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Sustaining implicit contracts when agents have career concerns: the role of information disclosure

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Firms often augment career concerns incentives with implicit incentive contracts. I formalize the interaction between these two incentives, and highlight its implications on a firm's decision to disclose its workers' productivity information. Disclosure enhances career concerns but inhibits implicit contracts. I show two main results. First, implicit contracts weaken (i.e., substitute) career concerns if the prior belief about the worker's ability is low, and vice versa. Second, when these incentives are substitutes, the optimal disclosure policy follows a cutoff rule: patient firms are opaque, and transparent firms never offer implicit contracts. These results need not hold if the incentives are complements.

1. Introduction

■ In providing incentives to their workers, firms often augment career concerns incentives with implicit incentive contracts that promise performance-based bonus payments. Such incentive provisions are frequently observed in some industries such as financial services, information technology, and so on. There is considerable evidence of career concerns among mutual fund managers (Chevalier and Ellison, 1999). Bonus payments also constitute a significant portion of the fund manager's total pay packages. Information technology professionals face strong career concerns incentives, because a better engineer often gets higher wage offers from the external labor market (Loveman and O'Connell, 1996). The use of bonus payments as an incentive device is also prevalent in this industry, and often aids in the retention of IT professionals (Agarwal and Ferratt, 1999).[1]

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[1] Such examples do not undermine the presence of explicit incentives, which are often used along with career concerns and implicit contracts (Das and Sundaram, 1998). However, the key tradeoff discussed here is immune to the presence of explicit incentive contracts.

The strength of career concerns incentives depends on how closely the outside labor market can observe the worker's performance, because the prospective employer's wage offer is based on her "beliefs" about the worker's productivity. However, when hiring an experienced worker, the prospective employer may suffer from an informational disadvantage. The initial employer typically possesses better information about the productivity of her workers, as she may have also observed the worker's performance in the past (Waldman, 1984). Hence, the initial employer may disclose this information strategically in order to influence the beliefs of the prospective employers, and consequently can manipulate the career concerns incentives of her workers.[2]

There are different channels of information transmission through which the market may attempt to learn, or through which the firm may influence the market's learning about a worker's productivity. A commonly used channel is the extent of worker/client interaction. For example, an IT firm can decide whether to send a worker to the client's site to do the project, or to complete the project in its own facility and send back the final product. In the first case, the firm is completely transparent. The client firm can easily identify the better workers. In the latter case, the firm is opaque. The client firm gets no information on an individual worker's productivity, and there is no room for career concerns incentives.[3] Promotion announcements or assignment to job titles are also commonly discussed as channels of information disclosure.[4, 5]

A firm's disclosure decision must balance a tradeoff when it attempts to augment career concerns incentives with implicit contracts. Although disclosure enhances career concerns incentives, it may lessen the firm's ability to sustain implicit contracts that promise performance-based bonus payments. Implicit contracts are sustained through the threat of future retaliation by the workers, which is initiated if the firm reneges on its bonus promises. However, a transparent firm can continue to rely on its workers' career concerns incentives even if it reneges on its bonus promises. In other words, the payoff of a transparent firm following a breakdown of the implicit contract (i.e., on the punishment path) is higher than that of its opaque counterpart. Consequently, under transparency, the firm's temptation to renege on its promises is higher, which lowers the firm's ability to sustain implicit contracts.

The purpose of this article is to study the role of disclosure in such an environment. It formalizes the aforementioned tradeoff associated with a firm's transparency decision, and brings out two substantive issues. First, it highlights the interaction between implicit contracts and career concerns incentives; second, it characterizes the optimal disclosure policy of the firm, and studies how the nature of interaction between these two incentives influences the firm's disclosure decision.

I consider a model where an infinitely lived principal ("firm") hires a sequence of short-run agents ("managers"). Each manager lives for two periods, and in the second period, he may be raided (i.e., "poached") by the outside labor market. In period 1, the manager brings an investment project to the firm. The project quality ("good" or "bad") depends only on the manager's ability. The ability of the manager is unknown to all players (including the manager himself), but follows a known prior distribution. Before the project is implemented, both the firm and the manager observe a signal ("good" or "bad"), which is informative of the underlying project quality. The manager can increase the precision of the signal by exerting effort. The firm implements the project if the signal is good. The true project type is subsequently revealed. The period 2 productivity of the manager is exactly equal to his ability.

[2] Such disclosure decisions play a crucial role in modern labor markets with a rising trend in job-to-job transition. In 2004, the average annual turnover rate in financial services was almost 20%, while the corresponding rate for high-tech industries was around 22% (Valdivia, 2005).

[3] Such an issue is central to a case study of a Silicon-Valley firm, HCL America (Loveman and O'Connell, 1996).

[4] See Waldman (1984, 1990) for a discussion on the signaling perspective of promotion policy, and Zábojník and Bernhardt (2001) on the role of rank-order tournaments in influencing market beliefs.

[5] In some cases, the worker can also present his credentials to signal his quality. But this does not undermine the firm's attempt to transmit information. The productivity is often "soft" information, and the worker may lack credibility in transmitting it.

The firm commits to a *disclosure policy* (i.e., whether to be transparent or opaque) at the beginning of the game. A transparent firm reveals all information about the manager's output, whereas an opaque firm does not reveal any. At the end of the first period of a manager's life, the raiders bid competitively for the manager. Observing the bids, the firm submits a counteroffer, and the manager chooses his period 2 employer. He leaves the environment at the end of period 2, and a new generation of manager is hired by the firm. Because the raiders infer the manager's ability by observing his output and bid accordingly, the manager has career concerns in a transparent firm.

The firm provides incentives through two channels. It can potentially rely on the career concerns of the manager and, in addition, it can offer bonus payments sustained through implicit contracts. If the firm reneges upon its implicit contract, future generations of managers play their static best response (trigger strategy). So, the effort that the firm can elicit from the managers on the punishment path is solely based on the managers' career concerns incentives.

