Flattening the Organization:
The Effect of Organizational Reporting Structure on Budgeting Effectiveness

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Flattening the Organization:
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This study investigates whether increasing a superior's span of control reduces the level of slack in a participatory budgeting setting. We develop our theory by incorporating into Antle and Eppen's (1985) budgeting model the recent empirical evidence that individuals have utility for enforcing social norms. Specifically, we assume the superior is willing to incur a cost in order to punish a subordinate who she believes is violating a social norm incorporating excessive slack in his budget. This theoretical refinement leads to the prediction that as the span of control increases, superiors will be more willing to reject project proposals with high budgeted costs. We further predict that subordinates under an expanded span of control will anticipate the superiors' increased "toughness," and will respond by reducing their budgetary slack. We conduct an experiment to test these predictions. The experimental results are consistent with our theory. That is, as the span of control is increased, superiors show a greater willingness to reject projects for which they believe slack is excessive, and subordinates respond by reducing slack. Our study suggests that increasing the span of control can improve the effectiveness of the budgeting process, which is an important component of most firms' control environments. Although prior research has generally assumed that increasing the span of control *weakens* the control environment, our study demonstrates that increasing the span of control can actually *strengthen* it.

I. INTRODUCTION

In most organizations, budgeting plays a crucial role in planning and control, resource allocation, and coordination. Accordingly, budgeting issues and problems have been extensively researched in managerial accounting. Much of this research focuses on participatory budgeting, a tool that a superior can use to elicit information from better-informed subordinates. Prior studies have examined a number of issues, including the factors that influence the effectiveness of participatory budgeting and the behavioral consequences of participation. While most prior research has focused on the participatory dyad (i.e., the superior and the subordinate), our paper contributes to this literature by addressing the influence of organizational structure on the effectiveness of participatory budgeting. Specifically, we examine the effect of increasing a superior's span of control, i.e., the number of subordinates reporting to the superior, on the level of slack subordinates report in the budgeting process.

We provide theory and experimental evidence to suggest that increasing the span of control reduces the level of slack in subordinates' budgets. Thus, we demonstrate a benefit to increasing the span of control that has not been identified previously. In fact, prior research has generally assumed that increasing the span of control *weakens* the control environment (Simon 1957, Williamson 1967, Leavitt 2005). Even the popular press describes "one inescapable fact about flatter organizations: The more you flatten, the less you control" (Henricks 2005, p. 70). Our results, on the other hand, demonstrate that increasing the span of control can actually *strengthen* the control environment by improving the effectiveness of the budgeting process, which is an important component of most firms' control environments.

This research is important to academic scholars interested in internal control, budgeting, and organizational design issues, as well as to the practitioners who determine organizational structures and establish managerial control systems. Empirical and anecdotal evidence suggests that firms are flattening their organizational structures (Rajan and Wulf 2003, Henricks 2005). Because budgeting is a central component of most firms' control systems, it is important to understand the effect of changes in organizational structures on budgeting effectiveness. Specifically, if flattening the organization improves the effectiveness of a formal control mechanism such as budgeting, this may change the optimal design of the organization and the management control system. Therefore, such an understanding can lead to improved control and ultimately better firm performance. Our research also provides useful information for the organizational design problem. In designing a firm's organizational structure, directors and senior managers must trade off the benefits and costs of tall (i.e., relatively many levels and small span of control) vs. flat (relatively few levels and large span of control) organizations. Our research informs this tradeoff, by demonstrating a previously unexplored advantage of flatter organizations.

We examine the effect of increasing the span of control in a two-part process. First, we modify Antle and Eppen's (1985) budgeting model to develop a refined theory of the budgeting process. Our theory incorporates the findings of recent experimental studies (e.g., de Quervain et al. 2004; Fehr and Fischbacher 2004) and related economic models (e.g., Rabin 1993; Fehr and Schmidt 1999) by assuming that the superior is willing to incur a cost in order to enforce social norms. That is, the superior will enforce social norms by rejecting projects that include excessive slack, even though such projects are profitable. It is this theoretical refinement, along with the standard assumption of diminishing marginal utility for wealth, that leads us to predict that superiors will be more willing to reject project proposals as the span of control increases. We further predict that subordinates under an expanded span of control will anticipate the superiors' increased "toughness," and will respond by reducing the level of slack in their budgets.

The second part of our study is an experimental investigation of the insights gleaned from the theoretical development. Participants act as superiors and subordinates involved in a participatory budgeting process. We manipulate the span of control by increasing the number of subordinates responsible to a superior, and observe the reporting behavior of the subordinates, as well as the superiors' project proposal acceptances and rejections. The experimental results are consistent with our theory with regard to the behavior of both superiors and subordinates. That is, as the span of control is increased, superiors show a greater willingness to reject projects they believe include excessive slack, and subordinates respond by reducing the slack in their budgets.

This paper contributes to the accounting literature in several important ways. Our theory and experimental results add to the growing evidence that socially-mediated controls can enhance or even substitute for explicit controls (Evans, Hannan, Krishnan and Moser 2001; Sprinkle 2003; Coletti, Sedatole and Towry 2005; Hannan 2005; Hannan, Rankin, and Towry 2005). In our study, the superior's willingness to incur a cost in order to enforce social norms serves as an informal control. This, in turn, reduces the need for explicit formal controls, particularly as the span of control increases. In addition, our study addresses the call for accounting research that investigates multi-person environments (Baiman 1990; Sprinkle 2003). Our experimental findings suggest that prior single manager studies may underestimate the importance of social factors in eliciting truthful reports. Thus, while prior experimental studies demonstrate that preferences for social factors such as honesty and fairness reduce the need for explicit formal controls, we show that this reduction is even greater in the multi-manager setting. Notably, our theory and experimental results can be compared to clear economic predictions.

This approach is consistent with Evans and Moser (2004), who argue that it is important for experiments to have a clear economic prediction against which to compare actual behavior if an experiment is to offer useful insights for developing an integrated theory of participative budgeting. As such, our study's findings are potentially important for the development of such a theory.

From a broader perspective, we contribute to the growing literature that incorporates both economic and psychological factors to provide insights into accounting issues. As Kachelmeier (1996) suggests, it is too simplistic to explore whether psychological or economic models can more accurately predict behavior. Accordingly, we develop a model of superior preferences that explicitly incorporates both traditional economic and psychological factors.

