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Visionaries, managers, and strategic direction

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and

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Incentives for profitable innovation may be enhanced by employing a “visionary” CEO whose “vision” biases him in favor of certain projects. CEO vision changes which projects get implemented and thus affects the incentives of employees who can be compensated for their innovative ideas only when they become embodied in implemented projects. Profits may be enhanced further by letting objective middle managers decide which projects to investigate even though their decisions can depart from the firm’s “strategy” by differing from those the CEO would have made.

1. Introduction

It is widely believed by managers and commentators on management that CEOs ought to have a “vision” for the future of their companies. For example, Bennis and Nanus (1985, p. 89) assert: “To choose a direction, a leader must first have developed a mental image of a possible and desirable future state of the organization . . . which we call a vision . . . [A] vision articulates a view of a realistic, credible, attractive future for the organization . . . With a vision, the leader provides the all-important bridge from the present to the future of the organization” (italics in original). Similarly, Aquiralar (1988, p. 70) says: “There are many different ways in which a general manager can lead, but they all share certain common elements, including espousing a vision of purpose.”

Implicit in this view is the notion that CEOs influence the strategic direction of the firm, since otherwise there would be little point in having a CEO with a vision. This is consistent with the tendency of the popular press to ascribe central roles to CEOs in directing—or failing to direct—successful strategic change. Evidence that managers believe that both articulating a vision and formulating a strategy are key roles of the CEO is provided by Quigley (1993). Citing a study conducted by Korn/Ferry

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We wish to thank Robert Burgelman, Benjamin Hermalin, Joseph Farrell, Thomas McCraw, David Scharfstein, Debora Spar, Richard Tedlow, David Yoffie, and participants at the 1997 Stanford Strategic Management Conference for helpful comments and conversations. We are grateful to the Graduate School of Business at Stanford University and the Harvard Business School Division of Research for support.
International\(^1\) of 1,500 senior managers in 20 countries, he reports that 98% believe the most important trait or talent desirable for a CEO to convey is “a strong sense of vision.” He also reports that “strategy formulation to achieve a vision was seen as the most important skill . . . by a margin of 25% over any other skill.”

The belief that top management sets the strategic direction of the firm can be contrasted with an alternative view in which managers further down in the organization also make decisions that result in strategic change. For example, Mintzberg (1987) suggests firms’ strategies often contain some “emergent” components. He defines these by describing the case of a purely emergent strategy in which “because big strategies can grow from little ideas (initiatives), and in strange places, not to mention at unexpected times, almost anyone in the organization can prove to be a strategist” (1994, p. 26).\(^2\)

Burgelman (1983, 1991) develops a framework in which both top management and middle managers play a role. He argues that complex organizations have both planned processes in which there is a significant role for senior management as well as evolutionary processes in which other members of the organization can influence strategy through their actions. At any point in time, senior management has responsibility for articulating a strategy that it believes is appropriate given the firm’s strategic position and the environment it faces. Over time, however, managers lower down in the organization, while cognizant of the firm’s articulated strategy, sometimes take actions that are outside its main thrust. These actions affect the strategic options the firm later faces and, as they are recognized by senior management, eventually influence the stated strategy. The potential conflict between the stated strategic direction of the firm and the desired actions of lower managers are mediated by middle managers who ultimately have a major impact on the strategic direction of the firm through their resource allocation decisions.\(^3\)

Burgelman (1994) provides a vivid description of the role of middle managers in the strategic transformation of Intel from a “memory company” to one emphasizing microprocessors. He shows that even as CEO Gordon Moore was championing computer memories, middle managers were both encouraging R&D projects useful in microprocessors and allocating an increasing fraction of manufacturing capacity to the production of microprocessors. He quotes then-COO Andy Grove as saying “By mid-1984, some middle-level managers had made the decision to adopt a new process technology which inherently favored logic [microprocessor] advances rather than memory advances, thereby limiting the decision space within which top management could operate” (p. 45). In November 1984, Intel decided not to produce 1-megabyte DRAM chips and effectively exited the memory business.\(^4\)

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\(^1\) See also Korn (1989).

\(^2\) Mintzberg (1987) contrasts emergent strategies with deliberate ones. Whether deliberate or not, strategies can originate with top management or be determined by the actions of people who are situated at lower levels in the organizational chart. Thus, the contrast drawn by Mintzberg does not map neatly into contrasting views about the locus of managerial influence regarding the strategic direction of the firm. However, Mintzberg’s description of emergent strategies makes it clear that he has in mind situations where employees with relatively low ranks affect the firm’s strategy.

\(^3\) Although Bower (1970) is concerned with capital budgeting rather than the determination of strategy, the importance of middle management in resource allocation is clearly documented in his work. See also Sayles (1993, p. 10) who says “[I]t takes a middle manager to get senior management’s attention and make the case for change.”

\(^4\) The drawn-out process that led to the adoption of the M-form at du Pont provides a quite different example, in which relatively junior managers persuaded the CEO to abandon a key component of his vision. As described in Chandler (1962, p. 99), CEO Irénée du Pont initially rejected this proposed change because he did not want to abandon the “principle of specialization.”
The view that both top and middle management are important in strategy formation is attractive because it integrates quite different perspectives in the managerial literature on the strategy process. However, it is also problematic precisely because the two perspectives it contains seem contradictory. If the most senior managers have the ability to chart a direction for the firm, why don’t they ensure that the direction is steadfastly adhered to by those lower down in the firm’s hierarchy? Otherwise, does it mean anything to set the direction of the firm? If there is a direction set by top management, why do those lower down in the hierarchy pursue activities that are outside its central thrust, and why are they given the resources to do so?

We offer a model of the strategy process that is very much in the spirit of the integrated view and which provides some possible answers to these questions. In keeping with some of our earlier work (Rotemberg and Saloner, 1993, 1994), the role of strategy in our model is to improve the set of innovative projects to which the firm has access. For the firm to have access to such projects, employees must expend effort. If it is difficult for the firm to compensate employees directly for such effort, but it is possible to give them a reward when their ideas are adopted, the general pattern of these adoptions—or strategy—affects employee effort. As long as the adoption of projects follows a pattern, so that the firm has a well-defined strategy, employees whose projects fit this strategy are more motivated in their exploration of innovative projects.

One way for the firm to convince its employees that it will be engaged in the same strategy in the future is to commit itself to eschewing opportunities outside its chosen scope (Rotemberg and Saloner, 1994). Another, and the one we pursue here, is to employ a CEO who has a vision of what is best for the firm. The idea, in part, is to leave little doubt as to what kinds of employee initiatives will be favored later. In the words of Aguilar (1988, p. 71): “Consistency of word and deed on the leader’s part is absolutely necessary if others are to commit themselves to the personal and business risks associated with new and unproven courses of action. The general manager who runs hot and cold will fail to encourage confidence in others. . . . Nobody wants to go out on a limb and risk being abandoned at the first sound of cracking wood.”

We capture this “visionary” behavior of the CEO by supposing that he is consistently biased toward certain kinds of projects and against others. Such bias can explain the existence of sets of interrelated CEO decisions that run counter to counsel and evidence. The management literature is replete with examples of this behavior. David Sarnoff persisted in producing color TV sets at RCA even after their high price and poor performance led Time magazine to call them the year’s “most resounding industrial flop” (McCraw, 2000, p. 130). In spite of considerable opposition, Edwin Land at Polaroid repeatedly committed the company to the failed attempt at instant cinematography in the form of Polavision (McElheny, 1998). Apple’s John Sculley pursued the Newton as a device for the broad consumer market even though internal and external evaluators expected it to bomb and suggested that it was more appropriate for niche applications (Carlton, 1997).

These are extreme examples. But if CEO bias is not too extreme, such bias can be better than committing the firm to a “narrow business strategy.” Whereas a firm pursuing a narrow business strategy forgoes all opportunities that are inconsistent with the current strategy, a biased CEO can recognize a sufficiently good opportunity outside his favored strategic vision and take advantage of it.

For the firm to be capable of investing in opportunities not initially favored by the biased CEO, it may also be necessary for the firm to have a layer of independent

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5 This fits with Andrews (1987, p. 13), who says: “Corporate strategy is the pattern of decisions in a company that determines and reveals its objectives, purposes, or goals.”

