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Can capital constraints restrain creativity? The spillover effect of budget constraints on employee creativity

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ESMT Working Paper 17-03

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Can Capital Constraints Restrain Creativity?

The Spillover Effect of Budget Constraints on Employee Creativity

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Abstract

When setting budgets, managers may place constraints on how resources can be used in an effort to mitigate opportunistic behavior by subordinates. These restrictions can affect the ability of the subordinate to succeed in the budgeted task, but may also have an unintended spillover effect on the ability to innovate. Using an experiment, we find that individuals working under higher budgetary constraints are more efficient in their use of budgeted resources, but are less successful in the budgeted tasks, than their counterparts working under lower budgetary constraints. Importantly, we find that imposing budgetary constraints also causes employees to subsequently generate fewer highly original and creative ideas in an unrelated activity. These findings suggest that budget structures can have unintended consequences on the innovative capabilities of organizations. This paper contributes to the expansive budgeting literature by showing budgetary control design has organizational performance implications beyond the specified budgeted activity.

Keywords: *budgetary controls, budgets, creativity, capital constraints, originality*

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I. Introduction

Budgets are pervasive and directly affect the effectiveness of resource utilization (Hansen, Otley, and Van der Stede 2003). Not surprisingly, budgeting is one of the most widely studied activities in managerial accounting. In recent years, the expansive literature has largely focused on how various features of the budgeting process directly affect manager and employee behavior, such as effort provision, truthfulness, reciprocity, performance, and implementation of organizational strategy (Covaleski et al. 2003; Brown, Evans, and Moser 2009). This research generally focuses on the consequences and outcomes of the activity being budgeted. One traditional trade-off in designing a budget is between giving more freedom to agents to utilize their private information versus imposing constraints to prevent opportunistic behavior.

However, the implications of budgetary design choices, such as whether to impose strict budgetary constraints, may go beyond the direct economic effects they produce within the budgeted task(s). Indeed, recent advances in psychology provide new insights into how situational constraints can influence one's mindset and thinking, which may carry over into other activities. Drawing on this research, we investigate how features of a budget may have spillover effects on the ability to innovate. Specifically, we use an experimental design to explore how aspects of budgetary control systems, such as the degree to which individuals can expend resources between tasks, affects not only performance in a budgeted task, but also creative performance in a subsequent activity unrelated to the budget.

We are particularly interested in the degree to which the allocated resources are restricted for a specific use. While budget constraints can vary in multiple ways, we investigate the degree to which the recipient of the allocated resources is restricted in the breadth of how she can utilize those resources between jobs, tasks, and goals (Soman and Cheema 2011). A high degree of constraint limits the amount of autonomy employees enjoy in resource utilization, while a low degree of constraint offers employees greater flexibility in their resource utilization choices. For example, at some academic institutions, faculty members are significantly restricted over the use of their budgets for the academic year (e.g., technology,

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travel, etc.) such that, even if a given faculty member has unused technology funds, those funds may not be available to reimburse travel expenses. At other institutions, faculty members receive one budget for the year such that they can allocate resources to technology and travel expenses as they see fit.¹

There are several reasons an organization may restrict employee choices over resource allocation. First, by increasingly restricting resource use, an organization has growing assurance that resources are only expended toward organizationally aligned goals. In addition, prior literature (e.g., Mani et al. 2013) has provided evidence that individuals utilize resources more efficiently when they have a smaller pool of resources. Thus, increased resource allocation constraints not only reduce potential opportunistic behavior, but also increases employee performance on a per resource unit level. In addition, budget restrictions simply make it more difficult for any one employee to achieve 100 percent budget utilization. For each of these reasons, constraining budget resources can be institutionally appealing (e.g., Antle and Eppen 1985).

However, these gains may come with the unintended consequence of affecting how employees think. By its very design, a budget without resource constraints means that an individual has more freedom to use resources towards multiple goals or tasks. When that individual is considering whether to use a resource unit on a given task, budgetary discretion requires that she consider the broader set of tasks for which that resource could also be used. Conversely, when resources come with more restrictions (i.e., the employee cannot, or perceives she should not, share resources across tasks), she faces fewer tradeoffs and thus is more likely to narrowly focus on the specific task at hand. In this sense, budgetary design choices may influence whether employees hold, what is termed in psychology, a broader, more global mindset or one that is more concrete and local (e.g., Burgoon, Henderson, and Markman 2013; Förster and Dannenberg 2010). For organizations that depend on employee creativity, employee mindset is important because prior research indicates that local and concrete mindsets tend to inhibit creativity (Friedman et al. 2003; Foster

¹ Another way to conceptualize this difference in budgetary design is how budget resources are pooled or aggregated. A budget that is disaggregated to a high degree restricts the available uses to which those budgeted resources can be used (e.g., technology budget, travel budget, participant budget, etc.). However, when a budget is aggregated to a high degree, the employee maintains a greater degree of autonomy in determining how to deploy their budgeted resources (e.g., academic budget for such uses as technology, travel, participants, etc.)

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et al. 2004; Jia et al. 2009; Liberman et al. 2012). In light of this prior work, we expect budgets with greater resource constraints to decrease employees' conceptual focus over their budgeted tasks, inducing a more concrete mindset and impairing their ability to think creatively. Conversely, we expect a budget with few to no constraints on how to utilize budgeted resources between tasks, to elicit a more abstract mindset, thereby facilitating creative thinking.

