Dividing the Pie: The Influence of Managerial Discretion Extent on Bonus Pool Allocation

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Data Availability: Contact the authors

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Firms often allow managers discretion when allocating bonuses so that they can incorporate relevant non-contractible information into employees' compensation. Using an experiment, we examine whether and to what extent managers use a piecemeal approach to process performance information (i.e., processing each cue separately), and how using this approach influences bonus pool allocations. Consistent with our predictions, we find that most managers use a piecemeal approach and that managers who use this approach tend to incorporate non-contractible information to a lesser degree than managers who use a more integrative approach. However, our results also indicate that this effect is mitigated when managers have partial discretion. When a piecemeal approach is used, managers with partial discretion incorporate non-contractible information into discretionary bonus pools to a greater degree than do managers with full discretion. The economic implication is counterintuitive, in that the total bonus allocations of managers with *less* discretion ultimately reflect non-contractible information to a *greater* degree. Our study contributes to academics' and practitioners' understanding of potential obstacles that preclude incorporation of relevant non-contractible information into bonus pool allocations, potentially circumventing intended benefits of managerial discretion.

Keywords: *discretionary bonus pools, anchoring, non-contractible information, subjective performance evaluation*

I. INTRODUCTION

An essential role of management is organizational control, or the process of "ensuring that the organization operates in the intended manner and achieves its goals" (Hilton 2008, 6). Accountants support managers in this role by providing information that forms the basis of performance evaluation and incentive-based contracting. However, managers also have available to them other relevant employee performance information – that is, information not explicitly contracted on because it represents unforeseen circumstances, cannot be jointly verified, or requires interpretation or judgment. To incorporate this non-contractible information into compensation decisions, firms often allow managers some degree of discretion in determining subordinates' compensation. This paper examines *how* managers use this discretion. Specifically, we investigate the processes by which managers allocate discretionary bonus pools. Further, we investigate the effect of an important institutional factor – the extent to which managers are endowed discretion – on managers' discretionary bonus allocations.[1]

Analytic research (e.g., Rajan and Reichelstein 2006a) models each bonus pool participant's allocation as a linear combination of performance measures. This linear combination may be conceptualized as a single, comprehensive measure of performance, in which all relevant (contractible and non-contractible) information is integrated. However, managers applying discretion face a relatively difficult task of integrating multiple pieces of performance information. Given this difficulty, managers will likely choose a decision process that simplifies the bonus allocation task. In this paper, we examine whether and to what extent managers use a piecemeal approach when allocating discretionary bonus pools, and how this approach influences managers' propensity to incorporate relevant non-contractible information into bonus pool allocations. We

[1] Although we state this research question in terms of firm managers evaluating employees, the same question applies to compensation committees who evaluate the performance of CEOs and other executive level employees.

argue that managers tend to consider the compensation implications of each information cue separately, as opposed to using an integrative approach in which contractible and non-contractible information is combined into a single, comprehensive performance measure. That is, managers choose some piece of information as a starting point for the allocation, and process additional information cues as qualitative adjustments from that starting point. Following psychology theory, we predict that managers who use such an approach will tend to incorporate non-contractible information to a lesser degree than will those who use an integrative approach.

We also investigate the influence of the extent of discretion endowed managers. Specifically, although the size of a bonus pool (in dollars) is typically based on some pre-determined formula, firms vary greatly in the extent to which managers are endowed discretion to allocate that pool (Murphy and Oyer 2003). That is, some plans allow managers full discretion in allocating the bonus pool, whereas other plans allow discretion over only a portion of the total pool, with the remainder contractually allocated by formula. We argue that, relative to full discretion, partial discretion more directly signals a purpose for discretion, thereby increasing the salience of the non-contractible information. Given this increased salience, we predict that managers endowed with partial discretion incorporate non-contractible information into the discretionary portion of the bonus allocation to a greater degree than managers endowed with full discretion. Following this, we examine the economic implications of this effect by providing evidence on the influence of discretion extent on the degree to which non-contractible information is ultimately reflected in managers' total bonus pool allocations (i.e., discretionary and non-discretionary bonus pools combined).

We investigate our research questions using a 2 x 2 between-subjects experiment. Graduate business student participants assume the role of a senior manager (i.e., the firm president) who must

allocate a bonus pool between two division-level employees. We manipulate discretion extent (*full, partial*) such that participants with full discretion allocate the entire bonus pool, while participants with partial discretion allocate half the bonus pool, with the remainder allocated based on reported division profit. We also manipulate the valence (*positive, negative*) of a subset of non-contractible information. That is, when combined with contractible information, this non-contractible information should have either a positive or negative effect on the overall performance evaluation (i.e., relative to an allocation based only on the contractible information). This manipulation allows us to measure the degree to which participants incorporate non-contractible information into bonus pool allocations. We replicate our study across two contextual settings to assess the robustness of our theory.

Our results are consistent with our predictions. In particular, we find that managers are likely to use a piecemeal approach when processing information to allocate discretionary bonus pools. In addition, we find that managers who use this approach tend to incorporate non-contractible information to a lesser degree than do those who use other approaches. However, our results suggest that this tendency is mitigated when managers have partial discretion. In particular, we find that among those who use a piecemeal approach, participants with partial discretion incorporate non-contractible information in discretionary bonus allocations to a greater degree than do participants with full discretion. Further, this pattern of results holds when we consider *total* bonus pool allocations (i.e., discretionary and non-discretionary bonus pools combined). While this latter finding is likely sensitive to specific aspects of the bonus plan design, it suggests the counterintuitive potential for total bonus allocations of managers with *less* discretion to ultimately reflect non-contractible information to a *greater* degree.

Our study contributes to the growing literature on subjective performance evaluation and, more specifically, to the literature considering the benefits and costs of discretionary bonus pools (e.g., Baiman and Rajan 1995; Ittner et al. 2003; Fisher et al. 2005). Further, our study is important to managers and accountants developing and maintaining incentive systems using discretionary bonus pools. In particular, by examining how managers use discretion, we improve academics' understanding of potential obstacles that reduce the incorporation of relevant non-contractible information, ultimately circumventing intended benefits of managerial discretion. Our results imply that limiting discretion could facilitate managers' incorporation of relevant non-contractible information into bonus allocations. Further, our theory and findings potentially serve as an underlying explanation for phenomena noted in prior literature on subjective performance evaluation (e.g., centrality bias, halo effect, etc. – see Bol (2008) for a review of this literature) and a basis for future research in this area. Finally, our findings related to the effect of discretion extent are important to academics and practitioners who study and design incentive systems that contain discretionary bonus pools, especially in scenarios in which a non-discretionary pool is present.

The remainder of this paper is organized as follows. The next section reviews the relevant literature and develops our hypotheses. The third section describes our experiment while the fourth section reports results. The last section concludes our paper with a discussion of implications for practice and research.

II. THEORY AND HYPOTHESES

Background and General Setting

Compensation contracts often make pay contingent on *contractible information* – information that is sufficiently precise and verifiable such that it is economically feasible to contract

upon. However, compensation contracts are often incomplete, in that relevant *non-contractible information* – information that reflects unforeseen circumstances, is subjective, is not verifiable, or is too costly to convert to contractible form – is excluded.[2] The purpose of *discretionary bonus plans*, compensation systems that endow managers with decision rights over bonus allocations to employees, is to mitigate costs associated with incomplete contracts. Specifically, by endowing managers with discretion, a discretionary bonus plan allows managers to incorporate relevant non-contractible information into bonus pool allocation decisions. Thus, managerial discretion creates the opportunity for more informed bonus pool allocations (Murphy and Oyer 2003).

Research in subjective performance evaluation has investigated the benefits and costs of discretionary bonus plans (e.g., Murphy and Oyer 2003; Ittner et al. 2003; Gibbs et al. 2004; Fisher et al. 2005; Rajan and Reichelstein 2006a, 2006b). For instance, Baiman and Rajan (1995) find that under fairly general conditions, it is in the firm's best interest to make bonus pool allocations contingent on both contractible, and subjective, non-contractible measures. Further, Fisher et al. (2005) find that managerial discretion mitigates employees' free-riding. Rajan and Reichelstein (2006a) extend this literature, and allow for partial discretion in their examination of the relative weights placed on subjective versus objective measures in optimal contracts. They demonstrate that a discretionary bonus scheme is optimal when relevant subjective measures are available.[3]

However, there are also costs associated with discretion. These costs include undesirable behavior on the part of both managers (e.g., opportunism, as discussed in Fisher et al. (2005)) and employees (e.g., propensity to game the evaluation process, as discussed in Prendergrast (1999)).

[2] Empirical evidence indicates that firms use relatively few performance measures in formal contracts, suggesting that it is not economically feasible to contract on other measures. For instance, Banker et al. (2003) document evidence that a large hotel chain limits the number of performance measures formally included in employees' incentive compensation contracts for reasons pertaining to simplicity, reliability, etc.

[3] Others have considered partial discretion in contexts other than discretionary bonus pools. For example, Baker et al. (1994) examine the interplay of subjective and objective performance measures in individual incentive contracts, but do not consider the use of bonus pools in multi-agent settings.

Prior research has documented such costs. For example, Ittner et al. (2003) describe a field study in which managers with discretion were inconsistent in applying relative weights to performance measures and establishing performance criteria. The firm ultimately eliminated discretion and adopted a purely formulaic bonus plan. Additionally, the analytic literature suggests that the use of subjective measures in discretionary bonus pools potentially imposes risks on agents, and thus results in agency costs (Rajan and Reichelstein 2006a).

A key motivation for our study stems from the state of the analytic literature on discretionary bonus pools. For purposes of tractability, analytic models make highly simplified assumptions about managers' decision processes. Specifically, they simplify the role and behavior of a manager with discretion to that of a "turn-key" mechanism. That is, the bonus pool allocation resulting from every possible combination of performance measure outcomes is determined *ex ante*, and the manager's *ex post* behavioral response to those outcomes is assumed away. The primary motivation for our paper is to understand this *ex post* behavioral response (i.e., how managers actually use discretion). Specifically, we investigate the processes by which managers allocate bonus pools, and the influence of an important dimension of the bonus plan design – the extent of discretion – on the degree to which managers incorporate non-contractible information into bonus pool allocations.

To investigate our questions, we incorporate the basic elements of related analytic models (e.g., Baiman and Rajan 1995; Rajan and Reichelstein 2006a) and the contracting solutions they provide to develop our general setting as follows.[4] Assume a firm's incentive system includes a discretionary bonus plan, in which the total bonus pool is funded based on corporate profit. With full discretion, the allocation of the entire bonus pool is left to the manager's discretion. With

[4] It is important to note that our goal is *not* to test these models, per se. Rather, our study complements this research as we investigate a factor that has been necessarily simplified in these models.

partial discretion, half the bonus pool is discretionary while the remaining non-discretionary portion is formulaically allocated based on reported division profit (i.e., each division's contribution to reported corporate profit).[5] In assessing employees' performance and allocating the bonus pool, the manager has available two types of information: contractible and non-contractible. In our scenario, reported division profit and corporate profit are economically feasible to contract on (e.g., sufficiently objective, verifiable, and precise). We assume that all other relevant information is non-contractible, by virtue of the fact that firm management has currently chosen to not write explicit contracts on this information (Rajan and Reichelstein 2006a). This non-contractible information may be unforeseeable, unverifiable, or subjective, such that it is economically infeasible (even if theoretically possible) to form the basis of contracting.[6] Managers can use discretion to incorporate this non-contractible information into bonus allocations.

Integration of Contractible and Non-Contractible Information

The analytic literature (e.g., Rajan and Reichelstein 2006a) models each bonus pool participant's allocation as a linear combination of all available performance measures. That is, this

[5] The non-discretionary pool is analogous to a setting in which the firm does not explicitly fund a bonus pool, but instead calculates formula-based bonuses by individual. Our assumption is consistent with Murphy and Oyer (2003) who treat the aggregation of these individual bonus arrangements as an implicit bonus pool. See also footnote 23 in Rajan and Reichelstein (2006a, 597).

