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The effects of forecast type and performance-based incentives on the quality of management forecasts

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ABSTRACT

Understanding forecasts is important because of their pervasiveness in business decisions such as budgeting, production, and financial reporting. In this study we use an abstract experiment to examine how the preparation of disaggregated forecasts interacts with performance-based incentives to influence the accuracy and optimism of forecasts. We manipulate two factors between subjects at two levels each: forecast type (*disaggregated* or *aggregated*) and performance-based incentives (*present* or *absent*). Consistent with our predictions, we find that (1) preparing disaggregated forecasts leads to greater improvements in forecast accuracy (compared to preparing aggregated forecasts) in the absence of performance-based incentives than in the presence of performance-based incentives, and (2) preparing disaggregated forecasts leads to greater increases in forecast optimism (compared to preparing aggregated forecasts) in the presence of performance-based incentives than in the absence of performance-based incentives. Our study contributes to our understanding of unintentional biases in the forecasting process. Our results have important practical implications for designers of management control systems who elicit internal forecasts from managers. Finally, our results also have important practical implications for those who either prepare or use external management forecasts.

1. Introduction

Understanding forecasts is important because of their pervasiveness in business decisions such as budgeting, compensation, and financial reporting. Inaccurate forecasts can reduce the effectiveness of the production planning process and negatively impact production efficiency, cost management, and ultimately firm performance (e.g., Bruggen, Grabner, & Sedatole, 2013). To increase the chance of obtaining accurate forecasts from an agent, a principal needs to be careful in designing the management control system that elicits such forecasts from the agent (e.g., Osband, 1989).

One such control system that is commonly used is the planning and budgeting system of a firm (Merchant & Van der Stede, 2012). Within the planning and budgeting system, an important design choice is the level of aggregation at which the principal elicits forecasts from the agent. In practice, firms vary considerably in the level of aggregation of the information elicited by the planning and budgeting system (Merchant & Van der Stede, 2012). For example, top management can request that divisional managers prepare either an aggregated forecast (e.g., forecast total sales for the division) or a disaggregated forecast (e.g., forecast sales for individual products within the division) (see Kahn, 1998 and Lapide, 2006). Although managers are likely to prepare both disaggregated and aggregated forecasts for internal decision-making purposes, the level of forecast aggregation required by the budgeting system will determine which forecast is more salient to them. Further, research on the anchoring and adjustment bias suggests that managers likely anchor on the numbers in the forecast that are most salient to them (Bromiley, 1987; Tversky & Kahneman, 1974). Therefore, the level of aggregation at which the principal elicits forecasts from the agent should affect managers' forecasts even when both types of forecasts are prepared.

Although economic theory suggests that a rational agent will provide the same forecast of a summary performance measure re-

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gardless of the level of forecast aggregation (or forecast type), psychology theory suggests that forecast type will influence the quality of the agent's forecasts, where forecast quality can refer to both the accuracy and optimism (or bias) in a forecast. We investigate how a control system design choice—forecast type—interacts with incentives to affect two dependent measures of forecast quality: *forecast accuracy* and *forecast optimism*. *Forecast accuracy* refers to the degree of closeness between a forecast and the actual outcome. *Forecast optimism* refers to consistent differences between forecasts and actual outcomes; that is, the extent to which forecasts exhibit a general tendency to be too high relative to actual outcomes. Specifically, we examine how forecast type affects forecast accuracy and forecast optimism in the presence or absence of explicit performance-based incentives that are tied to the measure being forecasted.

Drawing on psychology, forecasting, and accounting literatures on forecasts, we generate the following predictions for forecast accuracy and forecast optimism, respectively. First, we predict that preparing disaggregated forecasts leads to greater improvements in forecast accuracy (compared to preparing aggregated forecasts) in the absence of performance-based incentives than in the presence of performance-based incentives. When performance-based incentives are absent, disaggregated forecasts involve more careful and objective consideration of forecast components, which should improve forecast accuracy compared to preparing aggregated forecasts. Second, we predict that preparing disaggregated forecasts leads to greater increases in forecast optimism (compared to preparing aggregated forecasts) in the presence of performance-based incentives than in the absence of performance-based incentives. When managers produce disaggregated forecasts but *do* have explicit incentives to achieve favorable performance on the forecasted measure, they have both the motivation and opportunity to produce optimistic forecasts. In other words, while the preparation of disaggregated forecasts involves more complete consideration of information, theory suggests that individuals with performance-based incentives are likely to consider that additional information in a biased way that helps them reach their desired conclusions (Hales, 2007).