The remainder of this paper is organized as follows. In the following section, we develop the hypotheses by describing the setting, reviewing the relevant literature, and proposing a refined theory of the budgeting process. Section III describes the experimental procedures, and Section IV presents the results. The final section provides a discussion.

II. HYPOTHESES DEVELOPMENT

Setting

Our setting is an extension of Antle and Eppen's (1985) owner-manager model of the budgeting process.[1] Project completion requires the subordinate's presence and funding provided by the superior. The cost of the project is uniformly distributed as $c \in [c_{min}, c_{max}]$, and revenue, R, is equal to $c_{\max}$. The *expected* total surplus from the project is given by $R - E(c)$. Note, however, that for all realizations of $c \in [c_{min}, c_{max}]$, the *actual* surplus, R – c, is greater than

[1] For expositional purposes, we refer to the owner and manager as the superior and subordinate, respectively.

or equal to zero, and so the superior should prefer funding the project to rejecting it.[2] Revenue and the probability distribution over costs are common knowledge; however, only the subordinate ever knows the actual cost.[3] Because of the subordinate's private information, the superior uses participatory budgeting to elicit a "cost report" from the subordinate.

Under the assumption that both the superior and the subordinate have utility only for wealth, the subordinate "holds up" the superior, by submitting the highest feasible cost report (i.e., the highest report for which the superior will prefer funding to not funding the project – in this case, c_{max}). Hence, the subordinate appropriates the entire surplus.[4] Notice that this outcome suggests that regardless of the span of control (with independently determined costs and unlimited resources, as in our study), *each* subordinate holds up the superior. That is, reporting behavior is unaffected by the span of control.

Prior Literature – Span of Control

We are aware of no prior studies from the organizational literature that specifically examine the effect of increasing the span of control on the effectiveness of the budgeting process. However, a significant body of research has examined organizational design issues,

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[2] Consistent with Antle and Eppen's model, we assume that the superior is the residual claimant of the surplus. Whereas we recognize that, in the organizational setting, the superior may have one or more hierarchical levels between herself and the actual residual claimant, this technicality does not change the intuition from our theory. That is, assuming that the superior is employed under a performance-based contract, the hierarchical setting implies that the superior is a partial claimant of the residual. Other things equal, the superior would prefer to limit the subordinate's rent in order to increase the size of the residual surplus regardless of whether she can claim all or only part of it.

[3] Note that while we consider a setting of private information, the prior organizational literature on span of control (discussed below) has assumed either a moral hazard (unobserved action) setting, or that no incentive problem exists.

[4] Antle and Eppen (1985) show that the superior can limit the surplus appropriated by the subordinate by rationing capital. That is, the superior commits to a hurdle cost. If the subordinate's cost report is less than or equal to the hurdle cost, then the project is funded, and the subordinate earns rents equal to the difference between the hurdle cost and the actual cost. However, if the subordinate's cost report is greater than the hurdle cost, then the project is rejected. This solution requires that the superior commit ex ante to how she will use the subordinate's cost report. Although commitment is critical for the Antle and Eppen's (1985) results, the assumption is unreasonable in many settings (Arya, Glover and Sivaramakrishnan1997), and recent experimental work confirms that principals often have difficulty sticking to their commitments regarding how information will be used (Rankin, Schwartz and Young 2003). Therefore, we assume that commitment is not possible, and so the hurdle contract is not feasible.

including the determination of the optimal span of control (e.g., Keren and Levhari 1979, Calvo and Wellisz 1978). These studies generally assume that increasing the span of control will lead to a loss of control. For example, in his seminal work on the limitations of firm size, Williamson (1967) argues that delegation leads to control loss, because only a fraction of any superior's intentions can be effectively satisfied by a subordinate. Importantly, Williamson goes on to recognize that at any given layer in the organization, as the span of control increases the cumulative control loss is also likely to increase. Thus, Williamson explicitly acknowledges that one disadvantage of increasing the span of control is a deterioration of the control environment. Similarly, Simon (1957, p. 28), says:

> The dilemma is this: in a large organization with interrelations between members, a restricted span of control produces excessive red tape. . . The alternative is to increase the number of persons who are under the command of an officer . . . But this, too, leads to difficulty, for if an officer is required to supervise too many employees, his control over them is weakened. Granted, then, that both the increase and the decease in span of control have some undesirable consequences, what is the optimum point?

Other research also assumes that increasing the span of control will reduce the effectiveness of controls. This assumption is usually based on the supervisor's limited ability to simultaneously monitor the work of many subordinates. For example, in examining the optimal span of control and wage differentials throughout the hierarchy, Qian (1994) models the probability of a supervisor checking a subordinate's work as a decreasing function of the span of control. Colombo and Delmastro (1999) make the same argument, concluding that increasing the span of control will result in more shirking by subordinates. Singh (1985) argues that converting workers to supervisors (and thus decreasing the average span of control) will increase efficiency through better monitoring. In summary, the organizational design literature has generally assumed a negative relationship between span of control and control effectiveness. Our paper does not aim at rejecting this assumption – indeed, in the settings addressed by prior research, we believe that this assumption is reasonable. Rather, our goal is to demonstrate a different setting, namely, participatory budgeting, in which increasing the span of control can actually improve control effectiveness.

Research in accounting has also provided results that are potentially relevant for studying the effect of increasing the span of control on budgeting effectiveness. Agency theory-based research explores how features of the multi-agent setting may be exploited to reduce slack compared to the single-agent setting (e.g., Balakrishnan 1995; Arya, Glover and Young 1996). Although these models do not use the term span of control, moving from a single-agent setting to a multi-agent setting is analogous to increasing the span of control. Because these studies are not focused on the organizational design issue, they do not isolate span of control from other environmental factors. That is, they assume that additional control tools (i.e., competition for constrained resources or correlated costs) are available in the multi-agent setting, and assess the value of these additional tools. In contrast, we are interested in the effect of changing the span of control *per se*, and so we hold all other factors constant across conditions, assuming that the superior has unconstrained resources and that the subordinates' project costs are independent.[5]

Prior Literature – Utility for Enforcing Social Norms

Following recent trends in behavioral economics to incorporate social preferences into formal models (e.g., Rabin 1993; Fehr and Schmidt 1999; Bolton and Ockenfels 2000; Mittendorf 2005 a, b), we assume the superior's utility function consists of two components, a utility for wealth and a utility for enforcing social norms.[6] Numerous experimental studies have

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[5] Several experimental studies in accounting have also investigated participatory budgeting in a multi-agent setting (e.g., Waller and Bishop 1990; Chow, Hirst and Shields 1994; Fisher Maines, Peffer and Sprinkle 2002). However, these studies do not manipulate the span of control, and thus do not provide evidence on the effect of span of control on budgeting effectiveness.