To empirically test our predictions, we recruited 70 students to participate in a budgeted task setting, a word game that we will refer to as the "Hangman Task" given its similarity to the classic word game. Participants were randomly assigned into one of two conditions, each differing on the degree of budgetary constraints in which the participant could allocate their letter selections between the set of word puzzles. In the *Low Constraints* condition, each participant could utilize their total allotment of letter selections to the set of puzzles as they deemed appropriate. In the *High Constraints* condition, each participant was given an equal number of letter selections for each of the word puzzles, such that the participant could not reallocate letter selections from one puzzle to the other. Participants were compensated for each puzzle they solved. Once a participant had finished the set of puzzles (or had expended all available resources attempting to do so), they next completed an idea generation activity where they were asked to develop creative, unusual, and novel uses for a common object (Guilford 1956). Following the creative activity, participants completed a post-experimental questionnaire and then were paid in cash.

In line with a major objective of budget constraints, we find that those operating under high budgetary constraints (less freedom to allocate resources across puzzles) both utilize fewer resources (i.e., fewer letters in our case) overall and tend to utilize the resources they do expend more efficiently (i.e., guess letters accurately more often). However, this improved resource conservation and efficiency comes with costs – both direct and indirect. First, we find that strengthening budgetary constraints also results in lower performance in the budgeted tasks (i.e., solving fewer word puzzles). Second, and more importantly for this study, we find that those operating under greater budgetary constraints in the budgeted task produce fewer

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highly original and innovative ideas in the subsequent idea generation activity compared to their counterparts who have less constraints over the budget.

These results provide significant implications for both theory and managerial control practices. First, creativity can be economically very important because the ability to innovate is an essential capability for the growth and adaptability of many organizations (e.g., Fallon and Senn 2006). Yet, eliciting creativity is difficult, in large part, because simply “trying harder” does not necessarily result in more creative outcomes (Amabile 1996) and giving individuals incentives to put more effort into a creative task can actually backfire (Kruglanski et al. 1971). Rather, creativity seems to emerge indirectly from incentive systems, albeit sometimes unintentionally (e.g., Dietrich 2004). Our results speak directly to this issue and have implications for the management of innovation in organizations. For instance, firms sometimes require that their employees dedicate a certain percentage of their time on side projects that are truly innovative (Nagji and Tuff 2012), a managerial approach that Google recently popularized (Hardy 2011). Our findings suggest that imposing stricter budget constraints on the core activities of employees may inhibit their ability to innovate in their side projects, and thus limit the efficacy of this management practice.

Second, much of the budgeting literature has focused on how budgetary controls can affect the mental states, behavior, and performance of employees within the budgeted task (Covaleski et al 2003). By contrast, we provide evidence that the restrictiveness of budgetary controls has a spillover effect on individual performance in a subsequent, unrelated and organizationally important activity. In this sense, we complement recent research on employee creativity. In particular, Kachelmeier, Wang, and Williamson (2015) use an idea generation task to show that short-term performance-based incentives can motivate participants to sustain their attention on the task over time. This sustained attention enables the brain to work on a problem in the background. This type of “defocused attention” (Dietrich 2004) results in higher creative responses when the same task is repeated later. Thus, they provide evidence that performance-based incentives do not directly act upon the employee, but rather induce cognitive processes that are more favorable to creativity. Our study suggests that an analogous effect can arise with respect to the design of

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budgetary control systems and that the control system need not be intentionally directed towards the creative activity.

The following section will discuss prior literature as well as develop our hypothesis. The third and fourth sections will describe the design and results of our experiment. The last section will discuss the implications and limitations of our study, as well as provide paths for future research.

II. Theory and Hypothesis Development

Budgets

Budgeting is one of the most widely studied processes in the managerial accounting literature (Luft and Shields 2003; Covaleski et al. 2003). Covaleski et al. (2003) define budgets and budgeting broadly as an amount of resources allocated to an organizational subunit, a performance target, and the process of arriving at those numbers. Those authors also note that budgets are essentially used for two primary purposes: (1) planning and coordination, and (2) control through motivation and resource restriction. Much of the early accounting research on budgeting took an economic-based approach which focused primarily on how employee contracts could improve principal-agent conflicts (Covaleski et al. 2003), which the literature later expanded in several ways, by adding more complexity to the agent's utility function via social preferences (e.g., Evans et al. 2001, Rankin Schwartz, & Young 2003).

We take the more psychology-based approach by investigating how a particular aspect of the budgeting process affects the individual. Specifically, in this study we focus on the restrictions over budgeted resources and how this may affect the individual's behavior who is operating within the budget. Generally, the more budget restrictions, the less individuals operating under such a budget will be able to take opportunistic actions (e.g., economic or effort benefits). However, such restrictions reduce individuals' and the organization's ability to address uncertainty in their environment (Frow, Marginson, and Ogden 2010) and may lead individuals to take a short-term perspective in regards to firm performance (Van der Stede 2000).