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middle managers. These middle managers must not share the CEO's bias and must have autonomy over which ideas and projects the firm invests in. Such middle managers, which we model as being objective, are willing to investigate promising projects that are outside the scope of the CEO's strategy. They do so on the chance that the mainstream projects don't pan out. This funding by middle managers can raise profits because lower-level employees know that, despite CEO bias, their ideas will be adopted if they are "good enough" relative to the ideas produced by the mainstream projects. They may then be willing to put in the requisite effort. Our model therefore provides a rationale for middle managers even in settings where, in principle, the CEO is capable of making all decisions.

For this management structure to succeed, the biased CEO must not be able to interfere with the autonomy of middle managers. Otherwise, their resource allocation process would be corrupted. In some cases, the board of directors may be able to ensure that the biased CEO is complemented by unbiased and somewhat autonomous middle managers. Alternatively, the autonomy of middle managers might be ensured by a corporate culture that protects their right to do what they think is right without "meddling" by senior management.

We investigate four different settings where a biased CEO, sometimes augmented by unbiased middle management, can improve performance. In all four, employees in two different lines of business have the option of seeking competing innovations. In the first, the size of the reward received by employees whose innovation is implemented is exogenous, and may even consist primarily of a reward paid by the external labor market. CEO bias can then increase the frequency with which employees in the favored activities see their innovations implemented and thus increase the incentive to seek such innovations.

In the second setting we consider, we let the firm choose its incentive payments optimally though we impose the constraint that these incentive payments must be the same in the two activities. The firm is now able to motivate its employees without being biased by simply raising all incentive payments appropriately. Doing so may be costly, however, as some employees' incentive payments will rise beyond what is needed to induce them to exert effort. One solution is to hire a CEO who is biased toward the activity that is responsible for the high incentive payments of the entire firm. As the employees in the favored activity see their innovations implemented more often, the incentive payments they require fall, and this can reduce costs throughout the firm.

Our third setting is similar to that in Rotemberg and Saloner (1994) in that incentive payments are chosen optimally in each activity. The problem here is that raising the incentive payments in one activity to raise employee effort has the paradoxical effect of reducing the firm's ex post incentive to implement the innovation generated in this activity. CEO bias can resolve this bias both by leading to implementation in spite of high incentive payments and by reducing the incentive payments that are needed to induce effort.

In our fourth and final setting, employees have superior information about the potential payoff of the ideas they can explore. When an employee knows his project's potential payoff is low enough that it will be adopted only occasionally, he requires a large reward upon project adoption to make the effort. The result is that the employee earns an informational rent when the potential payoff is higher; he still gets the large reward when the project is adopted, but he now gets this award with high probability. A CEO who is biased in favor of this employee's projects increases the likelihood of his receiving his reward, so the magnitude of the rent can be reduced.

These four settings demonstrate the breadth of situations in which CEO bias, sometimes augmented by independent middle management, is beneficial. The first two and
the last setting are of independent interest because they also expand the range of situations in which there are potential benefits from narrow business strategies, thus extending the analysis of Rotemberg and Saloner (1994).

Like Hermalin (1998), we study methods used by leaders to increase their followers' effort. Our articles differ in that Hermalin focuses on the total effort of the leader himself, showing that this can be a useful signal to employees about the value of their own effort. By contrast, we suppose that the leader can truthfully reveal his opinions so that his total effort is not needed as a signal. This allows us to focus on the value of having a particular vision. In practice, having a well-formed vision of the future of the industry does not seem synonymous with working hard.

We begin, in Section 2, by describing in more detail the model that underlies all four settings, and we investigate the first best, which serves as a benchmark in what follows. In Section 3 we analyze the case with exogenous incentive payments. The case where incentive payments are optimal subject to the constraint that they be equal in both activities is covered in Section 4. Section 5 analyzes the outcomes when incentive payments are set optimally in each activity, while Section 6 examines the hidden-information case. We end with concluding remarks in Section 7.

2. The basic model

We first describe the way the firm is organized and decisions are made and then provide some specifics on timing and payoffs.

- **Hierarchy.** The firm we consider has three levels of hierarchy. The most senior, which we call the chief executive officer (or CEO), is responsible for deciding which projects the firm implements. While we suppose that the CEO maximizes his expectation of firm profits, possibly as a result of having his compensation tied to these profits, we depart from standard neoclassical models in terms of how the CEO evaluates the elements of his choice set. We wish to capture the idea that the CEO, rather than being a dispassionate optimizer of standard neoclassical models, brings passion and vision to his role.

We have in mind a CEO who has a somewhat idiosyncratic view of the likely evolution of the industry in which the firm competes and how the firm can be successful in that industry. These idiosyncratic beliefs can have two sources. First, the CEO may simply start out with a prior about the evolution of the industry that differs from that of others. Second, he may be overconfident in his ability to infer the truth from the limited information to which he has access. In either case, what matters for our analysis is that his opinion about his industry's evolution differs from that of his shareholders, whom we consider to be "unbiased." We do not mean to imply that the shareholders necessarily know the "objective truth." Rather, we treat their views as the baseline against which we contrast the CEO's views. We do this because absent the kinds of incentive problems that are the focus of our analysis, the shareholders would seek out a CEO whose opinions coincide with their own.

The CEO's decisions about which projects he implements clearly depend on his opinion of the likely evolution of the industry. Thus his idiosyncratic views affect which activities he supports. To keep the model simple, we consider just two possible

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Our results would be identical if we supposed that everyone believes the CEO acts in a biased way, rather than assuming that he is in fact biased. Such beliefs might be sustained in a reputational equilibrium even if the CEO bias is not genuine. In choosing between simple "bias" and a more intricate reputational setting that sustains "bias," we opt for the former to simplify the analysis. In particular, this choice allows us to neglect the CEO's incentive to act in a manner inconsistent with his reputation.

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activities. If the CEO’s vision favors one of these, he will be biased toward projects that are part of this activity and against projects that involve the other.

There are, of course, other reasons for CEOs to take decisions that do not maximize the firm owners’ expected value of profits (see Holmström and Tirole (1989) for a discussion). These range from the desire of senior management to feather their own nests at the shareholders’ expense to the pursuit of personal aggrandizement. In contrast to both of these—which are pursued in the principal-agent and size-maximizing strands of the literature—we abstract from moral hazard issues on the part of the CEO and assume instead that the CEO intends to maximize profits.

Skipping over middle management for a moment, we move to a description of the least senior members of the hierarchy. As in Rotemberg and Saloner (1993, 1994), these employees take the first step in a two-step process of innovation. By expending creative effort, the employees can probabilistically generate potentially valuable innovations or “ideas.” This potential can only be realized, however, if the firm goes through the second stage of implementing these ideas. We use the word “innovation” very broadly. We mean to include not only innovations in the firm’s products, the way they are produced, distributed, and sold, but also all other profitable changes in the firm’s processes for getting things done.

In organizations of any complexity, the CEO cannot be involved in the development of all the innovative projects pursued by his employees. Consequently, much of the care and feeding of these projects is delegated to middle management. Thus, in our model, middle management has an important influence on the resource allocation process within the firm. We attempt to capture this organizational reality by assuming that employees require authorization and funding from middle management in order to undertake the first step of the innovative process, i.e., coming up with the innovation. Again, we simplify by supposing that middle managers seek only to maximize their expectation of firm profits in making these decisions. This can be rationalized by supposing that their private benefits do not depend on their decisions and that they receive a small share of firm profits as compensation.

In summary, the CEO makes the major implementation decisions and thereby sets the firm’s overall strategic direction. This direction is obviously crucially dependent on his bias in making these decisions. Middle managers are charged with the responsibility of making resource allocation decisions that maximize firm profitability, given the strategic direction of the CEO and the known bias in favor of that strategic direction. They do so by allocating resources to the lower-level employees who are the engine of innovation within the firm.

We turn now from this broad description of the hierarchy to the details of the model.

**Specifics: timing and payoffs.** The firm can potentially be engaged in two lines of business indexed by \( i \), where \( i \) is either \( a \) or \( b \). In each line of business it is possible for an employee (\( A \) and \( B \) respectively) to undertake some innovative activity. Doing so in line of business \( i \) requires exerting effort for which the employee has disutility equivalent to \( e_i \) units of cash and also requires an expenditure of \( d_i \) of the firm’s own resources. If \( d_i \) is spent and the employee exerts effort, then with probability \( P_i \) an innovation whose value is \( g_i \) is generated in \( i \). With the complementary probability, \( 1 - P_i \), the effort in \( i \) is fruitless. Without loss of generality, we suppose that \( g_a > g_b \).

