspectives (i.e., financial, customer, internal business process, and learning and growth) are causally linked, making BSC a tool for strategic planning, communicating and implementing (Kaplan and Norton 1993, 2007). BSC researchers suggest that firms should communicate the causal linkages throughout the organization hierarchies (e.g., through a strategy map) because employees' understanding of the causal linkages is vital for successful strategy implementation (Malina and Selto 2001, Hoque 2014).

Based on prior studies, I define the communication of the causal linkages as the firm's communication of the cause-and-effect linkages among lagging and leading, financial and nonfinancial performance measures to its employees (e.g., Kaplan and Norton 1996, Nørreklit 2000, Tayler 2010, Hoque 2014). Firms use this communication to help employees see the cause-and-effect links among different strategic objectives and improve performance (Ittner and Larcker 2003). Specifically, following Farrell et al. (2012), I operationalize the construct as the firm's communication of the causal linkages between employees' current actions and future outcomes. Accounting literature has documented various decisional and behavioral benefits of such communication of the causal linkages. For example, Tayler (2010) shows that framing BSC as a causal chain, together with involvement in the selection of performance measures, can reduce motivated reasoning when managers evaluate the success of the initiative they select. Cheng and Humphreys (2012) find that presenting the causal linkages among strategic objectives in a strategy map fashion improves managers' judgments related to information relevance and



strategy appropriateness. Farrell et al. (2012) show that the communication of the causal linkages reduces short-sightedness and increases employees' allocation of effort to long-term goals, leading to higher overall firm profits in a multi-period setting. So far, research of the causal communication focuses primarily on the benefits of such communication for specific decisions or individual tasks. In this paper, I extend the literature by investigating whether such causal communication also influences employees' construal level mindsets, which then have a wide range of decisional and behavioral implications.

### **Static incentive vs. Dynamic incentive**

From a temporal perspective, financial incentives can be classified as either static or dynamic incentives. The key difference between the two types of incentives is whether there are intertemporal connections between employees' current-period actions and future-period compensation. A static incentive is an incentive under which employees' current actions only affect their current-period compensation. Under a static incentive, each period is independent for contracting purpose. That is, there are no intertemporal links between employees' actions in one period and their compensation in future periods (Prendergast 1999). A dynamic incentive is an incentive under which employees' current actions can affect not only their current-period compensation but also their compensation in future periods (Prendergast 1999). Under dynamic incentives, employees' expectations of their compensation in future periods can influence their choices of actions in the current period (Feltham et al. 2006). In other words, because of the intertemporal links between actions in one period and compensation in future periods, under dynamic incentives, employees face a multi-period decision when choosing their actions. Therefore, to maximize their overall compensation, employees with a dynamic incentive will have to consider the intertemporal connections between their current performance and future

compensation whereas employees with a static incentive will only need to consider the influences of their current actions on their current-period performance.

In practice, we observe both static and dynamic incentives being offered to employees.<sup>3</sup> Static incentives, such as fixed-rate piece rate and flat wage, have been widely used. In recent decades, incentives that reflect the intertemporal connections between employees' current actions and future-period compensation (i.e., dynamic incentives) became increasingly popular. For example, some firms provide incentives that incorporate forward-looking performance measures (e.g., quality, customer satisfaction) (e.g., Bouwens and Kroos 2016) to motivate employees to attend to the long-term impacts of their actions (Lambert 2001). Different firms or the same firm at different stages may choose different types of incentives to align interests (Chenhall 2003). For example, firms emphasizing short-term profitability may choose static incentives to boost current-period productivity while firms emphasizing long-term growth may choose dynamic incentives to promote forward-looking efforts by contracting on quality or learning.

In this paper, my focus is not on how firms select incentives. Instead, I investigate how the two types of incentives (static or dynamic), given their existence in a firm, affect employees' construal level mindsets. Furthermore, I also examine whether the two types of incentives, as a compensation-based management control, interact with a non-compensation-based control, the firm's communication of the causal linkages, in influencing employees' construal level mindsets.

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<sup>3</sup> Static and dynamic incentives do not refer to any specific forms of incentives. As defined earlier, whether an incentive is considered static or dynamic depends on whether there are intertemporal connections between employees' current-period actions and future compensation under that incentive. For example, a fixed-rate piece-rate contract is a static incentive, while a flexible-rate piece-rate contract (e.g., employees' current actions can influence future piece rate) is a dynamic incentive.

## **Development of hypotheses**

Drawing on the research on construal level mindsets in psychology, I predict that the communication of the causal linkages between employees' current actions and future outcomes will increase employees' construal levels. I also expect that dynamic incentives, compared with static incentives, will lead to higher levels of construal. Finally, I predict that the effect of the causal communication on construal level mindsets will be stronger under static incentives than under dynamic incentives. Below, I will elaborate the theory behind the three predictions in detail.