This article brings out two main results. First, if the prior expectation of the manager's ability is high, incentives from bonus payments enhance (i.e., complement) career concerns incentives, and attenuate them (i.e., substitute) otherwise. The argument is simple, yet subtle. The market expects the manager to work harder when his bonus payment is increased. If the manager fails in spite of working harder, the market interprets it as a stronger signal of the manager's underlying low ability. Consequently, the market evaluates him more harshly than before. If the manager's expected ability is high, it is more likely that he will succeed if he works hard. Thus, he works even harder in order to succeed and to avoid such harsh market evaluation. In contrast, if the manager's expected ability is low, it is likely that he will fail even if he works harder. Such a manager may find it optimal to reduce his effort so that the market may attribute his failure (at least partially) to his low effort, rather than interpreting it as a strong signal of his low ability. Observe that in the former case, the manager puts in extra effort to reveal his true ability, which he (and everybody else) expects to be good, whereas in the latter case he reduces his effort to hide his true ability, which he (and everybody else) expects to be bad.

Second, I show that when the prior expectation of the manager's ability is low, disclosure policy follows a cutoff rule. That is, the firm opts to be transparent if and only if its discount factor is below a certain threshold. Moreover, a transparent firm does not offer any bonus payment. These results need not hold if the prior expectation about the manager's ability is high. In such case, the optimal disclosure policy need not follow a cutoff rule, and a transparent firm may find it optimal to offer bonus payments.

This result suggests that the nature of interaction between the two types of incentives plays a crucial role in governing the firm's optimal disclosure policy. What drives the cutoff rule? Clearly, a firm with low reputation concerns (i.e., low discount factor) may not be able to credibly promise a high enough bonus, and prefers to be transparent to take advantage of the career concerns incentive. However, a firm with high reputation concerns (i.e., high discount factor) prefers to be opaque. Although the complete argument is a bit involved (discussed later in Section 5), the basic intuition is as follows. Consider an opaque firm with enough reputation concerns such that it can credibly promise a bonus that can induce an effort level that is at least as high as the career concerns effort level. There is a case for transparency only if this firm can profit by augmenting career concerns incentives with bonus incentives (also recall that a transparent firm must settle for a lower bonus incentive compared to its opaque counterpart). My first result suggests that if the prior expectation on the manager's ability is low, under transparency, the impact of a bonus payment on effort is weaker (compared to the opaque case) due to a dampened career concerns incentive. Thus, such a firm can do better by relying only on bonus payments (under opaqueness) rather than exposing its manager to both career concerns and bonus incentives simultaneously. There is no case to be made for transparency for such a firm.

However, this argument breaks down when bonus payments enhance (or complement) career concerns. This is the case when the prior expectation of a manager's ability is high. By exploiting the complementarity between the two incentives, the firm creates a greater impact on its manager's effort by applying both incentives simultaneously than what it can do by applying each of these incentives in isolation. Therefore, the optimal disclosure policy need not follow a cutoff rule. Moreover, a transparent firm may find it optimal to offer bonus payments.

This result leads to some interesting testable hypotheses. For example, one empirical implication of this result is that in an environment where talent is scarce, firms with low reputation concerns are more likely to opt for transparency.

□ **Related literature.** This article relates to two strands of literature—implicit contracts and career concerns—and attempts to bridge the two.

Several authors have discussed the role of implicit contracts both as incentive mechanisms (Bull, 1987; MacLeod and Malcomson, 1989; MacLeod, 2003; Levin, 2003) and in defining the boundaries of a firm (Baker et al., 2001, 2002). Although these authors take the firm's ability to sustain an implicit contract as a given, I endogenize it through the firm's disclosure policy.

The idea of career concerns as a disciplinary device dates back to Fama (1980), and subsequently formalized by Holmström (1982) (also see Scharfstein and Stein, 1990). These authors assume symmetric information between the initial and future employer(s) of a worker. In this article, in contrast, I allow for asymmetric information among employers. Therefore, it relates more closely to the works that consider the effect of varying amounts of information in a career concerns setting. For example, Jeon (1996) discusses the role of teams in filtering information. Allocation of power in a firm can also affect information disclosure, as studied by Ortega (2003). Gibbons and Waldman (1999) offer a survey on this topic. However, in contrast with this article, these authors do not consider the effect of information disclosure on a firm's ability to sustain implicit contracts.

Even though the interaction between implicit and explicit incentives in a firm is well studied (Gibbons and Murphy, 1992; Dewatripont et al., 1999a, 1999b), the interplay between career concerns and implicit contracts, and the role of organizational transparency in combining these two incentives have largely gone unnoticed. This article attempts to reconcile this gap.

Perhaps the paper that is more closely related to my work is by Baker et al. (1994), which characterizes the optimal contract when the firm combines incentives through implicit contracts with explicit incentives. Similar to this article, the authors assume that the firms resort to optimal explicit incentives in the case the implicit contract breaks down. However, because the firm cannot commit to implement a certain explicit contract every period, its punishment payoff is independent of the explicit contract it offers in equilibrium. In contrast with Baker et al., I allow the firm to commit to a certain level of punishment payoff by choosing an irreversible disclosure policy up front. Such an assumption on commitment also bears relation to Halonen (2002). She studies the tradeoff associated with the optimal ownership allocation in long-run relationships when such an allocation cannot be renegotiated on the punishment path. The tradeoff illustrated in this article, although similar in spirit with Halonen, originates in a completely different context (i.e., the interplay of implicit contracts and career concerns).

Finally, this article also relates to the literature on adverse selection in the labor market (Greenwald, 1986). I discuss how a firm's disclosure decision endogenizes the implications of the adverse selection problem, and how it affects worker turnover. However, I neutralize this effect in my model to stay focused on the key tradeoff between career concerns and implicit contracts.

The organization of this article is as follows. The next section develops a model that captures the aforementioned tradeoff. Section 3 develops some preliminary results that are useful for the main analysis. In Section 4, I analyze the interaction between career concerns and incentives through implicit contracts. The optimal disclosure policy of the firm is characterized in Section 5. Section 6 discusses the empirical implications of the main results. Section 7 discusses the robustness of my results and concludes. Unless mentioned otherwise, all proofs are given in the Appendix and are omitted in the text.

2. The model

■ *Players*. An infinitely lived firm, F, hires a sequence of short-lived managers. A manager in generation t, A_t, lives for two periods.[6] While in the first period of his life, A_t works for F, he can get raided in period 2. Two identical raiding firms, R_1 and R_2, bid competitively for A_t. Observing the raiders' bids, F makes a counteroffer. A_t works for the employer who offers the highest period 2 wage.