[6] From a practical perspective, our setting is similar to a variety of examples of bonus plans. Consider, for example, the following excerpt from Georgia Pacific Corporation's Economic Value Incentive Plan (EVIP): "Bonuses under the EVIP are composed of two different types of awards, viz., the non-discretionary annual bonus award . . . and the discretionary long-term bonus award." Similarly, First Alert, Inc.'s 10-K describes both (1) the formula used to compute program participants' non-discretionary bonus and (2) the formula used to compute the total discretionary bonus pool and the parties responsible for determining program participants' discretionary bonuses. Considering prior analytic research, our setting is most similar to that of Rajan and Reichelstein (2006a). However, there are two important differences. One, in our setting, the subjective allocation is non-negative. That is, using Rajan and Reichelstein's notation, we require that $w_i + \sum_{j=1}^{n} w_{ij} \cdot y_j \geq 0$ for each agent *i* and for all realizations of y_j (as opposed to Rajan and Reichelstein's characterization in which compensation based on subjective measures can reduce that provided via objective measures). Second, in our setting, *w* is also a function of the objective measures. This modifies the formula in Rajan and Reichelstein's footnote 23 to the following: $w = \alpha \sum_{i=1}^{n} \sum_{j=1}^{n} [u_{ij} \cdot x_j]$. In addition, $\alpha = \frac{1}{2}$ in our scenario.

literature implicitly assumes that all relevant performance information – both contractible and non-contractible – can be combined to yield a single, comprehensive performance measure. We denote this as an *integrative* approach. For example, in our setting, managers could combine the reported division profit with other relevant non-contractible information to arrive at a comprehensive, "revised division profit," which could be used as the basis for bonus pool allocations.[7] However, as we describe below, combining contractible and non-contractible information is a difficult task, and thus we expect managers to engage in processes that help simplify that task.

Implementing an integrative approach can be difficult, if not impossible, for at least three reasons. One, different information cues are often measured on different scales, making them difficult to combine or synthesize. For example, while contractible information is often quantitative, some non-contractible information is qualitative or subjective. Two, contractible information is likely to be perceived as sufficiently verifiable and precise whereas non-contractible information often suffers in comparison on these dimensions. Three, the design of the bonus pool treats contractible information and non-contractible information differently. Specifically, contractible information plays a clear role in determining important dimensions of employees' compensation (e.g., the size of the pool and the allocation of the non-discretionary portion). Thus, managers potentially will perceive that contractible information has been endorsed by designers of the incentive compensation system as relevant for compensation purposes. Non-contractible information is not explicitly recognized in the bonus plan to the same degree. Given these inherent

[7] For expositional purposes, we use the phrase "revised division profit" to refer to the comprehensive performance measure (where applicable) in our setting. We distinguish this from "reported division profit," which, in our setting, refers to division profit as originally reported, absent any adjustment for non-contractible information.

differences between contractible and non-contractible information, managers may not readily combine these two types of information into a comprehensive performance measure.[8]

To deal with this difficulty, a manager will likely use an allocation process that simplifies his/her task. One way of simplifying the allocation process is to use a *piecemeal approach*, through which a manager uses a piece of readily available information as a starting point for the allocation, and then adjusts the allocation amounts for other relevant information. In a piecemeal approach, a manager does not integrate the individual performance information cues into a single, comprehensive measure. Rather, each cue is processed individually as either the starting point or as an adjustment from that starting point, which results in a new starting point for the next cue. These steps are repeated until all relevant information cues are processed. We expect that when a manager uses a piecemeal approach, the adjustments from the starting point (or updated starting point) will be qualitative. That is, the manager subjectively determines the direction and extent to which each individual performance cue impacts the bonus pool allocations.

While some managers will use an integrative approach to allocate bonuses, and some may choose other simplifying strategies as well, the likelihood that managers use a piecemeal approach is exacerbated by the information-rich nature of the evaluation and compensation task. Specifically, allocating a discretionary bonus pool involves processing *multiple information cues*, which cannot be easily combined, and it is this aspect of the allocation task that makes a piecemeal approach a likely behavior. Prior research finds that individuals use a dimensional information processing strategy (as opposed to a holistic or global information processing strategy) when making multi-

[8] One additional source of difficulty relates to the common measures bias (Slovic and MacPhillamy 1974; Lipe and Salterio 2000). Specifically, while contractible measures are often available and comparable between sub-units and/or employees, some non-contractible information is asymmetrically available or non-comparable. For example, a manager might know more about the environmental conditions affecting one employee than those affecting another employee. In such scenarios, individuals tend to focus more on common as opposed to unique attributes, implying that managers may fail to attend to some non-contractible information (i.e., assuming that such non-contractible information is unique). This phenomenon is related to our setting, but is beyond the scope of our study. We do not assume that all non-contractible information is unique, nor do we model asymmetric information availability in our experiment setting.

attribute choices, even when a holistic strategy is better suited to the task (Russo and Dosher 1983). Specifically, when choosing between two alternatives, they tend to focus on one dimension of each alternative at a time, rather than making a holistic judgment of the alternative, taking into account and synthesizing all dimensions. The authors attribute this behavior to a desire to reduce cognitive effort in the presence of multiple dimensions. While the focus of this prior research is binary choices (which are markedly different from the bonus allocation task), the findings have direct relevance for our theory and setting. That is, Russo and Dosher (1983) find that individuals process information dimensionally, just as we expect managers to process performance information cues on a piecemeal basis. A piecemeal approach simplifies the bonus allocation task, especially relative to an integrative approach (which would be analogous to the holistic processing strategy described by Russo and Dosher (1983)). Therefore, we make the following prediction:

H1: Managers are more likely to use a piecemeal approach as opposed to an integrative approach to make bonus pool allocations.[9]

Notably, the piecemeal approach is akin to the anchoring heuristic, which individuals often (implicitly or unconsciously) rely on when performing cognitively difficult judgment tasks (Tversky and Kahneman 1974; Bazerman 1998, 2). However, the prevalence of the anchoring heuristic in judgment tasks does not necessarily imply that the analogous piecemeal approach will prevail in the decision-oriented task of allocating bonus pools. The majority of the prior anchoring literature uses a standard experiment design in which participants first consider a comparative assessment (e.g., "is the population of Chicago greater or lesser than 200,000?"), and then provide an absolute estimate of an unknown quantity (e.g., "what is the population of Chicago?"). (See Epley and Gilovich

[9] It is important to note that we primarily attribute managers' propensity to use a piecemeal approach to features of the discretionary bonus allocation task as opposed to specific domain-level variables. Thus, we contend that the level of difficulty associated with integrating contractible and non-contractible information in our setting likely exceeds a sufficiency threshold necessary to trigger the use of this approach. To ensure that managers' propensity toward a piecemeal approach is due to a sufficiency threshold and not domain-level variables, we test our hypotheses across two different settings (as discussed in Section III).

(2006) for related discussion.) The information environment of such tasks is quite different from that of the bonus pool allocation task. The bonus pool allocation task requires decision makers to consider and potentially incorporate into their decisions multiple information cues. The presence of these multiple information cues allows for the possibility of an integrative approach to bonus pool allocations, which is not applicable to the judgment tasks considered in the prior anchoring literature. Given this additional consideration, the extent to which managers will rely on a piecemeal approach for allocating bonus pools remains an open empirical question.

Implications for Non-Contractible Information Incorporation

A generally robust finding in prior literature is that when decision makers use an anchoring heuristic, they adjust insufficiently, leading to judgments that are biased in the direction of the anchor value (Hastie and Dawes 2001). Because the piecemeal approach is analogous to the anchoring heuristic, this finding has potential implications for managers' discretionary bonus pool allocations. Specifically, managers who allocate bonus pools via a piecemeal approach will incorporate some information (i.e., information *not* serving as the starting point for the allocation) to a lesser degree than those who use an integrative approach. Thus, the choice of the starting point in a piecemeal approach has potential implications for bonus allocations.

In our setting, we expect two starting points to be prevalent: (1) division profit and (2) an equal split of the bonus pool. It is reasonable to expect that managers may choose division profit as the starting point, given its relation to the information used to formulaically fund the bonus pool (i.e., corporate profit). Division profit – the disaggregation of corporate profit – is likely to be perceived as a reasonable representation of employees' respective contributions to the bonus pool. Alternatively, managers may start with an equal split of the bonus pool. A body of literature from such areas as economics, psychology, and sociology suggests that individuals have strong

preferences for equity (e.g., Kahneman et al. 1986). Even in business settings, in which strong profit motives are often presumed to prevail, equity preferences influence behavior (Luft and Libby 1997; Kachelmeier and Towry 2002).[10] In fact, it is feasible for a manager to hold to an equitable-outcome policy. That is, a manager might start with an equal split of the bonus pool, and then not adjust from this starting point at all. Importantly, it is unlikely that non-contractible information will serve as the starting point, due to its previously described information qualities, and thus, it will be incorporated into allocations only via adjustments.

Our intuition regarding managers' likely choice of a starting point has significant implications for the degree to which they incorporate non-contractible information, due to the phenomenon (discussed above) of insufficient adjustment. Specifically, a manager who starts with reported division profit (i.e., contractible information) will insufficiently adjust for non-contractible information. Likewise, a manager who starts with an equal split will insufficiently adjust for reported division profit, as well as for relevant non-contractible information.[11] Thus, given managers' likely starting point, the implication of managers' use of a piecemeal approach is that they will incorporate non-contractible information into bonus pool allocations to a lesser degree than will managers who use an integrative approach. Thus, we hypothesize the following:

> H2: Relative to managers who use an integrative approach, managers who use a piecemeal approach will incorporate non-contractible information into bonus pool allocations to a lesser degree.

While the phenomenon of insufficient adjustment is well established, it is not clear that H2 will be supported in the bonus pool allocation setting. Epley and Gilovich (2006) suggest that the

[10] Other starting points potentially exist (e.g., prior year bonus allocations, 100% for one employee, etc.). However, we focus our discussion on the two we expect to be most prevalent in our setting. Post-hoc analyses of starting points confirm this consideration (see Appendix A). Further, the order in which a manager receives information may influence what information serves as the starting point. As described in the next section, we model an end-of-period evaluation and compensation task, thus avoiding such order effects.

[11] Such behavior would yield bonus pool allocations that exhibit a centrality bias, as discussed by Prendergrast (1999) and Bol (2008). We discuss this issue further in Section V.

propensity to adjust from an anchor increases when individuals self-generate or choose anchor information (as opposed to being provided an anchor or forced to make a comparative assessment). Extending this notion to our setting, if managers choose their own starting points for the bonus pool allocation, then non-contractible information may be incorporated to a higher degree than anticipated, and H2 may not be supported. Thus, even given support for H1, the empirical question of whether non-contractible information will be insufficiently adjusted for, and thus incorporated to a lesser degree with a piecemeal approach relative to an integrative approach, remains.

Mitigating Effect of Partial Discretion

As discussed previously, prior analytic research models firms' use of partial discretion (Rajan and Reichelstein 2006a), but makes simplifying assumptions about how managers use discretion. However, managers' allocation decisions are likely influenced by various aspects of the bonus pool design, including the extent of discretion. In this sub-section, we develop theory and discuss implications related to the effect of partial (vs. full) discretion on managers' incorporation of non-contractible information in bonus pool allocations.