### *The effect of the communication of the causal linkages on construal level mindsets*

I predict that the firm's communication of the causal linkages can increase employees' construal levels in three ways. First, the communication makes employees see the long-term impacts of their actions and makes them think about the future, which leads to a high-level of construal mindset. Prior literature suggests that in an environment where actions have both short-term and long-term impacts, people tend to choose actions that maximize short-term payoffs and behave as if they are ignoring the long-term impacts (e.g., Herrnstein et al. 1993, Dasgupta and Maskin 2005, Neth et al. 2006, Farrell et al. 2012). In this circumstance, the communication of the causal linkages between current actions and future outcomes can help employees realize the more distant future impacts of their actions (Ittner and Larcker 2003). Trope and Liberman (2003) argue that thinking about how a current choice influences distant future outcomes can promote a high-level construal of the choice. Second, the causal communication can increase construal levels by making employees see the causality in their working environment and view their jobs from a broader perspective. Without such causal communication, employees are likely to view their tasks at hand from a relatively narrow perspective and focus on how to do the tasks,

leading to a low-level construal mindset. With the causal communication, employees think about why they choose certain actions in a period and no longer view their actions in each period as isolated. According to construal level theory, thinking about why to do something will lead to a high-level construal mindset. Third, the communication also has symbolic meanings. It allows employees to see that their current actions can affect future firm outcomes and implicitly conveys to employees that their work matters to the firm. Employees' attention on the meanings and implications of their work will make them view their work in a more abstract way, leading to a high-level construal mindset. In sum, the above discussions lead to the following hypothesis:

**H1: Communication of the causal linkages will increase construal levels.**

*The effect of incentives on construal level mindsets*

I expect that, compared with static incentives, dynamic incentives will lead to higher levels of construal. Prior literature suggests that incentives have an attention-directing property (Holmstrom and Milgrom 1991, Harris et al. 2018). *Under dynamic incentives*, employees' current actions affect not only their current-period compensation but also their compensation in future periods. This intertemporal link between current actions and future compensation provides employees economic incentives to consider the long-term consequences of their actions. *Under static incentives*, there are no economic incentives for employees to consider the future because their current actions only affect their current-period compensation. As a result, employees are likely to focus on the short-term consequences of their actions. According to construal level theory, the different temporal foci of employees working under the two types of incentives will influence their construal level mindsets differently. Specifically, considerations of relatively distant future will lead to higher levels of construal and considerations of relatively near future

will lead to lower levels of construal (Trope and Liberman 2003). The above discussions lead to the following hypothesis:

**H2: Dynamic incentives will lead to higher construal levels than static incentives.**

The above hypothesis is intuitive but not without tension. Prior literature shows that when employees work in an environment where their actions have both short-term and long-term implications, some of them have difficulty in taking the long-term impacts of their actions into consideration, despite their dynamic incentives (Farrell et al. 2012). These people behave as if they are ignoring the intertemporal linkages and focus on the short-term impacts of their actions (Farrell et al. 2012). If this is the case, these employees may not adopt high-level construal mindsets even working under dynamic incentives because they do not consider the future. In addition, compared with employees working under static incentives, employees working under dynamic incentives may find it more difficult to discover the appropriate task strategy because of the tradeoff between current and future compensation. As a result, employees with dynamic incentives may have to delve into the details of their tasks to find out the best strategy. Prior literature on construal level mindsets shows that when people focus on the details of how to do something, they think concretely (Vallacher and Wegner 1989, Freitas et al. 2004, Fujita et al. 2006). This concrete thinking may weaken the effect that dynamic incentives have on increasing construal levels.

*The effect of the communication of the causal linkages and incentives on construal level mindsets*

Given the potential for the communication of the causal linkages to increase construal levels, I predict that this effect will be stronger under static incentives than under dynamic incentives. The intuition behind the prediction is that dynamic incentives have already increased

construal levels to some extent so the effect of the communication on construal level mindsets is smaller under dynamic incentives than under static incentives.

*With a static incentive*, employees do not have economic incentives to concern the long-term influences of their actions because their future-period compensation are not affected by their current actions. As a result, in the *absence* of the communication of the causal linkages, employees are likely to only focus on the current period and construe their actions at a low-level construal mindset. In contrast, in the *presence* of the causal communication, as discussed in the development of H1, I expect the communication to increase the levels of construal of employees, even though static incentives provide employees no economic motivation to consider future periods. In psychology, researchers frequently use the priming technique to make experimental participants consider temporally distant or near events to induce high-level or low-level construal mindsets (e.g., Liberman and Trope 1998, Liberman et al. 2002, Förster et al. 2004, Wakslak et al. 2008). In these studies, the priming technique successfully influences construal level mindsets, but participants seldom receive any monetary incentive for them to process the information communicated to them. Moreover, several accounting papers studying communication show that employees process the information communicated to them (e.g., feedback, value statement, etc.) even with no monetary incentives to do so or with monetary incentives to not do so (e.g., Christ et al. 2012, Kachelmeier et al. 2016). Therefore, I expect that under static incentives, the communication of the causal linkages will significantly increase employees' construal levels.

*With a dynamic incentive*, employees are economically motivated to consider relatively more distant future. As discussed in the development of H2, considerations of future will increase construal levels. However, as also discussed in the development of H2, the effect of

dynamic incentives on construal levels may not be fully realized because of the cognitive difficulties employees face under dynamic incentives. In this case, I expect the communication of the causal linkages to lower employees' cognitive difficulties in seeing the future impacts of their current actions and further increase employees' construal levels. However, because dynamic incentives should have already increased employees' levels of construal to some extent, I expect the effect of the causal communication on construal levels to be only incremental.

Therefore, I predict that the firm's communication of the causal linkages will lead to a greater increase of employees' construal levels under static incentives than under dynamic incentives. The above discussions lead to the following hypothesis:

**H3: Communication of the causal linkages will increase construal levels to a greater extent under static incentives than under dynamic incentives.**

### **III. Method**

To test these hypotheses, I use a 2 x 2 between-subjects experimental design in which I vary two factors—communication of the causal linkages (absent or present) and incentives (static or dynamic).

