Abstract

Capital rationing, a widely used mechanism for controlling agency costs in budgeting, can take either competitive or noncompetitive forms. Accounting research has mostly addressed the non-competitive form, but competitive rationing is common in organizations. To examine effects of competitive rationing we conduct an experiment in which a principal allocates capital among three agents, who can each propose a single project. In the high (medium, low) competition condition, principals have sufficient funds to accept only one (only two, all three) projects. Prior literature provides three competing predictions about the effects of increasing competition in this setting. (1) Agents will make maximum credible misrepresentations under both medium and high competition to maximize their chance of receiving capital. (2) Agents will weigh the utility of honesty against the utility of receiving project funding, resulting in more misrepresentation at medium than at high levels of competition. (3) Misrepresentation will be highest in high competition, because agents will interpret the high-competition setting as one in which misrepresentation is most necessary or socially appropriate and honesty is least likely to be successful. We find that misrepresentation is highest in medium competition. In high competition, agents whose projects have low expected revenues are more likely to drop out of the competition by reporting relatively honestly.
1. INTRODUCTION

Competition for resources is pervasive in organizations (Mukherjee and Hingorani 1999), but it has been largely absent from the accounting literature on budgeting (see Fisher et al. 2002 and Baiman et al. 2007 for exceptions, and Covaleski et al. 2003 for a review of the budgeting literature in accounting). Experimental research on budgeting typically uses non-competitive settings, in which there is either no capital rationing or a non-competitive form of rationing in which any project with a rate of return higher than the hurdle rate can be funded (Evans et al. 2001; Hannan, Rankin and Towry 2006a,b; Rankin, Schwartz and Young 2008). Competitive capital rationing, in which a fixed investment budget is allocated to the projects with the highest expected returns, is common in organizations, however (Mukherjee and Hingorani 1999).\footnote{These projects can be either long-term capital projects or short-term discretionary projects, and the choice of competitive rationing can be due either to capital market frictions that limit the availability of capital or to the expectation that competition will reduce agency costs (Antle and Eppen 1985; Inderst and Laux 2005)}

Prior research provides some reason to expect that competitive capital rationing could alter one of the most robust results of prior experimental research, i.e., the propensity of subordinates to sacrifice monetary payoffs in order to be moderately (not extremely) honest in revealing their private information in budget proposals. This propensity has been documented in studies using a variety of (non-competitive) experimental paradigms (Young 1985; Waller 1988; Chow et al. 1988; Evans et al. 2001; Stevens 2002; Hannan et al. 2006a; Rankin et al. 2008). However, Rankin et al. (2008) suggest that some of the observed honesty effects are due to experimental tasks that frame the budget-reporting decision more as an ethical dilemma than as a strategic interaction in which each player’s role is to pursue his or her self-interest. Competition is a strong cue for strategic framing, in which self-interested
behavior is regarded as legitimate (Messick 1999). Moreover, the introduction of competition can reduce the payoffs from behavior off the economic equilibrium and thus reduce the incidence of such behavior (Prasnikar and Roth 1992). Competition reduces or eliminates the effect of social preferences like fairness or altruism in a variety of non-budgeting domains (Roth et al. 1991; Shleifer 2004; Bosco 2007), and could also reduce or eliminate the effect of preferences for honesty.

If the simple presence of competition does not eliminate the effect of preferences for honesty in budget proposals, then it is relevant to ask whether the intensity of competition, i.e., the amount of funding available relative to the funding requirements of the projects that agents propose, will influence the level of misrepresentation in budget proposals. Alternative theories detailed in the next section predict that misrepresentation will either be insensitive to differences in the intensity of (nonzero) competition, increase monotonically as competition increases, or peak at a medium level of competition and decrease at a higher level.

We test these predictions using a simple experimental setting in which a principal allocates capital among three agents who propose projects with the same cost but different expected revenues. (Revenues are always at least sufficient to break even if the project is funded). In the low competition condition principals have enough capital to fund all three projects; in medium (high) competition they have enough capital to fund only two (one) projects. Agents have probabilistic private information about the expected revenues of their own projects. Compensation for both principals and agents consists of a percentage of the earnings from funded projects plus a fixed payment; thus in medium and high competition agents have an incentive to overstate their revenues in order to induce principals to fund their projects.
Nevertheless, we find levels of honesty that are comparable with prior experiments. In medium (high) competition, agents’ mean overstatement of their private signal is 55% (41%) of the overstatement that they could make, comparable with the means of 51% (trust contract) or 57% (high-payoff trust contract) in Evans et al. (2001) and 51% (superior authority/factual assertion condition) in Rankin et al. (2008).²

We also find that the magnitude of misrepresentation is an inverted-U-shaped function of the intensity of competition, peaking at the medium competition level. The lower mean level of misrepresentation in high competition is largely driven by agents with low-revenue projects, who would have to make large misrepresentations in order to have even a moderate chance of winning funding (given that only one project will be funded and competitors are likely to propose high-revenue projects). These agents often drop out of the competition for funding by reporting their private signals with little or no overstatement. This behavior is consistent with models that treat misrepresentation as an action with a disutility like effort. Just as some individuals with high effort costs (low abilities) drop out of tournaments by exerting little effort when the prizes are few and therefore the probability of winning is low, so some individuals with high costs of misrepresentation (relatively honest types) drop out of such tournaments by reporting honestly, although they might be willing to misrepresent if the chances of winning were higher and the costs were lower (Freeman and Gelber 2006).

Previous budgeting literature has typically not addressed competition effects or else has treated competition as a largely benign factor that reduces slack and increases

² These figures are calculated by taking the % honesty in Table 1 Panel A of Evans et al. (2001) and subtracting this % from 1. For Rankin et al. (2008) we take the mean actual slack resulting from misrepresentation and divide it by the mean maximum slack that participants could have created.
performance (Frederickson 1992; Fisher et al. 2002). This study contributes to the literature by introducing level of competition as a driver of misrepresentation and documenting the non-monotonic shape of the relation. Understanding these effects of competition has become a more critical task with the recent growth of competition-based control and resource-allocation systems in organizations, in which conventional negotiations about targets and resources are replaced by auction mechanisms (Malone 2004; Stuart 2005).