Stage game. In what follows I will describe the stage game that is played between the firm, the raiders, and each generation of managers. The stage game has two periods and is defined in terms of its five key ingredients: *technology*, *incentive structure*, *disclosure policy*, *offer-matching behavior of the firm*, and the players' *payoffs*. I elaborate below on each of these ingredients.

Technology. The technology specification is based on Milbourn et al. (2001). The Milbourn framework offers a few modeling advantages over the canonical Holmström (1982) model. First, to derive the optimal disclosure policy, it is important to ascertain whether career concerns and implicit contracts are substitutes or complements. The Milbourn framework allows for an easy parameterization of this feature. Second, the Milbourn framework offers algebraic simplicity in modeling the interaction between career concerns and implicit contracts. Because this framework considers a discrete performance measure, the optimal implicit contract can be represented by a single bonus amount (elaborated below) rather than a continuous bonus schedule (as is the case in the Holmström framework).

Following Milbourn et al., I assume that at the beginning of the first period, F hires A_t who generates and evaluates an investment project for her. The quality (q) of a project can either be *good* (g) or *bad* (b), and it is revealed only after the project is implemented. The quality of a project is, however, not verifiable. Thus, F cannot write a pay-per-performance contract contingent on q.

The quality of the project depends only on the manager's ability.[7] A_t's ability $a \in [0, 1]$ is unknown to all players (the firm, the raiders, and the manager himself), but follows a known probability distribution with mean μ and variance σ^2. The higher the ability of the manager is, the more likely it is that he will generate a good project. More specifically, given his ability level a, the probability that the manager will generate a good project is assumed to be equal to a, that is, $\Pr(q = g|a) = a$. So, the prior (i.e., unconditional) probability of a manager to generate a good project is $\Pr(q = g) = \mathbb{E}(a) = \mu$.

F evaluates the viability of a project before it is implemented. The evaluation of a project is based on a signal $s \in \{s_g, s_b\}$ that is observed by both A_t and F. Although a signal is always realized irrespective of the effort $e \in [1/2, 1]$ of the manager, he can increase its precision by working harder. Let

$$\Pr(s = s_g \mid q = g) = \Pr(s = s_b \mid q = b) = e.$$

As $e \geq 1/2$, the signal is informative (unless $e = 1/2$). The level of effort is only observed by A_t. Let the cost of effort be $c(e)$ that satisfies the following conditions.

Assumption 1. $c(1/2) = c'(1/2) = 0$, $c' \geq 0$, $c'' > 0$, $c''' > 0$, and $c'(1) = \infty$.

In other words, $c(e)$ is an increasing and convex function on [1/2, 1]. Due to the restrictions on the marginal cost at the boundary points, the manager's incentive problem always yields an interior solution. The assumption of convexity of the marginal cost ensures some desirable continuity properties of the solution to the firm's profit maximization problem.

[6] I denote the life span of a manager as a "generation" (indexed by t, $t = 1, 2, \ldots,$), and a unit length of time within a generation as a "period."

[7] This implies that the quality of the project is a sufficient statistic for the manager's ability with respect to effort. This feature of the Milbourn framework yields a simple parameterization of complementarity and substitutability between the two incentives.

Observing the signal s, F decides whether to implement the project. Implementation requires a nonverifiable investment, i. Whereas a good project yields positive returns, a bad project results in a net loss, that is, $g > i > b$. The quality of a project is revealed only at the end of the first period. The project's unconditional expected net return (V) is therefore $\mathbb{E}(V) = \mu g + (1 - \mu)b - i$. Let F be *a priori* indifferent to this project, that is, $\mathbb{E}(V) = 0$. Because signals are informative and the expected net worth of a project (unconditional) is zero, $\mathbb{E}(V|s = s_g) > 0 > \mathbb{E}(V|s = s_b)\ \forall e > 1/2$. To simplify the subsequent analysis, I will assume that the firm does not invest if the expected net worth of the project conditional on the signal is negative.

Assumption 2. F invests if and only if $s = s_g$.

Assumption 2 has two major implications. First, it limits the set of information that F may have at the end of period 1. Because projects with bad signals are never implemented, the information available to F at the end of period 1 is $\omega_F \in \Omega_F = \{\{s_b\}, \{s_g, g\}, \{s_g, b\}\}$. Second, it creates career concerns for the managers. The working of the career concerns incentives is explained later in Section 3.

It is also important to note that this assumption is not crucial for the qualitative nature of my results. Although the firm might want to invest even in a bad project to provide stronger incentives for improving signal accuracy, it is never optimal to implement a bad project with certainty (because the expected net worth of the project is zero). The manager continues to have career concerns as long as there is a positive probability that a bad project will not be implemented.[8] Thus, even when Assumption 2 is relaxed, the trade-off with transparency remains relevant.[9]

The manager works on a different task in period 2, where his output is linear in his ability. Irrespective of his employer, the output of A_t with ability a is simply equal to a.[10]

Incentive mechanisms. Because output is not contractible, I assume that the only form of managerial compensation that F can specify through legally enforceable contracts is a lump-sum wage $W \in \mathbb{R}_+$.[11] But the firm can provide incentives through two channels.

First, the firm can offer an implicit contract that promises a bonus payment $B \in \mathbb{R}_+$ if the implemented project turns out to be *good*. Because the output is not contractible, this payment can only be sustained in a repeated game where the firm is willing to honor its current promise to avoid possible retaliation by the future generations of managers. The implicit contract is announced publicly; that is, the raiders observe the value of B. Although such a specification of implicit contracts may seem ad hoc, it creates a stronger incentive than the alternative specifications (where a bonus is paid only for observing a good [or bad] signal) if one assumes that $\mu > 1/3$. I will maintain this assumption throughout the rest of this analysis.[12]

Second, the firm can rely on the manager's career concerns incentives. The manager's period 2 wage is tied to the raiders' bids, which, in turn, depend on the raiders' beliefs about the manager's ability. Because the manager's period 1 output influences the raiders' beliefs, the manager works harder to affect their beliefs favorably. I will elaborate on this point in Section 3.