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There are numerous budgetary dimensions that could be described as ranging from restrictive to adaptable such as the ability to borrow resources from future periods or the frequency and degree to which budget allocations can be renegotiated within a given period. We investigate the degree to which managers are restricted in their ability to choose how to expend resources between several, simultaneous budgeted tasks. At one extreme, each resource unit is strictly allocated to a given task and cannot be shared across these tasks (i.e., high resource constraint). At the other extreme, resource units are in one common pool (no specific task allotment) such that the manager is free to utilize the resources across tasks as they see fit (i.e., low resource constraint).

While not our primary question, we do expect different levels of resource constraints to have differing effects on organizational performance in regards to the budgeted task. Specifically, we expect individuals operating under a more constrained budget to use their resources more efficiently (i.e., greater performance on a per resource unit level). Mani et al. (2013) provide evidence that when individuals have fewer resources to meet a goal, they expend greater cognitive effort in determining how to best utilize each resource unit effectively. As noted before, individuals have less freedom to shift resources between tasks when they operate within a more constrained budget. Thus for a given task, the potential of running out of resources is much more salient which would lead individuals to expend those resources more efficiently, controlling for economic incentives.

While we expect those with high budget constraints to be more effective per unit of resource, we also expect individuals operating under a less constrained budget to be more effective at achieving organizational goals than those with a more constrained budget. This is because individuals with less constraints over budgetary resources, have more freedom to determine how to allocate resources between tasks. Thus, if mid-task the individual realizes that one task is more challenging than another, they can expend more (less) resources on the challenging (easier) task and have a greater chance of successfully completing both, while the individual under a more constrained budget has far less control to make such decisions.

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In our study, we look to expand upon the prior budgeting literature in two ways. First, whereas much of the psychologically-based budgeting research has primarily focused on how budgets can influence task productivity by affecting how employees react to certain features of budgets via other-regarding preferences (Covaleski et al. 2003), we take a different perspective by investigating how a feature of the budget, in our case budget resource constraints, may affect performance via an individual's cognitive process. Second, while the budgeting literature primarily investigates how budgeting and contextual features interact to affect budgeted task performance, we depart from this by looking at organizational performance in activities that are not directly governed by the budget. Specifically, we investigate how resource constraints in a budgeted task affects an individual's creative performance in a subsequent, unrelated activity.

Creativity

Creativity is the ability to generate ideas and solutions that are both novel and suitable (Amabile 1996; Kleibeuker, De Dreu, and Crone 2013). While the psychology discipline has studied human creativity for nearly a century (e.g., Hutchinson 1931), accountants have only begun to examine how accounting systems may affect creativity. This literature has primarily focused on incentive compensation schemes to motivate creative output. Consistent with Amabile (1996), early findings show that incentives for creative output actually deteriorated total creative output (Kachelmeier, Reichert and Williamson 2008), though this deterioration was due to a decrease in the number of less creative (mediocre) ideas. Even when individuals could self-select into a creativity-based performance contract, these individuals performed worse over time than those with a quantity-based performance contract (Kachelmeier and Williamson 2010). However, in a group creativity task, inter-team tournament pay did increase creative output, as compared to a piece-rate pay scheme (Chen, Williamson, and Zhou 2012). This was achieved, not by directly motivating additional effort, but by instead increasing group cohesion, a known antecedent to group creativity. In a longitudinal study, a piece-rate pay scheme did not result in more highly creative ideas than a fixed wage in the

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incentivized period, but did lead to greater creativity in the subsequent period, even though the incentive contract was no longer in effect (Kachelmeier, Wang, and Williamson 2015).²

More relevant to our study, Brügger, Feichter, and Williamson (2015) provide evidence that a particular form of management control systems on a given task may affect creative output on a separate activity. Specifically, they find when participants receive management guidance in the form of non-binding input **and** output recommendations on a rote, non-creative task, the participants provide more creative output in a subsequent activity than when they only receive guidance on input, output, or neither. The authors theorize this occurs because more thorough guidance increases employee efficiency on the rote task, thus allowing more time and cognitive resources for the creative activity. Instead of examining incentive contracts and non-binding management communications, we take a different perspective by exploring how differences in a common administrative planning and control procedure, the level of budgetary resource restrictions, affects an individual's creative output.

Hypothesis Development

Förster and Dannenberg (2010) define a processing style as a particular, content-free perceptual, or conceptual framing in which individuals attend to information and represent memories. Trope and Liberman (2010) use a similar concept to define a mental construal. In this case, one's construal level describes how abstract (versus concrete) the individual encodes mental representations and memories. Both these theoretical frameworks utilize a unidimensional spectrum where individuals, who are in a more global processing focus or higher-level construal, tend to perceive goals, actions, and choices in a broad and decontextualized manner, and focus primarily on the target's superordinate features. By contrast, those in a local processing, or lower-level construal, perceive targets in a more narrow and contextual manner (Malkoc, Zauberan, and Bettman 2010).

² In this study, we focus on creativity tasks that rely on divergent thinking. There is another class of creativity tasks that rely on convergent thinking, known as insight or "aha" tasks. These problems typically have one solution and requires the association of previously unrelated attributes of the problem space (Kleibecker, De Dreu, and Crone 2013).