As in Rotemberg and Saloner (1994) we assume that the firm is able to implement at most one of these innovations. The most likely reason for this is that implementation requires the use of complementary resources and that the firm has access to a limited
amount of these resources (at a low cost). These complementary inputs could consist of firm-specific manufacturing facilities, dedicated sales forces, or even financial resources in the event that financial markets are imperfect. As long as the cheap availability of these resources is limited, the implementation of one project makes it more expensive to implement the second. Or, equivalently, the payoff from implementing the second is lower. To simplify, we assume that the costs of implementing the second project are prohibitive so that we may consider only the implementation of one idea.

The incentive structure is the same as in Rotemberg and Saloner (1993, 1994). We suppose not only that the effort of A and B is unobservable and hence uncontractible, but that the only possible incentive payment consists of a reward to the employee whose innovation is implemented. One reason to make this payment depend on implementation is that the implementation of an employee's idea may be observable by other firms. The employee may then see his compensation rise even if he stays with his original employer, as this employer is forced to match the increased wage that the employee can receive on the outside. More generally, fellow employees tend to know when an employee's idea is implemented. Since lines of authority within firms tend to be widely known, this is particularly true when implementation requires that the employee become the supervisor of several other workers.

The observability of the implementation decision may make it possible to support implicit "contracts" in which the firm makes these incentive payments because it fears that otherwise, fellow employees in the employee's own department or division would complain and worsen the firm's reputation for fair dealing. Since employees have incentives to overstate both their efforts and the value of their efforts, one would expect it to be more difficult for such implicit incentive payments to depend on the actual value of the innovation. Making incentive payments depend on the value of ideas that are not implemented at all would seem to be even harder.

We denote the incentive payment in activity i by $k_i$ and take several different perspectives on the determination of this payment. In particular, we consider the case where these are set optimally in each activity as well as cases in which exogenous constraints limit the firm's choices about these payments. The timing is the following: Before any moves are made, the nature of the CEO's bias (if he has any) is common knowledge. Middle managers move first and decide whether to spend the firm's resources $d_i$ in pursuit of innovations in either activity. In particular, they can decide to spend $d_i$ in $a$, in $b$, in both, or in neither. The employees then decide whether or not to exert effort. If they do, the fruits of their labor are revealed and the CEO decides whether or not to implement an innovation. If he does, the employee receives his incentive payment.

\[ V_i = P_i g_i - c_i \quad \text{where} \quad c_i = e_i + d_i, \quad i = a, b. \] (1)

In the first best, since $g_a$ exceeds $g_b$, a firm in which both employees attempt to innovate and in which both succeed chooses to implement A's innovation. The result is that the expected profits of a firm that seeks innovations in both lines of business by paying $c_i$ in each are
\[ V_f = P_a g_a + P_b (1 - P_a) g_b - c_a - c_b = V_a + V_b - P_a P_b g_b. \]  

(2)

The interpretation of this is that the value to the firm is the sum of the expected values of the two innovations minus the expected value of the less valuable one \((b)\) in the event that both are successful (in which case only \(A\)’s innovation is implemented). The firm benefits from pursuing innovations in both activities if \(V_f\) is positive and exceeds both \(V_a\) and \(V_b\). This requires

\[ V_i - P_a P_b g_b > 0, \quad i = a, b. \]

(3)

Obviously, this condition is somewhat stronger than the requirement that each innovation, on its own, is worth pursuing.

It is worth noting that when the firm is involved in only one activity, the first best is relatively easy to achieve even with incentive payments that depend only on the implementation of an employee’s idea. Indeed,

**Lemma 1.** When the firm is involved in just one activity, an incentive payment of \(k_i = e_i / P_i\) yields the first best.

**Proof.** If \(k_i = e_i / P_i\), the CEO is willing to implement an innovation, since the net gain to the firm is \(g_i - e_i / P_i > 0\). Knowing that the innovation will be implemented, the employee is willing to exert effort, since his net reward from doing so is \(P_i k_i - e_i = 0\). Expected profits are

\[ P_i (g_i - k_i) - d_i = P_i \left( g_i - \frac{e_i}{P_i} \right) - d_i = V_i, \]

which corresponds to the first best in the case where the firm is restricted to just activity \(i\) (see (1)). Effort is induced and the expected cost of inducing the effort is \(P_i k = P_i e_i / P_i\), i.e., it is equal to the cost of effort \(e_i\). \(^{Q.E.D.}\)

Matters are more difficult when the firm is involved in two activities. Before considering what happens in this case when the \(k\)’s are allowed to vary, we focus on the case where the \(k\)’s are exogenously fixed at \(\bar{k}\). Because \(\bar{k}\) can include nonpecuniary compensation as well as benefits the employees receive from the external labor market, we denote by \(\bar{k}/f\) the incentive payment disbursed by the firm. This distinction can matter below.

3. **Exogenous incentive payments**

- **Benefits of CEO bias.** The assumption of exogenous incentive payments makes the most sense when the firm is unable to offer high incentive payments. One reason for such limited incentive payments is that occasional large incentive payments raise issues of equity within the firm. Also, high bonuses might simply not be credible

\(^7\) We assume that if the employee is indifferent between making and not making the effort, he does make the effort. The reason for following this convention is that the firm can always break the indifference by offering a tiny bit more.

\(^8\) The result that the firm can obtain the first-best outcome when it concentrates on only one activity depends crucially on the assumption that there is only one kind of outcome in which the employee obtains a profitable innovation. When the employee can obtain innovations whose \textit{ex post} values to the firm differ, this is often impossible. See Rotemberg and Saloner (1993) for a more general treatment of this single-agent problem.

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because they create an excessive temptation for the firm to renege on its promise. These considerations lead us to suppose that \( \bar{\kappa} \) is quite small so that

\[
\bar{\kappa} < g_a - \frac{d_a}{P_a(1 - P_b)} \quad \text{and} \quad \bar{\kappa} < g_b - \frac{d_b}{P_b(1 - P_a)}.
\]  

(5)

The fact that \( \bar{\kappa} \) is smaller than both \( g_i \)'s ensures that this payment never stops the firm from adopting innovations (in contrast to some of the models in Rotemberg and Saloner (1993, 1994)). What is more, (5) ensures that middle management always spends \( d_i \) if it expects employees to make an effort. The reason is that effort by employee \( i \) leads to implementation of his idea at least with probability \( P_i(1 - P_j) \) (i.e., when the employee in \( i \) succeeds and the employee in the other activity fails). The inequalities in (5) ensure that implementation with this frequency is enough to make spending \( d_i \) worthwhile.

If \( P_i \bar{\kappa} < e_i \) in both activities, no employee makes the requisite effort. Employees would know that if they did make the effort and were successful, they would receive \( \bar{\kappa} \), but receiving this with probability \( P_i \) is not enough to compensate them for the cost of their effort. If this inequality is reversed in one activity but not the other, the employee in that activity makes the effort while the other doesn't. In neither of these cases does CEO bias play a role. We thus turn to the case where

\[ P_i \bar{\kappa} > e_i, \quad i = a, b. \]  

(6)

Bias plays a role only when both employees make the effort, both succeed, and the CEO must choose between their projects. An unbiased CEO chooses the project whose \( g_i \) is higher (since this ensures that its net ex post payoff to the firm \( g_i - \bar{\kappa} \) is higher). A CEO who is biased toward one activity ex post is more likely to pick innovative projects in that activity. Thus, if an employee is convinced that the CEO will be biased toward his activity at the time of implementation, he is more inclined to exert effort initially.

We assume that the employee knows the CEO's ex post bias, and we capture this bias by supposing that the CEO believes the values of projects in \( a \) and \( b \) differ from their true values by \( S_a \) and \( S_b \) respectively, i.e., the CEO perceives the values of innovations in \( a \) and \( b \) (net of costs) to be \( g_a + S_a \) and \( g_b + S_b \) respectively. In general, the biases \( S_a \) and \( S_b \) can be positive or negative so that the CEO can be biased either in favor or against an activity. As discussed above, it might be possible to interpret \( S_a \) and \( S_b \) as "rational" and resulting from a difference in the respective information sets of the CEO and the shareholders. These issues of interpretation are not central to our analysis, and we put them aside.