Disclosure policy. The raiders (R_1 and R_2) update their beliefs about the manager's ability based on the period 1 information available to them, $\omega_R \in \Omega_R \subset \Omega_F \cup \{\emptyset\}$, and the level of effort

[8] The working of the career concerns incentives is explained later in Section 3.

[9] However, one gets a richer contracting environment by relaxing Assumption 2, because the firm can now condition bonus payments on both $\{s_b, b\}$ and $\{s_b, g\}$ outcomes. I abstract away from this possibility for the sake of algebraic simplicity.

[10] This is only a simplifying assumption. To justify the presence of the raiders, one can indeed assume that the manager can be a better match with the raiding firms. I revisit this issue in Section 7.

[11] To draw out the implications of the interaction between implicit incentives and career concerns, I have assumed that no explicit contracts are feasible in this environment. I briefly discuss the possible role of explicit contracts in Section 7.

[12] The manager's optimization problem suggests (see Section 5) that when $\mu > 1/3$, a dollar increase in the bonus payment has the most impact on the incentives when it is offered only if $\{s_g, g\}$ is realized (as opposed to paying the bonus if $\{s_b\}$ and/or $\{s_g\}$ is realized).

they expect the manager to put in (which, in turn, depends on the publicly announced implicit contract offered by F). Because the raiders' bid is based on their beliefs about the manager's ability, the transparency decision of the firm affects career concerns by manipulating Ω_R.

I assume that the firm chooses its disclosure policy $d \in \{Opaque, Transparent\}$, that is, whether to be opaque or transparent, at the beginning of play.[13] When F is transparent, the raiders observe two things: the same information about the current project as available to F (that is, $\omega_R = \omega_F$), and the history of the game (formally defined below).[14] In contrast, when F is opaque, no information about the project is available to the raiders, that is, $\omega_R = \{\emptyset\}$, nor do they observe the history of the game.[15] It is worth emphasizing that under both opaqueness and transparency, the raiders observe the implicit contract that F offers to A_t (which is a public announcement). Also, all generations of managers observe the history of the game irrespective of the disclosure policy.

Assumption 3. F's disclosure decision is irreversible.

Once chosen, it is prohibitively costly to change the level of transparency at a future date. Assumption 3 strengthens the tradeoff between provision of career concerns-based incentives and sustenance of implicit contracts. Even if F chooses to forgo the career concerns-based incentives, as will be made clearer later, it might have an incentive to become transparent following a defection on the implicit contract. Assumption 3 rules out this possibility.[16, 17]

Offer matching. After observing the raiders' bids, F makes a counteroffer $\beta_F \in \mathbb{R}_+$ to A. β_F depends on F's information about the manager's ability (ω_F) and the history of the game. A_t chooses the highest bidder as his future employer. In case of a tie, he stays with F.

Payoff. The payoff of A_t, U_t, is the sum of his expected utilities in the two periods of his life, $U_t = u_1^t + u_2^t$, where u_τ^t is the expected utility in period $\tau = 1, 2$. Given the level of effort e, the expected utility of A_t in period 1 is simply equal to the expected transfer from F net of the cost of effort. Thus, $u_1^t(e) = \Pr(s = s_g, q = g)\, B + W - c(e)$.

In the second period of his life, A_t's expected payoff depends on his reputation and his choice of employer. Given e, A_t earns $\mathbb{E}_{\omega_R}[\beta(\omega_R, e^*) \mid e]$ with the raiders, where β is the highest bid by the raiders and e^* is the level of e that the raiders expect A_t to exert. In contrast, with F, the expected payoff is $\mathbb{E}\beta_F(\omega_R, \omega_F)$. Hence,

$$u_2^t(e) = \begin{cases} \mathbb{E}[\beta_F(\omega_R, \omega_F) \mid e] & \text{if } A_t \text{ stays with } F \\ \mathbb{E}\big[\beta\,(\omega_R, e^*) \mid e\big] & \text{otherwise} \end{cases}, \tag{1}$$

where the expectation is taken on (ω_R, ω_F). I assume that A_t's reservation payoff is just the unconditional expectation of manager's ability level (i.e., μ).[18] Such a specification implicitly allows F to enjoy bargaining power while hiring A_t.[19]

[13] To fix ideas, one can think of the transparency decision as whether the firm should allow for client contact (i.e., be transparent) or not (i.e., be opaque).

[14] If the raiders have an imperfect observation of history, they may not observe a breach of the implicit contract, and form wrong beliefs about the manager's effort level. This affects their bids in the punishment path, but does not eliminate the career concerns. The tradeoffs with transparency persist.

[15] The analysis does not change even if the raiders subsequently observe the game's history under opaqueness. As it will be clearer later, under opaqueness, the raiders' bid does not depend on the raiders' observability of the history.

[16] In fact, the tradeoff between the provision of career concerns incentives and sustenance of implicit contracts arises as long as the firm bears a cost to reverse its disclosure policy. In this sense, Assumption 3 is stronger than what is necessary to capture this tradeoff. However, it simplifies the subsequent analysis.

[17] If one interprets disclosure decisions as a part of job design, this assumption suggests that once a firm adopts a specific job design, it is costly to change it in the future.

[18] This is to say that the managers can participate in the experienced workers' market irrespective of whether he accepts the offer from F in period one.

[19] F's bargaining power is also irrelevant for the subsequent analysis. As discussed in Section 5, F's choice of optimal contract and disclosure policy maximizes the joint surplus between F and $A_t \cdot F$ and A_t can implement any arbitrary allocation of the joint surplus through up-front lump-sum transfers without affecting the contracting efficiency.

The expected payoff of F in generation t, π_t, is the total expected profit it earns over the two periods, that is, $\pi_t = \pi_1^t + \pi_2^t$, where π_τ^t is the profit in period $\tau = 1, 2$. Because the project is undertaken only if the realized signal is s_b, the period 1 profit of F for a given effort level is $\pi_1^t(e) = \mathbb{E}(V \mid s_g, e)\Pr(s = s_g) - \Pr(s = s_g, q = g)B - W$.