The remainder of the paper is organized as follows. Section 2 provides a theoretical background. Section 3 describes our experiment. Results are reported in section 4, and section 5 concludes this paper.

2. THEORY

This section first introduces competitive capital rationing, then summarizes relevant theory and evidence on honesty in budget reporting, and finally develops three competing predictions about behavior in our experimental setting.

Competitive Capital Rationing

Capital rationing is a mechanism for controlling agency costs. It is aimed in particular at limiting the over-investment in low-return projects that occurs when managers have incentives for controlling more assets and private information about the return on these assets (Antle and Eppen 1985; Zhang 1997; Inderst and Laux 2005). A survey on capital allocation decisions of Fortune 500 firms indicates that the majority of these firms ration capital, either by setting hurdle rates higher than the cost of capital or by setting fixed investment budgets and rejecting positive NPV projects that exceed the fixed budget (Mukherjee and Hingorani 1999).
Competitive rationing has a number of advantages. It provides incentives for agents to predict higher returns for their projects and thus provides a countervailing force against managers’ tendency to understate expected returns in order to set easier performance targets for themselves (Zhang 1997; Fisher et al. 2002). Also, to the extent that control mechanisms limit the divergence between managers’ predictions and reality, pressure to predict higher returns provides an incentive to discover new business opportunities with genuinely higher expected returns (Inderst and Laux 2005).

Competition can also have negative effects on the budgeting process. When divisions are heterogeneous ex ante in terms of resources and investment opportunities, competitive rationing is likely to provide less incentive than non-competitive rationing for the least advantaged divisions to undertake the effort of developing profitable new projects (Inderst and Laux 2005). Moreover, insofar as competition does increase incentives for managers, this is not unambiguously beneficial: some actions that increase the probability of receiving funding are detrimental to the organization (e.g., sabotage, dishonesty), and competition is likely to increase these actions as well as increasing effort that benefits the principal (Harbring and Irlenbusch 2003). But exactly how competition affects misrepresentation in budget proposals depends on whether and how individuals’ utility for honesty provides a counterweight against the incentive to misrepresent.

**Honesty in Budget Proposals**

People usually prefer to think of themselves as honest (Alicke et al. 1995) and, other things equal, to avoid actions that clearly conflict with this self-image (Mazar and Ariely 2006; Ariely, Amir and Mazar 2008). Both laboratory and field studies have provided evidence that individuals make costly choices to avoid dishonesty (e.g., Goldstone and Chin...
Although participative budgeting experiments have documented considerable misrepresentation by subordinates, the magnitude of the misrepresentation is often well below the amount that apparently would maximize the subordinates’ utility from wealth, and the magnitude varies with factors other than the monetary payoffs for misrepresentation. (See Luft 1997 for a review of this evidence and Hannan et al. (2006a) and Rankin et al. (2008) for recent examples.)

Experimental research on capital budgeting has found that the performance of budgeting mechanisms depends in complex ways on managers’ preferences for honesty. Evans et al. (2001) provide evidence that the higher-hurdle capital rationing mechanism proposed by Antle and Eppen (1985) does not perform as well as an alternative mechanism that relies more (but not completely) on the honesty of subordinates. Evans et al. (2001) also provide evidence that agents will sacrifice more cash payoffs to be honest when the compensation system does not award a disproportional share of the common surplus to the principal. Hannan et al. (2006a) find that individuals sacrifice cash payoffs not only to be honest but also to appear honest in a face-to-face interaction with a superior, even though this is a one-time interaction that can generate no future economic gains from reputation-building.

The effects of honesty and related social preferences in motivating “organizational citizenship behavior” have been identified as significant economic forces in firms, generating organizational capital and reducing transaction costs via “consummate cooperation” (Williamson 1985), i.e., cooperation beyond what can be cost-effectively induced through purely economic incentives in contracts (Deckop, Mangel, and Cirka 1999; Fehr and Falk
1999; Podsakoff et al. 2000). How robust these social preferences are to intrafirm competition for resources remains to be investigated.

**Competition and Misrepresentation in Budget Proposals**

In this study we consider a simple setting in which agents benefit from receiving funding for their projects, and reporting that their proposed projects are more profitable is the only means by which they can increase their probability of receiving funding (i.e., they cannot sabotage other agents’ proposals or engage in influence activities other than reporting). The amount of misrepresentation agents can engage in is limited but nonzero, as in many organizational settings where misrepresentation is limited by formal control mechanisms (e.g., post-audits and incentives), but complete elimination of misrepresentation by such mechanisms is too costly. Each agent has one positive NPV project to propose, and all projects have identical costs. Each agent has private information about the expected revenues of his or her project. These expected revenues are not identical across agents but are drawn from the same distribution.

The principal who accepts or rejects projects knows the distribution, i.e., knows that revenues outside a certain range are not credible. Within this limited range the principal does not know and will not be able to infer ex post, based on actual performance, whether agents honestly reported their private information about expected revenues. When there is sufficient capital to fund all three projects (our baseline “low competition” condition), agents can report honestly and principals can accept all projects. When only two projects, or only one project, can be funded (medium and high competition respectively), three alternative predictions can be put forward about agents’ behavior.
1) Maximum misrepresentation in both medium and high competition

Most formal agency models assume that the disutility of lying is too small to affect reporting decisions, and Baiman and Lewis (1989) provide experimental evidence consistent with this assumption. If this assumption is valid and common knowledge, then agents in both medium and high competition have no reason to forecast anything but the highest credible revenues. Any lower prediction reduces their chances of funding and thereby reduces their expected compensation in this setting. If it is common knowledge that the disutility of lying is zero – that there are no significantly honest “types” among agents – then there is no reason for a principal to believe that a report of lower revenues is more credible and therefore a better choice for funding. Hence agents cannot gain by imitating (nonexistent) honest types and reporting less than maximum revenues in order to increase the likelihood of receiving funding from the principal.