With full discretion, a manager will perceive all information – both contractible and non-contractible – as relevant to his/her task. That is, the perceived task is to consider all relevant information and to incorporate it into the allocation of a single bonus pool. On the other hand, a manager with partial discretion likely interprets a different set of information as relevant. Specifically, the existence of the non-discretionary pool serves as a signal to the manager that contractible information has already been considered in employee compensation. This signal decreases the perceived relevance of the contractible information to the allocation of the discretionary bonus pool and implies that the purpose of the discretionary bonus pool is to consider

non-contractible information. This, in essence, increases the salience of the non-contractible information for the purpose of discretionary bonus allocations.

Recall that we expect most managers will rely on a piecemeal approach, and will incorporate non-contractible information via a qualitative adjustment from a starting point. Recent research suggests that the degree of adjustment increases with the salience of the information serving as the basis for the adjustment. Specifically, Chapman and Johnson (1999) find that when individuals are prompted to consider information inconsistent with an anchor (i.e., when this information is made more salient), insufficient adjustment is mitigated. Applying this finding to our scenario, if partial discretion increases the salience of non-contractible information, it follows that limiting discretion increases the extent of adjustment for this non-contractible information. Thus, we hypothesize the following:

H3: When using a piecemeal approach, managers with partial discretion will incorporate relevant non-contractible information in the allocation of the discretionary portion of the bonus pool to a greater degree than will managers with full discretion.

A key question that follows from H3 relates to the impact of the predicted effect of discretion extent on managers' *total* bonus pool allocations. Specifically, to what extent does the increased salience of non-contractible information translate into differential incorporation of such information when considering the allocation of the total bonus pool (rather than just the discretionary portion, as addressed in H3)?

Under partial discretion, the extent to which non-contractible information is incorporated in discretionary pools is diluted when the discretionary and non-discretionary bonus pools are combined. Despite this, the effect predicted in H3 may be strong enough to drive a counterintuitive result – that is, the total bonus allocations of managers with *less* discretion could ultimately reflect non-contractible information to a *greater* degree. However, whether and the degree to which this

result arises is a function of two aspects of the bonus plan design. One factor is the proportion of the total bonus pool that is discretionary versus non-discretionary. The second factor is the non-discretionary bonus pool allocation as determined by the outcome(s) reflected in contractible information. For a manager with partial discretion, these factors jointly limit the degree to which non-contractible information is ultimately reflected in the total bonus pool allocation, by determining the minimum and maximum amounts that may be allocated to each employee participating in the bonus pool.

Suppose, for example, that 90% of the total bonus pool is non-discretionary, and that non-discretionary pool is being split 80% / 20% between two employees participating in the bonus pool. Mechanically, the first of these employees must receive at least 72% (90% x 80%) of the total bonus pool and the second must receive at least 18% (90% x 20%). If the non-contractible information heavily favors the latter of the two employees, the evaluating manager may feel strongly that this employee should receive a large bonus allocation. However, due to the design of the bonus pool, the maximum allocation that the latter participant may receive from the total bonus pool is 28% (18% from the non-discretionary portion, plus the full 10% from the discretionary portion). On the other hand, a manager with full discretion could allocate up to 100% of the total bonus pool to the latter employee. In summary, partial discretion potentially limits the degree to which non-contractible information will be ultimately reflected in the total bonus pool allocations.

Recall that H3 predicts managers with partial discretion will incorporate relevant non-contractible information in the *discretionary portion of the bonus pool* allocation to a greater degree than will managers with full discretion. Whether this finding extends to the *total bonus pool* depends on the strength of the H3 effect and the mechanical limitations created by the bonus pool

design. Given the potential for the bonus plan design to influence managers' total bonus pool allocations, we do not provide a formal hypothesis related to this effect.

III. METHOD

Participants and Task

We recruited graduate students from two business schools at universities in the southeast U.S. to participate in our study. One-hundred seventy participants with an average of four years of work experience and five accounting/finance courses completed the experiment.[12] Given the average work experience and the relevant coursework, we expect these participants to be a reasonable proxy for managers who routinely evaluate employee performance. Participants were randomly assigned to the experiment conditions described below. Each participant was instructed to assume the role of a firm president and informed that the company had two divisions – Control Devices, which contributed 60% of the reported annual corporate profit, and Electronics, which contributed 40%. Participants were asked to review company performance information and allocate a bonus pool between two division managers (hereafter, employees). The bonus pool was funded at 1% of reported annual corporate profit. We chose to model an end-of-period evaluation and compensation decision, which was elicited after all performance information was provided.[13]

[12] Five participants were dropped: three participants failed to complete the materials and two participants inadvertently switched the divisions when answering the questions.

[13] In a more natural setting, a manager might receive information in a sequential fashion, which could influence his/her allocation process and/or the extent to which he/she incorporates non-contractible information. For example, a manager might receive information about an employee's performance of a specific task during an evaluation period, and receive summary accounting measures of performance at the end of an evaluation period. The effect of information order on managers' bonus pool allocations is beyond the scope of our paper. Thus, we modeled participants' task as an end-of-period evaluation and compensation decision, and we presented case information to participants in the same order across all experiment-conditions.

Experiment Design and Independent Variables

We use a 2 x 2 experiment design with discretion extent (*full*, *partial*) and valence of non-contractible information *(positive, negative*) as between-subject factors.

Manipulation of Discretion Extent

We manipulate discretion extent (*full, partial*) so that participants with full discretion allocate the entire bonus pool, while participants with partial discretion allocate half the total bonus pool, with the remainder allocated based on reported division profit. Specifically, in the full discretion condition, participants were informed they would distribute the entire bonus pool. In the partial discretion condition, participants were informed they were to distribute 50% of the bonus pool, while the remaining 50% was distributed based on division profit (i.e., 60% to Control Devices and 40% to Electronics).[14]

Manipulation of Valence of Non-Contractible Information

We manipulate the valence (*positive, negative*) of a subset of non-contractible information for each division, such that when combined with contractible information, the non-contractible information should have either a positive or negative effect on the overall division performance. The non-contractible information for Control Devices has the opposite valence from the information for Electronics. For expositional purposes, however, we refer to the valence of non-contractible information condition using its effect on Control Devices. For example, the positive non-contractible information condition refers to the scenario in which the non-contractible information

[14] We do not claim to have operationalized an optimal contract, because to do so, we would have had to specify the statistical properties of each piece of performance-relevant information. This would have been virtually impossible, given the rich contextual scenario and subjective nature of the information. Thus, we made the discretionary portion equal in size to the non-discretionary portion so as to avoid inducing differential assessments of importance of discretion or related factors. Further, as described in Section II, this design choice ensures that partial discretion managers' opportunity to incorporate non-contractible information is not completely curtailed.

should have a positive effect on the overall evaluation of the Control Devices employee, and a negative effect on the overall evaluation of the Electronics employee.

Our valence manipulation allows us to infer the extent to which participants incorporate non-contractible information. Specifically, we manipulate only a subset of non-contractible information; all other experiment case information is the same across conditions. Thus, any difference in bonus pool allocations across valence conditions is attributable to differential incorporation of non-contractible information. As discussed subsequently, the inherent nature of discretion makes this approach necessary for maintaining internal validity. That is, an individual participant's allocation is difficult to predict given that his/her behavior is likely a function of myriad factors. Thus, while it is difficult to draw a conclusion from participants' behavior in a single valence condition, a comparison across valence conditions provides a reliable measure of the degree to which participants incorporate non-contractible information.

Finally, to test the robustness of our theory, we use two different settings.[15] These settings represent different sources of non-contractible information: opportunity costs and idiosyncratic environmental shocks.

Setting 1. In Setting 1, the manipulation of non-contractible information relates to unpredictable opportunity costs. The case contained information indicating that Control Devices produced a component that was used by Electronics. While company policy required that the component be sourced internally at a cost-based transfer price, the case also provided information on the price of the transferred component in a new, unanticipated outside market. In the positive (negative) non-contractible information valence condition, the outside market price was above (below) the internal transfer price such that Control Devices' profit was lower (higher) than it would have been if the division had been allowed to sell in the outside market. In other words, the non-

[15] Both settings were based loosely on a case entitled *Bay Industries* (Allen et al., 2005).

contractible information was the presence of an opportunity cost to Control Devices. The opportunity cost is non-contractible in that it is unpredictable (i.e., in our setting, the outside market for the transferred goods is new and unanticipated).[16] Consideration of this non-contractible information should lead to a more positive (negative) evaluation of the Control Devices employee, relative to an evaluation based solely on division profit. In contrast, when the outside market price for the transferred component was above (below) the internal transfer price, Electronics' division profit was higher (lower) than it would have been if the division had been buying in the outside market (i.e., the opposite that of Control Devices).

Setting 2. In Setting 2, the manipulated non-contractible information relates to unforeseen environmental shocks. In the positive (negative) non-contractible information condition, Control Devices faced an uncontrollable increase (decrease) in the price of a key raw material. Like Setting 1, the valence of the manipulated non-contractible information is opposite for the two divisions. So, in the same condition in which Control Devices experienced an uncontrollable cost increase (i.e., the positive valence condition), Electronics experienced an uncontrollable cost decrease, and vice versa.[17]

Experiment Design Features

An inherent difficulty associated with endowing participants with discretion is that participants' decisions likely vary significantly (i.e., participants are free to use whatever perspectives, policies, etc., they wish). To overcome this difficulty, we have embedded specific features in our experiment design. One, as aforementioned, our valence manipulation allows us to

[16] In future periods, the firm's accounting policy could be modified to require that internal transfers be made at the market price, thus avoiding the opportunity cost altogether. However, this scenario is quite realistic, because for various reasons, transfers are most often made on a cost basis, rather than a market or negotiated basis. For a summary of related surveys, see Horngren et al. (2006, 774).

[17] Note that in Setting 2, the reasons for the cost fluctuations were independent across divisions, and thus, separate calculations are necessary to determine the division-specific financial impact of the uncontrollable cost fluctuations. In Setting 1, a single calculation yields the financial impact of the non-contractible information for both divisions.

infer the degree to which participants incorporate non-contractible information. This inference can be made without extensive reliance on a normative benchmark. Two, we limit the information provided to participants. That is, we have intentionally excluded prior-period financial information, current period budgets, and forward-looking measures from the experiment case. While this approach foregoes mundane realism, it increases the salience of revised division profit as a comprehensive performance measure, and thus provides us greater opportunity to measure the phenomenon of interest. Finally, we develop a scenario in which the manipulated non-contractible information is fully quantifiable, and therefore can be integrated with contractible information to develop a comprehensive performance measure. This design choice also foregoes mundane realism, yet provides a conservative test of our theory related to the use of a piecemeal approach and its implications (i.e., the quantifiable nature of the manipulated non-contractible information actually facilitates participants' integration of contractible and non-contractible information). That is, the scale of some types of qualitative non-contractible information (e.g., creativity assessments) may make it impossible to combine with quantitative, contractible information.

In addition, recall (from Section II) that when managers have partial discretion, two aspects of the bonus pool design (proportion of discretionary vs. non-discretionary pools and outcome(s) reflected in contractible information) potentially limit the degree to which non-contractible information can be reflected in total bonus pool allocations. We designed our experiment case materials to limit the influence of these factors. (See Appendix B for sample calculations.)

IV. RESULTS

Coding and Setting-Level Analysis

Before testing our hypotheses, we discuss our measure of participants' bonus allocation process. We then present an analysis that serves to investigate potential setting-level differences.

Coding

As part of the experiment, participants documented the reasoning behind their bonus allocation decisions.[18] We use these self-described decision processes to test our hypotheses. Accordingly, two of the authors and one independent coder read and classified participants' descriptions of their allocation processes. All coders were blind to experiment conditions and the independent coder was blind to our hypotheses. All coding by the two authors and the independent coder resulted in inter-rater reliability scores, as measured by Cohen's Kappa, that exceeded a generally acceptable threshold of 0.80 (Stokes et al. 2000). Thus, we expect the coded classifications to be a reasonable proxy for participants' allocation processes.