[6] Although we characterize the superior's utility function as including a positive utility for enforcing social norms, it could also be characterized as a negative utility for being taken advantage of without loss of generality.

supported the notion that individuals are willing to incur a monetary cost in order to enforce social norms (see Camerer 2003; Gintis, Bowles, Boyd and Fehr 2003 for reviews). In fact, in a recent experimental study, Fehr and Fischbacher (2004) find that even third party observers, who are themselves unaffected economically by the actions of other experimental participants, are willing to incur a monetary cost to punish participants who violate social norms. Fehr and Fischbacher's findings provide strong evidence that individuals receive utility from punishing others who violate social norms.

De Quervain et al. (2004) provide neurological evidence of a utility for enforcing social norms. This study uses positron emission tomography (PET) to record the brain activity of participants while they play a well-known economics experiment called the "trust game." Participants are given the opportunity to punish partners who do not behave in a trustworthy manner and thus have violated a social norm. De Quervain et al. report that punishing behavior leads to activation of the dorsal striatum, the part of the brain that has been shown to process decision-related *rewards* (O'Doherty et al. 2004). In other words, the participants appear to experience satisfaction when they punish another person for violating a social norm. This finding provides a neurological explanation for the behavior exhibited in Rankin, Schwartz and Young (2003), an experimental study that investigates behavior in a budgeting setting similar ours. Rankin *et al*. find that superiors often refuse to fund profitable projects, consistent with the notion that superiors enforce social norms by refusing to fund projects that include excessive slack. This paper extends Rankin *et al.* (2003), first by providing a utility-based explanation for their finding, and second by demonstrating that the decision to reject profitable projects is affected by the superior's span of control.

Illustration of Utility Function

In this section, we present a superior's utility function to illustrate why as the span of control increases, the superior's willingness to reject projects also increases. This utility function reflects the notion that for each subordinate, the superior derives utility from *either* wealth (by accepting the project) *or* enforcing a social norm (by rejecting the project if it is perceived to incorporate excessive slack). The superior's utility for wealth is neither separable by nor specific to the subordinate. That is, wealth is fungible, and so wealth received from accepting subordinate *i*'s project is not differentiable from wealth received from accepting subordinate *j*'s project. We also make the standard assumption that the utility for wealth increases at a decreasing rate. Therefore, as the number of subordinates increases, the marginal utility of wealth from accepting one more project decreases. By way of contrast, the superior's utility for enforcing a social norm is both separable by and specific to the subordinate. In other words, if subordinate *i* is perceived to have violated a social norm by incorporating excess slack into his project proposal, the superior will receive utility from rejecting subordinate *i*'s project, but not from rejecting subordinate *j*'s project. Thus, the utility that a superior receives from rejecting a given subordinate's project is unaffected by the number of other subordinates. In summary, as the number of subordinates increases, the marginal utility from accepting a project decreases, whereas the marginal utility from rejecting a project is unaffected. Therefore, increasing the superior's span of control increases the superior's willingness to reject projects.

We now present a utility function to illustrate this intuition. We assume that the superior has an acceptable level of slack, S, which is determined by a social norm. For example, the norm of pure honesty would mean that $S = 0$, whereas the norm of fairness would mean that S equals a fair proportion of the estimated surplus (e.g., a 50-50 split). The specific social norm is likely to differ across individuals and organizations, but the implication for the span of control is the same regardless of the specific social norm that determines *S* in any given case. We further assume that the superior compares *S* to her estimate of slack in the subordinate's budget, $c_i^{report} - E(c)$, where c_i^{report} = subordinate *i*'s budget and $E(c)$ = expected cost of the project. The result of this comparison, denoted p_i, is the superior's estimate of the degree to which the level of slack in the subordinate's budget violates a social norm.

We assume that the superior acts to maximize the following utility function:

$$u = u(y, p_1, \ldots, p_n)$$

where *y* denotes the superior's pecuniary payoff and p_i = the superior's estimate of the degree to which the level of slack in the subordinate's budget violates a social norm. This estimate affects the superior's tradeoff between accepting the project and receiving utility through wealth or rejecting the project and receiving utility through enforcing a social norm. In addition to the typical assumption that utility is increasing in wealth at a decreasing rate, we assume that the superior's utility from enforcing a social norm is increasing in p_i. In other words, the greater the estimated social norm violation, the more utility the superior receives from rejecting the project and thereby punishing the subordinate for incorporating excess slack in his budget. (At this time we cannot predict whether the utility from enforcing a social norm will be convex, concave, or linear.)

This formulation of the superior's utility function implies that the span of control affects the superior's project funding decisions. We illustrate this point with a simple example, using the actual parameters from the experiment. Consider a situation with a superior and two subordinates with *c* uniformly distributed between 1 and 30 for each subordinate. Revenue *(R)* is known to equal 30, and the expected cost [$E(c)$] = 15.5, hence the expected surplus = 14.5 for each subordinate's project. Each subordinate's project cost is independently determined, and each subordinate submits a cost report to the superior. As described previously, S is the superior's acceptable level of slack and p_i is the superior's estimate of the degree to which the level of slack in the subordinate's budget violates a social norm.