(2) Highest mean misrepresentation in medium competition

If the psychological cost (disutility) of misrepresentation is a nontrivial amount, then it can be modeled as an effort-like action that agents are willing to undertake if the expected monetary payoff is high enough (Brickley, Smith and Zimmerman 2004). Just as individuals vary in ability, and therefore have different costs of effort to reach a given level of performance, so individuals also vary in their utility for honesty, resulting in different psychological costs for a given level of misrepresentation.

Moldovanu and Sela (2001) model tournaments with contestants of differing ability and show that when effort-cost functions are convex, multiple-prize tournaments (like our two-prize medium competition setting) result in higher expected effort than single-prize (high competition) tournaments. Medium competition should also result in higher
misrepresentation than high competition if misrepresentation can be modeled as effort, and if the psychological costs of misrepresentation are convex, i.e., large misrepresentations are disproportionately more costly than small ones. Convexity is not implausible: Goldstone and Chin 1993 and Ariely et al. 2008 provide evidence consistent with disproportionately large psychological costs for large misrepresentations. Freeman and Gelber (2006) use the Moldovani and Sela (2001) model as an ex post explanation of their (unanticipated) experimental evidence that cheating is an inverted-U-shaped function of the level of competition in tournaments: cheating (like productive effort) is highest at a medium level of competition.

3) Highest mean misrepresentation in high competition

A number of psychological considerations could, if they are strong enough, motivate individuals to misrepresent more when competition is high. First, the prediction that misrepresentation will peak at medium competition and then decline is driven by the expectation that agents with strong utilities for honesty and/or low-revenue projects are disadvantaged competitors and will drop out of the competition when it becomes particularly difficult (high competition). However, prior experimental research provides evidence that disadvantaged competitors often do not drop out as readily as equilibrium models predict, but increase their efforts to apparently suboptimal levels in an attempt to win (Bull, Schotter and Weigelt1987; Schotter and Weigelt 1992; Orrison, Schotter and Weigelt 2004). The presence

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3 In Moldovanu and Sela (2001) and Freeman and Gelber (2006) the total prize amount is identical across multiple-prize and single-prize tournaments, and thus the individual prizes are larger in single-prize (high competition) settings. In our setting the total prize amount varies across conditions but the individual prizes are identical. This could make the decrease in effort and misrepresentation from medium to high competition more marked in our setting, because the reduction in probability of winning in high competition is not offset by an increase in the size of the prize. Our budget setting also differs from standard tournaments in that an agent who wins with an honest proposal of (say) 60€ revenue earns more money than an agent who wins with a dishonest proposal of 60€ revenue, because the agents’ payoff depends on the actual cash flow from the project. This difference will tend to make large misrepresentations less attractive in our setting than in a standard tournament.
of competition often seems to drive excess costly actions: excess market entry (Camerer and Lovallo 1999 and Fischbacher and Thöni 2008), and excess investment to deter competitors (Krishnan, Luft and Shields 2002, Lankton and Luft 2008). Excess market entry increases as the intensity of competition increases (i.e., with larger winner-take-all markets in Fischbacher and Thöni 2008), and “excess misrepresentation” could do so as well.

Second, Messick (1999) argues that when individuals interpret a situation as more competitive, they regard it as socially appropriate for self-interest to dominate their decision-making, although it would not be appropriate in situations interpreted as non-competitive. Managers can believe that it is part of their job to gain funding for projects, and succeeding in this task is a quasi-normative obligation that justifies some misrepresentation. If agents in our budgeting setting think this way, and expect others to think this way, then misrepresentation will increase with competition because the cost of misrepresentation – the uncomfortable sense that it is wrong – decreases when competition is high.

Third, high competition could reduce honesty for the same reason that competition eliminates fairness behavior in Roth et al. (1991): individuals experience utility from the effects their actions have on others' payoffs, and different levels of competition result in different potential for one individual's actions to affect another's payoffs. In Roth et al. (1991), individuals refuse proposed unequal ("unfair") divisions of a common surplus in a two-person (non-competitive) ultimatum game but not in a setting where nine individuals compete to receive the smaller share of the surplus, while a tenth individual receives the larger share. In the non-competitive ultimatum setting, refusal gives individuals the satisfaction of penalizing unfair proposers by imposing a zero payoff on them. But in the competitive setting, given nine competitors with varying levels of tolerance for inequality,
one will probably be willing to accept the highly unequal distribution. In this case, the refusal by more inequality-sensitive individuals does not prevent the recipient of the disproportionately large share from receiving his or her payoff. Therefore refusal is considerably less attractive, and individuals behave as if they were relatively indifferent to unequal payoff distributions.

In our setting also, utility for others' payoffs (in this case positive rather than negative) could help to determine the influence of competition. Gneezy (2005) and Rankin et al. (2008) provide evidence that concern for the other party's welfare is a driver of honesty: individuals are honest because they are concerned that dishonesty will harm another party. In our setting, honest reporting by all agents benefits principals by enabling them to fund the most profitable projects and maximize their own payoffs. Honest reporting by any one agent, however, has different expected effects on the principal's welfare in medium versus high competition, if there is some probability that other agents will not report honestly. In high competition, honest reporting by one or two agents has little likelihood of enabling the principal to achieve her objective of choosing the one best project to fund, so long as at least one agent with an inferior project misrepresents to the maximum and the principal chooses the project with the highest reported revenue. In medium competition, in contrast, honest reporting by one or two agents can help support the principal's objective of choosing the two best projects to fund. Honest reporting of the lowest-revenue project in the firm enables the principal to choose the two better projects, whether they are honestly reported or not; and honest reporting of a higher-revenue project, which should be funded, increases its likelihood of being funded so long as the other two agents do not both misrepresent to the maximum. In
consequence, honest reporting could be more attractive to individuals in medium than in high competition.