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Our setting of interest varies the degree to which an individual is constrained in how they can allocate resources between a set of budgeted tasks. Specifically, we consider two levels of budget constraints: one where an individual is free to allocate budgeted resources from a common resource pool between budgeted tasks at their own discretion (i.e., a less constrained budget). The second level of budget constraints is where resources are allotted to specific tasks and cannot be reallocated among tasks (i.e., a more constrained budget). Since individuals utilizing a more constrained budget cannot choose how to allocate resources between tasks, they do not need to consider the other tasks when using a given resource unit, because the decision on how to use that resource is necessarily independent to the performance on other budgeted tasks. Thus, we argue that constraining budgeted resources will lead individuals into a narrow processing focus and a concrete mindset. Conversely, individuals operating under a budget with less constrained resources are more likely to be cognitively considering the other budgeted tasks since the decision to expend a resource on a given task necessarily reduces the available resources for the other tasks. Hence, we argue that maintaining focus on multiple budgeted tasks will lead an individual into a broader processing focus and a more abstract mindset.

Prior literature has identified abstract (concrete) thinking as an antecedent to increased (decreased) creative performance in both divergent and convergent thinking tasks. This is because, by definition, a mindset or processing focus is not context specific and persist over at least short periods of time. As a result, an event or task that leads an individual to perceive information in a more abstract (concrete) manner will continue to perceive information more abstractly (concretely), even as the individual moves on to new and different activities.

Förster, Friedman, and Liberman (2004) found that priming individuals into a far temporal distance, a dimension of psychological distance, lead to more creative ideas than those primed with near temporal distance. Similar results were found when using a spatial distance manipulation of psychological distance (Jia, Hirt, and Karpen 2009; Liberman et al. 2012).³ In addition, Friedman et al. (2003) provided evidence

³ Psychological distance is a well-developed construct made up of temporal, spatial, social, and probabilistic distance that has been associated with one's construal-level (Trope and Liberman 2010).

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that the association between mindset and creativity is not limited to the construct of psychological distance, but more generally related to an abstract mindset/broad processing focus. Specifically, they manipulated the perceptual attention focus of individuals, and found that those with a broader focus had greater creative performance than those with a narrow focus.

This literature argues that being in a more abstract mindset allows an individual to conceive targets in a more abstract fashion, therefore facilitating the filtering out of irrelevant contextual features. This then increases the individual's ability to reformulate these superordinate, primary attributes of the target into different and potentially novel fashions. Conversely, those in a concrete mindset are predisposed, not to filter out, but to focus on the contextual, and potentially irrelevant, features of the target. This focus reduces their ability to identify the primary attributes of the target, thus making it more difficult to reformulate the attributes into a novel and useful idea. Given these prior findings, we expect individuals who operate under a more constrained budget will generate less creative output than those operating within a less constrained budget. Based on these arguments we make the following formal hypothesis:

Individuals who operate within a more constrained budget in a budgeted task will be less creative in a subsequent activity than individuals who operate within a less constrained budget.

III. Experiment

Participants

We recruited 70 student participants enrolled in a public university in the southeastern US, 67 of which were undergraduates, with the remaining being graduate students. In our study, we investigate how a variation in a managerial accounting procedure, budget resource constraints, affects individuals' creative performance in an unrelated activity. Since all aspects of the tasks are learned within the experiment, no advanced work experience or specialized knowledge is necessary, thus undergraduate and graduate students are an appropriate participant pool to test our hypothesis (Libby, Bloomfield and Nelson 2002). Fifty three percent of the participants identified as male, 44 percent identified as female, and the remaining choosing

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not to identify with either gender choices. Ninety six percent of the participants range between the ages of 18 and 24, and 90 percent are either business or engineering students.

Procedures and Experimental Design

Procedures

We ran four experimental sessions with approximately 17 participants per session. In each session we provided a wide time window for participants to arrive and begin the study in order to reduce the potential for social comparisons in regards to the length of time it took individuals to complete the study. As each participant arrived, they were assigned to one of two conditions per a predetermined random order. After reading a set of general instructions each participant began the Hangman Task which included the between-subjects manipulation. The participants took approximately 18 minutes, on average, to complete the Hangman Task, after which the participants completed a survey, which included the primary dependent variable, as well as several processing and demographic questions.

Hangman Task

The participants played a word game in which they were tasked to solve five word puzzles, similar to the game Hangman. The only information they knew about each word puzzle was (1) the number of letters each word contained (the words ranged between six and eight letters in length) and (2) the fact that each word puzzle was not a proper noun. Each participant was given a set number of letter selections they could make from the entire English alphabet. A participant would first select one of the word puzzles. Then the entire English alphabet would appear and they were directed to select a letter. If the selected letter was in the unknown word, the letter would appear in the word as many times as it was present. The game displayed the number of remaining letter selections for each participant. After each letter selection, this number was updated and the participant was given the opportunity to guess the unknown word, in full. This guess did not deduct from their remaining letter selections. The participants also had the choice to make no

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word guess and continue with their letter selections. After each word guess, the specific word puzzle was deselected and the participant would again need to choose which word puzzle to work on. This feature was included to emphasize that participants were free to work on the puzzles in any particular order and could return to a puzzle after working on other puzzles.