Consider the following characterization of the superior's utility function.

$$u = a[\sum_{i=1}^{2} d_i(y_i)]^{.5} + b\sum_{i=1}^{2}[(1-d_i)p_i]$$

where

$$d_i = \begin{cases} 1 \text{ if the superior accepts subordinate } i\text{'s project} \\ 0 \text{ if the superior rejects subordinate } i\text{'s project.} \end{cases}$$

$$y_i = R - c_i^{report}$$

$$p_i = \begin{cases} [c_i^{report} - E(c)] - S & \text{if } [c_i^{report} - E(c)] > S \\ 0 & \text{if } [c_i^{report} - E(c)] \leq S \text{ (no social norm violation)} \end{cases}$$

Two aspects of this utility function are important to note. First, the decision related to each individual subordinate's project affects only one component of the utility function. If the subordinate's project is accepted, the wealth component, y, is increased, and the social norm component, p_i, is not changed. The reverse is true for project rejections. Second, the form of the function differs across the wealth and social norm components. For the wealth component, we use the square root function to reflect the decreasing marginal utility for wealth. We sum the surplus earned from each subordinate's project *before* taking the square root to reflect the fungibility of wealth, resulting in a function that is not additively separable by manager. For the social norm component, we use a simple linear function, which satisfies the requirement of additive separability by manager.[7]

The relative importance a superior places on the wealth and social norm-related components of her utility are represented by *a* and *b*, respectively. Principal-agent analyses typically assume $a = 1$ and $b = 0$, i.e., only utility for wealth matters. In that case, the issue of trading off the utility for wealth and the utility for enforcing a social norm is irrelevant. Therefore, all projects are accepted, and the number of subordinates reporting to the superior does not matter.

When $b > 0$ the superior receives utility from preventing subordinates from incorporating excessive slack in their budgets. Let $a = b = 1$, so that the superior places equal weight on the wealth and social norm-related components of utility. Assume that the superior uses a fairness social norm, whereby fairness is defined as an equal split of the expected surplus. In that case, $S = [R - E(C)] / 2 = [30 - 15.5] / 2 = 7.25$. Consider the case when subordinates one and two submit cost reports of 22 and 24, respectively. Facing *either* subordinate one or subordinate two, the superior would choose to fund the project because for each individual subordinate the utility for wealth is greater than the utility for enforcing a social norm ($u = 2.83$ vs. $u = 0.00$ for subordinate one and $u = 2.45$ vs. $u = 1.25$ for subordinate two). However, if the superior faces *both* subordinates, she receives greater utility from funding subordinate one's project only ($u = 4.08$) than from funding both subordinates' projects ($u = 3.74$). Therefore, she would accept the lower cost report and reject the higher cost report.[8]

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[7] Recall that we are aware of no theory to predict the specific form of this function. If we were to specify a convex or concave function, additive separability would be achieved by applying the exponent before the summation.
[8] Although we demonstrate this effect assuming a social norm of fairness, it is generalizable to other norms, such as honesty. We use fairness because Rankin et al. (2005) conclude that fairness explains superiors' rejection decisions better than honesty. Likewise, although we assume that $a = b = 1$, the effect is generalizable for any positive level of *b*. That is, as long as the superior receives some degree of satisfaction from preventing subordinates from

Hypotheses

The prior literature, discussed above, provides evidence that individuals derive utility from enforcing a social norm, and therefore, are often willing to incur a cost to do so. As described in the preceding section, our characterization of the superior's utility function leads to our first hypothesis.[9]

H1: ***When the span of control increases, the superior's willingness to reject projects also increases.***

Our second hypothesis relates to the reporting behavior of subordinates. As discussed earlier, if subordinates and superiors have utility for wealth only, with no utility for social preferences, subordinates will always report the maximum (or nearly maximum) possible cost, because the superior will accept any project that adds even one dollar to her wealth. We do not expect this type of reporting for two reasons. First, prior budgeting experiments (and analogous dictator games in the experimental economics literature, e.g., Forsythe *et al.* 1994) find that, even when the superior cannot reject the funding request, subordinates report less than the maximum cost report (e.g., Evans et al. 2001; Hannan, Rankin and Towry, 2005). Although these experimental results are consistent with social preference utilities on the part of the subordinates, we expect them to be unaffected by span of control. The second reason we expect to observe cost reports that are less than the maximum is related to the superior's ability to reject projects. If subordinates anticipate that superiors have social preferences that will cause them to reject profitable projects, they are likely to reduce their reported costs. This is the focus of hypothesis 2.

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incorporating excessive slack in their budgets, the threshold for project rejection increases as the span of control increases. Finally, the effect is generalizable to non-linear forms of a utility for enforcing social norms.

[9] This characterization implies that for successively larger increases in the span of control, the effect becomes stronger.

We are primarily interested in whether subordinates can anticipate that superiors will be more likely to reject projects as their span of control increases and adjust their reporting behavior accordingly. Extant research using the structure of the ultimatum game suggests that subordinates' cost reporting behavior will be affected by their beliefs regarding the rejection behavior of the superior. For example, Roth et al. (1991) compare behavior in the ultimatum game across four countries. In the ultimatum game, an offeror receives a sum of money and offers a share of it to a receiver who can either accept his share, or reject the offer in which case both parties receive zero. Roth et al. provide evidence that offerors make offers that are a best reply to their beliefs concerning the rejection behavior of receivers. In another ultimatum game experiment, Winter and Zamir (1997) use real and virtual receivers and find that offerors adapt their offers to the rejection behavior of receivers. In accounting, Rankin et al. (2003) use a budgeting experiment, in which superiors can (and do) reject projects. They report that subordinates overstate costs by only 58% on average.

Given the findings of these prior studies in economics and accounting, we predict that subordinates will be able to deduce the effect that increasing the span of control has on the superior's increased likelihood to reject projects. As a result, subordinates will report lower project costs. This leads to our second hypothesis.

H2: ***When the superior's span of control increases, subordinates report lower project costs.***

III. EXPERIMENTAL METHOD

The *primary* experimental design includes two (between-subjects) conditions: Low and High Span of Control. As described below, to rule out an alternate explanation, we collect data on a third experimental condition, Payoff-Adjusted Low Span of Control. We describe the Low

Span condition in detail below and then specify the differences between this condition and the two other conditions.

Low Span of Control Condition

Low Span sessions consist of eight superiors and eight subordinates. Participants are randomly assigned as either a superior or a subordinate. Before the experiment begins, we distribute instructions and read them aloud to the participants. All participants are required to pass a quiz to ensure that they fully understand the instructions before we begin the actual experiment.