In period 2, F can earn positive profit only if she is successful at retaining the manager. So,

$$\pi_2^t(e) = \begin{cases} \mathbb{E}_{(\omega_R,\omega_F)}\mathbb{E}_a[(a - \beta_F(\omega_R, \omega_F)) \mid (\omega_R, \omega_F),\ e] & \text{if } A_t \text{ stays with } F \\ 0 & \text{otherwise} \end{cases}. \tag{2}$$

Note that $\mathbb{E}_a[(a - \beta_F) \mid (\omega_R, \omega_F),\ e]$ is the expected profit of F from retaining A_t in period 2 when the market observes ω_R and F observes ω_F. The expected profit of F in period 2 is simply the expected value of this term, given the distribution of (ω_R, ω_F) and the manager's effort level e. It is implicit in this specification that both F and A_t are risk neutral, and do not discount the future in the stage game.

□ *Timeline.* The timing in the stage game is as follows.
Period 1.0. F offers an implicit contract (publicly) to A_t. If accepted, the game goes to period 1.1; the game ends otherwise.
Period 1.1. A_t generates a project, puts in e, and a signal s on the project quality is realized.
Period 1.2. Project is implemented if $s = s_g$.
End of period 1. Project quality is realized. F decides whether to pay the bonus. R_1 and R_2 observe the available information ω_R.
Period 2.0. R_1 and R_2 bid for A_t, offer β_1 and β_2.
Period 2.1. Observing β_1 and β_2, F makes a counteroffer β_F.
Period 2.2. A_t chooses his employer.
End of period 2. Period 2 wages paid; stage game ends.

Repeated game. The firm discounts its profits from the future generations at the rate $\delta \in [0, 1)$. The lifetime payoff of F is $\Pi = \sum_{t=1}^{\infty} \delta^{t-1}\pi_t$.

Strategies and equilibrium. I will focus only on pure strategies due to their analytical tractability. A pure strategy of the firm has two components. First, at the beginning of the game, F decides its disclosure policy, this is, whether to be transparent or opaque. Second, in every generation, F again takes two decisions. First, depending on the history of the game, it offers a contract to each new manager at the beginning of period 1 that specifies a lump-sum wage (W) and a bonus payment (B). Second, at the beginning of period 2, it decides on the counteroffer to the manager given the history of the game and the available information (including R_1 and R_2's offer).

The strategy of the manager, A_t, in each generation also has two components. At the beginning of period 1 the manager decides on his effort level, given the history of the game and the wage/bonus offer of the firm. Also, at the beginning of period 2, the manager chooses his future employer, given the history of the game and the available information (including R_1 and R_2's offer).

Finally, the strategy of a raider, R_i, is simply a wage bid, β_i, given the information available to it and its perceived level of manager's effort. (See Mukherjee (2005b) for a formal definition of the players' strategies.)

I consider *Perfect Bayesian Equilibrium in trigger strategies* as a solution concept where punishment is triggered by the manager if the firm reneges on its promised bonus payments.[20]

In order to understand the nature of the interaction between the implicit contracts and career concerns, a set of preliminary results is important. These are developed in the next section.

[20] One can allow a richer strategy space by allowing F to build a reputation about its offer-matching behavior. I abstract away from these issues to stay focused on F's reputation in honoring its bonus promise.

3. Some preliminary results

■ I start my analysis by discussing the first best effort level that maximizes the joint surplus of the firm and the manager in each generation. This effort level provides a benchmark to compare and contrast the effectiveness of the different incentive provisions (or, equivalently, disclosure policies) that I am interested in.

□ **The first best.** By assumption, the firm invests *iff* $s = s_g$. So the joint surplus, $S(e)$, of the firm and the manager in any given generation is simply the sum of the value generated in the two periods, $S(e) = [\mathbb{E}(V \mid s_g, e)\Pr(s = s_g) - c(e)] + \mu$. The first best effort level e^{FB} that maximizes $S(e)$ must solve $S'(e^{FB}) = 0$, that is,[21]

$$c'(e^{FB}) = 2\mu(1-\mu)(g-b). \tag{3}$$

The profit of the firm is increasing in effort until the first best level is reached. To characterize the optimum effort level under the two disclosure regimes, one needs to follow two key steps: (i) derivation of the raider's equilibrium bidding strategy and (ii) characterization of the manager's maximal effort level that can be sustained through career concerns. The following two subsections are devoted to this purpose.

□ **The raiders' bidding strategy.** Recall that the manager is equally productive with both raiders. As the raiders compete in their bids to hire the manager, in equilibrium each raider must bid the same amount. Their bid is equal to the expected productivity of the manager conditional on the available information ω_R, and the event of winning the bidding competition (given the strategy of F).

When F is transparent, $\omega_R = \omega_F$. Thus, possible outcomes from a manager's effort that the raiders can observe are $\{s_b\}$, $\{s_g, b\}$, and $\{s_g, g\}$. The following lemma reports the raider's posterior expectations about the manager's ability level for each of these three outcomes. (This is based on Lemma 1 in Milbourn et al., 2001. I omit the proof here, because it is available in their article.)

Lemma 1. The posterior expectations of the manager's ability conditional on each of the project performances are: $\mathbb{E}_a(a \mid \{s_g, g\}, e^*) = \mu + \sigma^2/\mu$, $\mathbb{E}_a(a \mid \{s_g, b\}, e^*) = \mu - \sigma^2/(1-\mu)$ and $\mathbb{E}_a(a \mid \{s_b\}, e^*) = \mu - \sigma^2(2e^* - 1)/(\mu - (2\mu - 1)e^*)$.

(Recall that e^* is the raider's belief about the manager's effort level.) As these posterior expectations play an important role in this analysis, it is worthwhile to develop more concise notations for them. Let

$$w_g := \mathbb{E}_a\big(a \mid \{s_g, g\}, e^*\big),\ \bar{w}(e^*) := \mathbb{E}_a\big(a \mid \{s_b\}, e^*\big),\ \text{and } w_b := \mathbb{E}_a\big(a \mid \{s_g, b\}, e^*\big).$$

A few observations regarding Lemma 1 are worth noting.[22] First,

$$w_b \le \bar{w}(e^*) \le \mathbb{E}(a) = \mu < w_g\ \ \forall e^*.$$

The posterior expectation about the manager's ability is at its highest when a good project is realized, followed by the cases where no project is implemented and where a bad project is implemented.