Participants' self-described decision processes naturally fell into one of three categories: piecemeal, integrative, or did not describe/other. Participants who use an allocation process that establishes a starting point for the allocation (in percentage or dollar-amount terms), and *qualitatively* adjusts upward or downward for other information are categorized as using a piecemeal approach. Participants who calculate a revised division profit measure by quantifying the effect of the manipulated non-contractible information are categorized as integrative. Finally, participants who did not describe a decision process or who could not be reliably coded as

[18] Verbal protocol analysis, in which participants are interviewed as they perform the bonus allocation task, is an alternative method by which we could have elicited participants' process and reasoning. Such an approach would ensure a more accurate recall of the process and reasoning (i.e., verbal protocol analysis would have occurred real-time, as opposed to after the allocation is determined) and increased the consistency of the information provided by participants (i.e., we would have used an interactive script). We chose to not use verbal protocol analysis, however, as it was important to us that we not interrupt participants' performance of the bonus allocation task. That is, verbal description of reasoning (especially to experiment-facilitators) would likely detract from participants' natural responses to the information and completion of the task.

piecemeal or integrative are categorized as did not describe / other.[19] Additional information about the categorization process and validation of this measure is in Appendix A.

Setting Differences

As described earlier, we evaluate the robustness of our theory using two settings, each involving a different source of non-contractible information. To test for setting differences, we perform two analyses. First, we compare the categorization of participants' bonus allocation processes across settings. As expected, the proportion of participants coded as using a piecemeal approach did not differ across settings ($\chi^2 = 0.25, p = 0.88$). Second, we perform an (un-tabulated) ANOVA using the percentage of the total bonus pool allocated to Control Devices as the dependent measure. Setting (*setting 1, setting 2*), discretion extent (*full, partial*), and valence of non-contractible information (*positive, negative*) are the independent factors. The results indicate that none of the setting interactions are significant at conventional levels (*all p-values > 0.70*). Because there are no indications of interactions between setting and the other independent variables, we focus our analysis and discussion of results at the aggregate level (i.e., Setting 1 and Setting 2 combined). However, we do note a marginally significant main effect for setting ($F = 3.00, p = 0.09$), and thus we enter setting as a covariate, where applicable. Further, we tested our hypotheses at the setting level, and results are qualitatively similar to those reported at the aggregate level.

[19] Our coding of participants' descriptions is conservative with respect to categorizing participants as piecemeal, as a participant who processes information cues separately but attempts to quantify non-contractible information is coded as integrative. For example, if a participant described a process where he or she first considered division profit as the allocation basis, but then *quantitatively* adjusted for other information by calculating the impact of other factors on division profit, the process is coded as integrative. In addition, we attempted to further classify the 30 participants who did not provide sufficient descriptions via review of any available information (e.g., notes on experiment case materials, actual bonus allocations, etc.), but could not reliably classify these participants.

Tests of Hypotheses

Hypothesis 1

H1 predicts that managers are more likely to use a piecemeal approach as opposed to an integrative approach to incorporate non-contractible information into bonus allocations. To test H1, we use the coded decision process described above. As reported in Table 1, 100 of 170 participants (58.8%) described a piecemeal approach, 40 of 170 participants (23.5%) described an integrative approach, and 30 of 170 participants (17.7%) described different processes or did not sufficiently describe their processes. The presence of this third category raises the question of the appropriate comparison for testing H1. We take the conservative approach of including participants in the "did not describe / other" category with those using the integrative approach. Combining these categories likely overstates the number of participants using an integrative approach and, thus, makes it more difficult to find support for H1. The number of participants using a piecemeal approach is significantly higher ($\chi^2 = 5.29, p = 0.02$) than the number of participants who do not (i.e., the participants using an integrative approach and those who did not describe – collectively labeled *other processes*).[20] These results support H1. Therefore, we conclude that managers are more likely to use a piecemeal approach than they are to use an integrative approach.

Hypothesis 2

H2 predicts that managers who use a piecemeal approach incorporate non-contractible information into total bonus pool allocations to a lesser degree than managers who use an integrative approach. To test this hypothesis, we calculate the percentage of the total bonus pool

[20] Of the participants coded as piecemeal, 90% used division profit (35%) or an equal split (55%) as the starting point. This distribution appears to vary by discretion extent condition. Specifically, 52% (48%) of the piecemeal full discretion participants were coded as starting with division profit (equal split), while 24% (76%) of the piecemeal partial discretion participants were coded as starting with division profit (equal split). We elaborate on related descriptive statistics in Appendix A.

awarded to the Control Devices employee[21] and compare the percentage allocations of participants coded as using a piecemeal approach to the allocations of all other participants (thus using the same conservative approach described above). For this hypothesis test, we use participants in the full discretion condition.[22]

As depicted in the left graph of Figure 1, the bonus allocations for full discretion piecemeal participants appear to differ only slightly across valence conditions. That is, the slope of the line connecting the valence conditions for piecemeal participants is relatively flat. This suggests that there is little difference in the allocations of these participants, and thus, little consideration given to the manipulated non-contractible information. This result is in stark contrast to allocations of full discretion participants using other processes, for which the slope is steeper, suggesting greater incorporation of non-contractible information.

To test for significance in this pattern, we conduct an ANOVA using valence of non-contractible information (*positive, negative*) and bonus allocation process (*piecemeal, other processes*) as independent factors. The dependent measure is the percentage of the total bonus pool allocated to Control Devices. As reported in Panel A of Table 2, the interaction is significant ($F = 21.06, p < 0.01$), which suggests that piecemeal participants incorporate non-contractible information to a lesser degree than do other participants.[23,24] This analysis supports H2. Therefore,

[21] Given that participants are required to allocate the entire bonus pool to the two divisions, no information is lost focusing on the Control Devices' allocation.

[22] Results of analyses using partial discretion participants are inferentially identical to that reported for full discretion participants. We present these results in Figure 1 and Panels C and D of Table 2 for completeness.

[23] To corroborate this analysis, we use contrast coding (Buckless and Ravenscroft 1990). Contrast weights are as follows: -1 for negative/piecemeal, +1 for positive/piecemeal, -2 for negative/other processes, and +2 for positive/other processes. As reported in Panel B of Table 2, the planned contrast indicates a statistically significant interaction ($F = 12.01, p < 0.01$), confirming that the bonus allocations of piecemeal participants vary across valence conditions less than the bonus allocations of participants using other processes. Further, post hoc tests indicate that the bonus allocations of piecemeal participants do not differ significantly across valence conditions ($p = 0.82$) while the bonus allocations of participants using other processes are significantly different across valence conditions ($p < 0.01$).

[24] We designed our experiment to allow for the calculation of a comprehensive performance measures that combines relevant contractible information with the manipulated non-contractible information. (This design choice provides for a conservative test of H1.) Appendix B describes the development of the *revised division profit allocation* – the total

we conclude that, relative to managers who use an integrative approach, managers who use a piecemeal approach incorporate non-contractible information to a lesser degree.

Hypothesis 3

H3 predicts that partial discretion mitigates piecemeal managers' propensity to incorporate non-contractible information to a lesser degree than full discretion managers. To test this hypothesis, we compare the discretionary bonus allocations of piecemeal participants across discretion extent conditions. Recall that the discretionary portion is 50% (100%) of the total bonus pool for partial (full) discretion participants.

As depicted in Figure 2, the percentage allocations for full discretion participants appear to differ only slightly across valence conditions. In contrast, partial discretion participants' allocations differ to a greater extent. To test for the significance of this pattern, we conduct an ANOVA, using valence (*positive, negative*) and discretion extent (*full, partial*) as independent factors. The dependent measure is the percentage of the discretionary bonus pool allocated to Control Devices. As reported in Panel A of Table 3, the interaction is significant ($F = 5.45, p = 0.01$), which suggests that, among those participants who use a piecemeal approach, partial discretion participants incorporate non-contractible information to a greater degree than do full discretion participants.[25]

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bonus pool allocation based on this comprehensive performance measure. While we do not claim this allocation is optimal, we can use this benchmark in a supplemental test of H2. Averaging across both settings, we note that for the positive (negative) valence condition, the revised division profit allocation is 70.2 % (46.3%). Thus, if this calculation is the basis of the allocation decision, we would expect to see a difference in bonus allocations across valence conditions of 23.9% (i.e., 70.2% - 46.3%). If, on the other hand, participants are using a piecemeal approach *and* are insufficiently adjusting for non-contractible information, we would expect the difference across conditions to be less than this benchmark difference. Thus, we compare the difference in participants' actual allocations across valence conditions with the difference reflected in the revised division profit allocation. For full discretion participants, the difference in the actual bonus allocations across the two valence conditions is 0.6%. This difference is statistically smaller than the revised division profit measure difference of 23.9% ($t = -10.5, p < 0.01$). These results further corroborate our earlier test of H2.

[25] To corroborate this analysis, we use contrast coding. Contrast weights are as follows: -1 for negative/full discretion, +1 for positive/full discretion, -2 negative/partial discretion, and +2 for positive/partial discretion. The planned contrast indicates a statistically significant interaction ($F = 4.29, p < 0.01$) confirming that the discretionary bonus allocations of partial discretion participants vary across valence conditions to a greater degree than the allocations of full discretion participants. Further, post hoc tests indicate that the bonus allocations of participants in the negative valence / partial

Thus, this analysis supports H3. Therefore, we conclude that managers with partial discretion incorporate such information to a greater degree in discretionary bonus allocations than do managers with full discretion.

Implications of H3

As discussed in Section II, an important implication of H3 relates to the degree to which non-contractible information is ultimately reflected in managers' *total* bonus pool allocations. That is, the question remains whether the total bonus allocations of managers with partial discretion ultimately reflect non-contractible information to a greater degree than do those of managers with full discretion. To test for this implication, we perform analyses similar to those reported for our main test of H3, but our comparisons are based on the *total* bonus allocations of piecemeal participants with partial discretion to those of piecemeal participants with full discretion.

As depicted in Figure 3, in contrast to full discretion participants' allocations, partial discretion participants' total bonus allocations differ to a greater extent across valence conditions. To test for the significance of this pattern, we conduct an ANOVA, using valence of non-contractible information (*positive, negative*) and discretion extent (*full, partial*) as independent factors. The dependent measure is the percentage of the total bonus pool allocated to Control Devices. As reported in Panel A of Table 4, the interaction is marginally significant ($F = 2.07$, $p = 0.07$).[26]

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discretion condition are at least marginally significantly different from the other three conditions (*all* $p < 0.09$). At the same time, the post-hoc comparisons among the remaining three conditions are not statistically significant (*all* $p > 0.73$).

[26] To examine this result further, we use contrast coding based on the same weights used for our test of H3. The planned contrast indicates a statistically significant interaction ($F = 3.12$, $p = 0.03$) confirming that the total bonus allocations of partial discretion participants vary across valence conditions to a greater degree than the allocations of full discretion participants. Further, post hoc tests indicate that the bonus allocations of participants in the positive valence / partial discretion condition are significantly different from the other three conditions (*all* $p < 0.03$). At the same time, the post-hoc comparisons among the remaining three conditions are not statistically significant (*all* $p > 0.76$). It is important to reconcile these results (in which the *positive* valence / partial discretion condition is significantly different from all other conditions) with the analogous results when using only the discretionary bonus pool (in which the

These results suggest that, given use of a piecemeal approach, the total bonus allocations of managers with partial discretion ultimately reflect non-contractible information to a greater degree than managers with full discretion. As discussed earlier, the robustness of this result is likely a function of specific aspects of the bonus pool design (i.e., portion of total bonus pool that is discretionary versus non-discretionary and contractible performance measure outcomes). Notwithstanding this potential limitation, our results document the potential for an important, and rather counterintuitive effect of discretion extent – managers with *less* discretion ultimately incorporate non-contractible information to a *greater* degree.