The experiment consists of eight independent periods. Participants interact over a computer network in order to maintain anonymity. At the beginning of each period, participants are assigned to new subordinate-superior dyads, and the matching protocol ensures that each subordinate and superior are paired only once during the experiment. Each period consists of the same basic procedures: 1) each subordinate learns the actual cost of his/her project, 2) each subordinate proposes a project by submitting a cost report to his/her respective superior, 3) the superior determines whether to accept and, therefore, fund the project, and 4) the subordinate is informed of the superior's decision.

The subordinate's payoff function is:

Reported cost – Actual cost, if the project is accepted
0, if the project is rejected

To prevent the possibility of negative earnings, the program requires that reported cost be greater than or equal to the actual cost.

The superior's payoff function is:

Project revenue – Reported cost, if the project is accepted
0, if the project is rejected

Project revenue and the distribution of project costs are public information. If a project is implemented, it generates revenues of $30 for certain. Project costs are uniformly distributed between $1 and $30 in whole dollar increments, i.e., {$1, $2, $3, … $30}. The actual project cost is determined randomly each period and is private information, known only to the individual subordinate. Project costs are independently drawn for each subordinate, and participants are informed as such.

The process by which the superior decides whether to accept the project differs slightly between periods one through four and periods five through eight. In the first four periods, the superior decides whether to accept the project *after* observing the reported cost. In the last four periods, we employ the "strategy method," by requiring the superior to set a threshold cost *before* observing the reported cost. [10] This modification in procedures is common knowledge to all participants. If the reported cost is less than or equal to the threshold cost, the project is accepted; otherwise it is rejected. This modification allows us to gather more precise data on the superiors' willingness to reject projects for testing Hypothesis 1. We do not use the strategy method in the initial four periods in order to allow the superior to "learn" how he/she responds to the individual reported costs. Importantly, this modification does not change the payoff function of either the superior or the subordinate. That is, the superior funds accepted projects at the reported cost, not the threshold cost. The subordinate still learns only whether the project was accepted; subordinates are not informed of the threshold cost.

At the end of the experiment, participants complete a post-experimental questionnaire. One period is selected at random for payment, and participants are paid privately in cash. Each participant receives a participation fee of $10.00 in addition to experimental earnings, if any.

High Span of Control Condition

[10] For more on the use of the strategy method see Kagel and Roth (1995).

High Span of Control sessions consist of twelve subordinates and four superiors. The only difference between the Low Span and High Span sessions is that in the High Span sessions, each superior has three subordinates reporting to her. As previously mentioned (see footnote 8), the hypothesized effect should be larger for successively larger increases in the span of control. We take the conservative approach of operationalizing a high span of control using only three subordinates. As in the Low Span sessions, superiors and subordinates are re-matched each period. The matching protocol ensures that each subordinate is matched with each superior only once during periods one through four and once during periods five through eight. Subordinates are also re-grouped each period. We do not limit the number of projects that a superior can fund. Therefore, the superior can potentially accept, fund, and earn revenues from all three projects in each period.

As in the Low Span sessions, project costs are independently drawn for each subordinate. In order to facilitate comparisons across conditions, we use the same sets of actual costs so that the mean actual cost is the same each period for both the Low Span and the High Span conditions. Specifically, we randomly generated twelve sets of actual cost draws, one for each subordinate in the High Span condition. These same sets are used in the Low Span sessions. Because there are only eight subordinates in the Low Span sessions, we use eight of the twelve cost draws in each session. We rotate the sets to ensure that each set of cost draws is used twice over the three Low Span sessions, thereby ensuring that the mean actual cost is the same across the two conditions each period.

Payoff-Adjusted Low Span Condition

A consequence of our primary manipulation is that the range of payoffs available to the superiors varies across our two primary conditions. Recall that in the High Span condition, the superior has the opportunity to earn revenues from all three projects, for a total of $90, less costs. In contrast, in the Low Span condition, the superior has the opportunity to earn revenues of only $30, less cost. For this reason, one might argue that if we observe a greater willingness to reject projects in the High Span condition, as we predict, the result could be entirely driven by differences in the superior's payoff potential. Although we are aware of no theory that would predict such an effect of payoff potential, we include the Payoff-Adjusted Low Span of Control condition to control for this possibility. These sessions are identical to the Low Span sessions except that the revenue and cost parameters are multiplied by three. Specifically, certain revenue from accepted projects is $90 and project costs range from $3 to $90. Thus, in comparing this condition to the High Span condition, the superior's payoff potential is held constant. It should be noted, however, that the payoff potential of the subordinates varies between this condition and the High Span condition. This is the unavoidable consequence of varying the number of subordinates matched with each superior – either the superiors' or the subordinates' payoff potential must vary across conditions. By including all three conditions, we eliminate the possibility that payoff potential creates a confound.

IV. RESULTS

Undergraduate students from a large university were recruited for the experiment. Three Low Span of Control sessions, four High Span of Control sessions, and three Payoff Adjusted Low Span of Control sessions were conducted.

Before formally testing our hypotheses, we provide descriptive data to evaluate the reasonableness of our characterization of the superior's utility function. Specifically, we compare actual decisions to three benchmarks: random, pure wealth maximization and the predicted decision using our characterization of the superior's utility function. We use the parameters from the example described above (i.e., $a = b = 1$, $S = 7.25$, exponent on wealth = .5, exponent on social norm = 1) to make our predictions. Of course, these parameters are individually specific, and so our predictions are noisy to the extent that actual parameters differ from our example parameters. Nonetheless, these data provide a useful benchmark for evaluating our characterization of the superior's utility function. For these comparisons, we use Periods 1-4, in which superiors evaluated each project individually, rather than providing a threshold for project acceptance.

In the Low Span condition, the superior makes one binary decision (accept or reject), and, therefore, a random model provides 50% accuracy. A model assuming wealth maximization (i.e., $a = 1$ and $b = 0$) improves on the random model, increasing accuracy to 70.8%. Our model improves accuracy slightly over the wealth maximization model, to 77.1%. Whereas this degree of accuracy provides a reasonable level of assurance for our model, the high accuracy rates of the other two benchmarks does not allow much room for improvement.