Each participant first engaged in a practice round to become familiar with the game and its parameters prior to the round that determined their experimental earnings. The practice round, which included the assigned experimental condition, consisted of two words and enough letter selections so that they would necessarily solve each word, so that everyone became familiar with the procedures necessary to solve the word puzzles and increase their earnings. To incentivize participants we provided a payment of three dollars for each successfully solved word, for a total potential performance earnings of 15 US dollars. Due to the nature of the Hangman Task, participants received immediate feedback including whether each letter selection was correct and whether each word puzzle was successfully solved. In addition, each participant received 5 US dollars for participating in the study.

Manipulation

As discussed in the theoretical section above, our goal was to operationalize two specific types of budgeting settings, one in which budgeted resources are allotted to a specific task (i.e., high budgetary constraints) such that resources cannot be reallocated to another task, and a second setting where there is one pool of budget resources that may be allocated between a set of tasks as determined by the budget user (i.e., low budgetary constraints). To operationalize these budgetary control settings, individuals were randomly assigned into either the *High Constraints* or the *Low Constraints* condition (this was a between subjects' manipulation so participants were not aware of the experimental condition they were assigned to). In the *High Constraints* condition, participants were given seven letter selections per word puzzle, for a total of 35 letter selections. In this condition, if a given puzzle was solved before exhausting all seven letter selections, any remaining letter selections for that puzzle were lost (i.e., could not be used on another

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puzzle). In the *Low Constraints* condition, participants were given 35 letter selections for all five word puzzles, such that they could choose how to allocate the selections across the puzzles. Therefore, individuals in the *Low Constraints* condition would only have unused letter selections if they correctly solved all five puzzles before exhausting all 35 letter selections (see Figure 1 for image samples of the Hangman Task). As mentioned above, with this design choice, we expected, on average, better performance (i.e., a greater number of puzzles solved) in the *Low Constraints* condition. While there is the potential that a difference in performance could affect an individual's mindset, we intentionally made this design feature to better proxy for the real world conditions employees experience in these two budgeting settings.

<INSERT FIGURE 1 ABOUT HERE>

Dependent Variable

Once participants completed the Hangman Task they were directed to an online survey. The first question in the survey elicited the primary dependent variable, creativity. To elicit participants' creativity we used the Alternative Uses Task (Guilford 1956), where individuals are provided a common object and are asked to generate applicable creative uses of the object. This is a common procedure to assess an individual's creativity in terms of divergent thinking (e.g., Friedman et al. 2003). Divergent thinking tasks are open-ended questions (i.e., no finite set of solutions) to assess an individual's creative potential and ability to generate novel ideas (Kleibecker, De Dreu, and Crone 2013).

Before participants were prompted to respond to the Alternative Uses Task for our selected object, we provided them an example object (a paper clip) along with several, varyingly creative uses of that object (e.g. cheese cube skewer). We then asked the participants to "...list as many creative uses for a **barrel**. These uses should be uncommon, creative, and unusual." While we did not put a minimum number of uses participants were required to provide, we did restrain individuals from moving on to the next question for at least four minutes, at which point they were free to continue providing creative uses or to move on to the remainder of the survey. We instituted a minimum time since prior research has found that individuals often take some time to collect their thoughts before they are able to provide useful and creative uses (Horne

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1988), however we did not put a time maximum on the task as time pressure has been identified to affect creativity (Baer and Oldman 2006). Once participants completed the creative activity they responded to a series of processing and demographic questions. Lastly, participants were compensated for their participation and performance in the Hangman Task before departing the lab.

The most essential attribute of creative quality is originality (Runco 2004), which is defined as an idea that is not obvious, banal or typical (Torrance, 1974), but is infrequent, novel, and uncommon (Marguc, Van Kleef, and Förster 2015; De Dreu, Nijstad, and Baas 2011). Because this is a fairly subjective assessment, we used independent raters, to the manipulation and research question, to assess the creativity of each unique barrel use generated by the participants. The raters were employed via Amazon Mechanical Turk (MTurk). Since the task is not a specialized business or accounting procedure the use of MTurk raters is appropriate (Libby, Bloomfield, and Nelson 2002).⁴ We employed 230 MTurk raters to each assess the creativity of twenty-five unique ‘uses of a barrel’ generated by the study’s participants. Each group of twenty-five uses were rated by 10 different MTurk raters. Each rater was asked to rate the creativity of each of their 25 uses on a scale of 1 (not at all creative) to 7 (extremely creative) based on how “original, innovative, and clever” the uses were. In addition, since creative solutions are both meant to be creative and useful (De Dreu, Baas, and Nijstad 2008), the raters had the option to identify the use as invalid.⁵ We then averaged the ten ratings to create a creativity score for each idea.

To test the consistency between of the MTurk raters, we calculated the Intraclass Correlation Coefficient for each group of ten raters. Of the twenty-two groups of raters, 17 had Intraclass Correlation Coefficients of 0.6 or better, indicating the interrater consistencies are relatively good to excellent (Cicchetti 1994). Of the remaining five groups, Intraclass correlation coefficients ranged from .35 to .55. These lower levels of consistency were driven primarily by ten uses, which had unusually high creativity rating variances

⁴ MTurk Raters were screened for (1) whether they were based in the United States (2) had a HIT approval rating of at least 98% and (3) had at least 500 HITs approved. The raters were compensated \$1.00 for the HIT.

⁵ Only two of 568 unique uses were considered invalid by ten raters. These uses were then excluded from all further analysis due to the consensus that they were inappropriate responses to the task.