#### **Experimental tasks**

The experiment contains two tasks, a production task and an atypical example task. In the production task, participants assume the role of workers who produce computer chips and allocate their effort between the quantity dimension and the quality dimension of their production. The production task contains three periods. In each period, participants have 10 hypothetical effort points to allocate. They have to allocate away all 10 points and allocate at least 1 point to each dimension. The more effort allocated to the quantity dimension, the more

computer chips a worker produces. The more effort allocated to the quality dimension, the higher the quality of the computer chips a worker produces.

The quality of the computer chips produced in one period influences the selling price of the computer chips in subsequent periods.<sup>4</sup> The selling price may rise or fall, and the relationship between quality and selling price is held constant across all conditions. In the first period, the selling price per computer chip is always 100 *Lira* (an experimental currency). Appendix A shows the underlying relationships between effort points allocated to each dimension, the number of computer chips produced, and the changes of selling price from period to period. These relationships are held constant across all conditions.

Feedback is also held constant across all experimental conditions. At the end of each period, participants are informed of the number of computer chips they make and their earnings in the current period, and also the selling price and their pay per computer chip in the next period. They are also reminded of their allocation decisions, and the selling price and their pay per computer chip in the current period.

After the production task, participants proceed to an atypical example task that is unrelated to the production task and is used to measure participants' construal levels. In this task, participants are presented with three categories of common objects (i.e., clothing, vehicles, and furniture) and nine examples of each category. The nine examples in each category differ in their representativeness of that category. Participants' task is to indicate to what extent they think each example belongs to the given category on a 10-point scale. A rating of 1 means the example definitely does not belong to the category, and a rating of 10 means the example definitely

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<sup>4</sup> I create this production task based on the underlying logic of the "sandwich task" used by Farrell, Kadous, and Towry (2008, 2012). In the task, participants make virtual sandwiches in a video-game kind of program. In my production task, I abstract away from real effort task and ask participants to allocate hypothetical effort points. I keep the intertemporal connection between quality and selling price in the sandwich task in my production task.



belongs to the category. The three categories are taken from the seminal paper on mental representation of semantic categories by Rosch (1975). The strength of the representativeness of the examples is validated in that paper. Among the nine examples of each category, three are strong examples, three are medium examples, and three are weak/atypical examples.<sup>5</sup> In the task, participants see the three categories in sequence. In each category, the nine examples are presented in a random order (with the exception that the first example shown in each category is always a strong example) (Isen and Daubman 1984, Smith and Trope 2006). Participants in all conditions are paid \$0.5 for doing this atypical example task.

### **Manipulation of the communication of the causal linkages**

In the *Communication* conditions, participants receive a message from the management team of the firm about the causal linkages between quality, customer satisfaction, and future selling price. Specifically, participants are informed that higher quality of computer chips will lead to higher customer satisfaction, which will then lead to higher selling prices in future periods. In the *No Communication* conditions, participants do not receive the message.

### **Manipulation of incentives**

For participants in all conditions, their compensation in every period equals the number of computer chips they produce in that period times the payment rate for that period. The payment rate is how much a participant earns for producing one computer chip. In the *Dynamic Incentive* conditions, the payment rate is 10% of the current-period selling price. Since the selling price can rise or fall from period to period, the payment rate can be different in every period. In a

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<sup>5</sup> Below are the three categories and the nine examples in each category used in the experiment. For each example, I use S (M/W) to indicate that it is a strong (medium/weak) example of the corresponding category.

**Clothing:** Dress(S), Belt(M), Shirt(S), Gloves(W), Pants(S), Purse(W), Ring(W), Raincoat(M), Shoes(M); **Vehicle:** Truck(S), Boat(M), Feet(W), Bus(S), Camel(W), Bike(M), Subway(M), Car(S), Elevator(W); **Furniture:** Chair(S), Lamp(M), Bookcase(M), Footstool(M), Fan(W), Stove(W), Sofa(S), Table(S), Telephone(W).

given period, the selling price and the payment rate are determined by the quality of computer chips produced in previous periods. That is, under the dynamic incentive, there is an intertemporal link between current-period action choices and subsequent-period compensation. In the *Static Incentive* conditions, the payment rate is 10 *Lira* in *all* periods. That is, under the static incentive, there are no intertemporal links between current-period action choices and subsequent-period compensation. Participants' total compensation from the production task is the sum of their earnings in the three periods. The conversion rate is 800 *Lira* per \$1.

### **Participants and experimental procedures**

One-hundred and twenty participants were recruited through the MTurk platform to participate in the experiment. To participate in the study, MTurk workers were directed to a Qualtrics survey by a web link. First, they read the consent form and the general introduction. Next, they were randomly assigned to one of the four experimental conditions and read the instructions of the production task. As part of the instructions, participants read about their incentives (static or dynamic) of the production task and for those in the *Communication* conditions, they also read the firm's communication of the causal linkages between quality and future selling price (see Appendix B). Participants took a quiz to ensure they understand the instructions before proceeding to the production task. After the production task, participants answered a post-experimental question that captures their considerations of future impacts of their actions at the production task. Then, participants' construal levels were measured using the atypical example task. At the end of the study, participants provided some demographic information. Each participant then received a random number for them to type into the MTurk website to get paid. Participants were paid their earnings from the experiment in US dollars

through the MTurk website. On average, participants spent around 10 minutes on the experiment and earned \$1.65, ranging from \$1.4 to \$2.09.

**Dependent variable**

The dependent variable is construal level, which is measured as the average rating participants assign to the nine weak examples of the three categories in the atypical example task. A higher rating indicates a higher level of construal. The rationale is that participants with high-level construal mindsets will view the three categories from a broader and more abstract perspective so that they are more likely to consider the weak examples as belonging to the corresponding categories.