*The Principal’s Problem*

The principal's decision task is restricted in our experiment, for simplicity. The system that limits agents' misrepresentation is already in place, so the principal does not make control-system design decisions. Because we are interested in the degree to which agents' honesty will reduce misrepresentation that cannot be eliminated by other means at a reasonable cost, our experimental setting does not allow control mechanisms to reduce misrepresentation further within this limited range. Thus we do not provide principals with information that would allow them to detect overstatement in project proposals (even probabilistically) within the limited range of possible misrepresentation. Because the distribution of revenues is uniform, a very high-revenue project is no less likely (no more "suspicious") than a moderate-revenue project. Agents cannot benefit by developing reputations for honesty, and principals benefit by developing reputations for rejecting very high-revenue proposals and thus deterring extreme misrepresentation. (Principals and agents are anonymous and re-matched in each period.)

In such a setting, the principal has little reason to choose projects other than those with the highest reported revenues. Projects with low reported revenues are virtually certain to have low actual revenues, since there is no motivation for agents to under-report, but there is some probability that projects with high reported revenues will actually have high revenues. Of course principals' behavior can vary depending on their conjectures about agents' reporting strategies. Principals might in fact tend to reject very high-revenue proposals if they believe maximum overstatement is common, or they might tend to reject
moderately high revenue proposals if they believe (consistent with much actual behavior) that agents are more likely to make small overstatements than large ones. Agents' behavior in turn can vary depending on their conjectures about the principals' decision strategies. Equilibria in such cases are difficult to calculate and not likely to describe players' actual behavior, due in part to the cognitive difficulty of determining optimal strategies (for evidence on the cognitive difficulty of tournament strategies, see Bull, Schotter and Weigelt 1987; Schotter and Weigelt 1992; van Dijk, Sonnemans and van Winden 1998; Harbring and Irlenbusch 2008).

Therefore in this study we do not attempt to make detailed ex ante predictions of players' conjectures about each other's behavior, which would support calculations of an equilibrium. The three predictions described above simply assume that principals will tend to choose projects with high reported revenues – because they have little rational basis for doing otherwise – and that agents will trade off the possible disutility of misrepresentation against the benefits to themselves of high reports. We check the validity of these assumptions ex post by examining the consistency of principals' and agents' decisions with these assumptions.

3. EXPERIMENTAL METHOD

Participants and experimental task

Participants were 80 business and economics students with a mean age of 22. They were randomly assigned to either the agent or principal role. One principal (in the role of corporate manager) and three agents (in the role of divisional managers) composed one firm. Each agent’s task was to propose a project for funding, and the principal’s task was to accept or reject projects. Each firm was randomly assigned to the low, medium, or high competition condition.
All participants knew that each project required an investment of 30, and true project revenues followed a uniform (integer) distribution {30, 31, …60}. Thus all projects had a positive return, and misrepresentations were possible only within a limited range. This limitation of the range of reports provides a parsimonious representation of the limits that might be provided in the natural environment by a variety of possible control mechanisms.

Each agent received private information about the revenues of his or her project, in the form of a statement that the revenues would be X with a probability of 75 percent; the remaining 25 percent probability was evenly distributed across the rest of the uniform distribution. Participants were told that each revenue draw was independent; thus, knowing the revenue of one agent’s project did not provide additional information about the revenue of projects of other agents in their firm or projects in other periods. A new set of private signals was drawn for each period, but within each period the same set of signals was used for all firms: thus, for example in the first practice round, the three agents in each firm received signals of 37, 50, and 55.

Compensation for both principals and agents depended on their projects’ realized cash flow, i.e., the difference between the project’s realized revenue (a draw from the (30€, …60€) uniform distribution) and its investment cost of 30€. Participants were told:

The compensation is as follows:
Corporate Manager:
   25% of profit (revenue – investment) per accepted project + Fixed wage
Divisional Manager:
   25% of profit (revenue – investment) per accepted project + Fixed wage

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4 The positive return guarantees that even completely honest agents always have an incentive to propose their project, and that principals will always have three proposals to choose from.
Agents thus had an incentive to win funding for their proposals, and principals had an incentive to choose the most profitable proposals. The exact amount of the fixed payment was set ex post to result in approximately equal mean payments across roles and conditions.

Mean compensation in the low-competition condition was $10.40 for principals and $10.93 for agents; in medium competition, $12.14 for principals and $11.71 for agents; and in high competition, $10.50 for principals and $10.00 for agents.

**Procedure**

Before the start of the experiment instructions were distributed and read aloud to participants. Participants had to pass an understanding quiz about the information and incentive structure of the setting in order to begin the experiment. No participant proceeded with the experiment until all questions in the understanding quiz had been answered correctly. Participants interacted over a computer network to ensure anonymity.

The task then proceeded as follows:

1) Each agent received private information about the revenues of his or her project.

2) Each agent privately reported a cash flow (revenue minus cost) forecast to his or her principal. Both principals and agents were told that agents “… can decide themselves whether to submit a revenue report that is equal, more or less than the actual revenue prediction.”

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5 As with many performance-based contracts in natural settings, the agent participates in any profit generated by his action.

6 In a pilot version of this experiment, principals received 20% of the cash flow of each funded project in low competition, 40% in medium competition, and 60% in high competition: the different percentages compensated for the different number of projects that could be funded. Agents received 30% of the cash flow in each condition, plus an ex ante fixed payment of 4€. This resulted in roughly equal mean compensation to principals and agents in each condition. However, the unequal (60-30 split) of the cash flow between principal and agent in the high-competition condition appears to have been highly salient to the agents, resulting in additional fairness-driven misrepresentation in this condition in the pilot. (See Results section for evidence of the association between fairness concerns and misrepresentation in the experiment.) The version of the experiment reported here eliminated this potential confound by using equal percentage divisions of the cash flow and controlling for reported fairness judgments.
3) The principal determined whether or not to accept (fund) the project.

4) The agent was informed about the principal’s decision.

5) The principal learned the true realized cash flow of each funded project; agents learned the true realized cash flow of their own project if it was funded.

The experiment consisted of nine periods. The first eight periods were practice periods. Participants received compensation only for the final period, which provided data for the analyses presented in the next section. This payment method provided additional assurance that participants understood the experiment and knew that a substantial payoff was at stake when they made the decisions that we use to test our predictions.