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(variances greater than or equal to 4.00).⁶ These ten uses were approximately equally distributed between the five low consistency groups of raters, with no group containing more than three of these uses. In short, these low consistency ratings were a result of ten out of 575 barrel uses (1.74% of uses). Since this is a fairly low percentage of uses, we choose to rely upon our raters' creativity assessments and include the average ratings of these ten uses. Further, it is important to note that creativity is used as a dependent variable. Random noise in the measurement of this variable should not create major econometric problems (aside from reducing the R^2 of the regressions).

IV. Results

Descriptive Statistics and Manipulation Checks

The descriptive statistics for all relevant outcome variables are provide in Table 1. On average, the participants solved 3.13 word puzzles, thus earning on average a total of \$14.39, including a participation fee. In addition, participants provided, on average, eleven creative uses of a barrel, and approximately 2 (2.5) of these uses were rated greater than (or equal to) 4.0 out of 7.0 on the creative scale.

<INSERT TABLE 1 ABOUT HERE>

One of the goals of the budget manipulation (i.e., how the use of resources across budgeted tasks were constrained) was to engender different perceived levels of restriction over resource use in successfully completing the Hangman Task. To confirm whether our manipulation was successful, we elicited two processing questions after the creative activity. The first asked the participants how much flexibility they felt they had in solving the word puzzles on a Likert-type scale, 1 (no flexibility) to 7 (total flexibility). Individuals in the *Low Constraints* condition reported more flexibility in their ability to solve the words than those in the *High Constraints* condition ($t = 4.04$, $p < .01$, one-tailed). The second question asked to what extent the participants felt limited in the number of letter selections they could make per word on a Likert scale. Individuals in the *High Constraints* condition felt more limited in the number of letter

⁶ The uses were: fish tank, balancing ball (using sideways), look at it, platform elevating, brewer, fruit basket, large candle holder, nightstand, a hiding spot, and Niagara Falls raft.

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selections than did those in the *Low Constraints* condition ($t = 2.84, p < .01$, one-tailed). Thus, we can conclude that the manipulation of budget resource utilization constraints had the appropriate effect on the participants.

Task Performance

While the central question of our paper is whether constraints over budgeted resources has a spillover effect on an individual's creativity, it is worth investigating how budgetary constraints affect individual's performance in the budgeted tasks. As a brief reminder, both conditions were endowed with the same quantity of resources (35 letter selections). However, those in the *High Constraints* condition strictly had seven letter selections per puzzle, whereas the *Low Constraints* condition had one pool of resources and could allocate these resources between puzzles at their own discretion. Therefore, while each condition was endowed with the same quantity of resources, the greater restriction on the *High Constraints* condition often led to less available resources used. For example, if an individual in the *Low Constraints* condition solved a given puzzle after only five letter selections, they would be able to expend two additional letter selections on the other word puzzles. If this happened to an individual in the *High Constraints* condition, those two unused letter selections would be lost.⁷ We then expect the *Low Constraints* condition to be more successful in achieving their goal (i.e., solving more word puzzles). Using an ordered-probit model, we regressed the number of words solved (0 to 5) on the indicator variable for the budgeting condition, as shown in Table 2. Controlling for individuals' experience with word-based games, we find that individuals in the *Low Constraints* condition solved more word puzzles than those in the *High Constraints* condition ($z = 2.49, p < .01$, one-tailed).^{8,9}

<INSERT TABLE 2 ABOUT HERE>

⁷ In an independent samples, t-test, the *Low Constraints* condition had a significantly larger number of total letter selections than did the *High Constraints* condition ($t = 1.987, p = .03$, one-tailed).

⁸ To test the robustness of the regression model, we also ran analysis in an ordered-logit model and found inferentially the same results ($z = 2.13, p = .02$, one-tailed).

⁹ In both models, we controlled for participants' self-reported experience with word-based games, such as hangman, as this should be a predictor of their overall performance. In both models the experience was marginally significant.

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Resource Efficiency

As shown above, individuals in the *Low Constraints* condition solved more word puzzles than those in the *High Constraints* condition. We argued this was due to the reduced resources as a result of the budgetary resource restrictions (not due to the initial endowment). An alternative explanation could be that the improved performance in the *Low Constraints* condition was driven by the more efficient use of the resources (i.e., more successful letter selections per total letter selections). However, recent psychology literature has found that individuals with fewer resources tend to use each resource unit more efficiently (Shah, Mullainathan, and Shafir, 2012). Using this logic, we would expect individuals in the *High Constraints* condition to use their resources more efficiently (i.e., greater performance per resource unit) than those in the *Low Constraints* condition. In our setting we define efficiency as the ratio of correct (successful) letter selections to total letter selections. Using a two-sided censored tobit regression model (lower limit = 0, upper limit = 1), we regressed this ratio on the indicator variable for the budgeting condition (see Table 3). We find that the *High Constraints* condition has a greater ratio of correct to total letter selections than the *Low Constraints* condition, controlling for word game experience ($t = -1.80$, $p = 0.04$, one-tailed). Thus, while the main focus of our study is the spillover effects of budgetary constraints on creativity, our results do conform to logic and prior literature on budgeted task performance, providing evidence to the trade-offs between budget types on the direct effect to the budgeted tasks.