Second, because the quality of a project is a sufficient statistic for the manager's ability with respect to his effort, when the quality of the project is revealed (that is, under $\{s_g, g\}$ and

[21] Here I use the following conditions: $\Pr(s = s_g, q = g) = \Pr(s = s_g \mid q = g)\Pr(q = g) = \mu e$, $\Pr(s = s_g, q = b) = (1-\mu)(1-e)$, and $\mathbb{E}(V) = \mu g + (1-\mu)b - i = 0$.

[22] To be precise, $\mathbb{E}_a(a \mid \{s_g, b\}, e^*)$ is defined only for $e^* \in [1/2, 1)$. If $e^* = 1$, $\{s_g, b\}$ can never be observed, because a bad project will surely be detected and never be implemented. For the sake of completeness, I define $w_b = \mathbb{E}_a(a \mid \{s_g, b\}, e^*)$ for $e^* \in [1/2, 1)$ and $w_b = \mathbb{E}_a(a \mid \{s_b\}, e^*)$ for $e^* = 1$.

$\{s_g, b\}$), the raiders' posterior expectations of the manager's ability are independent of their beliefs about the manager's effort (that is, w_g and w_b are independent of e^*).

Third, $\bar{w}(e^*)$ is decreasing in the raider's belief about the manager's effort (e^*). Higher e^* implies that the raiders believe the signal to be very accurate. Hence, the realization of s_b is a strong indicator that the underlying project is indeed bad, that is, Pr $(b \mid s_b, e^*)$ is high. But the probability of a bad project is decreasing in the manager's ability. So the occurrence of s_b hurts the manager's reputation more when the signal is assumed to be very precise.[23]

Lemma 1 is useful to pin down the raider's bidding strategies. Under transparency, the event of winning the bidding competition provides no additional information to the raiders regarding the quality of the manager. As a consequence, in equilibrium, a raider's bid is equal to the expected value of the manager's ability conditional on the realized information $\omega_R (= \omega_F)$.

On the contrary, when firm F is opaque (that is, $\omega_R = \{\emptyset\}$), the event of winning the bidding competition does carry additional information about the manager's quality. In equilibrium, the raider must take this information into account to avoid overbidding. This is a typical adverse selection argument (Akerlof, 1970; Greenwald, 1986). Because F values the manager as much as the raiders do, the raiders must bid only for the lowest type of manager. This observation is similar to the winner's curse problem in a common value auction. Lemma 2 summarizes this discussion, and states the raiders' equilibrium bidding strategies under both transparency and opaqueness. I will omit the proof as the logic has already been discussed above.

Lemma 2. The equilibrium bidding strategies of the raiders are as follows.

(i) Under transparency, $\beta_1(\omega_R, e^*) = \beta_2(\omega_R, e^*) = \mathbb{E}(a \mid \omega_R, e^*)$.
(ii) Under opaqueness, $\beta_1(\omega_R, e^*) = \beta_2(\omega_R, e^*) = w_b$.

Because the manager is equally productive with the firm and the raiders, under transparency, the firm will always match the raiders' bid. Under opaqueness, due to the adverse selection problem, the raiders bid only (the value of) the lowest-type manager. Hence, the firm has a stronger incentive to match the bids and earns a retention profit on all manager types except the lowest one.

Using this fact and the above lemmas, I now characterize the maximal effort level induced by the career concerns of the manager.

□ **Career concerns based incentives.** To highlight the role of career concerns, I assume for the moment that the firm cannot provide any incentives through bonus payments (that is, $B = 0$) for exogenous reasons, and may only rely on the manager's career concerns to motivate him to work. Recall that such incentives are present only when the firm is transparent, and the possible outcomes of a manager's effort that the raiders can observe are $\{s_b\}$, $\{s_g, b\}$, and $\{s_g, g\}$. From Lemma 2, one finds that given ω_R, the raiders bid $\beta(\omega_R, e^*) = \mathbb{E}(a \mid \omega_R, e^*)$, which—by virtue of competition—is also the manager's payoff in period 2 following ω_R. Hence, the manager's expected utility in period 1 is $u_1^t(e) = W - c(e)$, and in period 2 is $u_2^t(e) = \mathbb{E}_{\omega_R}(\mathbb{E}_a(a|\omega_R, e^*) \mid e)$. The manager's problem is to choose an effort level that maximizes his payoff, given the raiders' belief about his effort level (e^*), that is,

$$\max_e U_t(e) = \underbrace{W - c(e)}_{u_1^t(e)} + \underbrace{\mu e w_g + (1-e)(1-\mu)w_b + (\mu(1-e) + (1-\mu)e)\bar{w}(e^*)}_{u_2^t(e)}. \quad (4)$$

The first-order condition of the manager's optimization problem is

$$\mu\big(w_g - \bar{w}(e^*)\big) + (1-\mu)\big(\bar{w}(e^*) - w_b\big) = c'(e). \quad (5)$$

[23] Indeed, if $e^* = 1$, a bad signal indicates a bad project with certainty. Thus, $\{s_b\}$ would be observationally equivalent to $\{s_b, b\}$.

Equation 5 is the key in understanding how career concerns arise in this model. Career concerns incentives arise because higher effort increases the precision of the signal. It ensures that a good project is identified and implemented with a higher probability. Consequently, the manager's expected period 2 payoff increases from $\bar{w}(e^*)$ to w_g. Also, with increased precision, a bad project is identified (and not implemented) with a higher probability. This raises the manager's expected ability level (i.e., his period 2 payoff) from w_b to $\bar{w}(e^*)$. Thus, higher effort helps the manager to reveal his true ability when the underlying ability is high. It also helps him to hide his true ability when the underlying ability is low. Plugging in the expressions for w_g, w_b, $\bar{w}(e^*)$ (using Lemma 1) and simplifying equation (5), one arrives at

$$\kappa(e^*) := \frac{\sigma^2}{\mu - (2\mu - 1)e^*} = c'(e). \tag{6}$$

The left-hand side of the above equation, $\sigma^2/\mu - (2\mu - 1)e^*$, is the marginal gain in the manager's future wage if he exerts an additional unit of effort today, and the raiders believe the effort level to be e^*. I will denote this gain as the marginal benefit of effort due to career concerns. If the bonus payments are absent (i.e., $B = 0$), in equilibrium this quantity must be equal to the marginal cost of effort, $c'(e)$.[24] Milbourn et al. (2001) make an important observation about the κ function, which I summarize in the following remark.