Consolidation of Results

It is important to note that collectively, the theory underlying H2 and the implications of H3 implicitly suggests a three-way interaction among valence of non-contractible information, discretion extent, and bonus allocation process. That is, our theory suggests that the allocation differences across valence conditions depend on the process used by managers, but discretion extent moderates (i.e., mitigates) this differential. In an un-tabulated ANOVA, we do indeed find a three-way interaction among the three factors of interest ($F = 6.46, p = 0.01$). Thus, a consolidated view of our results further corroborates our individual tests of H2 and the implications of H3.

Influence of Incentives

One possible explanation for participants' propensity to use a piecemeal approach and/or minimally consider non-contractible information is the lack of incentives. That is, participants may

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negative valence / partial discretion condition is significantly different than all other conditions). To do so, consider the influence of merging the non-discretionary and discretionary bonus pools (i.e., to yield the total bonus pool allocation). Given the non-discretionary bonus allocation (i.e., 60% bonus allocation to the Control Devices division, regardless of valence condition) and participants' discretionary bonus allocations, merging the non-discretionary bonus allocation yields a total bonus allocation that is higher – for both valence conditions – than that reflected in the discretionary bonus allocation. This shifts the line representing partial discretion participants' allocations upward in Figure 3 relative to that in Figure 2. Thus, among the four conditions of interest, the condition that differs from the other conditions shifts from the negative valence / partial discretion condition (in tests related to H3) to the positive valence / partial discretion condition (in tests related to the implications of H3).

have relegated the non-contractible information to a qualitative adjustment simply because they did not have an incentive to engage in more formal calculations. Given that it remains an empirical question whether and to what extent insufficient adjustment is an effort-related bias (see Hastie and Dawes (2001) and Epley and Gilovich (2005) for related discussions), we explore this potential explanation via an additional experiment.[27]

We provided partial discretion condition case materials from Setting 2 to 40 graduate business students, none of whom participated in the original experiment, as a graded class assignment. The additional pressure to analyze employee performance and to justify the bonus pool allocation provides an explicit incentive to exert effort.[28] We chose setting 2 and the partial discretion condition for this investigation because these are the conditions where we saw the greatest number of participants using a piecemeal approach. Therefore, we allow incentives the best chance to increase effort and thus, reduce participants' propensity to use this approach.

Results are quite similar to those from the primary experiment.[29] The proportion of class-assignment participants coded as piecemeal (55.0%) is similar to the proportion of original participants (58.8%). Further, the difference in piecemeal participants' total bonus pool allocations between valence conditions does not differ between the participant groups (i.e., neither the main effect for participant group ($F = 0.57$, $p = 0.45$), nor the participant group x valence interaction (F

[27] This approach is similar to that adopted by Libby et al. (2004), as they investigate the potential for accountability pressure to reduce managers' propensity toward the common measures bias when using Balanced Scorecard information to evaluate employees.

[28] The case was presented to student-participants as a mini-case conducted during class time. They were instructed that their submitted work would be reviewed for clarity, completeness of the materials, and soundness of logical argument. Note that the graded assignment provided incentives to thoroughly analyze employee performance and justify allocations, but did not suggest that there was a "correct" answer. Thus, student participants were provided with a realistic task of subjective performance evaluation.

[29] One notable difference across participant pools (unrelated to our hypotheses) is the extent to which participants described their reasoning behind their bonus pool allocations. Participants who completed experiment materials as a graded assignment provided much longer and more organized statements. This is consistent with our claim that the scenario enhanced participants' incentives to justify their bonus pool allocation.

= 0.50, p = 0.49) is statistically significant in an un-tabulated ANOVA). Thus, it does not appear that our original results are explained by participants' incentives to exert effort.

V. DISCUSSION

In this study, we examine how managers allocate discretionary bonus pools, and the influence of discretion extent on managers' allocations. We find that managers generally use a piecemeal approach when allocating discretionary bonus pools. That is, when processing performance information, managers tend to choose a starting point and then qualitatively adjust from this starting point for non-contractible information. This approach is in contrast to an integrative approach, in which a manager integrates contractible and non-contractible information into a single, comprehensive performance measure. Further, we find that managers who use a piecemeal approach incorporate non-contractible information into bonus pool allocations to a lesser degree than those who use an integrative approach. However, we find that this tendency to incorporate non-contractible information to a lesser degree is potentially mitigated when managers are endowed with partial (as opposed to full) discretion.

Our study contributes to the growing literature on subjective performance evaluation and, more specifically, to literature considering the benefits and costs of discretionary bonus pools (e.g., Baiman and Rajan 1995; Ittner et al. 2003; Fisher et al. 2005). We address statements in Ittner and Larcker (1998, 228) and Sprinkle (2003, 305) concerning the need for research on managerial discretion in performance evaluation. In particular, our study develops academics' and practitioners' understanding of potential implications of managerial discretion. In doing so, our research sheds light on the potential for managers' allocation processes to potentially circumvent the intended benefits of managerial discretion. Further, we document the mitigating influence of limiting discretion on managers' propensity to insufficiently adjust for non-contractible information.

More generally, our study documents an influence of the presence of a non-discretionary bonus pool on managers' processes and resulting bonus pool allocations.

Our study is subject to some limitations. Most importantly, we examine managers' bonus pool allocations under specific circumstances (e.g., relevant non-contractible information is quantifiable, particular settings, etc.). Our theory may not generalize to bonus plans and/or settings not explicitly considered in this study. For instance, our finding related to the implications of H3 – that managers with *less* discretion incorporate non-contractible information in total bonus pool allocations to a *greater* degree – is likely to be sensitive to the degree of discretion endowed managers, as well as the non-discretionary bonus allocation.

Our choice to model an end-of-year evaluation and compensation task may limit the generalizability of our theory pertaining to the starting points for bonus pool allocations. For example, the order in which information is received may influence managers' starting points (i.e., managers could potentially start with non-contractible information which they receive during the year). Further, many of our experiment design choices maintain internal validity, but inherently limit the scope of our study. For instance, our choice to use a relatively sparse information environment and quantifiable non-contractible information potentially limits the generalizability of our theory. While the qualitative nature of some non-contractible information may preclude a manager from using an integrative approach, it is an empirical question as to how the extent to which non-contractible information is quantifiable influences the degree to which such information is incorporated in discretionary bonus pool allocations. Still other factors may influence manager's propensity to incorporate non-contractible information. For instance, a manager's experience with processing different types of non-contractible information may influence the process used and/or the degree to which s/he incorporates such information.

Many aspects of our study (including, but not limited to, the limitations) implicitly establish future research opportunities. For instance, we do not investigate the influence of discretion extent on managers' approach to allocating discretionary bonus pools. Future research could consider this and other related implications of discretion extent on managers' allocation behavior. As another example, future research might more deeply consider how managers' allocation process relates to other phenomenon noted in prior literature on subjective performance evaluation. In particular, our finding related to managers' use of a piecemeal approach is consistent with findings in prior literature on managers' propensity toward the centrality bias and the halo bias. Specifically, starting with an equal split of the bonus pool and insufficiently adjusting for relevant non-contractible information yields allocations consistent with a centrality bias (i.e., relative evaluation and compensation outcomes are closer to even than actual performance suggests). Similarly, starting with division profit as the basis of the bonus pool allocation and insufficiently adjusting for relevant non-contractible information yields allocations consistent with a halo effect (i.e., evaluation of multiple aspects of employees' performance is more consistent than actual performance suggests). Future research could explore the potential for our theory related to managers' use of a piecemeal approach as a facilitator, or partial explanation for, managers' behavior documented in prior literature. Finally, future research could investigate employees' responses (i.e., effort and/or performance) to managers' use of discretion. Employees may be proactive in providing favorable non-contractible information to their superiors, thus influencing managers' processing (i.e., incorporation) of such information. Further, employees' reaction to discretionary bonus pool compensation (and managers' anticipation of such reactions) may vary across different levels of discretion extent and/or given their perceptions of managers' allocation processes.

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TABLE 1
Coded Bonus Allocation Process by Setting
All Participants

		Bonus Allocation Process [b]			
		Piecemeal	Integrative	Other/ Did Not Describe	Total
Setting [a]	Setting 1	49 (58.3%)	21 (25.0%)	14 (16.7%)	84 (100.0%)
	Setting 2	51 (59.3%)	19 (22.1%)	16 (18.6%)	86 (100.0%)
	Aggregate	100 (58.8%)	40 (23.5%)	30 (17.7%)	170 (100.0%)
			Other Processes		
			70 (41.2%)		

[a] *Setting* refers to the context of the case materials representing one of two different sources of non-contractible information: opportunity costs (setting 1) or idiosyncratic environmental shocks (setting 2). *Aggregate* refers to combined data from both settings.

[b] *Bonus allocation process* refers to coding of participants in one of three categories: (1) *Piecemeal* – refers to participants who used an allocation decision process that uses some piece of information as an explicit or implicit starting point and then qualitatively adjusts for other information; (2) *Integrative* – refers to participants who used an allocation process that bases bonus allocations on revised division profit, calculated by quantifying the effect of the manipulated, setting-specific non-contractible information; and (3) *Other/Did Not Describe* – which refers to all other participants (i.e., they did not provide a description, or could not be coded as piecemeal or integrative). The latter two categories are combined and referred to as *Other Processes*.

TABLE 2
Tests of H2

Panel A: ANOVA Results for Percentage of Total Bonus Pool [a] – Full Discretion [b]

Source of Variation	SS	df	MS	F	p
Valence of Non-contractible Info [c]	1,665.27	1	1,665.27	23.67	< 0.01
Bonus Allocation Process [d]	21.77	1	21.77	0.31	0.58
Valence x Allocation Process	1,481.58	1	1,481.58	21.06	< 0.01
Error	5,628.41	80	70.36		

Panel B: Bonus Allocations for Valence[c] by Process[d] Contrast – Full Discretion [b]

	MS	F	p
Bonus Allocation [a]	845.19	12.01	< 0.01
Error	70.36		

Post-Hoc Comparison	|Mean Difference|	p
Positive/Piecemeal vs. Negative/Piecemeal [c,d]	0.53	0.82
Positive/Piecemeal vs. Positive/Other Processes	9.94	< 0.01
Positive/Piecemeal vs. Negative/Other Processes	8.32	< 0.01
Negative/Piecemeal vs. Negative/Other Processes	7.79	< 0.01
Negative/Piecemeal vs. Positive/Other Processes	10.47	< 0.01
Positive/Other Processes vs. Negative/Other Processes	18.26	< 0.01

Panel C: ANOVA Results for Percentage of Total Bonus Pool [a] – Partial Discretion [b]

Source of Variation	SS	df	MS	F	p
Valence of Non-contractible Info [c]	1,272.58	1	1,272.58	56.86	< 0.01
Bonus Allocation Process [d]	86.28	1	86.28	3.86	0.05
Valence x Allocation Process	263.57	1	263.57	11.78	< 0.01
Error	1,835.22	82	22.38		

TABLE 2 (continued)

Panel D: Bonus Allocations for Valence[c] by Process[d] Contrast – Partial Discretion [b]			
	MS	F	p
Bonus Allocation [a]	477.64	21.34	< 0.01
Error	22.38		

Post-Hoc Comparison	|Mean Difference|	p
Positive/Piecemeal vs. Negative/Piecemeal [c,d]	4.27	< 0.01
Positive/Piecemeal vs. Positive/Other Processes	5.60	< 0.01
Positive/Piecemeal vs. Negative/Other Processes	5.79	< 0.01
Negative/Piecemeal vs. Negative/Other Processes	1.52	0.29
Negative/Piecemeal vs. Positive/Other Processes	9.87	< 0.01
Positive/Other Processes vs. Negative/Other Processes	11.39	< 0.01

[a] *Percentage of total bonus pool* is the percentage of the total bonus pool allocated to Control Devices.