<INSERT TABLE 3 ABOUT HERE>

Subsequent Creativity

Our key hypothesis predicts that the more freedom an individual has in using their budgeted resources to achieve several tasks (i.e., the fewer constraints over the budgeted resources), the greater their capabilities in generating creative output should be. Prior literature has found that age is a significant predictor of creativity in verbal divergent thinking tasks (e.g., the Alternative Uses Task). To assure we

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control for alternative explanations of our results, we include participant age group as a covariate in our primary analysis.

To test our main hypothesis we used the creativity ratings, as determined by MTurk raters, to develop a frequency score. This frequency score is the number of highly creative uses of a barrel each individual provided. Relying on prior accounting literature investigating creativity, we determined the cutoff point of a highly creative use as the third quartile (Kachelmeier, Reichert, and Williamson 2008). Thus, any idea that has a creativity rating above 4.0 (out of 7.0), the third quartile of all unique creative use ratings, is counted as a highly “creative” idea for a given individual participant.¹⁰ Using a Poisson regression model and controlling for the total number of uses provided and age (explained above), we see in Table 4 that individuals in the *Low Constraints* condition produce a significantly greater number of highly creative uses than those in the *High Constraints* condition ($z = 1.80, p = .04$, one-tailed).^{11,12}

<INSERT TABLE 4 ABOUT HERE>

These findings are consistent with our main hypothesis. Overall our results provide evidence that allowing individuals’ greater flexibility in allocating their budgeted resources elicits more original and innovative ideas in activities requiring creative solutions, even when those activities are unrelated to the budgeted resources.

V. Conclusion

We investigate how constraints over budgeted resources for a set of tasks affects an individual’s creative ability in an independent and unrelated activity. Using two abstract tasks, we experimentally test and find as an individual has more freedom to allocate their resources among numerous tasks (i.e., less

¹⁰ This cutoff point is not only the third quartile threshold for creativity scores, but is also the midpoint on the creativity scale raters could rate the individual uses.

¹¹ We tested the robustness of the highly creative cutoff by running the same analysis but including ideas that had a score of 4.0 (greater than or equal to the cutoff score). These results are inferentially equivalent ($z = 1.80, p = .04$, one-tailed). In addition, both analyses are inferentially equivalent when age is excluded as a covariate.

¹² We also tested the robustness of the Poisson model by running the same analysis with a Negative Binomial regression model, another acceptable model with a frequency outcome variable. The results are inferentially equivalent using both cutoff points.

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resource constraints) they generate more highly original and creative ideas in an ideation task. Thus, if a firm derives value from original, new, creative solutions, the restrictiveness in which they structure their budgets may have a significant impact on their employee's creative output.

This study contributes to the literature in several ways. First, managerial accounting researchers have developed a body of literature on whether and how reward systems may be able to motivate creativity, or at least, result in more creative output. This study adds a new dimension to this stream, by providing evidence that creative capacity can be elicited through means beyond incentive systems. Specifically, we show that creative performance can be brought about through administrative and/or control procedure design, even when these design choices are unrelated to the creative task.

Second, while much of the psychologically motivated budgeting literature has focused on social psychological constructs, such as social norms, equity, and trust, our study is one of the first to introduce cognitive psychological constructs into a budgeting setting. We purport that operating under different budgetary constraint regimes affects creativity by affecting an individual's cognitive mindset. By being pushed into a more abstract mindset (i.e., higher construal-level) an individual is able to make more original connections between target attributes because they perceive and encode information in a more schematic way allowing them to avoid the clutter in the details of the target.

While we do provide evidence that one dimension of budget restrictions does have an effect on subsequent creative performance, we do not test whether this results is robust to other budgetary dimensions. Theoretically, any budget dimension that leads an individual to maintain a broad focus over multiple tasks or organizational goals on the whole should have a similar effect on individual creative capacity. In addition, we find that greater budget resource constraints decrease the creative performance in a divergent thinking task. However, there are other types of creativity, such as convergent creativity which requires an individual to identify the non-apparent relationship between several disparate pieces of information. Thus our study cannot speak to whether budget constraints affects individuals' ability to solve these insight or "aha" tasks.

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Figure 1: Hangman Task Sample Images

Panel A: *Low Constraints Condition*

<i>Initial View</i>	<i>Partially Solved</i>
Guesses Remaining: 35	Guesses Remaining: 23
<p>○ _ _ _ _ _ _ _ _</p> <p>○ _ _ _ _ _ _ _</p> <p>○ _ _ _ _ _ _ _ _</p> <p>○ _ _ _ _ _ _ _ _ _</p> <p>○ _ _ _ _ _ _ _ _</p>	<p>○ _ _ s _ _ e s s</p> <p>○ _ i r _ _ _ _ _</p> <p>○ _ _ _ _ e _ _ _</p> <p>○ _ _ a s _ _ s</p> <p>○ _ _ _ _ _ t</p>