What is important is that when both employees succeed in obtaining worthwhile innovations, the CEO now implements A's innovation whenever

\[ g_a - \bar{\kappa} + S_a \geq g_b - \bar{\kappa} + S_b. \]  

(7)

Notice that, in this setting, there is no benefit to making the CEO biased toward A, i.e., setting \( (S_a - S_b) > 0 \). The reason is that an unbiased CEO already chooses A's project whenever he succeeds in coming up with an innovation.

On the other hand, a bias toward \( B \) can be useful if

\[ P_b(1 - P_a) \bar{\kappa} < e_b. \]  

(8)

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This condition ensures that, without bias, B does not make an effort. The reason is that, given (6), A makes the effort. Thus, B’s innovation is only implemented with probability $P_a(1 - P_a)$ even if he exerts himself and (8) ensures that this is not enough to make B’s effort worthwhile. This yields

Lemma 2. If (6) and (8) hold, setting $S_b - S_a > g_a - g_b > 0$ is profitable if

$$P_a(1 - P_b)k < e_a \quad \text{and} \quad P_b(g_b - \bar{k}') - d_b > P_a(g_a - \bar{k}') - d_a$$

(9) or

$$P_a(1 - P_b)k > e_a \quad \text{and} \quad g_b - \frac{d_b}{P_b} > P_a g_a + (1 - P_a)\bar{k}'$$

(10)

Proof: Consider setting $S_b - S_a > g_b - g_a$ so that B’s project is implemented when they are both successful. Knowing this bias, A ceases to make an effort if the first condition in (9) holds. B, on the other hand, does exert himself. This means that the firm earns the left-hand side of the second inequality in (9) instead of its right-hand side.

If the first condition in (9) fails, and supposing that the bias is such that

$$g_a + S_a - \bar{k}' > 0$$

(11)

A continues to exert himself in spite of the bias for b. The reason is that receiving $\bar{k}$ only when he alone is successful is enough to motivate him. Since the bias also motivates B, both employees exert effort. The result is that the firm earns $P_b(g_b - \bar{k}') - d_b + P_a(1 - P_b)(g_a - \bar{k}') - d_a$ instead of $P_a(1 - P_b)(g_a - \bar{k}') - d_a$. The former is larger whenever the second inequality in (10) holds. Q.E.D.

Conditions (9) cover cases where neither employee can be motivated when his innovation fails to be implemented when they are both successful. Moreover, while it is easier to motivate A, B’s innovation is more valuable. Bias toward B can induce B to carry out the necessary effort because it promises him that his innovation will be implemented when they both succeed. A narrow focus on B would achieve the same thing, however.

Bias achieves strictly more than a narrow focus on B when (10) holds. Here it is possible to motivate A even if his idea is adopted only when he alone is successful. Moreover, the first inequality in (5) implies that the firm benefits from this effort. Bias toward B thus achieves the same profits in b as narrow focus on b and, in addition, leads to strictly positive profits in a because it induces A to make an effort.

Positive versus negative bias and the role of middle management. Only the net bias toward b, $S_b - S_a$, matters for the provision of incentives for B. This raises the question of whether it is better to have a CEO with a positive $S_b$, one with a negative $S_a$, one who combines elements of both, or one whose bias toward both is of the same sign with the appropriate differential between them. We start by discussing relatively broadly the benefits and costs of positive and negative bias. Then we discuss the need for independent middle management when the CEO has negative bias toward some activities.

In a world where the firm is only contemplating A’s and B’s projects, the magnitudes of $S_a$ and $S_b$ are irrelevant as long as their difference is of the right magnitude.

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In a more realistic setting, however, the CEO must obviously consider a wide variety of projects in a and b, not just those that involve difficulties in eliciting innovative effort from employees. In such a setting, the magnitudes of $S_a$ and $S_b$ become important because these biases involve real costs. For example, ignoring the difficulties of effort elicitation, a CEO who is biased in favor of projects in a may well adopt negative-NPV projects in this activity.

Without formally modelling such a setting, it should be clear that a firm that wants to have a positive net bias $S_b - S_a$ would choose $S_b \geq 0$ and $S_a \leq 0$. If both biases had the same sign, the firm could reduce the distortions in decision making by reducing the absolute magnitude of the $S$ whose absolute value is largest and setting the other $S$ equal to zero. This still leaves the question of the optimal magnitudes, however.

In general, the optimal size of $S_a$ and $S_b$ will depend on the distribution of potential investment projects that the firm faces. Presumably there are typically many more potential investment projects whose present value is negative than projects that are worthwhile from the firm’s point of view. An example of such a distribution is illustrated in Figure 1. In that figure, $S_a$ and $S_b$ are also illustrated under the assumption that $S_b = -S_a > 0$. Since the firm ought to invest in those projects whose NPV is to the right of zero, this bias for b creates inefficiencies of two types: negative-NPV projects are undertaken in b and some positive-NPV projects are not undertaken in a.

With a distribution like that in Figure 1, however, the former occurs more frequently than the latter, and at the margin, the firm does better by increasing (in absolute value) $S_a$ and decreasing $S_b$. These considerations seem to suggest that, for a given net bias $S_b - S_a$, the firm is better off with a relatively small value of $S_a$. That is, negative bias (against a) is better than positive bias (for b).

We turn now to the role of middle management. In the case where the CEO has negative bias toward a, it is important for shareholders to ensure that project initiation is in the hands of a relatively independent set of middle managers. To see this, note that a CEO would not fund A’s search for innovative projects as long as

$$P_a(1 - P_b)(g_a + S_a - \bar{k}) < d_a.$$  

With a negative $S_a$, this can fail even if the first inequality in (5) holds. A biased CEO would then fail to develop innovative projects in a whose present value is positive. This is simply a manifestation of the aforementioned tendency of CEOs with negative bias to pass up positive present value projects.

In this case, however, profit-maximizing unbiased middle managers (i.e., ones whose assessments of the $g$’s are closer to those of shareholders) can play a positive role. In particular, such middle managers would respond to the first inequality in (5) by funding A’s search for an innovation as long as the bias against A is not so strong that (11) is violated. This ensures that the CEO implements A’s project when A alone is successful. The reason (11) can hold even though (12) fails is that $d_a$ is sunk by the time the CEO makes the implementation decision. We summarize the above discussion in the following:

**Proposition 1.** If (5) and (10) hold while (12) fails, the firm should provide financing for A’s project and independent middle management would do so while a biased CEO would not. Therefore, having a layer of objective middle managers improves the firm’s resource allocation and profitability in that case.

---

9 Indeed, $-S_b$ is the NPV of marginal projects in b.
Bias toward activities with potentially high rewards. One unattractive feature of the setup we have considered so far is that the only bias we have shown to be profitable is bias toward projects that are consistently less attractive ex post. Given that visionary CEOs speak of their projects with great enthusiasm, this seems unappealing. Of course, CEO bias toward a project in situations where incentive payments are identical only makes sense if the project is sometimes less valuable ex post. But this need not occur in every instance. In particular, we now show that CEO bias toward A can be profitable in situations where A's project is sometimes a great deal more valuable than B's.

We suppose, in particular, that when A succeeds in coming up with an innovation (which continues to occur with probability $P_a$), there is a probability $\alpha$ that this innovation is worth $g'_a$ while there is a probability $(1 - \alpha)$ that it is worth $g''_a$. Employee A is as ignorant as the firm about which of these outcomes will prevail. Moreover,

$$g'_a > g_b > g''_a. \tag{13}$$

The discussion above ought to make it clear that with an unbiased CEO, A now fails to seek innovations even if (6) holds as long as

$$P_a[1 - (1 - \alpha)P_b]k < e_a. \tag{14}$$

For A to seek an innovation in these circumstances, the CEO must be biased toward A and $S_a - S_b$ must equal at least $g'_a - g_b$. That this can be beneficial to the firm is most easily shown in the case where (8) is violated so that B makes the effort even if his project is implemented when he alone is successful. Bias toward A (while maintaining B's effort) then makes profits in $b$ fall from $P_b(g_b - \bar{k}') - d_b$ to $(1 - P_a)P_b(g_b - \bar{k}') - d_b$, while profits in $a$ rise from zero to $P_a[\alpha g'_a + (1 - \alpha)g''_a - \bar{k}'] - d^a$. The net effect can easily be positive.