The richer decision context in the High Span condition allows for a more rigorous comparison across models. Notably, our model provides substantial predictive improvement compared to the benchmark models in this richer context. In the High Span condition, the superior makes a binary decision for three projects, and therefore, a random model provides 12.5% (.5 x .5 x .5) accuracy. A pure wealth maximization model predicts that all three projects are accepted 100% of the time; this prediction is only 20.3% accurate. Our model improves accuracy substantially. It predicts the actual pattern of project accept/reject decisions with 82.8% accuracy. Thus, an initial evaluation provides substantial support for our characterization of the superior's utility function.

We now provide formal tests of the hypotheses. We analyze the results by comparing the High Span condition to both the Low Span condition and the Payoff-Adjusted Low Span condition for both hypotheses. Although we report both types of comparisons, as discussed previously, the more valid comparisons for superiors (H1) are between the High Span condition and the Payoff-Adjusted Low Span condition, because such a comparison holds the superior's payoff potential constant. Likewise, the more valid comparisons for subordinates (H2) are between the High Span condition and the Low Span condition, because such a comparison holds the subordinate's payoff potential constant. In order to make meaningful comparisons, all values in the Payoff-Adjusted Low Span of Control condition are divided by three.

Tests of Hypothesis 1

Hypothesis 1 predicts that when the number of managers proposing projects increases, the superior's willingness to reject projects also increases. Therefore, we expect the cost threshold (above which projects are rejected) to be lower in the High Span condition compared to either of the Low Span conditions. Measurement of the superior's cost threshold is straightforward in periods five through eight because superiors indicated their cost threshold. We use these data as our primary test of Hypothesis 1. As reported in the last three columns of Panel A of Table 1, the mean cost threshold of superiors in the High Span condition, 22.1, is lower than the threshold of superiors in the Low Span condition, 23.4 ($t = 3.1, p < 0.01$), and lower than the threshold of superiors in the Payoff-Adjusted Low Span condition, 25.9 ($t = 6.6, p < 0.01$).[11] Thus, this primary test provides unqualified support for Hypothesis 1.[12]

[11] Recall that we argue that the more appropriate comparison for the superior's decisions is between the Payoff-Adjusted Low Span and the High Span conditions, because this comparison holds the superior's potential wealth constant.

[12] The t-test reported uses the mean of each superior's cost threshold across periods five through eight. Individual period analyses give almost identical results. In each period, the mean threshold is lower in the High Span condition compared to both of the Low Span conditions, and each of these differences is statistically significant ($p < 0.02$ each period).

We also use the data in periods one through four to provide supplemental tests of Hypothesis 1. Because in these periods, superiors did not indicate a cost threshold but rather decided whether to accept a project after receiving the subordinates' cost reports, we use two measures to estimate the superior's willingness to reject projects. These measures are noisier than the point estimate provided by the threshold measure. However, to the extent that inferences using these measures are consistent with Hypothesis 1, they provide confidence that the results are robust to the method used to elicit the superior's decision. The first measure, "Highest Accepted," is the highest project cost that each owner accepted in periods one through four. It proxies for the lower bound of each superior's cost threshold. We expect the lower bound of the cost threshold to be lower in the High Span condition. As reported in the first three columns of Panel A of Table 1, mean Highest Accepted is lower in the High Span condition, 23.8, compared to the Low Span condition, 24.5, as well as the Payoff-Adjusted Low Span condition, 26.3. However, the difference is only significant when comparing the High Span condition to the Payoff-Adjusted Low Span Condition *($t = 2.7$, $p < 0.01$)*. Recall that the superior's potential payoff is held constant across the High Span and the Payoff-Adjusted Low Span conditions, and so this comparison is more theoretically valid. Therefore, particularly given the conservative nature of this proxy, we feel comfortable concluding that this supplemental test provides further evidence confirming Hypothesis 1.

The second measure, "Lowest Rejected," is the lowest project cost that each superior rejected in periods one through four. It proxies for the upper bound of each superior's cost threshold, although it is biased upwards by at least one for each observation (because the threshold for acceptance must be at least one dollar lower if the superior rejected a given project cost). We expect the upper bound of the cost threshold to be lower in the High Span condition.

As reported in the middle three columns of Panel A of Table 1, mean Lowest Rejected is lower in the High Span condition, 24.8 compared to the Low Span condition, 27.1, as well as compared to the Payoff-Adjusted Low Span condition, 27.8. Both comparisons are statistically significant (*$t = 3.1$, $p < 0.01$; $t = 3.8$, $p < 0.01$*). Thus, the test using the proxy for the upper bound of the cost threshold also supports Hypothesis 1.[13]

In summary, the experimental results consistently support Hypothesis 1. That is, superiors in the High Span condition are more willing the reject projects compared to those in the Low Span conditions. With only one exception, noted above, this conclusion is supported regardless of whether we use the precise cost threshold measure from periods five through eight or the noisier estimates of the lower and upper bounds from periods one through four.

Tests of Hypothesis 2

Hypothesis 2 predicts that when the number of subordinates proposing projects increases, these subordinates report lower project costs. Therefore, we expect that subordinates in the High Span condition will report lower project costs compared to those in the two Low Span conditions. Table 2 reports the mean actual cost and, for each condition, the mean reported cost. Recall that by experimental design, the mean actual cost is the same across conditions for each period as well as overall. This allows us to compare mean reported cost directly, without adjusting for differences in actual cost.

Our primary test of Hypothesis 2 compares the mean reported cost for each subordinate for the eight periods across the two conditions. As reported in Table 2, the mean reported cost in

[13] Nine superiors in the Low Span condition and eight in the Payoff-Adjusted Low Span condition did not reject any projects. We treated these observations as missing values in the tests reported in Table 1. Inferences do not change if missing values are replaced with a conservative estimate of the lowest rejected amount. That is, we estimated the upper bound for these nine superiors as the highest accepted cost plus one. This is a conservative estimate because it biases the upward bound downward in the Low Span conditions, which works against finding support for Hypothesis 1. Using this conservative estimate results in inferentially identical results.

the High Span condition, 22.9, is lower than the mean reported cost in the Low Span condition, 24.3 *($t = 4.64$, $p < 0.01$),* as well as the Payoff-Adjusted Low Span condition, 24.4 *($t = 4.64$, $p < 0.01$)*. Thus, we provide unqualified support for Hypothesis 2. As a secondary analysis, we also compare the mean reported cost across conditions for each of the eight periods. As shown in Table 2, the mean reported cost is lower in the High Span condition than in either of the Low Span conditions. This difference is statistically significant for ten of the sixteen comparisons of the eight periods. Thus, our analysis at the individual period level provides additional, albeit somewhat weaker, support for Hypothesis 2.