The role of each participant remained the same throughout the experiment, but principals and agents were re-matched within each treatment after each period to avoid reputation building. The experiment concluded with participants’ completion of an exit questionnaire, including a manipulation check and questions designed to provide additional information about participants’ reporting choices in the experiment. The experiment lasted about 30 minutes. Data from one firm in the low-competition condition was lost due to software problems, resulting in usable observations from 76 participants.

**Independent and Control Variables**

The independent variable was the level of competition generated by capital rationing. With no capital rationing (low competition) the principals could accept all three of the proposed investment projects (or fewer if they chose). At the medium competition level, the principals could accept no more than two projects, and at the high level, the principal could accept no more than one project.
In the exit questionnaire we measured additional variables that were expected to influence individuals’ propensity to misrepresent private information. First, agents’ expected payoffs for a given level of misrepresentation, and therefore their reporting strategies, should depend on their beliefs about how much their competitors were misrepresenting. Therefore in the exit questionnaire we asked agents to respond (on a 7-point scale where 1= strongly agree and 7 = strongly disagree) to the statement: "I believe the other divisional managers overstated their predictions."

Second, we asked for a response (on the same 7-point scale) to the statement, "I found the distribution of profits of an accepted project between the superior and me fair." Zhang (2008) provides experimental evidence that individuals report more honestly when they believe their compensation is fair. Cohen et al. (2006) find that experienced managers are less likely to state an intention of misallocating project costs to make their current project performance look better when they believe that the misallocation results in unfairness. Although the compensation system in our experiment was the same for all agents, they could (and did) have beliefs about its fairness that varied significantly within conditions and influenced their reporting decisions.

**Dependent Variable**

The dependent variable is agents’ misrepresentation of their private information. We use multiple measures of misrepresentation both to provide comparability with prior research and to allow for the fact that participants were likely to conceptualize misrepresentation in different ways. Agents could have believed that an honest report was either their private

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7 We also included two other potential control variables, an indicator of risk preference (the probability that would make individuals indifferent between a given lottery and a certain payment) and an item on individuals’ ethical beliefs ("It is unethical to overstate predictions of an investment project"). These items proved not to have significant incremental associations with agents' misrepresentations, however.
signal or the expected revenue conditional on their private signal. We therefore calculated the following measures:

1. Misrepresentation of private signal: the agent’s revenue prediction minus his or her private signal about future revenue.

2. Misrepresentation of expected revenue: the agent’s revenue prediction minus the expected revenue conditional on his or her private signal.

3. Actual misrepresentation as a percentage of possible misrepresentation: (prediction – private signal)/(60 – private signal), where 60 was the maximum possible revenue that could be reported. This measure is a “% dishonesty” measure, equivalent to (1 – % honesty) using the % honesty measure in Evans et al. (2001).

4. RESULTS

Manipulation check

In the exit questionnaire participants indicated on a scale from one (do not agree at all) to seven (absolutely agree) their agreement with the statement “The chances of getting a project approved are very high.” Agreement with this statement should decrease as competition increases. The mean responses are 6.45, 4.10, and 2.45 in the treatments low, medium and high competition, respectively. Pairwise t-tests indicate that these responses are significantly different from each other (p<0.01); thus we conclude that the manipulation was successful.

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8 The use of probabilistic private information was a design choice intended to capture an element of real-world private information that can significantly influence individuals’ honesty. Schweitzer and Hsee (2002) find that individuals tend to misrepresent more when their private information is probabilistic than when it is certain, because the uncertainty allows them to justify the misrepresentation to themselves. (After all, the value of a project could turn out to be as high as an overstated proposal claims.)
Effects of Competition

Table 1 Panel A reports the means and standard deviations of agents’ misrepresentations. The mean level of misrepresentation of private signals is 2.27, 7.67, and 5.83 in the treatments low, medium, and high competition, respectively. A similar pattern of results appears for misrepresentation of expected revenue and % of available misrepresentation. Panel B of Table 1 presents the distribution of misrepresentation in low, medium, and high competition. As expected, misrepresentation is minimal in the low competition condition (median = 0 for two of the three measures), although a few individuals pad their proposals even in this setting. The difference between medium and high competition is most marked at the upper end of the distribution. The 25th percentile of the distribution is much the same in the two competitive conditions, as comparable numbers of participants are completely honest or pad their proposals only slightly in both medium and high competition. But misrepresentations at the high end of the distribution (75th percentile) are smaller in high than in medium competition. This is consistent with the motivation of prediction (2), which argues that large misrepresentations are particularly costly, and the expected benefits of misrepresentation in high competition are not large enough to motivate such misrepresentations by many individuals.

To assess the statistical significance of the observed differences in misrepresentation, Table 2 presents ANOVAs using the three principal measures of misrepresentation as dependent variables and level of competition as an independent variable. When the private signal is not used to calculate the dependent measure (Panels A and B), the private signal is

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9 Principals occasionally rejected a proposal in the low-competition condition, perhaps to find out if this would have any unexpected consequences. As a result, some agents in the low-competition condition were concerned that their proposals might not be attractive enough to be funded.
included as an independent control variable. All three ANOVAs indicate that the level of competition has a significant effect on the magnitude of misrepresentation.

We therefore proceed to more specific tests of the three alternative predictions presented in Section 3. All three predictions assume that misrepresentation will be lowest in low competition, and the results are consistent with this assumption. The three misrepresentation measures are significantly lower in low than medium competition (t-values > 2.4, one-tailed p-values < 0.01). The misrepresentation measures are also significantly or marginally lower in low than in high competition (t = 1.74, p = .045 for misrepresentation of private signal, t = 1.90, p = .033 for misrepresentation of expected revenue, and t = 1.34, p = .099 for percent of possible misrepresentation; all p-values are one-tailed).