One attractive feature of this example is that the CEO bias can be thought of as necessary to incubate projects with extremely high payoffs. The reason bias is needed is not that it is hard to implement these projects when they do in fact succeed fully. It

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is simply that to motivate the employees seeking these breakthroughs, it is helpful to promise them implementation of their projects even when their success is less dramatic. This may require that better projects be passed over at that point. Once again, if the bias for A takes the form of negative bias toward B, objective middle management may be needed to spend $d_b$ on B's search for innovations.

The analysis so far has been somewhat ad hoc because the incentive payments have been exogenous. Moreover, one might think that this assumption was central for the results because bias circumvents the limited size of incentive payments by increasing their frequency. We now show that bias can be equally useful when the firm is free to vary $k_a$ and $k_b$ optimally. We consider two variants. First, we allow the firm to pick these $k$'s optimally but assume that they must be the same in the two lines of business. We also consider the case where the firm has even more flexibility because it can choose different $k$'s in the two activities. This latter case can be thought of as resulting from the implicit assumption that the firm's reputation for fair dealing rests separately with the employees in each activity.10

4. Equal incentive payments across activities

We now let $\bar{k}$ be a variable that is optimally chosen by the firm. To simplify our expressions, we suppose that $\bar{k}$ is equal to the payment made by the firm $\bar{k}^i$. We show that bias can increase firm profits in this setting by reducing the rents earned by the employee who, otherwise, tends to drive incentive payments up for all employees. In this section we return to the case where A's project always yields $g_a > g_b$ so that his project is always implemented when both succeed. This means that with an unbiased CEO, $\bar{k}$ need only equal equal $e_a/P_a$ to ensure that A makes the effort.

There are now three cases to consider, depending on whether $P_b(1 - P_a)e_a/P_a$ is smaller than, equal to, or greater than $e_b$. Suppose first that they are equal. The first best is then achievable; all the firm must do is set $\bar{k}$ slightly above $e_a/P_a$ (which is equal to $e_b/P_b(1 - P_a)$). Both employees make the effort and, in expectation, the firm pays as much for this effort as it would if it could pay employees directly for their exertion.

The first best is not achievable, and bias can play a positive role, if11

$$\frac{e_a}{P_a} < \frac{e_b}{P_b(1 - P_a)}.$$  \hspace{1cm} (15)

In the absence of bias, the firm now has a nontrivial choice concerning $\bar{k}$. If it sets $\bar{k}$ equal to $e_a/P_a$, only A makes the requisite effort and the firm’s profits equal $V_a$. An alternative choice is to set $\bar{k}$ equal to $e_b/P_b(1 - P_a)$. This leads both employees to make an effort, since B's effort now raises his expected compensation by $e_b$. A's expected compensation from making an effort now equals $P_a e_a/P_b(1 - P_a)$, which exceeds $e_a$. Thus, A now earns a rent. This would not matter if A were somehow able to compensate the firm for choosing this value of $\bar{k}$. We ignore this possibility, however, so that the firm's expected profits from choosing this $\bar{k}$ equal

10 In practice, "clashes of culture" in merged firms often involve the presence of very different incentive schemes. The unhappiness that surrounds this suggests that having radically different $k$'s may be difficult.

11 The first best is also not achievable when this inequality is reversed, for in this case, B earns a rent when A's effort is elicited by setting $\bar{k}$ equal to $e_a/P_a$. However, bias for a does not reduce this rent. Nor can the firm achieve anything by having a CEO biased toward b that it could not achieve more simply by setting $\bar{k}$ equal to $e_b/P_b$.

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When (15) holds, bias toward $b$ can be beneficial to the firm whether or not (16) is greater than $V_a$. To illustrate the principle involved, we only discuss the case where it is. Then,

**Proposition 2.** If $\bar{k}$ is set optimally, $V_a$ is smaller than the expression in (16), and (15) holds, the firm can benefit from hiring a CEO with $S_b - S_a > g_a - g_b$ so that $B$'s project is adopted when both employees succeed. When $e_b/P_b < e_a/[P_a(1 - P_b)]$, this occurs if either $V_a$ is greater than the expression in (16) or if

$$V_f - P_a \left[ \frac{e_b}{P_b(1 - P_a)} - \frac{e_a}{P_a} \right].$$  

(16)

When $e_b/P_b > e_a/[P_a(1 - P_b)]$, this bias is beneficial if

$$\frac{P_a + P_b - P_aP_b}{P_b^2(1 - P_a)} e_b - g_a + g_b > 0.$$  

(17)

**Proof.** Consider first the case where $e_b/P_b < e_a/[P_a(1 - P_b)]$. With CEO bias toward $B$, the firm now has a nontrivial choice of whether to set $\bar{k}$ equal to $e_b/P_b$ or to $e_a/[P_a(1 - P_b)]$. If it sets it to the former, $A$ makes no effort and the firm earns $V_b$. This is preferable to the outcome without bias when $V_b$ exceeds the expression in (16). If the firm sets $\bar{k} = e_a/[P_a(1 - P_b)]$, both employees make an effort and $A$'s innovation is implemented only when he alone succeeds. The resulting profits equal

$$V_f - P_aP_b(g_a - g_b) - P_b \left[ \frac{e_a}{P_a(1 - P_b)} - \frac{e_b}{P_b} \right],$$

where the second term captures the losses that result from implementing $B$'s innovation instead of $A$'s when both employees succeed and the last term captures $B$'s rent from having an incentive payment that exceeds $e_b/P_b$. When (17) holds, this expression exceeds that in (16) so that profits are higher with CEO bias.

Now turn to the case where $e_b/P_b > e_a/[P_a(1 - P_b)]$. CEO bias only leads to effort by $B$ if $\bar{k}$ is set equal to at least $e_b/P_b$. With this incentive payment, $A$ makes the effort as well and gathers a rent in the process. The profits of the firm are

$$V_f - P_aP_b(g_a - g_b) - P_a(1 - P_b) \left[ \frac{e_b}{P_b} - \frac{e_a}{P_a(1 - P_b)} \right],$$

where the third term represents $A$'s rent. This exceeds the expression in (16) if (18) holds.  

Q.E.D.

It is possible to find numerical values for the parameters such that

$$\frac{e_b}{P_b} < \frac{e_a}{P_a(1 - P_b)}$$

and (17) holds. Still, the combinations of parameters that do so are fairly special. By contrast, (18) requires only that $e_b$ be large relative to $g_a - g_b$. When
the advantages of bias are easy to describe. They allow the firm to lower the incentive payment from \( e_b/[P_b(1 - P_a)] \) to \( e_b/P_b \) at the cost of implementing \( B \)'s innovation when both are available. This means that when both employees succeed, the firm loses \( g_a - g_b \). On the other hand, its expected payment to \( A \) falls not only because \( \bar{k} \) falls but also because \( A \) receives this high incentive payment less frequently.

If the firm chooses a CEO who is not only biased for \( b \) but also biased against \( a \), there is once again a role for independent middle management. If \( g_a - \bar{k} + S_a \) is positive, objective middle managers will fund \( A \)'s effort as long as

\[
P_a(1 - P_b)[g_a - \bar{k}] - d_a > 0.
\]

By contrast, the biased CEO would fund this effort only if

\[
P_a(1 - P_b)[g_a + S_a - \bar{k}] - d_a > 0,
\]

which is more demanding when \( S_a < 0 \).

This section has considered only cases where \( A \)'s project cannot have ex post payoffs in excess of \( B \)'s. However, one can easily extend the analysis of this section to show that bias toward \( A \) can be profitable when \( A \)'s project can be worth either \( g_a' \) or \( g_a'' \) with (13) holding as in the last subsection of Section 3.