**IV. Results**

**Descriptive statistics**

The means of construal levels in the four conditions are presented in Table 1. The average age of the participants is 35 years old, and 66 percent of the participants are male. There was no difference across the four conditions in terms of gender, age, or ethnicity.

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**Table 1**

**Descriptive Statistics**

**Construal Level<sup>a</sup>**

Mean (Standard deviation)

**Communication of the Causal Linkages<sup>b</sup>**

	<b><u>No</u></b>	<b><u>Yes</u></b>
<b><u>Static Incentive</u></b>	3.92 (1.94) N=28	4.56 (2.41) N=32
<b><u>Dynamic Incentive</u></b>	3.67 (1.79) N=32	4.30 (2.40) N=28

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### Table 1 (continued)

<sup>a</sup> *Construal Level* is measured as the average of the ratings participants assign to the nine weak examples (Gloves, Purse, Ring; Camel, Feet, Elevator; Stove, Fan, Telephone) of the three categories (Clothing, Vehicle, Furniture), respectively. For each example, participants rate it on a 10-point scale (1=definitely does not belong to the category; 10=definitely belongs to the category).

<sup>b</sup> *Communication of the Causal Linkages* refers to the presence or absence of the firm's communication of the causal linkages between employees' current actions and future outcomes at the production task.

<sup>c</sup> *Incentives* refer to the incentive that participants receive for the production task.

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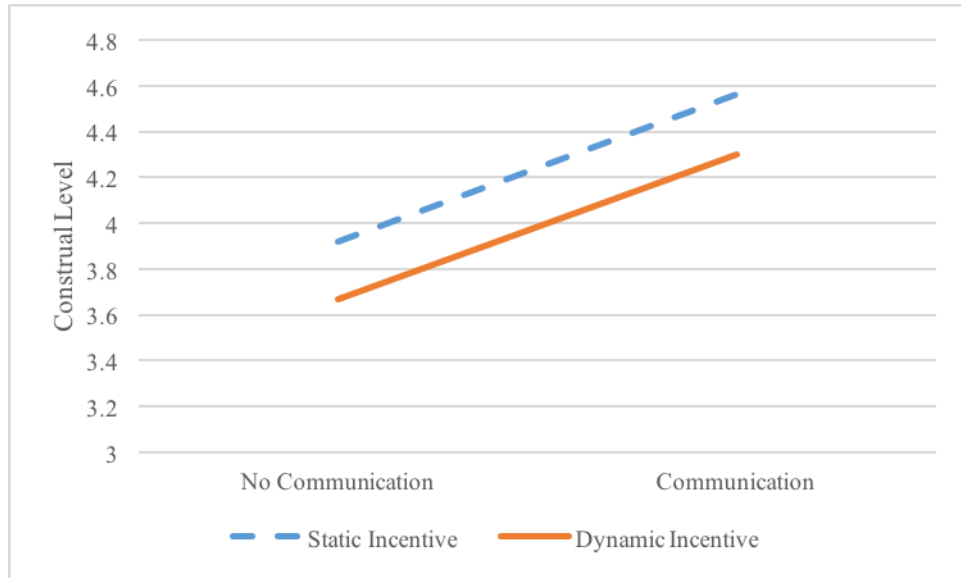
### Hypotheses testing

I predict that both the communication of the causal linkages and dynamic incentives will increase construal levels (H1 and H2). I also predict that the effect of the causal communication on construal level mindsets will be stronger under static incentives than under dynamic incentives (H3). Figure 1 shows the means of construal levels in the four experimental conditions. A qualitative observation from Figure 1 is that participants who receive the causal communication show higher levels of construal than participants who do not receive the communication. This pattern is directionally consistent with H1.

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**Figure 1**

**Effects of Communication of Causal Linkages<sup>a</sup> and Incentives<sup>b</sup> on Construal Levels<sup>c</sup>**



<sup>a</sup> *Communication of Causal Linkages* refers to the presence or absence of the firm’s communication of the causal linkages between employees’ current actions and future outcomes at the production task.

<sup>b</sup> *Incentives* refer to the incentive that participants receive for the production task.

<sup>c</sup> *Construal Level* is measured as the average of the ratings participants assign to the nine weak examples (Gloves, Purse, Ring; Camel, Feet, Elevator; Stove, Fan, Telephone) of the three categories (Clothing, Vehicle, Furniture), respectively. For each example, participants rate it on a 10-point scale (1=definitely does not belong to the category; 10=definitely belongs to the category).

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Table 2 reports the results of an ANOVA with construal levels as the dependent variable, and the communication of the causal linkages and incentives as the independent variables. The ANOVA results show a marginal significant main effect of the causal communication on construal levels ( $F_{1,116}=2.63$ ,  $p=0.108$ ), which supports H1.<sup>6</sup> The results show no main effect of incentives on construal levels ( $F_{1,116}=0.43$ ,  $p=0.515$ ), so H2 is not supported. Regarding the

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<sup>6</sup> All the p-values reported in this paper are two-tailed unless indicated otherwise.

predicted interaction, the results show an insignificant interaction between the causal communication and incentives ( $F_{1,116}=0.00$ ,  $p=0.985$ ). Therefore, H3 is not supported.