The three predictions differ about behavior in medium and high competition. According to the first prediction, the magnitude of misrepresentation will be equal (and maximal) in medium and high competition; according to the second, misrepresentation will be highest in medium competition; and according to the third, misrepresentation will be highest in high competition. In the rest of the analysis we therefore focus on comparing medium and high competition conditions only.

(1) Do subordinates misrepresent to the maximum when they must compete for capital? Prediction (1) above proposes that agents will report their private information relatively honestly in low competition but will predict the highest credible revenues when capital rationing forces them to compete, resulting in maximum overstatement at both medium and high low levels of competition. The experimental evidence is not consistent with this prediction. The maximum credible revenue that subordinates could report is 60; the mean

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10 Adding other control variables (fairness and beliefs about others' misrepresentations) does not qualitatively change the results; these variables are therefore omitted from this table and reported only for the main tests of predictions (2) and (3) in Table 3.
private signal is 43.3, leaving a mean possible private-signal overstatement of 16.67 (or 100%). Actual mean misrepresentation is significantly less than 16.67 (100%) in both medium and high competition conditions (p-values < 0.01 for all misrepresentation measures in both conditions). Thus the results are not consistent with prediction (1), based on the assumption that agents’ disutility for lying is trivial and that this is common knowledge, so that agents cannot imitate honest types by limiting their overstatement of revenues.

(2) and (3) Is misrepresentation highest in medium or high competition? The second prediction proposed that misrepresentation would be highest in medium competition, while the third prediction proposed that misrepresentation would be highest in high competition. The results shown in Table 1 are qualitatively consistent with the second but not with the third prediction.

To test for the statistical significance of the observed difference, we estimated the following regression model:

\[
\text{misrepresentation} = \alpha_0 + \alpha_1 \text{high} + \alpha_2 \text{signal} + \alpha_3 \text{fairness} + \alpha_4 \text{others} + (1) \\
\alpha_5 \text{signal}\times\text{high} + \alpha_6 \text{signal}\times\text{others} + \alpha_7 \text{signal}\times\text{fairness} + \alpha_8 \text{fairness}\times\text{others} + \varepsilon
\]

where high is a dummy variable for the experimental treatment with 1=high competition and 0=medium competition. Signal is the private revenue signal subordinates receive. Fairness is the response on a 7-point Likert scale (1=strongly disagree, 7=strongly agree) to the statement in the exit questionnaire, “I found the distribution of profits of an accepted project between me and the superior fair.” Others is the response on a 7-point scale (1= strongly agree, 7 = strongly disagree) to the exit-questionnaire statement, “I believe the other divisional managers overstated their predictions.”
Results of the regression appear in Table 3, using misrepresentation of the private signal as the dependent variable. All p-values are two-tailed. The model was originally estimated with all interactions, but for simplicity non-significant interactions (p > 0.20) were omitted from the version of the model reported in the table; inferences are the same whether the model is estimated with or without the nonsignificant interactions.\(^{11}\)

Results indicate that subordinates misrepresent significantly less under high than medium competition (\(a_1 = -28.58\), p=0.011). This finding supports prediction (2) that misrepresentation would be highest under medium competition. A number of the control variables also have significant effects on misrepresentation. Not surprisingly, misrepresentation is lower when the private signal is higher (\(a_2 = -2.53\), p<0.01). A belief that the division of the common surplus is fair reduces misrepresentation (\(a_3 = -15.68\), p < 0.01) at both medium and high levels of competition (no significant interaction with level of competition). A belief that competitors are not overstating their revenues also reduces misrepresentation (\(a_4 = -13.07\), p<0.05) and does not interact with competition. Because there is less opportunity for misrepresentation when the signal is high, the effects of competition, belief in others’ honesty, and fairness are all larger for agents with low signals than with high signals (\(a_5 = 0.54\), p < 0.05, \(a_6 = 0.21\), p < 0.05; \(a_7 = 0.14\), p<0.05). In addition, beliefs about fairness and others’ honesty interact, so that the combined effect of the two is less than the sum of their separate effects (\(a_8 = 1.30\), p < 0.05).

Results are virtually identical if misrepresentation of the expected value is used as the dependent variable. If % of possible misrepresentation is used as the dependent variable, and

\(^{11}\) Inclusion of other potential control variables and demographic variables from the exit questionnaire (e.g., gender, stated risk attitudes) did not provide additional explanatory power or qualitatively change the results in Table 3.
the private signal and its interactions are omitted from the model (because the private signal effect is included in the dependent variable), the effect of medium versus high competition is weaker (two-tailed p = 0.109); effects of beliefs about fairness and the honesty of others and their interactions are qualitatively the same as those reported in Table 3.

**Additional Evidence on Misrepresentation Choices in Medium and High Competition**

The prediction that misrepresentation would be highest in medium competition is based on an argument that some nontrivial number of agents would drop out of high competition and report honestly because the psychological cost of misrepresentation was not worth the expected payoff, given the low likelihood of funding in high competition. We provide two additional sets of evidence consistent with this argument, one from responses to the exit questionnaire and one from individual reporting decisions.

Two exit questions asked agents to suppose that there was another round in which they received a private signal of 40. The first question asked for the likelihood that they would gain funding with a revenue report of 55, and the second question asked, “Do you think it would be worthwhile to report a prediction of 55 instead of 40?” in these circumstances. Mean ratings of both the likelihood of funding and the worthwhileness of reporting 55 were lower in the high competition than the medium competition condition (t-values = 1.95 and 2.38, two-tailed p-values = 0.058 and 0.022, respectively). These responses are consistent with the argument that agents in high competition are more honest on average because their expected payoff for misrepresentation is lower.

We analyze individual reporting decisions in the high competition condition in order to provide evidence on the plausibility of an alternative explanation for agents' honesty. Agents might believe that principals would be suspicious of projects with high revenue
forecasts and would therefore be likely to reject such projects. If this were the case, then agents might limit their misrepresentations solely in order to increase their credibility and their chances of success in winning funding. If these beliefs are particularly strong in high competition, they could account for the lower mean misrepresentation in high competition.