5. Activity-specific incentive payments

- **Unbiased CEOs.** We now allow each activity to have a different value of \( k \). We consider an extreme version where the two activities have little contact with one another so that employees in one activity do not even know the incentive payment offered in the other. It then follows that

**Lemma 3.** With two activities and an unbiased CEO, the first best can be achieved if and only if

\[
g_a - \frac{e_a}{P_a} \geq g_b - \frac{e_b}{P_b}, \tag{19}
\]

**Proof.** We first show that the first best can be achieved when (19) holds. The firm can do so by setting \( k_a = e_a/P_a \) and \( k_b = e_b/[P_b(1 - P_a)] \). Since

\[
g_a - \frac{e_a}{P_a} \geq g_b - \frac{e_b}{P_b} > g_b - \frac{e_b}{P_b(1 - P_a)},
\]

the firm is willing to implement \( A \)'s project when both employees succeed. Therefore, \( A \) is willing to make the effort with this incentive payment. At the same time, \( B \) is willing to make the effort if his project is implemented when he alone succeeds.

If the first best involves innovative effort by \( B \), (3) implies that

\[
P_b(1 - P_a)g_b \geq e_b + d_b,
\]

so that an unbiased CEO would be more than willing to pay \( B \) the amount \( e_b/[P_b(1 - P_a)] \).
in order to implement the project that leads the firm to earn $g_b$. Finally, (3) ensures that the firm finds it worthwhile to spend $d_i$ in activity $i$ to help the employee seek innovative ideas. Thus the first best is implemented by these incentive payments.

We now show that if, in contrast, (19) does not hold, it is impossible to achieve the first best. The proof is by contradiction. In the first best, $A$ must exert effort and his innovation must be implemented whenever he is successful. So, suppose that an equilibrium with these characteristics exists. For $A$ to be willing to exert effort, it must be the case that $k_a \geq e_a/P_a$. For his innovation to be implemented when both $A$ and $B$ are successful, it must be the case that $g_a - k_a \geq g_b - k_b$. These conditions, combined with the violation of (19), imply that it must be the case that $k_b > e_b/P_b$. However, the firm would never set $k_a$ higher than $e_b/P_b$. In any candidate equilibrium in which $A$ is exerting effort, the firm can do better by setting $k_b = e_b/P_b$. This is enough to ensure that $B$ makes an effort because the violation of (19) implies that, with this incentive payment, $B$'s innovation is implemented whenever he is successful. Moreover, paying a lower incentive payment to $B$ is clearly advantageous to the firm. Q.E.D.

To see the intuition for why the firm cannot implement the first best when (19) does not hold, let us reconsider the set of contracts that do implement the first best when (19) holds and see why they don’t work here. Recall that these incentive payments are $k_a = e_a/P_a$ and $k_b = e_b/[P_b(1 - P_a)]$. If the firm sets these incentive levels, it implements $B$’s innovation when he alone is successful provided

$$g_b \geq \frac{e_b}{P_b(1 - P_a)}, \quad (20)$$

and it implements $A$’s innovation when both are successful as long as

$$g_a - \frac{e_a}{P_a} \geq g_b - \frac{e_b}{P_b(1 - P_a)}. \quad (21)$$

These equations can be satisfied even when (19) does not hold, because the incentive payment to $B$ is higher than $e_b/P_b$. If (20) and (21) did hold, the employees would be willing to exert effort and the firm would implement innovations in the way required to achieve the first best.

The problem is that even when conditions (20) and (21) hold, the violation of (19) implies that it is not an equilibrium to set $k_b = e_b/[P_b(1 - P_a)]$ and $k_a = e_a/P_a$ in the first place. When (19) does not hold, a firm that sets $k_a = e_a/P_a$ is better off lowering $k_b$ from $e_b/[P_b(1 - P_a)]$ to $e_b/P_b$. Since $A$ believes his innovation will always be implemented, he is willing to exert effort as before. However, $B$ knows both that (19) does not hold and that $A$ cannot be given an incentive payment smaller than $e_a/P_a$. $B$ is thus able to infer that his innovation is always implemented if he accepts an incentive payment of $e_b/P_b$. The firm profits from the deviation because it results in a lower incentive payment whenever $B$ succeeds.

We turn now to describing the equilibria in the case where (19) does not hold.

Lemma 4. If (19) does not hold, equilibria depend on the following condition:

$$g_a \geq \frac{e_a + d_a}{P_a(1 - P_b)}. \quad (22)$$

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If (22) holds, the firm sets $k_a = e_a/[P_a(1 - P_b)]$ and $k_b = e_b/P_b$, both $A$ and $B$ exert effort, and $B$’s innovation is implemented when they are both successful. If (22) does not hold, the firm sets $k_b = e_b/P_b$ and $B$ exerts effort. The magnitude of $k_a$ is arbitrary because $A$ exerts no effort.

**Proof.** The violation of (19) implies that for any $k_a$ sufficient to induce effort by $A$, $k_b = e_b/P_b$ implies that $B$’s innovation is implemented whenever he is successful. He is thus induced to exert effort. To see whether, in addition, $A$ is induced to exert effort, there are three cases to consider. First, suppose that $g_a \geq e_a/[P_a(1 - P_b)]$. In that case, the firm can induce $A$ to exert effort even though his innovation will be implemented only when he alone is successful. If, in addition, (22) holds, the firm profits from doing so. While the implementation decision when both succeed is inefficient, at least, profits are somewhat larger than $V_b$. They equal

$$V_b + P_a(1 - P_b)g_a - e_a. \quad (23)$$

The second case is where $g_a > e_a/[P_a(1 - P_b)]$ holds, as above, but (22) does not hold, i.e., where $e_a + d_a/[P_a(1 - P_b)] > g_a \geq e_a/[P_a(1 - P_b)]$. While the firm could induce $A$ to exert effort in this case, it is not profitable to do so. Rather than having both employees seek innovative activities and implementing $A$’s when he alone succeeds, the firm is better off having only $B$ seek innovations.

The final case is where $g_a < e_a/[P_a(1 - P_b)]$. In that case, $A$ cannot be induced to make an innovative effort, and firm profits equal $V_b$. **Q.E.D.**

**CEO bias.** As long as the net CEO bias satisfies

$$S_a - S_b + g_a - \frac{e_a}{P_a} \geq g_b - \frac{e_b}{P_b}, \quad (24)$$

$A$ makes an effort in equilibrium with an incentive payment of $e_a/P_a$. The reason is that the CEO now implements his project even when both employees succeed and $B$ is given the minimum possible incentive payment consistent with his effort. Notice that in this model, a CEO who is biased toward $a$ has no reason to raise $A$’s incentive payment. He still maximizes profits by lowering $A$’s incentive payment to the point where the employee is just indifferent with respect to his effort choice.

The result of this bias is that $B$ can, at most, expect his project to be implemented when he alone succeeds so that $k_b$ must equal at least $e_b/[P_b(1 - P_a)]$. Offering $B$ such an incentive payment while also spending $d_b$ on his project is profitable for the firm if

$$g_b = \frac{e_b + d_b}{P_b(1 - P_a)} \geq 0. \quad (25)$$

The CEO would still implement $B$’s project when he alone succeeds as long as his negative bias against $B$ is not too large. What is required is that

$$g_b + S_b - \frac{e_b}{P_b(1 - P_a)} > 0. \quad (26)$$

If the CEO wants $B$ to pursue his project, he is willing to offer the relatively large incentive payment of $e_b/[P_b(1 - P_a)]$ *ex ante* because, recognizing his own bias, he
knows that B needs this to search for an innovation. Summarizing this discussion, we have the following:

**Proposition 3.** When (25) is satisfied and CEO bias is consistent with both (24) and (26), the equilibrium has $k_a = e_a/P_a$, $k_b = e_b/[P_b(1 - P_a)]$, both A and B exert effort, and firm profits are $V_f$ as defined in (2). Moreover, profits exceed $V_a$, which would accrue from the narrow business strategy of concentrating only on $a$.

**Proof.** We have already explained the equilibrium outcome. The fact that profits exceed $V_a$ follows directly from (25). \(Q.E.D.\)

Note that a CEO would not fund B’s search for innovative projects as long as his negative bias is such that

$$P_b(1 - P_a)(g_b + S_b) < e_b + d_b.$$  

But if equation (25) holds, i.e.,

$$P_b(1 - P_a)g_b \geq e_b + d_b,$$

the firm should induce B to innovate. So if both of these equations hold, objective middle managers can increase profits by spending $d_b$ and ensuring that B gets $e_b/[P_b(1 - P_a)]$ when his project is implemented. They would be willing to do this as long as $S_b$ is not so negative that (26) ceases to be satisfied.