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**Table 2**  
**Hypotheses Testing**

**ANOVA model of Construal Level<sup>a</sup>**

<u>Source</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p-value*</u>
Model	3	4.958	1.07	0.365
Communication <sup>b</sup>	1	12.172	2.63	0.108
Incentives <sup>c</sup>	1	1.979	0.43	0.515
Communication <sup>b</sup> x Incentives <sup>c</sup>	1	0.002	0.00	0.985
Residual	116	4.634		

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<sup>a</sup> *Construal Level* is measured as the average of the ratings participants assign to the nine weak examples (Gloves, Purse, Ring; Camel, Feet, Elevator; Stove, Fan, Telephone) of the three categories (Clothing, Vehicle, Furniture), respectively. For each example, participants rate it on a 10-point scale (1=definitely does not belong to the category; 10=definitely belongs to the category).

<sup>b</sup> *Communication* refers to the presence or absence of the firm’s communication of the causal linkages between employees’ current actions and future outcomes at the production task.

<sup>c</sup> *Incentives* refer to the incentive that participants receive for the production task.

\* All p-values are two-tailed.

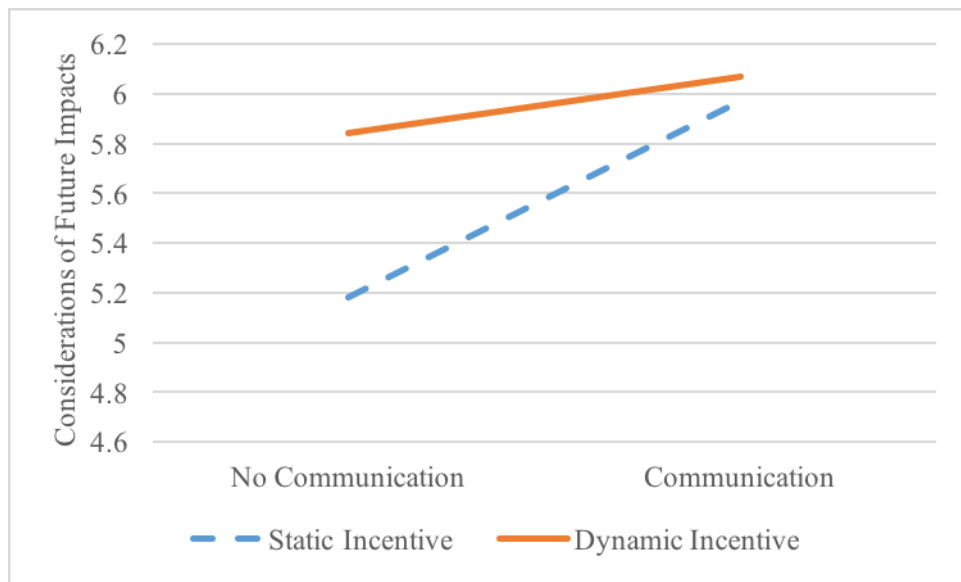
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To find out why there are no main effect of incentives on construal levels and no interaction between the causal communication and incentives, I analyze the post-experimental question that participants answered after the production task. The question asks participants “In each period, to what extent did you consider how your effort allocation in that period would influence your pay in subsequent periods? (1=not at all; 4=to some extent; 7=to a great extent)”. This question is designed to capture the extent to which employees consider the future impacts of their current actions when they make their effort allocation decisions. The pattern in Figure 2

shows that, compared with the static incentive, the dynamic incentive does make participants consider the future impacts of their decisions more.

Figure 2

**Effects of Communication of Causal Linkages<sup>a</sup> and Incentives<sup>b</sup> on Considerations of Future Impacts<sup>c</sup>**



<sup>a</sup> *Communication of Causal Linkages* refers to the presence or absence of the firm’s communication of the causal linkages between employees’ current actions and future outcomes at the production task.

<sup>b</sup> *Incentives* refer to the incentive that participants receive for the production task.

<sup>c</sup> *Consideration of Future Impacts* represents the responses to the post-experimental question: In each period, to what extent did you consider how your effort allocation in that period would influence your pay in subsequent periods? (1=not at all; 4=to some extent; 7=to a great extent)

Panel A of Table 3 reports the means of the responses to this question in the four conditions. Panel B of Table 3 reports the results of an ANOVA with responses to the post-experimental question as the dependent variable, and the communication of the causal linkages and incentives as the independent variables. Given the marginal significant interaction term in

the ANOVA results, I use simple effects analysis to examine the effect of incentives on considerations of future impacts in Table 3 Panel C. The results show that the dynamic incentive significantly increases the extent to which participants consider the future impacts of their actions in the absence of the causal communication ( $F_{1,116}=4.94$ ,  $p=0.028$ ).

**Table 3**

**Post-experimental Question on Considerations of Future Impacts**

**Panel A: Considerations of Future Impacts<sup>a</sup>**

Mean (Standard deviation)

		<u>Communication of the Causal Linkages<sup>b</sup></u>	
		<u>No</u>	<u>Yes</u>
<u>Incentives<sup>c</sup></u>	<u>Static Incentive</u>	5.18 (1.49) N=28	5.97 (0.78) N=32
	<u>Dynamic Incentive</u>	5.84 (1.30) N=32	6.07 (0.94) N=28

**Panel B: ANOVA model of Considerations of Future Impacts<sup>a</sup>**

<u>Source</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p-value*</u>
Model	3	4.591	3.43	0.019
Communication <sup>b</sup>	1	7.736	5.78	0.018
Incentives <sup>c</sup>	1	4.402	3.29	0.072
Communication <sup>b</sup> x Incentive <sup>c</sup>	1	2.363	1.77	0.186
Residual	116	1.338		

**Panel C: Simple effects analysis**

<u>Simple effects</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p-value*</u>
Effect of Incentives <sup>c</sup> when Communication <sup>b</sup> is absent	1	6.607	4.94	0.028
Effect of Incentives <sup>c</sup> when Communication <sup>b</sup> is present	1	0.157	0.118	0.732



**Table 3 (continued)**

<sup>a</sup> *Consideration of Future Impacts* represents the responses to the post-experimental question: In each period, to what extent did you consider how your effort allocation in that period would influence your pay in subsequent periods? (1=not at all; 4=to some extent; 7=to a great extent)

<sup>b</sup> *Communication* refers to the presence or absence of the firm's communication of the causal linkages between employees' current actions and future outcomes at the production task.