The reporting decisions made by participants in the high competition condition are more consistent with the “honesty as dropping out” explanation than with the alternative “limiting misrepresentation to increase likelihood of acceptance” explanation. Virtually all of the difference in misrepresentation between medium and high competition is driven by agents with low private signals, who have the largest opportunities for misrepresentation. If these agents intend to be only honest enough to escape rejection by the principal, they would report moderately high revenues, similar to revenue reports with which they succeeded in winning funding in practice rounds. In contrast, if they were dropping out of competition because they believed misrepresentation was not worthwhile when the chances of winning were low, then they would propose low revenues, close to either their private signal (37) or the expected revenues given the private signal (39).

Of the eight low-signal agents in high competition, none exhibited behavior clearly consistent with a strategy of being just honest enough to escape rejection. Two agents reported maximum (60) or near-maximum (58) revenues, inconsistent with fear of rejection of high-revenue proposals. Of the remaining six agents, five reported either their private signal or an approximation of expected revenues given the private signal (≤ 40); one reported revenues of 46. Most of these individuals had experience of receiving funding for proposals with reported revenues > 55 during the practice rounds. It does not seem plausible that they

---

12 The exceptions were one had never succeeded in receiving funding, and one who had been funded on a single occasion only, with a low report.
would believe they needed to report revenues ≤ 40 in order to win funding in the last round. Thus it seems likely that the relatively high level of honesty in high competition comes from decisions to drop out of competition rather than from an attempt to increase the likelihood of receiving funding.

**Principals' Behavior**

Although we did not have a large enough number of principals in the experiment to provide reliable tests of predictions about their behavior, some examination of their behavior is appropriate to verify that it was not unreasonable. An exit question asked principals how they would report if they were agents who received a private signal of 45. The mean response was 54 in medium competition and 47 in high competition, suggesting that principals understood the setting and correctly expected more misrepresentation in medium competition. In medium competition, principals usually chose the two projects with the highest predicted revenues; this often though not always resulted in funding the projects with the two highest expected revenues. Although the honesty of low-signal agents in high competition generally protected principals from choosing the worst of the three projects, they had mixed success in identifying which of the remaining two projects was the best.

5. **DISCUSSION**

As organizations explore more competitive, market-like mechanisms for resource allocation and control (Malone 2004; Stuart 2005), understanding the effects of competition on accounting decisions becomes increasingly important. In this study we examine effects of competitive capital rationing on the residual misrepresentation that is not eliminated by costly controls such as monitoring, post-audits, or truth-inducing incentives. Understanding

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13 The mean of 47 for high competition omits an outlier observation of zero.
what influences individuals' propensities to misrepresent when the control system does not prevent them from doing so is important to designing efficient control systems: the less honest reporting an organization can expect without costly formal control mechanisms, the more it should spend on such mechanisms.

Although there is some reason to expect that competition for budget resources will sharply reduce the effect of preferences for honesty, the results of our experiment do not support these expectations. Competition does not eliminate honesty effects in our setting (unlike the elimination of fairness effects by competition in Roth et al. 1991 and Prasnikar and Roth 1992). Competition does, however, significantly affect the magnitude of agents' misrepresentation of private information in our experiment: misrepresentation is highest at a moderate level of competition for resources and decreases again as competition becomes more intense.

One limitation of our experiment is the stylized representation of existing limits on agents' ability to misrepresent. For simplicity, we merely state a range outside of which revenue reports will be non-credible and not accepted. In practice, limits on misrepresentation come from a variety of different specific sources: monitoring by competitors, the expectation of post-audits, or reputation-building. It is possible that the choice of formal mechanism to limit misrepresentation will affect agents' propensity to make misrepresentations that the formal mechanism cannot prevent. Christ, Sedatole and Towry (2009) find that some controls are felt to be more intrusive than others that specify the same economic payoffs, and the more intrusive controls result in lower levels of trust and

14 Another mechanism that limits overstatement of future profitability in budget proposals is the use of budget targets in performance evaluation (Fisher et al. 2002): managers are less likely overpromise future performance when they are held responsible for performing at the promised level. This mechanism is likely to be less effective for longer-term projects, however. Targets need to be adjusted from year to year to accommodate unpredictable change, and it is often impracticable to hold managers responsible for long-term forecasts.
cooperation. Future research could determine whether such control also result in lower levels of honest reporting.

A variety of features of budgeting and resource-allocation systems could alter the results observed in our experiment. For example, like Evans et al. (2001) and Zhang (2008), we find that agents' beliefs about the fairness of their compensation have a strong influence on their propensity to misrepresent private information. In our experiment, mean judgments of fairness did not differ across conditions, but in the natural environment, changes in the intensity of competition could result in changed beliefs about the fairness of the situation that would affect the level of honesty among agents. For example, if an increase from a medium to a high level of competition was believed to be unfair, it might well prompt increased rather than decreased misrepresentation.

The effect of differences in the information available to agents in competitive budgeting systems is a potentially rich area for future research. In our experiment, as in many but not all natural settings, agents did not have information about the proposals made by their competitors. Receiving this information could alter their behavior, as could other information that would reduce their uncertainty about the amount of misrepresentation that would be likely to make their own projects successful. Freeman and Gelber (2006) find that in their tournament setting more exact information about other competitors’ likely performance strengthens the inverted-U relation between competition and misrepresentation.