6. **Hidden information**

Employees often have opinions about the value of their potential innovations at the time that they must exert effort to develop them. Here we suppose that this information is private so that employees may garner informational rents. In particular, the firm must offer a high bonus if it wants employees to pursue projects whose probability of adoption they believe to be small. If the bonus must be the same for all projects, this means that the employees can expect to earn a positive rent when they confront projects that they believe will be adopted with high probability.

We show in this section that these informational rents provide an additional rationale for CEO bias. The result is slightly paradoxical because we show that the informational rents of an employee, say $A$, can be eliminated by having a CEO who is biased *in favor of* $a$. It might be thought instead that bias in favor of an activity would tend to confer rents on the employees working in this activity. Here the opposite can occur because a neutral CEO is less likely to implement the innovations in this activity, and this forces the firm to offer a higher incentive payment to employees in this activity.

To illustrate this benefit of bias, we consider a simple case where, as before, effort by $A$ that costs him $e_a$ leads to a valuable innovation with probability $P_a$. As in the last subsection of Section 3, there is a probability $\alpha$ that the resulting innovation is worth $g'_a$ and a probability $(1 - \alpha)$ that it is worth $g''_a$. While we maintain the assumption that employers are unable to vary their payments to the employee as a function of $g$, we now suppose that $A$ has private information about $g$. He can thus make his effort depend on whether his project eventually yields $g'_a$ or $g''_a$.

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12 One particularly simple case where this result obtains is when $e_b$ and $d_b$ are both equal to zero, so that inducing $B$ to make an effort is trivial. Then, $V_f$ is definitely larger than $V_a$, which in turn can exceed profits with an unbiased CEO who allows both activities to take place in the firm.
We consider parameters such that the firm is able to attain the first-best decisions on effort and implementation even with such a limited incentive contract. We do so to show that the resulting informational rents, by themselves, can rationalize CEO bias. We thus suppose that

\[ g_a'' < g_b < g_a', \tag{29} \]

while

\[ P_a(1 - P_b)g_a'' \geq c_a \quad \text{and} \quad P_b(1 - P_a)g_b \geq c_b. \tag{30} \]

The inequalities in (29) imply that if both employees succeed and the firm can pay directly for the employee’s effort, the firm implements A’s innovation if it yields \( g_a' \) and implements B’s otherwise. The first inequality in (30) implies that the firm would find paying for A’s effort worthwhile even if this yields at most \( g_a'' \). The second implies that it would find paying for B’s effort worthwhile even if A’s project would yield \( g_a' \) if A succeeds. Naturally, these inequalities imply also that B’s effort is worth paying for when A’s project has the potential of yielding \( g_a'' \) (since B’s innovation is implemented more often in this case), and that A’s effort is worth paying for when his project has the potential of yielding \( g_a' \) (since this makes the project more valuable). Thus, under these assumptions both employees always make an effort in the first best.

To ensure that the projects implemented when the firm can only motivate A with a single \( k_a \) mimic those implemented in the first best, we assume that

\[ g_a' - \frac{e_a}{P_a(1 - P_b)} \geq g_b - \frac{e_b}{P_b}, \]

\[ g_a'' - \frac{e_a}{P_a} \leq g_b - \frac{e_b}{P_b(1 - \alpha P_a)}, \quad \text{and} \]

\[ (1 - \alpha)[P_a(1 - P_b)g_a'' - e_a - d_a] > \frac{\alpha P_b e_a}{1 - P_b}. \tag{31} \]

The first of these conditions implies that when A’s innovation has the more attractive value, \( g_a' \), it is implemented by an unbiased CEO when \( k_a \) equals \( e_a/[P_a(1 - P_b)] \) and \( k_b \) equals \( e_b/P_b \) even if B also succeeds in generating an innovation. The second condition says that the unbiased CEO implements B’s innovation rather than A’s when the latter innovation’s value is \( g_a'' \) even if \( k_a \) takes the lower value \( e_a/P_a \) and \( k_b \) takes the higher value \( e_b/[P_b(1 - \alpha P_a)] \). Finally, the third condition says the expected increase in profits the firm receives from A’s effort when the project is worth at most \( g_a'' \) (which is equal to the left-hand side of this condition) is larger than the expected increase in the rents garnered by A as a result of being offered a \( k_a \) equal to \( e_a/[P_a(1 - P_b)] \) rather than one equal to \( e_a/P_a \). The difference between these two values of the bonus is \( e_a P_b/[P_a(1 - P_b)] \), since the lower incentive payments only motivate A when his project has a maximum value of \( g_a'' \), this difference is received as a rent only with probability \( \alpha P_a \) so that the right-hand side of this third equation represents the expected value of this rent. In effect, this third condition requires that the firm gain more by having access to the \( g_a'' \) project when \( B \) fails than it loses from having to give a higher incentive payment to A when his project is actually worth \( g_a' \).

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We are now in a position to establish the following:

**Lemma 5.** If (29)–(31) hold, the unique equilibrium involves \( k_a = e_a / [P_a(1 - P_b)] \) and \( k_b = e_b / [P_b(1 - \alpha P_a)] \). Both \( A \) and \( B \) always exert effort, and the project with the greater ex post value (gross of incentive payments) is implemented.

**Proof.** We first show that the above constitutes an equilibrium. We then briefly discuss why it is unique. To prove that this is an equilibrium, we consider all possible deviations. For the given value of \( k_a \), the firm does not gain by offering \( B \) a lower incentive payment, because the first inequality in (31) ensures that \( B \)'s project is not implemented when \( A \)'s project is worth \( g_a' \) even if \( k_a \) is as small as \( e_a / P_a \). Thus, \( B \) does not make an effort unless \( k_b \) equals at least \( e_b / [P_b(1 - \alpha P_a)] \). Since the firm has nothing to gain by raising \( k_b \) above this, this \( k_b \) is consistent with equilibrium given \( k_a \).

With \( k_a \) equal to \( e_a / [P_a(1 - P_b)] \) \( A \)'s effort is worthwhile to him if his project is implemented at least when he alone succeeds. Moreover, the last inequality in (31) ensures that this occurs even if his project is only worth \( g_a'' \). Thus \( A \) seeks innovations regardless of their potential value.

If the firm lowers \( k_a \) even slightly, \( A \) ceases to make an effort when he knows that his effort would at most yield a project that is worth \( g_a'' \). Given the first inequality in (31), \( A \) continues to make an effort if the maximum value is \( g_a' \) as long as the incentive payment is no smaller than \( e_a / P_a \). Thus, the firm prefers setting \( k_a \) equal to \( e_a / P_a \) to setting it strictly between this value and \( e_a / [P_a(1 - P_b)] \). The last inequality in (31) ensures that it prefers to set \( k_a \) equal to \( e_a / [P_a(1 - P_b)] \) rather than setting it equal to \( e_a / P_a \). To see this, note that the profits in \( b \) are the same with either value of \( k_a \) and that the profits in \( a \) with the former \( k_a \) are

\[
P_a \left[ \alpha \left( g_a' - \frac{e_a}{P_a(1 - P_b)} \right) + (1 - \alpha) \left( (1 - P_b) g_a'' - \frac{e_a}{P_a(1 - P_b)} \right) \right] - d_a,
\]

while they are

\[
\alpha [P_a g_a' - e_a - d_a]
\]

with the latter. The last inequality in (31) ensures that the former exceeds the latter.

Variants of these arguments ensure that there is no equilibrium with different incentive payments. Setting \( k_a \) equal to \( e_a / P_a \) does not induce \( A \) to make an effort when his project is only worth \( g_a'' \) because (30) together with the second inequality of (31) ensures that the firm profits from offering \( B \) an incentive payment \( k_b \) equal to \( e_b / [P_b(1 - \alpha P_a)] \) so that \( A \)'s project is not implemented when it is worth \( g_a'' \). By the same token, setting \( k_b \) equal to \( e_b / P_b \) does not motivate \( B \).

The equilibrium in this case is equivalent to the first best except that \( A \) earns more in equilibrium. This wouldn’t matter if \( A \) could pay for his job ex ante. We now show that if he can’t, either because he doesn’t have sufficient funds or because he doesn’t trust the firm not to abscond with these payments, the firm may profit from having a biased CEO.