<sup>c</sup> *Incentives* refer to the incentive that participants receive for the production task.

\* All p-values are two-tailed.

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Taken together, the analyses of the post-experimental question and the test of H2 indicate that without the causal communication, the dynamic incentive does lead to more considerations of future impacts but does not subsequently increase construal levels. As discussed in the development of H2, it is possible that even though the dynamic incentive does make participants consider more distant future, it may also draw participants' attention to the details of the tradeoff between current and future compensation. In the experiment, this intertemporal tradeoff boils down to the quantity-quality tradeoff at the production task. Under the static incentive, participants face no such tradeoff. To maximize their compensation, they should always allocate the minimum level of effort to the quality dimension and the maximum level of effort to the quantity dimension. However, under the dynamic incentive, to maximize their compensation, participants need to consider the tradeoff. Allocating more effort to quantity increases current-period compensation but hurts future-period compensation. Allocating more effort to quality decreases current-period compensation but helps future-period compensation. When comparing different allocation strategies, participants are likely to delve into the details of the production task in order to make a better tradeoff. Particularly, this quantity-quality tradeoff is a bigger challenge and requires more trials for employees who do not receive the communication of the

causal linkages. According to prior literature, focus on details will lower construal levels (Vallacher and Wegner 1989, Freitas et al. 2004, Fujita et al. 2006) and may offset the effect dynamic incentives have on construal levels through motivating more considerations of the future.

To examine whether it is strategy experimentations of different tradeoffs that lower construal levels, I create a measure to capture strategy experimentations. The measure is calculated as the sum of the absolute changes of the effort points allocated to the quantity dimension from period one to period two and from period two to period three (See Appendix A). A higher sum indicates more strategy experimentations. Results of a t-test show that without the causal communication, participants receiving the dynamic incentive engage in more strategy experimentations than do participants receiving the static incentive ( $t_{58}=-3.18$ ,  $p=0.001$ , one-tailed, untabulated). This result provides some evidence that considerations of the quantity-quality tradeoff may explain why in the absence of the causal communication, participants working under the dynamic incentive show more considerations of future impacts of their actions but show the same level of construal as participants working under the static incentive.

### **Production task performance**

Because the performance of the production task is not the focus of this study, I do not form hypotheses on it. However, I analyze the effort allocation decisions in the production task to see whether the two management controls work as expected. I expect that, compared with participants receiving the dynamic incentive, participants receiving the static incentive will allocate more effort to the quantity dimension and less effort to the quality dimension. I also expect that participants who receive the communication of the causal linkages will allocate more

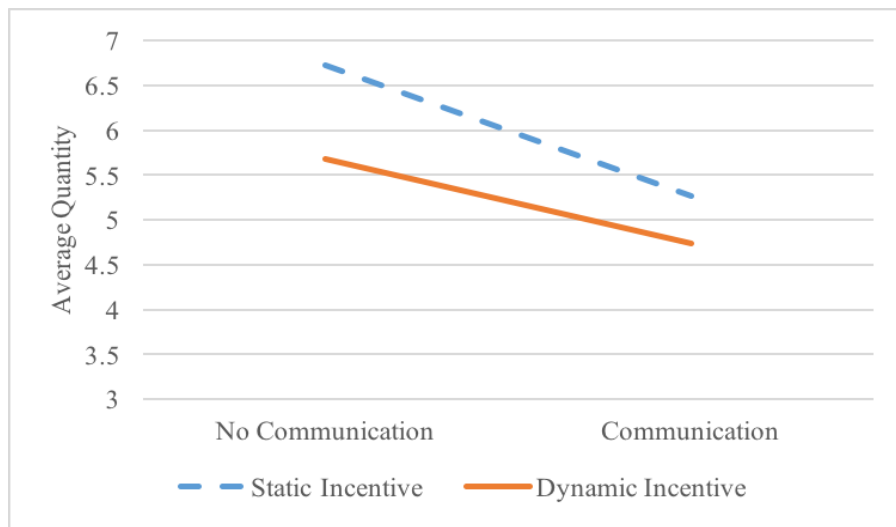
effort to the quality dimension and less effort to the quantity dimension than participants who do not receive such communication do.

I define *Average Quantity* as the average number of effort points participants allocate to the quantity dimension in the production task in the three periods and *Average Quality* as the average number of effort points participants allocate to the quality dimension in the production task in the three periods. Figures 3 and Figure 4 show participants' effort allocations to the quantity and the quality dimensions, respectively.

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**Figure 3**

**Effects of Communication of Causal Linkages<sup>a</sup> and Incentives<sup>b</sup> on Average Quantity<sup>c</sup>**



<sup>a</sup> *Communication of Causal Linkages* refers to the presence or absence of the firm's communication of the causal linkages between employees' current actions and future outcomes at the production task.

<sup>b</sup> *Incentives* refer to the incentive that participants receive for the production task.