In summary, the experimental results support Hypothesis 2. That is, subordinates in the High Span condition reported lower project costs. Apparently, these subordinates were able to anticipate that superiors would have a lower threshold for accepting projects, and thus reported lower project costs.

Additional Analysis

Table 3 reports descriptive data related to our two hypotheses. We partition cost reports into three ranges, 12-20, 21-25 and 26-30 (12 was the lowest observed reported cost and 30 was the highest). We then report the acceptance rates and the percentage of reported costs within that range for each condition. Acceptance rates are consistent with Hypothesis 1 in that superiors in the High Span condition are less likely to accept projects with reported costs above 20 compared to superiors in the two Low Span conditions. Specifically, acceptance is nearly assured for projects with very low reported costs, 12-20, regardless of condition (100% for both Low Span conditions and 98.5% for the High Span condition). However, acceptance rates diverge at the middle range of reported cost, 21-25. Superiors in the Low Span conditions are more likely to accept projects at these costs (80.2% in the Low Span condition and 85.3% in the Payoff-

Adjusted Low Span condition) compared to superiors in the High Span condition (64.4% accepted). Projects with very high reported costs, 26-30, are less likely to be accepted than lower reported costs in all three conditions, but are less likely to be accepted in the High Span condition (2.9%) than in either of the Low Span conditions (11.9% in the Low Span condition and 62.9% in the Payoff-Adjusted Low Span condition).[14]

Consistent with Hypothesis 2, the distribution of reported costs shifts to the left in the High Span condition. That is, substantially more reported costs fall into the lowest cost range in the High Span condition (35.2%) compared to the two Low Span conditions (14.1% in the Low Span condition and 10.4% in the Payoff-Adjusted Low Span condition).[15]

V. DISCUSSION

This study investigates whether increasing a superior's span of control reduces the level of slack in a participatory budgeting setting. We extend Antle and Eppen's (1985) budgeting model by explicitly modeling the superior's willingness to incur a cost in order to prevent subordinates from incorporating too much slack in their budgets, and show that, as a result, superiors are more willing to reject project proposals as their span of control increases. Our experimental results are consistent with our model. That is, as the span of control is increased, superiors show a greater willingness to reject projects for which they believe slack is excessive. Further, subordinates respond by building less slack into their budget requests. Thus, our study provides theory and experimental evidence that increasing the span of control can improve the effectiveness of the budgeting process, which is an important component of most firms' control

[14] We attribute the notably higher acceptance rate for high cost reports in the Payoff-Adjusted Low Span of Control condition compared to the Low Span of Control condition to the fact that rejection of a comparable project came at a much higher opportunity cost to superiors in the Payoff-Adjusted Low Span of Control condition compared to superiors in the Low Span of Control condition.

[15] The substantial proportion of reported costs in the highest range (30.7% Low Span; 36.5% in the Payoff-Adjusted Low Span; 26.8% High Span) does not indicate substantial irrational behavior because 17.7% of the actual costs fell within this range. Thus, the managers had no choice but to report a high project cost.

environments. Although prior research has generally assumed that increasing the span of control *weakens* the control environment, our study demonstrates that increasing the span of control can actually *strengthen* it.

Our results are especially relevant given the empirical and anecdotal evidence suggesting that firms are getting flatter over time. While the reason for this trend is unclear, authors have conjectured a number of causes, including improvements in corporate governance, improved information technology, and even consulting fads (Rajan and Wulf 2003). Regardless of the motives firms have for flattening their organizations, our research provides evidence that they may be in store for an unexpected and counter-intuitive benefit. Specifically, with regard to the budgeting process, flattening the firm may actually improve the control environment. In fact, this improvement may be even greater if one considers an indirect effect of increasing the span of control. In our model and experiment, we hold the number of hierarchical levels constant at two, ignoring the fact that if the firm size is held constant, increasing the span of control actually results in fewer hierarchical levels. If each manager expropriates a share of the surplus along the reporting chain, fewer hierarchical levels would result in fewer managers extracting their share. Thus, this indirect effect suggests an even greater benefit to increasing the span of control.

Our study contributes to the growing experimental evidence that social preferences, such as fairness, honesty, and impression management, can have predictable and important effects in accounting contexts (e.g., Young 1985; Moser, Evans and Kim 1995; Luft and Libby 1997; Evans et al. 2001; Stevens 2002; Kachelmeier and Towry 2002; Rankin, Schwartz and Young 2003; Hannan 2005). As Sprinkle (2003) observes, organizations may incorporate these social preferences into informal systems to mitigate contracting frictions. In our study, the superior's willingness to enforce social norms, even at a cost, acts as an informal control.

The role of this enforcement as an informal control is a relatively unexplored area in accounting. However, research in the cultural evolutionary perspective provides growing evidence of punishment's role in enforcing cooperation. Henrich and Boyd (2001) demonstrate how punishment can become an equilibrium strategy in cooperating societies and recent theories of the evolution of cooperation indicate that punishment has deep evolutionary roots (Gintis et al. 2003; Bowles and Gintis 2004). In fact, neurological evidence supports the evolutionary roots of punishment. Specifically, de Quervain et al. (2004) find activation in the area of the brain associated with decision-related *rewards* when participants punish another person for violating a social norm. These theories and findings suggest a fruitful area for future research in accounting as we add to our understanding of informal contracting arrangements.

Although we treat social norms as exogenous in our study, the cultural evolutionary perspective suggests a role for endogeneity. Consistent with this perspective, Fischer and Huddart (2005) model an endogenously-determined social norm for ethical behavior and discuss the implications for organizational design. Their model suggests that the increased honesty (i.e., lower slack) we observe in the participatory budgeting context, which results from the increased span of control, will influence honesty in other contexts as well. That is, increased honesty in budgeting will result in increased honesty elsewhere as the social norm for honest reporting permeates the organization. This view is consistent with the Jensen (2003) argument that, to the extent dishonesty becomes a norm in the budgeting context, it extends to a multitude of other relationships in the organization. The existence of endogenous social norms suggests that identifying mechanisms for increasing honesty in participatory budgeting has implications for organizations well beyond the budgeting process itself.