To test our predictions we conduct an abstract laboratory experiment where participants complete a knowledge task with questions from four different categories (e.g., English, math, grammar, and logic) and prepare forecasts of their performance. Participants complete two rounds of the task. After the initial round, participants receive feedback on their performance. Before the second round begins, participants provide forecasts of their second-round performance. Participants then answer the second round of questions and learn their actual performance.

We use an abstract task in our study for two reasons. First, we are interested in examining a fundamental psychological bias rather than reactions to rich, institutional features. An abstract knowledge test allows us to test the fundamental processes that affect the characteristics of our two types of forecasts while avoiding noise in participants' responses that could arise from asking them to do an unfamiliar task like forecasting revenues and expenses. Second, using a task with rich institutional features could introduce other incentives that may lead to intentional biases in the forecasts. For example, in an internal budgeting setting, managers may intentionally provide lower forecasts to increase the probability of achieving targets or intentionally provide higher forecasts to increase resource allocations (Fisher, Maines, Peffer, & Sprinkle, 2002). Using an abstract task removes the institutional features that might drive managers to intentionally produce biased forecasts, allowing us to isolate the effects of unintentional bias.

We manipulate two factors between subjects at two levels each. First, to manipulate forecast type, participants in the disaggregated forecast condition forecast their scores in all four categories of the test (e.g., English, math, grammar and logic), while participants in the aggregated forecast condition forecast their total score.[1] Second, we manipulate whether explicit performance-based incentives are present or absent.[2] We hold average participant compensation constant across the two incentive conditions. We examine two dependent variables: (1) forecast accuracy, where overestimation of scores is treated as equivalent to underestimation of scores; and (2) forecast optimism, which captures systematic tendency to overestimate scores.

Consistent with our predictions, we find that: (1) preparing disaggregated forecasts leads to greater improvements in *forecast accuracy* (compared to preparing aggregated forecasts) in the *absence* of performance-based incentives than in the *presence* of performance-based incentives; and (2) preparing disaggregated forecasts leads to greater increases in *forecast optimism* (compared to preparing aggregated forecasts) in the *presence* of performance-based incentives than in the *absence* of performance-based incentives. Given that participants' pay would be higher in the absence of the forecast error and forecast optimism described above, our results show that participants' judgments conflict with their financial incentives and therefore suggest that the biases we observe are unintentional.

Our study contributes to our understanding of unintentional biases in the forecasting process. Since unintentional biases may be more difficult to discipline than intentional, incentive-driven biases, our study provides insights that are likely useful to both preparers and users of forecasts. First, our results contribute to the budgeting literature. Prior budgeting literature focuses heavily on the opportunistic behavior of agents in the budgeting process and the effectiveness of truth-inducing incentives (e.g., Chow, Cooper, & Waller, 1988; Church, Hannan, & Kuang, 2012; Shields & Young, 1993; Waller, 1988; Webb, 2002; Young, 1985). However, unintentional biases such as those documented in our paper are more difficult to mitigate. Specifically, our results show that a control system design choice that has so far been largely overlooked in management accounting research—the level of forecasts elicited—can have unintended consequences for potential bias and accuracy in management forecasts.

Second, by highlighting the potential effect of an internal planning and budgeting system design choice (i.e., forecast type) on externally reported management forecasts, our study complements the accounting literature on management forecasts as well as an emerging literature that examines the link between external disclosures and internal decision-making (e.g., Goodman, Neamtiu, Shroff, & White, 2014; Hemmer & Labro, 2008; McNichols & Stubben, 2008). Prior research on management forecasts has shown that disaggregated forecasts increase the market's perception of the informational value and credibility of management forecasts (Hirst, Koonce, & Venkataraman, 2007; Hutton, Miller, & Skinner, 2003; Lansford, Lev, & Tucker, 2013), reduce investors' fixation on announced earnings (Elliott, Hobson, & Jackson, 2011), and decrease auditors' tolerance for misstatement (Libby & Brown, 2013). Our study differs from these prior studies by: (1) taking the perspective of the preparer, rather than the users, of management forecasts; and (2) by focusing on the actual, rather than perceived, quality of disaggregated forecasts. Despite the documented perceived benefits of disaggregated forecasts, our results suggest

[1] Although we manipulate the level of disaggregation at two levels in our experiment, the level of disaggregation can vary in degrees in practice. We expect the directional effects we document in our study to hold with varying levels of disaggregation.

[2] We manipulate incentives at two levels in our experiment, but the absence of performance-based incentives versus presence of performance-based incentives conditions can also map into low-powered incentives versus high-powered incentives in the real world.