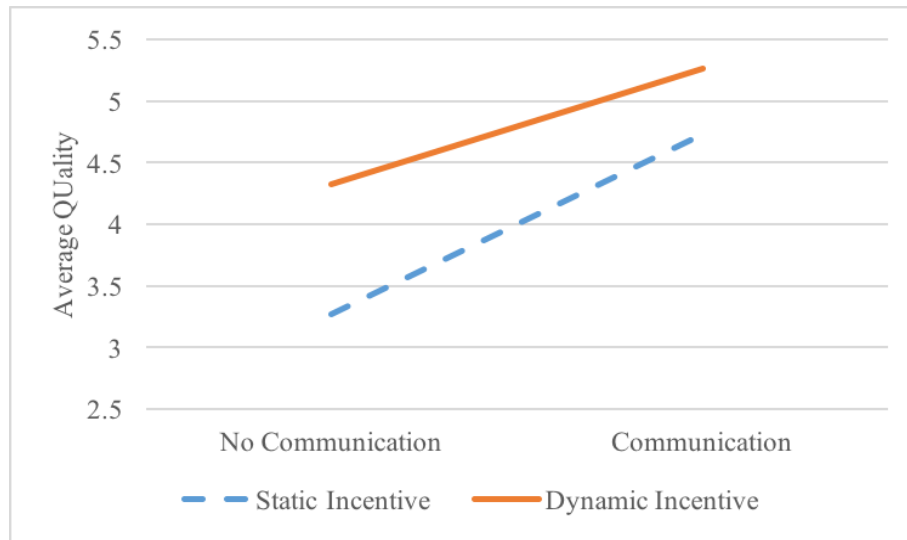
<sup>c</sup> *Average Quantity* represents the average effort points participants allocate to the Quantity dimension in the production task in the three periods.

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**Figure 4**

**Effects of Communication of Causal Linkages<sup>a</sup> and Incentives<sup>b</sup> on Average Quality<sup>c</sup>**



<sup>a</sup> *Communication of Causal Linkages* refers to the presence or absence of the firm’s communication of the causal linkages between employees’ current actions and future outcomes at the production task.

<sup>b</sup> *Incentives* refer to the incentive that participants receive for the production task.

<sup>c</sup> *Average Quality* represents the average effort points participants allocate to the Quality dimension in the production task in the three periods.

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Panel A and Panel B of Table 4 report the means of *Average Quantity* and *Average Quality* in the four conditions, respectively. Consistent with my expectations, results of an ANOVA in Panel C of Table 4 show that, compared with participants working under the dynamic incentive, participants working under the static incentive allocate more effort to the quantity dimension and less effort to the quality dimension ( $F_{1,116}=8.13, p=0.005$ ); participants who receive the causal communication allocate more effort to the quality dimension and less effort to the quantity dimension than participants who do not receive the communication ( $F_{1,116}=18.63, p<0.001$ ). In

sum, the results indicate that the two management controls affect participants' effort allocation decisions at the production task in an expected way.

**Table 4**

**Analyses of Production Task**

**Panel A: Descriptive Statistics of Average Quantity<sup>a</sup>**

Mean (Standard deviation)

		<u>Communication of the Causal Linkages<sup>b</sup></u>	
		<u>No</u>	<u>Yes</u>
<u>Incentives<sup>c</sup></u>	<u>Static Incentive</u>	6.73 (1.75) N=28	5.27 (1.55) N=32
	<u>Dynamic Incentive</u>	5.68 (1.47) N=32	4.74 (1.25) N=28

**Panel B: Descriptive Statistics of Average Quality<sup>d</sup>**

Mean (Standard deviation)

		<u>Communication of the Causal Linkages<sup>b</sup></u>	
		<u>No</u>	<u>Yes</u>
<u>Incentives<sup>c</sup></u>	<u>Static Incentive</u>	3.27 (1.75) N=28	4.73 (1.55) N=32
	<u>Dynamic Incentive</u>	4.32 (1.47) N=32	5.26 (1.25) N=28

**Panel C: ANOVA model of Average Quantity<sup>a</sup> (or Average Quality<sup>d</sup>)**

<u>Source</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p-value*</u>
Model	3	19.989	8.70	<0.001
Communication <sup>b</sup>	1	42.806	18.63	<0.001
Incentives <sup>c</sup>	1	18.683	8.13	0.005
Communication <sup>b</sup> x Incentive <sup>c</sup>	1	1.991	0.98	0.354
Residual	116	2.298		

#### Table 4 (continued)

<sup>a</sup> *Average Quantity* represents the average effort points participants allocate to the Quantity dimension in the production task in the three periods.

<sup>b</sup> *Communication* refers to the presence or absence of the firm's communication of the causal linkages between employees' current actions and future outcomes at the production task.

<sup>c</sup> *Incentives* refer to the incentive that participants receive for the production task.

<sup>d</sup> *Average Quality* represents the average effort points participants allocate to the Quality dimension in the production task in the three periods.

\* All p-values are two-tailed.

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I also examine the performance on the production task. I define *Total Profit* as the sum of firm profits in the three periods. Firm profit in each period is computed as firm revenue in that period minus the worker's salary in that period. Revenue of each period equals the production quantity in that period times the selling price in that period. Results of an ANOVA show a significant main effect of the causal communication on *Total Profit* ( $F_{1,116}=11.35$ ,  $p=0.001$ , untabulated) in the way that firm profits are higher in the presence of the causal communication than in the absence of such communication. The results also show a marginal significant main effect of incentives on *Total Profit* ( $F_{1,116}=1.93$ ,  $p=0.168$ , untabulated) in the way that firm profits are higher under the dynamic incentive than under the static incentive. There is no interaction between the causal communication and incentives ( $F_{1,116}=0.77$ ,  $p=0.383$ , untabulated). The findings show that the firm's communication of the causal linkages, as a management control, is effective in making participants make more goal-congruent choices.