[b] *Discretion extent* refers to our manipulation of bonus pool design. *Full discretion* refers to the condition in which participants allocated 100% of the bonus pool. *Partial discretion* refers to the condition in which participants allocated 50% of the bonus pool (while 50% of the bonus pool is determined formulaically).

[c] *Valence of non-contractible information* refers to our manipulation of a subset of non-contractible information. In the *positive* condition, non-contractible information, when combined with reported division profit, should have a positive effect on the overall evaluation of performance for the Control Devices employee. In the *negative* condition, non-contractible information, when combined with reported division profit, should have a negative effect on the overall evaluation of performance for the Control Devices employee.

[d] *Bonus allocation process* refers to coding of participants as piecemeal or other processes. *Piecemeal* refers to participants who used an allocation decision process that uses some piece of information as an explicit or implicit starting point and then qualitatively adjusts for other information. *Other processes* refers to participants in either of the following two categories: (1) an integrative approach, which refers to participants who used an allocation process that bases bonus allocations on revised division profit, calculated by quantifying the effect of the manipulated, setting-specific non-contractible information and (2) *did not describe / other*, which refers to all other participants (i.e., they did not provide a description, or could not be coded as piecemeal or integrative).

TABLE 3
Tests of H3

Panel A: ANOVA Results for Percentage of Discretionary Bonus Pool [a] – Piecemeal [d]

Source of Variation	SS	df	MS	F	p
Valence of Non-contractible Info [c]	505.69	1	505.69	6.99	0.01
Discretion Extent [b]	105.90	1	105.90	1.46	0.23
Valence x Discretion Extent	393.96	1	393.96	5.45	0.01
Error	6,944.61	96	72.34		

Panel B: Bonus Allocations for Valence[c] by Discretion Extent[b] Contrast – Piecemeal [d]

	MS	F	p
Bonus Allocation [a]	310.51	4.29	< 0.01
Error	72.34		

Post-Hoc Comparison	|Mean Difference|	p
Positive/Full Discretion vs. Negative/Full Discretion [b,c]	0.53	0.99
Positive/Full Discretion vs. Positive/Partial Discretion	1.93	0.83
Positive/Full Discretion vs. Negative/Partial Discretion	6.63	0.04
Negative/Full Discretion vs. Negative/Partial Discretion	6.09	0.09
Negative/Full Discretion vs. Positive/Partial Discretion	2.47	0.74
Positive/Partial Discretion vs. Negative/Partial Discretion	8.56	< 0.01

[a] *Percentage of discretionary bonus pool* is the percentage of the discretionary bonus pool allocated to Control Devices. For partial (full) discretion participants, the discretionary bonus pool is 50% (100%) of the total bonus pool.

[b] *Discretion extent* refers to our manipulation of bonus pool design. *Full discretion* refers to the condition in which participants allocated 100% of the bonus pool. *Partial discretion* refers to the condition in which participants allocated 50% of the bonus pool (while 50% of the bonus pool is determined formulaically).

[c] *Valence of non-contractible information* refers to our manipulation of a subset of non-contractible information. In the *positive* condition, non-contractible information, when combined with reported division profit, should have a positive effect on the overall evaluation of performance for the Control Devices employee. In the *negative* condition, non-contractible information, when combined with reported division profit, should have a negative effect on the overall evaluation of performance for the Control Devices employee.

[d] *Bonus allocation process* refers to coding of participants as piecemeal or other processes. *Piecemeal* refers to participants who used an allocation decision process that uses some piece of information as an explicit or implicit starting point and then qualitatively adjusts for other information. *Other processes* refers to participants who use an integrative approach that bases bonus allocations on revised division profit (calculated by quantifying the effect of the manipulated, setting-specific non-contractible information), use a different decision process, or did not provide a bonus allocation description.

TABLE 4
Implications of H3

Panel A: ANOVA Results for Percentage of Total Bonus Pool [a] – Piecemeal [d]

Source of Variation	SS	df	MS	F	p
Valence of Non-contractible Info [c]	140.90	1	140.90	3.43	0.07
Discretion Extent [b]	135.60	1	135.60	3.30	0.07
Valence x Discretion Extent	85.22	1	85.22	2.07	0.07
Error	3,946.11	96	41.11		

Panel B: Bonus Allocations for Valence[c] by Discretion Extent[b] Contrast – Piecemeal [d]

	MS	F	p
Bonus Allocation [a]	128.20	3.12	0.03
Error	41.11		

Post-Hoc Comparison	|Mean Difference|	p
Positive/Full Discretion vs. Negative/Full Discretion [b,c]	0.53	0.77
Positive/Full Discretion vs. Positive/Partial Discretion	4.22	0.02
Positive/Full Discretion vs. Negative/Partial Discretion	0.05	0.98
Negative/Full Discretion vs. Negative/Partial Discretion	0.49	0.80
Negative/Full Discretion vs. Positive/Partial Discretion	4.75	0.01
Positive/Partial Discretion vs. Negative/Partial Discretion	4.27	0.02

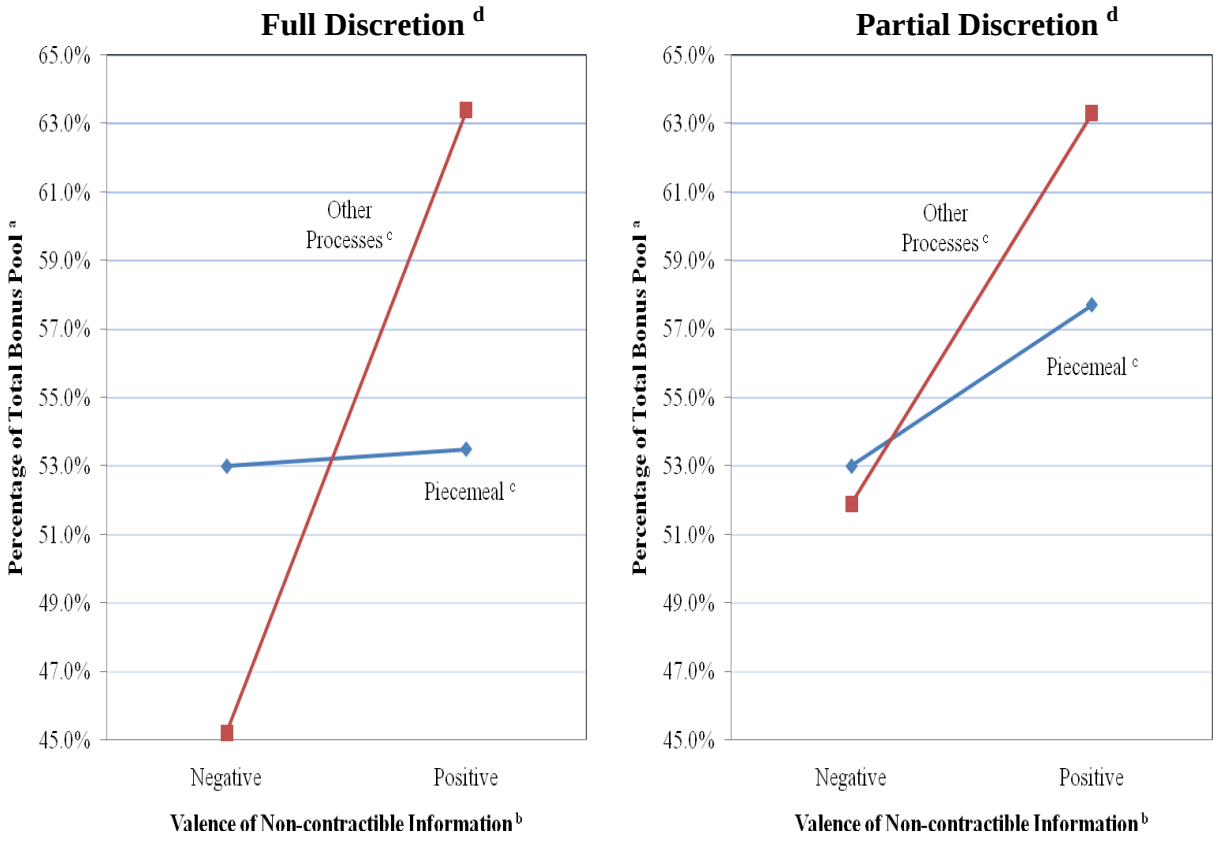
[a] *Percentage of total bonus pool* is the percentage of the total bonus pool allocated to Control Devices.

[b] *Discretion extent* refers to our manipulation of bonus pool design. *Full discretion* refers to the condition in which participants allocated 100% of the bonus pool. *Partial discretion* refers to the condition in which participants allocated 50% of the bonus pool (while 50% of the bonus pool is determined formulaically).

[c] *Valence of non-contractible information* refers to our manipulation of a subset of non-contractible information. In the *positive* condition, non-contractible information, when combined with reported division profit, should have a positive effect on the overall evaluation of performance for the Control Devices employee. In the *negative* condition, non-contractible information, when combined with reported division profit, should have a negative effect on the overall evaluation of performance for the Control Devices employee.

[d] *Bonus allocation process* refers to coding of participants as piecemeal or other processes. *Piecemeal* refers to participants who used an allocation decision process that uses some piece of information as an explicit or implicit starting point and then qualitatively adjusts for other information. *Other processes* refers to participants who use an integrative approach that bases bonus allocations on revised division profit (calculated by quantifying the effect of the manipulated, setting-specific non-contractible information), use a different decision process, or did not provide a bonus allocation description.

FIGURE 1
Percentage of Total Bonus Pool by Process and Discretion Extent



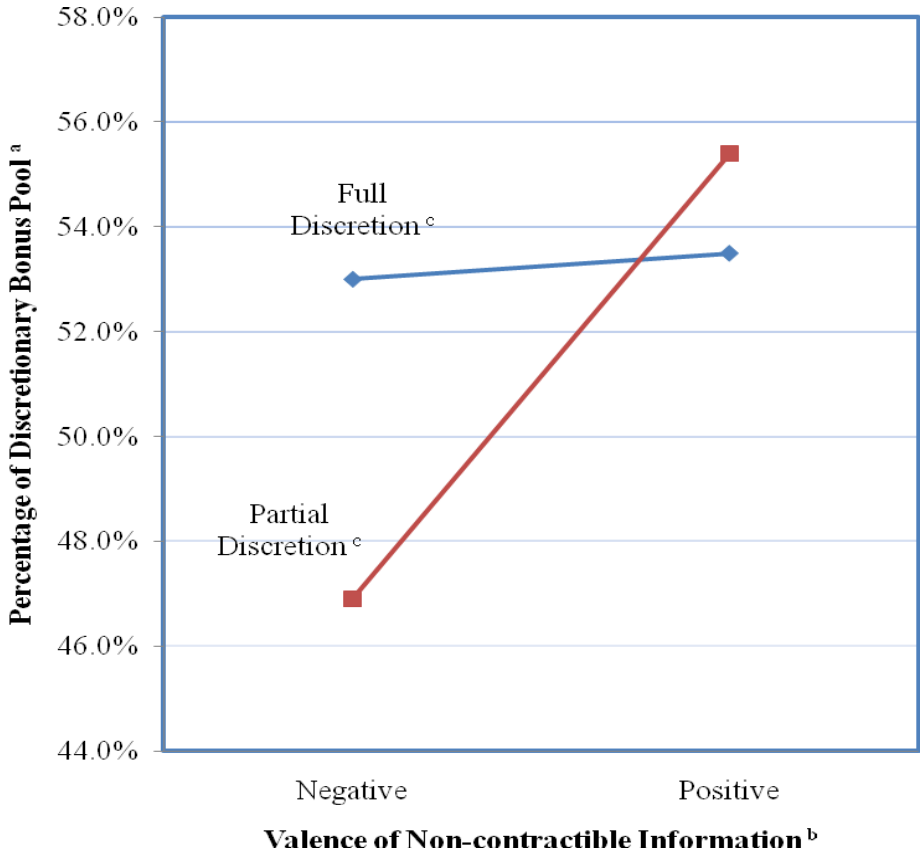
[a] *Percentage of total bonus pool* refers to the percentage of the total bonus pool allocated to Control Devices.