Remark 1. $\kappa'(e^*) >$ or < 0 according to whether $\mu >$ or $< 1/2$.

The marginal benefit of effort due to career concerns increases in the raiders' belief about the manager's effort level (e^*) if and only if a good-quality project is more likely than a bad one (that is, $\mu > 1/2$). The intuition behind this result can be traced from the source of career concerns incentives. Such incentives originate as effort increases the probability that a good project *will be* implemented (thus, the manager's period 2 wage increases from $\bar{w}(e^*)$ to w_g), and that bad projects will *not* be implemented (thus, the manager's period 2 wage increases from w_b to $\bar{w}(e^*)$). As e^* increases, the former benefit $(w_g - \bar{w}(e^*))$ rises while the latter one $(\bar{w}(e^*) - w_b)$ falls. This is due to the fact that $\bar{w}(e^*)$ is decreasing in e^*. When the good project is more likely, then the former benefit dominates, and the total marginal benefit increases (see equation (5)). The opposite happens when the bad project is more likely. This finding will play a central role in the analysis of a firm's disclosure decision. One can also check that $\kappa''(e^*) > 0$, that is, κ is convex in e^*.

In equilibrium, the raiders must hold correct beliefs about the manager's effort level, that is, $e^* = e$. So, the level of effort sustained through the career concerns-based incentives must solve

$$\kappa(e) = c'(e). \tag{7}$$

I denote this effort level as e^C. The restrictions on c' as mentioned in Assumption 1 ensure that the solution to (7) always exists. The following assumption puts restrictions on the function $c'(e) - \kappa\ (e)$ to ensure that this solution is also unique.

Assumption 4. $c'(e) - \kappa(e)$ is increasing and convex in e.

The above assumption requires marginal cost of effort (c') to be sufficiently steep and convex because κ' can be positive (if $\mu > 1/2$) and $\kappa'' > 0$. In fact, e^C is unique whenever $c' - \kappa$ is monotone. The restrictions in Assumption 4 are therefore stronger than what is needed to ensure uniqueness.[25] However, this assumption simplifies the analysis for a transparent firm (to be discussed in Section 5). It is also worth noting that e^C is increasing in the mean and variance of the prior distribution of the manager's ability.

[24] The second-order condition is trivially satisfied as $c'' > 0$.

[25] In fact, for $\mu < 1/2$, $c' - \kappa$ is increasing because $\kappa' < 0$. Thus, Assumption 4 is partly redundant in this case.

To make the problem interesting, I will assume that $e^C < e^{FB}$; else, the implicit incentives are irrelevant for optimal incentive provisions.[26]

4. Interaction between the two types of incentives in a transparent firm

■ Under transparency, the raiders observe the manager's performance and form posterior beliefs about his ability accordingly. This gives rise to career concerns for the manager. Thus, unlike opaqueness, a transparent firm can rely on the career concerns incentives as well as on the bonus payments sustained through reputation.

Lemma 2 suggests that given ω_R, the raiders bid $\mathbb{E}_a(a|\omega_R, e^*)$ in equilibrium. Given a bonus level B, by equation (1), the manager's problem can be written as

$$\max_e U_t(e) = u_1^t(e) + u_2^t(e) = \mu e B + W - c(e) + \mathbb{E}_{\omega_R}\left(\mathbb{E}_a\left(a \mid \omega_R, e^*\right) \mid e\right).$$

The first-order condition of the above problem (using Lemma 1) is

$$\mu B + \kappa(e^*) = c'(e). \tag{8}$$

(Recall that $\kappa\,(e^*) = \sigma^2/(\mu - (2\mu - 1)\,e^*)$.) This is the (IC) constraint of the manager that equates the combined marginal benefit from the bonus payment (μB) and career concerns ($\kappa(e^*)$) to the marginal cost of effort. Because the raiders must hold correct beliefs about the manager's effort level in equilibrium, that is, $e^* = e$, the effort level that the firm can sustain under transparency (given B) must solve

$$\mu B + \kappa(e) = c'(e). \tag{9}$$

Equation (9) delivers an important insight into the comparative statics effect of the bonus payment in the presence of career concerns. An increase in the bonus payment impacts the manager's choice of effort in two ways. Keeping κ fixed at $\kappa\,(e^*)$, an increase in B leads to an increase in the marginal benefit of effort. Therefore, the optimal effort level increases. This is the *direct effect* of increasing the bonus payment. However, because the raiders always hold correct beliefs about the manager's effort level in equilibrium, with the rise in the bonus payment the raiders expect the manager to work harder, that is, e^* increases. The raiders will now evaluate a manager more harshly if he fails, because he has failed in spite of working harder. This creates an *indirect effect*. By Remark 1, $\kappa\,(e^*)$ increases with e^* when $\mu \geq 1/2$ and decreases otherwise. Hence, if $\mu \geq 1/2$, an increased bonus payment also provides an indirect impetus to the manager's effort incentives by increasing the marginal benefit of effort due to career concerns. He finds it optimal to work even harder to succeed in order to avoid the harsh evaluation that comes with failure. In other words, if $\mu \geq 1/2$, bonus payments enhance (or *complement*) career concerns-based incentives.

The opposite happens when $\mu \leq 1/2$. With an increase in e^*, $\kappa\,(e^*)$ decreases, dampening the direct effect of bonus payments. The manager finds it optimal to reduce his effort in order to attribute his possible failure to low effort rather than to low ability. In other words, bonus payments weaken (or *substitute*) career concerns incentives in such an environment. The following proposition summarizes this finding (I omit the proof as the argument is already discussed above).

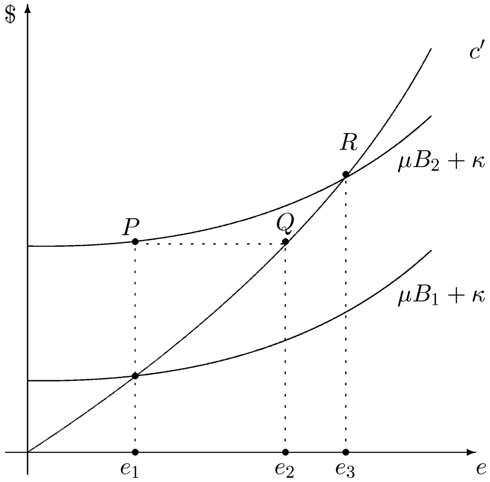
Proposition 1(Interaction of incentives). Bonus payments sustained through implicit contracts enhance (complement) career concerns incentives if $\mu \geq 1/2$, but weaken (substitute) them otherwise.