Panel B: *High Constraints Condition*

<i>Initial View</i>	<i>Partially Solved</i>
Guesses Remaining: 7 ○ _ _ _ _ _ _ _ _	Guesses Remaining: 6 ○ _ _ _ _ _ e _
Guesses Remaining: 7 ○ _ _ _ _ _ _ _	Guesses Remaining: 3 ○ _ _ _ _ _ i _ _
Guesses Remaining: 7 ○ _ _ _ _ _ _ _	Guesses Remaining: 6 ○ _ _ _ _ _ _ s
Guesses Remaining: 7 ○ _ _ _ _ _ _ _ _	Guesses Remaining: 4 ○ _ _ r _ _ _
Guesses Remaining: 7 ○ _ _ _ _ _ _ _ _	Guesses Remaining: 5 ○ _ _ a _ _ t

Table 1: Descriptive Statistics

Budget Condition	n	Budgeted Task Performance		Creativity		
		Total Words Solved	Letter Selection Ratio	Number of Ideas above 75% Cutoff (exclusive)	Number of Ideas above 75% Cutoff (inclusive)	Quantity
<i>High Constraints</i>	36	2.69 (1.33)	0.585 (0.080)	1.83 (1.93)	2.39 (2.23)	11.67 (7.43)
<i>Low Constraints</i>	34	3.59 (1.21)	0.563 (0.100)	2.06 (1.39)	2.56 (1.76)	10.29 (5.71)
Difference		-0.90	0.022	-0.23	-0.17	1.38

Notes. *Total Words Solved* ranges from 0 to 5 and represents the number of word puzzles solved by each participant in the Hangman Task. *Letter Selection Ratio* ranges from 0 to 1 and is the ratio of correct letter selections divided by the total number of letter selections made during the Hangman Task. *Number of Ideas above 75% Cutoff exclusive (inclusive)* indicates the number of uses each participant generated that were greater than (greater than or equal to) a rating of 4.0 on a scale of 1.0 (not creative at all) to 7.0 (extremely creative). *Number of Ideas* is the total number of ‘barrel’ uses each participant generated. In the *High Constraints* condition, individuals have seven letter guesses for each of five word puzzles. In the *Low Constraints* condition, individuals have 35 letter guesses for all five word puzzles.

Table 2: Results of Hangman Task Performance¹³

Ordered Logistic Regression				
<i>Total Words Solved</i>	Coefficient	Robust Error	z	p > z
<i>High Constraints</i>	-0.98	0.46	-2.11	0.02
<i>Word Game Experience</i>	0.25	0.20	1.24	0.11

Ordered Probit Regression				
<i>Total Words Solved</i>	Coefficient	Robust Error	z	p > z
<i>High Constraints</i>	-0.66	0.26	-2.57	0.01
<i>Word Game Experience</i>	0.14	0.11	1.30	0.10

Notes. Analysis uses a total sample of 70 participants. *Total Words Solved* ranges from 0 to 5 and represents the number of word puzzles solved by each participant in the Hangman Task. The *High Constraints* variable is a dummy variable which equals 1 (0) when the observation was in the *High (Low) Constraints* condition. The *Word Game Experience* is a self-report variable indicating the participant's past frequency participating in word-based games. The scores ranged from 1 (Never) to 7 (Very Frequently)

¹³ All bolded p-values are one-tailed test due to the directional prediction

Table 3: Results for Hangman Task Efficiency¹⁴

Tobit Regression [0, 1]				
<i>Letter Selection Ratio</i>	Coefficient	Robust Error	t	p > t
<i>High Constraints</i>	0.04	0.02	1.77	0.04
<i>Word Game Experience</i>	0.02	0.01	2.94	<0.01

Notes. Analysis uses a total sample of 70 participants. *Letter Selection Ratio* ranges from 0 to 1 and is the ratio of correct letter selections divided by the total number of letter selections made during the Hangman Task. *High Constraints* is a dummy variable which equals 1 (0) when the observation was in the *High (Low) Constraints* manipulated condition. *Word Game Experience* is a self-report, ranging from 1 (Never) to 7 (Very Frequently) indicating the participant's past experience participating in word-based games.

¹⁴ All bolded p-values are one-tailed test due to the directional prediction

Table 4: Creativity Analysis¹⁵

Poisson Regression				
<i>Number of Ideas above 75% Cutoff (exclusive)</i>	Coefficient	Robust Error	z	p > z
<i>High Constraints</i>	-0.30	0.16	-1.80	0.04
<i>Number of Ideas</i>	0.07	0.09	7.87	< 0.01
<i>Age</i>	-0.12	0.09	-1.37	0.17

Poisson Regression				
<i>Number of Ideas above 75% Cutoff (inclusive)</i>	Coefficient	Robust Error	z	p > z
<i>High Constraints</i>	-0.25	0.14	-1.80	0.04
<i>Number of Ideas</i>	0.07	0.01	8.33	< 0.01
<i>Age</i>	-0.08	0.08	-0.98	0.33

Notes. Analysis uses a total sample of 70 participants. *Number of Ideas above 75% Cutoff exclusive (inclusive)* indicates the number of ideas each participant generated that was greater than (greater than or equal to) a rating of 4.0 on a scale of 1.0 (not creative at all) to 7.0 (extremely creative). *High Constraints* is a dummy variable which equals 1 (0) when the observation was in the *High (Low) Constraints* manipulated condition. *Number of Ideas* is the total number of ‘barrel’ uses each participant generated. *Age* is a categorical variable corresponding to the age range each participant indicated they were in.

¹⁵ All bolded p-values are one-tailed test due to the directional prediction

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