[b] *Valence of non-contractible information* refers to our manipulation of a subset of non-contractible information. In the *positive* condition, non-contractible information, when combined with reported division profit, should have a positive effect on the overall evaluation of performance for the Control Devices employee. In the *negative* condition, non-contractible information, when combined with reported division profit, should have a negative effect on the overall evaluation of performance for the Control Devices employee.

[c] *Piecemeal* refers to participants who used an allocation decision process that uses some piece of information as an explicit or implicit starting point and then qualitatively adjusts for other information. *Other processes* refers to participants in either of the following two categories: (1) an integrative approach, which refers to participants who used an allocation process that bases bonus allocations on revised division profit, calculated by quantifying the effect of the manipulated, setting-specific non-contractible information and (2) *did not describe / other*, which refers to all other participants (i.e., they did not provide a description, or could not be coded as piecemeal or integrative).

[d] *Full discretion* refers to the condition in which participants allocated 100% of the bonus pool. *Partial discretion* refers to the condition in which participants allocated 50% of the bonus pool (while 50% of the bonus pool is determined formulaically).

FIGURE 2
Percentage of Discretionary Bonus Pool by Discretion Extent
Piecemeal Participants

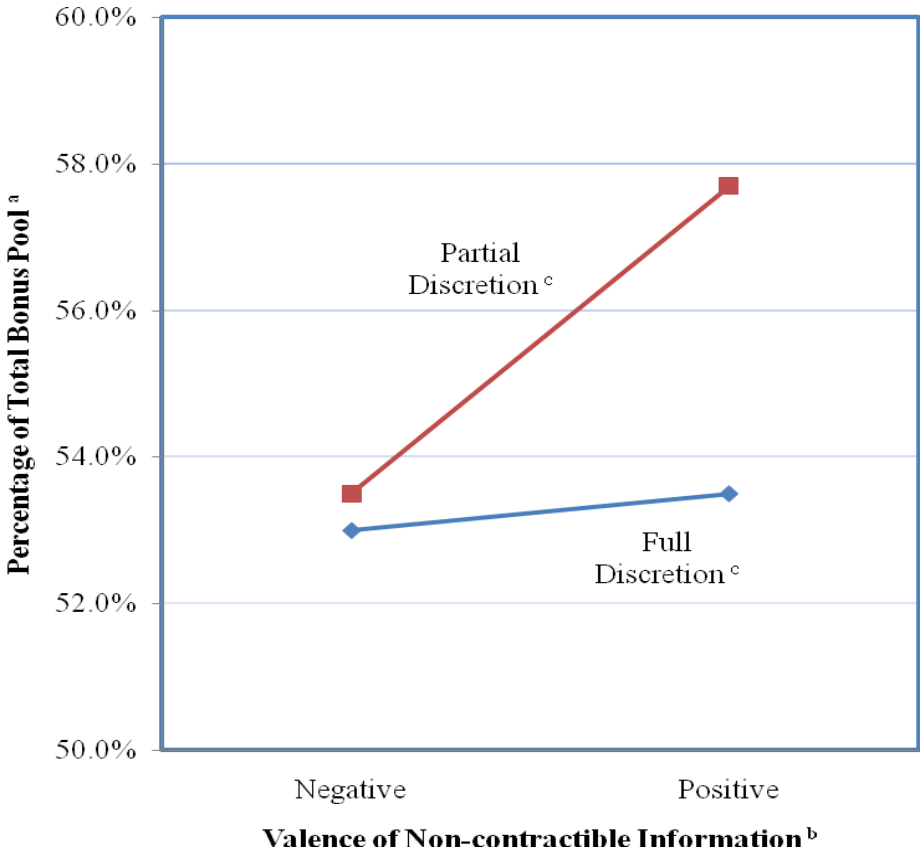


[a] *Percentage of discretionary bonus pool* is the percentage of the discretionary bonus pool allocated to Control Devices. For partial (full) discretion participants, the discretionary bonus pool is 50% (100%) of the total bonus pool.

[b] *Valence of non-contractible information* refers to our manipulation of a subset of non-contractible information. In the *positive* condition, non-contractible information, when combined with reported division profit, should have a positive effect on the overall evaluation of performance for the Control Devices employee. In the *negative* condition, non-contractible information, when combined with reported division profit, should have a negative effect on the overall evaluation of performance for the Control Devices employee.

[c] *Discretion extent* refers to our manipulation of bonus pool design. *Full discretion* refers to the condition in which participants allocated 100% of the bonus pool. *Partial discretion* refers to the condition in which participants allocated 50% of the bonus pool (while 50% of the bonus pool is determined formulaically).

FIGURE 3
Percentage of Total Bonus Pool by Discretion Extent
Piecemeal Participants



[a] *Percentage of total bonus pool* refers to the percentage of the total bonus pool allocated to Control Devices.

[b] *Valence of non-contractible information* refers to our manipulation of a subset of non-contractible information. In the *positive* condition, non-contractible information, when combined with reported division profit, should have a positive effect on the overall evaluation of performance for the Control Devices employee. In the *negative* condition, non-contractible information, when combined with reported division profit, should have a negative effect on the overall evaluation of performance for the Control Devices employee.

[c] *Discretion extent* refers to our manipulation of bonus pool design. *Full discretion* refers to the condition in which participants allocated 100% of the bonus pool. *Partial discretion* refers to the condition in which participants allocated 50% of the bonus pool (while 50% of the bonus pool is determined formulaically).

APPENDIX A
Allocation Process Coding and Validation

Piecemeal

A participant is coded as using a piecemeal approach if he/she had some explicit or implicit starting point, and then qualitatively adjusted from that starting point.[30] Thus, while the adjustment process is qualitative, a participant is not restricted in the information type he/she adjusts for (i.e., a participant could adjust for division profit, non-contractible information, etc.). The possibility also exists that the participant does not adjust from their starting point.

Setting 1

> "Originally, CD had 60% of the total profit. But, they would have gotten more if they could have sold in the outside market. So I gave them an extra 10%."
>
> *This participant would be coded as using a piecemeal approach, and his/her explicit starting point is division profit. His/her adjustment from this starting point is qualitative.*
>
> "Control Devices isn't getting enough, because the transfer price isn't fair to them."
>
> *This participant would be coded as using a piecemeal approach, and his/her implicit starting point is division profit, because in saying that Control Devices isn't getting "enough," the participant is apparently evaluating corporate profit as an appropriate split.*
>
> "I split the money evenly. There was no significant growth or decline in the business from the prior year. While one division is more profitable, there is no information available to indicate that the manager running it grew it to that level as opposed to simply inheriting the division and maintaining the level of profitability similar to her counterpart."
>
> *This participant would be coded as using a piecemeal approach, and his/her explicit starting point is a 50/50 split.*
>
> "I looked at the gross margin for each division, and saw that Controls had a gross margin of about 30%. Electronics' margin was only half of that. So I gave Electronics only half as much as Control."
>
> *This participant would be coded as using a piecemeal approach, and his/her explicit starting point is gross margin (i.e., "anchored-other").*

Setting 2

[30] As discussed in Section II, the piecemeal approach is analogous to the *anchoring* heuristic. Further, in our setting, an integrative approach (i.e., combining contractible and non-contractible information into a single, comprehensive performance measure) involves *calculating* a revised division profit performance measure. Although we use the terms piecemeal and integrative in the paper, our coders used anchoring and calculating during the coding process.

"I allocated more to the Control Devices division than the other division because the manager was responsible for larger numbers."

This participant would be coded as using a piecemeal approach, and his/her implicit starting point is a 50/50 split. That is, by saying that he/she gave one division "more" than the other, s/he is implying that his/her starting point is 50/50.

"I allocated the bonuses strictly based on the profitability of each division."

This participant would be coded as using a piecemeal approach, and his/her explicit starting point is division profit. Note further that this participant did not adjust at all to incorporate additional information.

Integrative

A participant is coded as integrative if he/she based his/her allocation on revised division profit. That is, he/she attempted to incorporate manipulated non-contractible information by calculating the amount of profit each division would have generated if, in Setting 1, the transfer price had been set based on the outside market price, or if, in Setting 2, neither of the unexpected cost fluctuations had occurred.

Setting 1

"I adjusted the numbers to represent what Electronics would have paid at market prices and what Control would have sold at market prices. I got percentages of total profit and gave the managers that %."

"Each division's profits plus extra profit/loss it may get if it went to the outside market."

Setting 2

"Basically, I refigured COGS to reflect the situations that were not in the managers' control and then reworked the profit, giving the bonus based on the newly calculated profit."

"I don't think that the price of copper or shipping should be included when judging the 2 managers. I found out what profits were without those changes and compensate the managers based on those numbers."

In each of the above examples, the participant is making reference to quantitative adjustments to the reported division profit to yield a "revised" division profit measure.

Did Not Describe / Other

A participant is categorized as did not describe / other if he/she (1) did not provide an adequate explanation or (2) used a process other than piecemeal or integrative.

Validation of Categorization – Piecemeal

To test the validity of our piecemeal categorization, we compare the percentage of the total bonus pool allocated to Control Devices by participants in our piecemeal category to a two-step cluster analysis. To make this comparison, we further categorized piecemeal participants according to the specific anchor (i.e., starting point) they used *(division profit, equal split*). The anchor is coded as described above. Ninety out of 100 participants (90%) chose either division profit or equal split as an anchor. The remaining 10 out of 100 participants (10%) chose other anchors and are dropped from this validation analysis.

For full discretion participants, there are two clusters at allocations of 59.1% (n = 26) and 46.5% (n = 22). These clusters mirror closely the allocations of full discretion participants we *coded* as anchoring on division profit (57.4%, n = 25) and an equal split (48.9%, n = 23), respectively. Further, these clusters closely mirror what one would expect given a division profit anchor (i.e., 60%) and an equal split anchor (i.e., 50%).

For partial discretion participants, there are two clusters at allocations of 62.9% (n = 11) and 53.7% (n = 31). These clusters mirror closely the allocations of partial discretion participants we *coded* as anchoring on division profit (58.4%, n = 10) and an equal split (55.3%, n = 32), respectively. Again, these clusters closely mirror the division profit anchor (i.e., 60%) and an equal split anchor for partial discretion (i.e., 55%, which is the result of combining 50% from the discretionary portion and 60%, as formulaically determined in the non-discretionary portion).

Our coding of participants as using a piecemeal approach is consistent with the output of this analysis. Thus, we conclude that our coding is valid.

Mean (Std) for Percentage of Total Bonus Pool for Piecemeal Participants

		Coding by Anchor		Cluster Analysis	
		Division Profit	Equal Split	Cluster 1	Cluster 2
Discretion Extent	Full Discretion	57.4% (6.2) n = 25	48.9% (6.4) n = 23	59.1% (2.5) n = 26	46.5% (5.5) n = 22
	Partial Discretion	58.4% (5.2) n = 10	55.3% (4.9) n = 32	62.9% (3.8) n = 11	53.7% (2.9) n = 31

Validation of Categorization – Integrative

To test the validity of our integrative categorization, we compare the percentage of the total bonus pool allocated to Control Devices by participants in our integrative category to a two-step cluster

analysis.

For full discretion participants, there are two clusters at allocations of 43.7% (n = 21) and 68.0% (n = 11). These clusters mirror closely the allocations of full discretion participants we *coded* as following an integrative approach in the negative valence condition (45.2%, n = 20) and in the positive valence condition (63.4%, n = 12), respectively.