To see this, set the CEO’s bias such that

\[
S_a - S_b + g_a'' - \frac{e_a}{P_a} > g_b - \frac{e_b}{P_b(1 - \alpha P_a)} \quad (32)
\]

\[
g_b - \frac{e_b}{P_b(1 - P_a)} + S_b \geq 0. \quad (33)
\]
Assuming the firm finances the effort of both employees, the only equilibrium is then to set \( k_a \) equal to \( e_a/P_a \) while setting \( k_b \) equal to \( e_b/[P_b(1 - P_a)] \). The logic of the argument is similar to that of the arguments we made earlier, and we do not go through it in detail. The key to the argument is that (32) ensures that with \( k_a = e_a/P_a \) and \( k_b = e_b/[P_b(1 - P_a)] \), A’s project is also implemented when it is worth \( g_a^* \). This means that the firm would deviate from the equilibrium in which the CEO is unbiased by lowering \( k_a \) to \( e_a/P_a \). A now makes the effort with probability one because the bias of the CEO ensures that his project is implemented whenever he succeeds. In addition, the two conditions in (30) ensure that unbiased middle managers would indeed finance the research projects of the two employees. Thus bias has two related effects. It leads the firm to implement A’s project even when B’s project is more valuable, and at the same time it lowers A’s incentive payment. These two effects have countervailing effects on profits. Bias is beneficial on net if

\[
P_a[\alpha g_a^* + (1 - \alpha)g_a^*] - c_a + P_b(1 - P_a)g_b - c_b
\]

\[
> P_a\left[\alpha \left(g_a - \frac{e_a}{P_a(1 - P_b)}\right) + (1 - \alpha)\left(1 - P_b\right)g_a^* - \frac{e_a}{P_a(1 - P_b)}\right] - d_a
\]

or

\[
+ P_b(1 - \alpha P_a)g_b - c_b \quad \text{or} \quad (1 - \alpha)P_aP_b(g_b - g_a^*) < \frac{\alpha P_b e_a}{1 - P_b}.
\]

This last condition requires that the expected loss from implementing a project whose value is \( g_a^* \) rather than one whose value is \( g_b \) when they are both available (which occurs with probability \((1 - \alpha)P_aP_b\)) be smaller than the expected rent paid to A by the unbiased CEO.

We have thus demonstrated the following:

**Proposition 4.** When (30), (31), and (34) hold, the firm benefits from hiring a biased CEO.

The actual level of the bias that is needed must satisfy (32) and (33). Finding levels of bias that satisfy these inequalities poses no difficulties, so the only issue that remains is whether parameters exist such that the reduction in A’s rents is sufficient to justify bias.\(^{13}\) We thus studied these inequalities numerically and verified that all six inequalities are strictly satisfied when \( g_a^*, g_b, g_a^* \), are given by 20, 11, and 10 respectively, \( P_a \) and \( P_b \) equal .6, and \( e_a, e_b, d_a, \) and \( d_b \) equal 1 while \( \alpha \) equals .2. In this example, the costs of effort and the probabilities of success in the two activities are the same. The key feature of the example is that the ex ante value of the innovations, as represented by the \( g \)'s and their probabilities, is quite a bit higher than the cost of the innovations, as represented by the \( e \)'s and the \( d \)'s. This means that the firm finds it worthwhile to induce A to make an effort even when the CEO is unbiased and his innovation would have a relatively low payoff if he succeeds. The result is that A

\(^{13}\) Since (30), (31), and (34) involve only six inequalities and there are ten parameters \((P_a, P_b, g_a^*, g_b, g_a^*, e_a, e_b, d_a, d_b, \text{ and } \alpha)\), one should not be surprised to find that such parameters exist. What makes this particularly likely is that the six inequalities are not independent, and indeed, the third inequality in (31) is strictly stronger than the first inequality in (30) so that the latter can be ignored. However, because the probabilities \( P_a \) and \( P_b \) must lie between zero and one and because the \( g \)'s must also satisfy (29), it is worth checking that the relevant set of parameters is nonempty.

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receives some rents and that, because the difference between $g''$ and $g_b$, is not too large, the firm gains from hiring a biased CEO who eliminates $A$'s informational rents.

The size of the net bias in favor of $a$ needed to satisfy (32) is .77. With this bias, the ex ante profits from inducing $B$ to make an effort (which is the difference between the left- and right-hand sides of the second expression in (30)) equal .64. This means that if this net bias takes exclusively the form of a negative $S_{ab}$, the CEO would not fund $B$'s research, whereas a less biased middle manager would.

7. Conclusions

We had several objectives in this article. The first was to demonstrate the role of visionary senior managers in ameliorating incentive problems within their organizations. Visionary CEOs provide partial commitment to the strategies that are consistent with their vision. The employees then know that the firm is likely to favor investments that are consistent with this vision. They are thus led to work hard on such projects, particularly if they can only be rewarded for their efforts when their projects are implemented. In spirit, this solution to employee incentive problems is very similar to committing the firm to a specific (narrow) business strategy. We have shown here, however, that a biased CEO can sometimes do even better than a narrow strategy, since the commitment is partial rather than absolute.14

A second objective was to highlight the role of middle managers in bridging the gap between visionary senior managers and the lower-level managers who are the engine of innovation, experimentation, and change in the organization. We have shown that unbiased middle managers may be able to ensure that lower-level managers undertake projects that are in the long-run interests of the firm even if they run counter to the official strategy being espoused by top managers. For them to do so they must both be provided with some autonomy and be assured that their future compensation is tied to firm profitability. The autonomy of managers is thus valuable to shareholders. The resulting position of middle management within firms is very similar in spirit to the position it occupies in the analysis of Burgelman (1983, 1991).

This raises the question of how CEOs can be visionary if they are selected from the ranks of unbiased middle managers. Some of the difficulties involved are discussed in Zaleznik (1992). One requirement may be that CEOs choose a vision (and thereby become biased) when they ascend into leadership roles. This fits with Bennis and Nanus (1985, p. 88), who report: “Over and over again the leaders we spoke to told us that they did the same things when they took charge of their organizations . . . they set a new direction and they concentrated the attention of everyone in the organization on it. We soon found that this was a universal principle of leadership.” They say shortly thereafter that setting a new direction requires a vision.

To elucidate the basic ideas and to cover several cases, we have kept the models extremely simple. There are a number of ways these basic models might be extended in future work. One obvious gap in the analysis is that we have not derived formally the costs of bias, even though these costs play a role in our analysis. While we have focused here on the benefits of bias, the cost of bias is that it induces incorrect decisions in situations without incentive problems. Misguided vision, even if it is motivational, can be costly. A fuller treatment would explicitly model these costs.

A second, and more important, way in which the models ought to be extended is to draw a distinction between employees who are different but work in the same line

14 Thus, hiring a biased CEO provides commitment in a way that is related to Rogoff’s (1985) argument for hiring a conservative central banker.
of business and employees whose activities are truly unrelated. In our model, there are just two employees and one might conceive of them as both working in the same area. The model would then be a model of preference for individual projects rather than one of preference for lines of activity. We prefer our interpretation in which the two employees stand for unrelated lines of business because, in at least some cases, this fits better with our assumption that the adoption of one project makes it difficult to adopt another. This is particularly true if the projects within a particular line of business are complementary, so that adoption of one makes adoptions of others more attractive. It is then easy to imagine that the key adoption decision faced by senior management is whether to adopt a series of complementary projects in one line of business or to adopt another series of complementary projects in another. We suspect that our model would apply to such decisions once it is properly extended so that there are many employees working on complementary projects within each line of business. Demonstrating that this conjecture is correct awaits future research.

A third extension that would be worthwhile is to consider models in which ex post negotiation affects the wage of the employee whose idea is implemented. If this employee is needed to implement his idea, and if the outside labor market is not competitive, this employee might expect to receive a fraction of the value the firm expects to reap from his innovation. For example, Nash bargaining between an employee with a fixed outside wage and a biased CEO might lead the employee to receive half the CEO's estimate of the innovation's value. CEO bias for an activity can thus raise the wages of employees who succeed in innovating within the activity. This would appear to provide an alternate avenue through which CEO bias can be helpful in overcoming the incompleteness of contracts between firms and their employees. One potential defect of this mechanism relative to those we considered explicitly in this article is that CEO bias might then stifle innovations in other activities, as innovators outside the preferred activity receive little compensation even when their ideas are implemented. Shareholders might then seek mechanisms that curtail this ex post influence of biased CEOs on employee compensation.

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