Table 1
Superiors' Willingness to Reject Projects

<table>
<tr><th colspan="9">Panel A: Mean Cost Thresholds</th></tr>
<tr><th colspan="6">Periods 1-4</th><th colspan="3">Periods 5-8</th></tr>
<tr><th colspan="3">Mean (sd) Highest Accepted</th><th colspan="3">Mean (sd) Lowest Rejected</th><th colspan="3">Mean (sd) Threshold</th></tr>
<tr><th>Low Span of Control</th><th>Payoff-Adj. Low Span of Control</th><th>High Span of Control</th><th>Low Span of Control</th><th>Payoff-Adj. Low Span of Control</th><th>High Span of Control</th><th>Low Span of Control</th><th>Payoff-Adj. Low Span of Control</th><th>High Span of Control</th></tr>
<tr><td>24.5
(1.6)</td><td>26.3
(2.9)</td><td>23.8
(2.6)</td><td>27.1
(1.9)</td><td>27.8
(2.6)</td><td>24.8
(1.8)</td><td>23.4
(1.8)</td><td>25.9
(2.3)</td><td>22.1
(0.9)</td></tr>
<tr><td>n=24</td><td>n=24</td><td>n=16</td><td>n=15</td><td>n=8</td><td>n=16</td><td>n=24</td><td>n=24</td><td>n=16</td></tr>
</table>

<table>
<tr><th colspan="6">Panel B: T-tests</th></tr>
<tr><th colspan="2">Highest Accepted</th><th colspan="2">Lowest Rejected</th><th colspan="2">Threshold</th></tr>
<tr><th>Low Span
vs.
High Span</th><th>Payff-Adj Low Span
vs.
High Span</th><th>Low Span
vs.
High Span</th><th>Payff-Adj Low Span
vs.
High Span</th><th>Low Span
vs.
High Span</th><th>Payff-Adj Low Span
vs.
High Span</th></tr>
<tr><td>1.2</td><td>2.7***</td><td>3.1***</td><td>3.8***</td><td>3.1***</td><td>6.6***</td></tr>
</table>

*** $p \leq .01$, one-tailed

All values in the Payoff-Adjusted Low Span of Control condition are adjusted to a comparable value by dividing by three.

In periods 1-4, superiors did not indicate a cost threshold but rather decided whether to accept a project after receiving the subordinates' cost reports. We estimate the cost threshold for accepting projects by using two measures. "Highest Accepted" is the highest project cost that each superior accepted in periods 1-4, and represents the lower bound for the cost threshold. "Lowest Rejected" is the lowest project cost that each superior rejected in periods 1-4, and represents the upper bound (plus 1) for the cost threshold. Note that nine superiors in the Low Span condition and eight in the Payoff-Adjusted Low Span condition did not reject any projects; hence n is reduced from 24 to 15 and 16, respectively, in those conditions. Inferences do not change if missing values are replaced with the highest accepted cost plus one as a conservative estimate of the lowest rejected amount (see footnote 13).

In periods 5-8, superiors indicated their cost threshold for accepting projects. "Threshold" is the mean of each superior's cost threshold for periods 5-8. Thus, the reported mean is the mean of a mean.

Table 2
Subordinates' Reported Costs

Period	Mean Actual Cost	Mean (sd) Reported Cost			t-stats	
		Low Span of Control	Payoff-Adj Low Span of Control	High Span of Control	Low Span vs. High Span	Payoff-Adj Low Span vs. High Span
1	17.00	24.58 (2.87)	24.60 (3.30)	23.50 (4.03)	1.17	1.15
2	15.75	24.88 (3.42)	24.97 (3.57)	23.44 (4.36)	1.41 *	1.49*
3	13.75	24.17 (4.08)	24.39 (3.98)	22.42 (4.44)	1.62 *	1.84**
4	14.67	24.33 (3.02)	24.26 (2.68)	22.96 (3.10)	1.79 **	1.76**
5	15.67	23.42 (3.32)	23.38 (3.09)	22.44 (3.76)	1.08	1.05
6	19.75	26.00 (3.66)	25.44 (3.07)	24.48 (4.29)	1.49 *	0.98
7	9.67	22.29 (2.68)	22.35 (2.67)	20.31 (1.96)	3.57 ***	3.67***
8	17.33	24.83 (3.89)	25.38 (2.12)	23.69 (4.31)	1.10	1.81**
Overall	15.45	24.31 (1.37)	24.35 (1.46)	22.90 (1.12)	4.67 ***	4.64***
		n=24	n=24	n=48		

* p ≤ .10, one-tailed
** p ≤ .05, one-tailed
*** p ≤ .01, one-tailed

All values in the Payoff-Adjusted Low Span of Control condition are adjusted to a comparable value by dividing by three.

"Actual Cost" is the actual cost of the project, which was private information of the individual subordinate and known before submitting the reported cost to the superior. Twelve series of actual cost draws were used. Therefore, the mean actual cost is equal across treatments but varies by individual subordinate.

"Reported Cost" is the cost of the project that the subordinate reported to the superior. If the project was accepted, funding was based on the reported cost.

The "Overall" row represents the mean of each subordinate's reported cost across the eight periods. Thus, the reported mean is the mean of a mean.

Table 3
Acceptance Rates

Reported Cost	Acceptance Rate			Percent of Observations		
	Low Span of Control	Payoff-Adj. Low Span of Control	High Span of Control	Low Span of Control	Payoff-Adj. Low Span of Control	High Span of Control
12-20	100%	100%	98.5%	14.1%	10.4%	35.2%
21-25	80.2%	85.3%	64.4%	55.2%	53.1%	38.0%
26-30	11.9%	62.9%	2.9%	30.7%	36.5%	26.8%

All values in the Payoff-Adjusted Low Span of Control condition are adjusted to a comparable value by dividing by three.

"Acceptance Rate" is the percent of projects that were accepted by the superior within each Reported Cost range.

"Percent of Observations" is the percentage of cost reports that fall within each Reported Cost range.

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