#### V. Conclusion and Discussion

Weisner (2015) calls for more research on construal level theory in accounting and this paper studies how management controls affect construal level mindsets. In particular, I

investigate the effects of two management controls, communication of causal linkages and incentives, on employees' construal level mindsets via an experiment. I find that when the firm communicates to its employees the causal linkages between their current actions and future outcomes, the communication makes employees adopt high-level construal mindsets.

High-level construal mindsets can lead to behaviors that firms desire. For example, with high-level construal mindsets, employees view their jobs from a more abstract perspective and understand firm strategy better (Choi et al. 2016). The current paper presents organizations a low-cost way to influence employees' construal mindsets, that is, communicating the causal linkages. The implementation of this communication control allows organizations to capitalize on the benefits of high-level construal mindsets. I also find that dynamic incentives that tie employees' future-period compensation to their current actions do not increase construal levels and the effect of the causal communication on construal level mindsets does not depend on whether employees work under dynamic or static incentives. These are interesting findings because, compared with non-compensation-based controls, compensation-based controls are normally expected to have a stronger effect on decisions and behaviors. However, it is possible that when it comes to construal level mindsets, communication actually has a greater impact than incentives do. This possibility provides an interesting question for future research.

It is worth noticing that even though I believe that high-level construal mindsets have many behavioral and decisional benefits, I do not argue that high-level construal mindsets are always better than low-level construal mindsets. There are definitely situations that low-level construal mindsets are preferable to high-level construal mindsets. Specifically, in situations that concrete thinking and attention to details are preferred, low-level construal mindsets should lead to better judgments, decisions, and performance. For example, Förster et al. (2004) show that

while high-level construal mindsets lead to better performance on creative tasks, low-level construal mindsets lead to better performance on analytical tasks. In sum, in practice, when designing management controls to influence employees' construal level mindsets, firms should consider the specific situations they face and try to induce the construal level mindsets that work best for the goal of the firm.

There are some limitations to this study that also provide opportunities for future research. For example, I do not find that dynamic incentives increase construal levels. One possible explanation is that participants focus too much on the details of making the quantity-quality tradeoff under dynamic incentives. This focus on details may offset the effect that considerations of the future has on construal levels. Future research can look into this explanation and examine the effect of dynamic incentives on construal level mindsets after controlling the cognitive load under the two types of incentives. It is possible that with some decision aids on the quantity-quality tradeoff, employees under dynamic incentives may show higher levels of construal. The finding of the null effect may also suggest that considerations of future consequences and high-level temporal construal are two theoretical related but different constructs. Future research can look into this difference more directly. In addition, in the current study, I only investigate one dimension of firms' incentive design, the temporal feature of incentives. Future research can examine whether other features of incentives can affect construal level mindsets. Another avenue for future research is to examine the effects of other management controls on construal level mindsets. Specifically, future studies can investigate whether different management controls can affect construal level mindsets through influencing different dimensions of psychological distance.



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## Appendix A

Quantity<sub>n</sub>: the effort points allocated to the Quantity dimension in period n

Quality<sub>n</sub>: the effort points allocated to the Quality dimension in period n

SP<sub>n</sub>: the selling price of computer chips in period n

Payment rate: the pay for each computer chip produced

Number of computer chips produced in period n = 20 + Quantity<sub>n</sub> x 2

Selling price in period n = SP<sub>(n-1)</sub> x (1 + (Quality<sub>(n-1)</sub> - 5) x 10%)

Under dynamic incentive, payment rate in period n = 10% x SP<sub>n</sub>

Strategy experimentation = |effort allocated to the quantity dimension in period one - effort allocated to the quantity dimension in period two| + |effort allocated to the quantity dimension in period two - effort allocated to the quantity dimension in period three|

## Appendix B

### Static incentive:

**As a worker, in each working period you will be paid 10 Lira per computer chip you produce.**

**In other words, in each period your pay will depend on the QUANTITY of computer chips you produce. The more chips you produce, the more you will earn.**

### Dynamic incentive:

**As a worker, you will be paid M Lira per computer chip you produce. In each working period, M equals 10% of the selling price of the chips in that period.**

**In other words, in each period your pay will depend on both the QUANTITY of computer chips you produce and the SELLING PRICE of the computer chips in that period.**

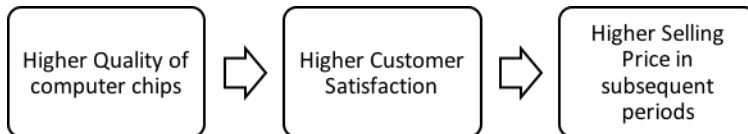
Remember that, the selling price of computer chips is 100 Lira in the first working period and it may rise or fall from one working period to another.

### Communication of the causal linkages:

Here is a message from the management team of the firm to workers who make computer chips:

The selling price of the computer chips you produce may rise or fall from period to period, depending on **the QUALITY** of the chips you produced in prior periods.

Specifically, **the cause-and-effect relationship between quality and selling price** is as below:



That is, as a worker, if you put more effort to the quality dimension of the chips you produce, customers will be more satisfied with the computer chips. As a result, customers will be more willing to pay higher prices to buy the computer chips in the future. In sum, higher product quality in one period will lead to higher selling price in subsequent periods.