In order to provide relatively unambiguous and efficient tests of the influence of competition on agents' behavior, we constrain the role of the principals in our experiment. Another avenue for future research would be to investigate principals' control-system design and implementation decisions in competitive settings. Heath (1999) provides evidence that
individuals tend to overestimate the effect of monetary incentives and underestimate the
effect of intrinsic incentive on others; and Rowe (2004) finds that individuals in a control-
system-designer role tend to underestimate the extent to which design choices influence
cooperative behavior via social (rather than monetary) incentives. Whether control system
designers would readily identify and incorporate honesty effects into their decision-making
remains to be investigated.
References


### TABLE 1
Misrepresentation in Budget Proposals

#### Panel A: Mean Misrepresentation in Budget Proposals Under Three Levels of Competition (standard deviations in parentheses)

<table>
<thead>
<tr>
<th>Competition Level</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=15</td>
<td>n=21</td>
<td>n=24</td>
</tr>
<tr>
<td>(i) Misrepresentation of private signal</td>
<td>2.27</td>
<td>7.67</td>
<td>5.83</td>
</tr>
<tr>
<td>(revenue report – private signal)</td>
<td>(4.68)</td>
<td>(7.46)</td>
<td>(6.99)</td>
</tr>
<tr>
<td>(ii) Misrepresentation of expected revenue</td>
<td>2.37</td>
<td>7.92</td>
<td>6.08</td>
</tr>
<tr>
<td>(revenue report – expected value given private signal)</td>
<td>(4.83)</td>
<td>(6.56)</td>
<td>(6.56)</td>
</tr>
<tr>
<td>(iii) Misrepresentation as a % of possible misrepresentation</td>
<td>18.2%</td>
<td>55.2%</td>
<td>41.1%</td>
</tr>
<tr>
<td>misrepresentation</td>
<td>(33.1)</td>
<td>(42.2)</td>
<td>(60.6)</td>
</tr>
</tbody>
</table>

#### Panel B: Distribution of Misrepresentation Under Three Levels of Competition

<table>
<thead>
<tr>
<th>25th percentile</th>
<th>Measure (i)</th>
<th>Measure (ii)</th>
<th>Measure (iii)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>n=15</td>
<td>n=21</td>
<td>n=24</td>
</tr>
<tr>
<td>Median</td>
<td>Measure (i)</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Measure (ii)</td>
<td>-2</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>Measure (iii)</td>
<td>0</td>
<td>0.14</td>
</tr>
<tr>
<td>75th percentile</td>
<td>Measure (i)</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Measure (ii)</td>
<td>4.25</td>
<td>11.25</td>
</tr>
<tr>
<td></td>
<td>Measure (iii)</td>
<td>0.29</td>
<td>1.00</td>
</tr>
<tr>
<td>Variable</td>
<td>Df</td>
<td>SS</td>
<td>MS</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>Competition</td>
<td>2</td>
<td>257.65</td>
<td>128.83</td>
</tr>
<tr>
<td>Private Signal</td>
<td>2</td>
<td>421.63</td>
<td>210.82</td>
</tr>
<tr>
<td>Competition x Private Signal</td>
<td>4</td>
<td>199.64</td>
<td>49.91</td>
</tr>
<tr>
<td>Error</td>
<td>51</td>
<td>1923.66</td>
<td>37.72</td>
</tr>
</tbody>
</table>

Panel B: Dependent Variable = Misrepresentation Of Expected Revenue Conditional On Private Signal

<table>
<thead>
<tr>
<th>Variable</th>
<th>Df</th>
<th>SS</th>
<th>MS</th>
<th>F-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition</td>
<td>2</td>
<td>272.83</td>
<td>136.41</td>
<td>3.62</td>
<td>.03</td>
</tr>
<tr>
<td>Private Signal</td>
<td>2</td>
<td>57.23</td>
<td>28.61</td>
<td>0.76</td>
<td>.47</td>
</tr>
<tr>
<td>Competition x Private Signal</td>
<td>4</td>
<td>199.62</td>
<td>49.91</td>
<td>1.33</td>
<td>.27</td>
</tr>
<tr>
<td>Error</td>
<td>51</td>
<td>1920.02</td>
<td>37.65</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Panel C: Dependent Variable = Misrepresentation as % of Possible Misrepresentation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Df</th>
<th>SS</th>
<th>MS</th>
<th>F-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competition</td>
<td>2</td>
<td>1.20</td>
<td>0.60</td>
<td>2.53</td>
<td>0.09</td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>13.54</td>
<td>0.24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See Table 1 for calculation of dependent variables. The private signal is coded as high, medium or low. The private signal and its interaction with competition are not included in the ANOVA in Panel C because the dependent variable in this model is already adjusted for the private signal.
TABLE 3  
Misrepresentation of Private Signal  
In High and Medium Competition  
(n = 45)

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>p-value (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>$\alpha_0$</td>
<td>150.81</td>
</tr>
<tr>
<td>High competition</td>
<td>$\alpha_1$</td>
<td>-28.58</td>
</tr>
<tr>
<td>Private signal</td>
<td>$\alpha_2$</td>
<td>-2.53</td>
</tr>
<tr>
<td>Fairness</td>
<td>$\alpha_3$</td>
<td>-15.68</td>
</tr>
<tr>
<td>Others honest</td>
<td>$\alpha_4$</td>
<td>-13.07</td>
</tr>
<tr>
<td>Signal×high competition</td>
<td>$\alpha_5$</td>
<td>0.54</td>
</tr>
<tr>
<td>Signal × others honest</td>
<td>$\alpha_6$</td>
<td>0.21</td>
</tr>
<tr>
<td>Signal × fairness</td>
<td>$\alpha_7$</td>
<td>0.14</td>
</tr>
<tr>
<td>Fairness × others honest</td>
<td>$\alpha_8$</td>
<td>1.30</td>
</tr>
</tbody>
</table>

Adjusted $R^2$  
0.47

*High competition* is a dummy variable for the experimental treatment with 1=high competition and 0=medium competition.  
*Private signal* is the private revenue signal agents receive.  
*Fairness* is the response on a 7-point Likert scale (1=strongly disagree, 7=strongly agree) to the statement: “I found the distribution of profits of an accepted project between the superior and me fair.”  
*Others honest* is the response on a 7-point Likert scale (1=strongly agree, 7=strongly disagree) to the statement: “I believe the other divisional managers overstated their predictions”.  
Using misrepresentation of expected value conditional on the private signal as the dependent variable in this model yields virtually identical results. Using misrepresentation as a % of available misrepresentation (and omitting private signal as a predictor) yields weaker results (p = .109 for *high competition*, p = .016 for *fairness*, p = .04 for *others honest*, and p = .011 for the interaction of *fairness* and *others honest*).