For partial discretion participants, there are two clusters at allocations of 50.6% (n = 19) and 62.9% (n = 19). These clusters mirror closely the allocations of partial discretion participants we *coded* as following an integrative approach in the negative valence condition (51.9%, n = 22) and in the positive valence condition (63.3%, n = 16), respectively.

Our coding of participants as integrative is consistent with the output of this analysis. Thus, we conclude that our coding is valid.

Mean (Std) for Percentage of Total Bonus Pool for Participants Using an Integrative Approach

		Coding by Valence		Cluster Analysis	
		Negative	Positive	Cluster 1	Cluster 2
Discretion Extent	Full Discretion	45.2% (8.2) n = 20	63.4% (11.2) n = 12	43.7% (5.7) n = 21	68.0% (5.3) n = 11
	Partial Discretion	51.9% (4.7) n = 22	63.3% (5.0) n = 16	50.6% (3.4) n = 19	62.9% (4.7) n = 19

APPENDIX B
Calculations Related to Revised Division Profit Allocation

We calculate a revised division profit allocation to compare to actual bonus allocations. We constructed the experiment materials so that there is a mathematical revised division profit (i.e., division profit adjusted for the quantitative effect of manipulated non-contractible information). All calculations are provided in detail following this narrative.

In setting 1, the market price (as opposed to the cost-based transfer price) of the good transferred between divisions could be used to calculate revised division profit. If participants in the positive (negative) valence condition were to allocate the bonus pool based on this revised division profit, the allocation to Control Devices would be 72.2% (47.8%). In setting 2, the manipulated non-contractible information represents idiosyncratic environmental shocks that yield uncontrollable cost fluctuations. Because participants may not view the hypothetical cost fluctuations as completely uncontrollable, we adjust revised division profit allocation to include participants' assessments of cost fluctuation controllability. The controllability-adjusted revised division profit allocation in the positive (negative) valence condition is 68.4% (44.8%).

To perform our analysis at the aggregate level, we created a weighted-average revised division profit allocation across the two settings of 70.2% (46.3%) in the positive (negative) valence condition. The weights applied to the revised division profit allocation are based on the number of participants in each setting.

SETTING 1

The following represents information provided to participants (Section 1), details of calculations of a revised division profit measure (Sections 2a and 2b) and resulting bonus pool allocations (Section 3).

1. Given Information (all experimental conditions)

	Control Devices	Electronics	Total
Sales	$ 165,298,000	$ 90,311,000	$ 255,609,000
Cost of Goods Sold	117,362,000	74,565,000	191,927,000
Gross Margin	47,936,000	15,746,000	63,682,000
Operating Expenses	40,586,000	10,846,000	51,432,000
Net Profit	7,350,000	4,900,000	12,250,000

2a. Positive Valence of Non-contractible Information

In the positive valence of non-contractible information condition, participants received the following additional (bullet-point) information:

- The mandated transfer price is $8.52 (1,573,200 units)
- For the first time this year, an outside market for the transferred good existed. The average market price per unit during 2004 was $9.47.

This information suggests that Control Devices (i.e., the selling division) would have earned more profit had they been able to sell the transferred component outside the corporation and/or sell to the Electronics at the market price. Further, Electronics would have earned less profit had they had to purchase the transferred component from outside suppliers and/or from Control Devices at the market price.

The quantitative effect of this price difference is:

1,573,200 x ($9.47 - $8.52) = $ 1,494,540

Adjusting division profit for this amount results in a revised division profit measure:

Control Devices:	$ 7,350,000 + $ 1,494,540 = $ 8,844,540
Electronics:	$ 4,900,000 - $ 1,494,540 = $ 3,405,460

Note that while total corporate profit remained the same at $12,250,000, the proportion that each division contributed to corporate profit has changed from the original 60% - 40% distribution:

Control Devices:	$ 8,844,540 / $ 12,250,000 = 72.2%
Electronics:	$ 3,405,460 / $ 12,250,000 = 27.8%

Applying this revised division profit distribution to the total bonus pool yields the following allocation:

Control Devices:	72.2% x $ 122,500 = $ 88,445
Electronics:	27.8% x $ 122,500 = $ 34,055

2b. Negative Valence of Non-contractible Information

In the negative valence of non-contractible information condition, participants received the following additional (bullet-point) information:

- The mandated transfer price is $8.52 (1,573,200 units)
- For the first time this year, an outside market for the transferred good existed. The average market price per unit during 2004 was $7.57.

This information suggests that Control Devices (i.e., the selling division) would have earned less profit had they had to sell the transferred component outside the corporation and/or sell to the Electronics at the market price. Further, Electronics would have earned more profit had they been able to purchase the transferred component from outside suppliers and/or from Control Devices at the market price.

The quantitative effect of this price difference is:

1,573,200 x ($8.52 - $7.57) = $ 1,494,540

Adjusting division profit for this amount results in a revised division profit measure:

Control Devices:	$ 7,350,000 - $ 1,494,540 = $ 5,855,460
Electronics:	$ 4,900,000 + $ 1,494,540 = $ 6,394,540

Note that while total corporate profit remained the same at $12,250,000, the proportion that each division contributed to corporate profit has changed from the original 60% - 40% distribution:

Control Devices:	$ 5,855,460 / $ 12,250,000 = 47.8%
Electronics:	$ 6,394,540 / $ 12,250,000 = 52.2%

Applying this revised division profit distribution to the total bonus pool yields the following allocation:

Control Devices:	47.8% x $ 122,500 = $ 58,555
Electronics:	52.2% x $ 122,500 = $ 63,945

3. Revised Division Performance Measure

The process described in Sections 2a and 2b result in the following bonus allocations in each valence condition. We refer to these allocations as *revised division profit allocations*.

Condition	Control Devices	Electronics
Positive Valence	$ 88,445 (72.2%)	$ 34,055 (27.8%)
Negative Valence	$ 58,555 (47.8%)	$ 63,945 (52.2%)

(Setting 2 information begins on the next page.)

SETTING 2

The following represents information provided (or otherwise available) to participants (Section 4), details of calculations to develop a revised division profit measure (Sections 5a and 5b) and resulting bonus pool allocations in all conditions (Section 6).

4. Available Information (all experimental conditions)

	Control Devices	Electronics
Financial Information (all given)		
Sales	$ 165,298,000	$ 90,311,000
Cost of Goods Sold	117,362,000	74,565,000
Gross Margin	47,936,000	15,746,000
Operating Expenses	40,586,000	10,846,000
Division Profit	7,350,000	4,900,000
Percentage of Reported Corporate Profit	60%	40%
Cost Fluctuation Information		
Source of fluctuation (line item)	Copper (COGS)	Shipping (OpExp)
Reported cost as percent of line item	30%	50%
Reported cost (percent x line item)	$ 35,208,600	$ 5,423,000

5a. Additional Information and Calculations – Positive Valence of Non-Contractible Information

	Control Devices	Electronics
Direction of fluctuation	Unfavorable	Favorable
Percentage fluctuation	10.9% higher	5.7% lower

The first step in developing a revised division profit measure is the calculation of the financial impact of the cost fluctuation. For example, the reported cost of copper on Control Devices' financial statements is $35,208,600. The uncontrollable cost fluctuation was 10.9%. The "controllable" cost of copper is calculated as follows:

Controllable copper cost x 110.9% = $ 35,208,600
Controllable copper cost = $ 31,748,061

The difference between the controllable copper cost and the reported copper cost is the financial impact of the uncontrollable cost fluctuation:

$ 35,208,600 - $ 31,748,061 = $ 3,460,539

Similar calculations for the Electronics' division yield a financial impact of the uncontrollable cost fluctuation of $ 327,795.

Note that the amounts calculated above assume that the cost fluctuation is deemed completely uncontrollable. In Setting 2, we elicited participants' assessments regarding the extent to which cost fluctuations were within

the division managers' control, and calculated the average controllability adjustment within each experiment-condition. We assume that the complement of the controllability adjustment (i.e., 100% - controllability assessment %) is the extent to which the financial impact of the cost fluctuation was outside the division employee's control. Adjusting the financial impact for participants' average controllability assessment yields the following uncontrollable financial impact of the cost fluctuation.

	Control Devices	**Electronics**
Financial impact (calculated above)	$ 3,460,539	($ 327,795)
Average controllability assessment	21.6%	25.6%
Uncontrollable Portion of Financial Impact	$ 2,713,063	($ 243,879)

The next step is to calculate revised division profit. Adjusting division profit for the uncontrollable portion of the cost fluctuation results in the following revised division profit measure:

Control Devices: $ 7,350,000 + $ 2,713,063 = $ 10,063,063
Electronics: $ 4,900,000 - $ 243,879 = $ 4,656,121

Note that the total revised corporate profit and the proportion that each division contributed to revised corporate profit has changed from the original 60% - 40% distribution:

Control Devices: $ 10,063,063 / $ 14,719,184 = 68.4%
Electronics: $ 4,656,121 / $ 14,719,184 = 31.6%

Applying this revised division profit distribution to the total bonus pool yields the following allocation:

Control Devices: 68.4% x $ 122,500 = $ 83,790
Electronics: 31.6% x $ 122,500 = $ 38,710

5b. Additional Information and Calculations – Negative Valence of Non-contractible Information

	Control Devices	**Electronics**
Direction of fluctuation	Favorable	Unfavorable
Percentage fluctuation	8.9% lower	6.4% higher

The first step in developing a revised division profit measure is the calculation of the financial impact of the cost fluctuation. For example, the reported cost of copper on Control Devices' financial statements is $35,208,600. The uncontrollable cost fluctuation was 8.9%. The "controllable" cost of copper is calculated as follows:

Controllable copper cost x 91.1% = $ 35,208,600
Controllable copper cost = $ 38,648,298

The difference between the controllable copper cost and the reported copper cost is the financial impact of the uncontrollable cost fluctuation:

$ 35,208,600 - $ 38,648,298 = ($ 3,439,698)

Similar calculations for the Electronics' division yield a financial impact of the uncontrollable cost fluctuation of $ 326,195.

Note that the amounts calculated above assume that the cost fluctuation is deemed completely uncontrollable. In Setting 2, we elicited participants' assessments regarding the extent to which cost fluctuations were within the division managers' control, and calculated the average controllability adjustment within each experiment-condition. We assume that the complement of the controllability adjustment (i.e., 100% - controllability assessment %) is the extent to which the financial impact of the cost fluctuation was outside the division employee's control. Adjusting the financial impact for participants' average controllability assessment yields the following uncontrollable financial impact of the cost fluctuation.

	Control Devices	**Electronics**
Financial impact (calculated above)	($ 3,439,698)	$ 326,195
Average controllability assessment	8.7%	14.1%
Uncontrollable Portion of Financial Impact	($ 3,140,444)	$ 280,202

The next step is to calculate revised division profit. Adjusting division profit for the uncontrollable portion of the cost fluctuation results in the following revised division profit information:

Control Devices:	$ 7,350,000 - $ 3,140,444 = $ 4,209,554
Electronics:	$ 4,900,000 + $ 280,202 = $ 5,180,202

Note that the total revised corporate profit and the proportion that each division contributed to revised corporate profit has changed from the original 60% - 40% distribution:

Control Devices:	$ 4,209,554 / $ 9,389,756 = 44.8%
Electronics:	$ 5,180,202 / $ 9,389,756 = 55.2%

Applying this revised division profit distribution to the total bonus pool yields the following allocation:

Control Devices:	44.8% x $ 122,500 = $ 54,880
Electronics:	55.2% x $ 122,500 = $ 67,620

6. Revised Division Profit Measure

The process described in Sections 5a and 5b result in the following bonus allocations in each valence condition. We refer to these allocations as *revised division profit allocations*.

Condition	**Control Devices**	**Electronics**
Positive Valence	$ 83,790 (68.4%)	$ 38,710 (31.6%)
Negative Valence	$ 54,880 (44.8%)	$ 67,620 (55.2%)