This point is further illustrated in Figure 1, which plots the right- and left-hand sides of equation (9), when $\mu \geq 1/2$ (the complements case).

[26] In other words, there is a need for augmenting career concerns incentives with implicit contracts only when career concerns incentives are not adequate to elicit the first best effort level. This condition can easily be ensured when $g - b$ is sufficiently large.

FIGURE 1

IMPACT OF INCREASED BONUS: COMPLEMENTS CASE (μ > 1/2)



Suppose the firm increases the bonus level from B_1 to B_2. Because I consider the case $\mu > 1/2$, $\mu B + \kappa\ (e)$ is an increasing function of e. Let the solution to equation (9), when $B = B_1$, be e_1. As B_1 increases to B_2, the $\mu B_1 + \kappa$ curve shifts up to $\mu B_2 + \kappa$. Let the new solution be e_3. The move from e_1 to e_3 can be decomposed into a direct and an indirect effect. Keeping κ fixed at $\kappa\ (e_1)$, a rise in B increases the marginal benefit of effort to the point P. The (IC) constraint of the manager, therefore, implies that the optimal effort level must rise to e_2 where marginal cost of effort is equal to the marginal benefit (if the raiders' belief is held fixed at e_1). So the direct effect of an increased bonus payment is an increase in the effort level from e_1 to e_2 (movement from P to Q). However, the value of κ will also increase as the effort level increases, because the raiders will update their beliefs about the manager's effort level. Therefore, the total marginal benefit of effort (based on both bonus and career concerns) is further enhanced. The optimal effort level must rise to e_3 where the marginal cost of effort is equal to the marginal benefit. The movement from e_2 to e_3 is the indirect effect of an additional bonus amount (movement from Q to R). Both direct and indirect effects are positive when $\mu > 1/2$.

The analysis is similar when $\mu < 1/2$ with one major exception: the indirect effect (movement from e_2 to e_3) is negative as κ decreases with μ when $\mu < 1/2$.

Recall that μ represents the prior expectation of the manager's ability, which is also the probability of finding a good project. Thus, Proposition 1 can also be interpreted as follows. When the prior expectation on the manager's ability is high (that is, a good project is relatively easy to find), bonus payments enhance career concerns-based incentives, and vice versa. If the expected ability of the manager is high, he works harder to reveal his ability. If his ability is low, he reduces his effort to hide it from the market.

Two issues are important to note in this context. First, this result is reminiscent of Dewatripont et al. (1999b), who show that the complementarity of effort and ability in the firm's production function can lead to a complementarity between career concerns and explicit pay-per-performance contracts. In contrast, here the complementarity between the two incentives originates solely from the impact of the labor market's belief (about the manager's effort level) on the career concerns incentives. Indeed, in this model, the quality of the project is entirely governed by the manager's ability and does not depend on effort level.

Second, the fact that in this model, effort plays no role in governing project quality is not crucial for this result. As long as the future wage gains from correctly identifying a good project (that is, $w_g - \bar{w}(e^*)$) are increasing, and those from a bad project (that is, $\bar{w}(e^*) - w_b$)

are decreasing in the market's belief about the manager's effort level, a similar result will hold.

The insight developed in Proposition 1 plays a key role in understanding the optimal disclosure policy of a firm, as discussed in the following section.

5. The optimal disclosure policy

■ **Optimal contract in an opaque firm.** Because the raiders do not observe the manager's (A_t) performance under opaqueness, their posterior beliefs about the manager's ability are the same as their prior beliefs. Consequently, the expected wage of A_t in period 2 is independent of his performance, and simply equals his expected ability ($u_2^t(e) = \mu$). Thus, the firm (F) cannot rely on the manager's career concerns incentives. However, as mentioned in Section 2, F can provide implicit incentives (bonus payments) sustained through reputation. Given a bonus level B (paid only if the implemented project is good), the optimization program for A_t is $\max_e U_t(e) = u_1^t(e) + u_2^t(e) = \mu e B + W - c(e) + \mu$. Therefore, the optimal effort level must solve the following first-order condition[27]:

$$\mu B = c'(e). \tag{10}$$

The firm's profit in period 1 is $\pi_1^t(e) = \mathbb{E}(V \mid s_g, e)\Pr(s = s_g) - \mu e B - W$. In period 2, by Lemma 2, both raiders bid w_b, and the firm will always match the offer, that is, $\beta_F = w_b$ for all ω_F.[28] So, from equation (2), the period 2 profit of F can be derived as $\pi_2^t(e) = \mathbb{E}_{(\omega_R,\omega_F)}\mathbb{E}_a[a - \beta_F(\omega_R, \omega_F)] = \mu - w_b$. The firm's choice of B and e that maximizes its profit from each generation ($\pi_t = \pi_1^t + \pi_2^t$) must satisfy the individual rationality (*IR*) and the incentive compatibility (*IC*) constraints of the manager. Moreover, because the bonus payment is sustained through reputation, it must also satisfy a dynamic restriction (*DR*) constraint. The (*DR*) constraint requires that the firm's payoff from reneging on the bonus payment must be (weakly) less than its equilibrium payoff.

The firm's payoff from reneging on the bonus payment deserves careful study. Under the grim trigger strategies, the future generations of managers will exert their lowest possible effort ($e = 1/2$), which is their static best response.[29] Because the signal is not informative about the quality of the project when $e = 1/2$, $\mathbb{E}(V \mid s_g, e = 1/2) = \mathbb{E}(V) = 0$. Hence, on the punishment path, F and A_t jointly produce a surplus of μ (that is, only the period 2 output of the manager). However, F must at least offer μ to A_t to make him accept the contract (recall that the manager's outside option is μ). Thus, on the punishment path, F earns $\pi_t(1/2) = 0$ in each generation.[30] The dynamic restriction constraint therefore requires that F's continuation payoff in equilibrium, $\delta\pi_t(e)/(1-\delta)$, must be at least as large as its payoff from reneging on the bonus payment. The latter payoff is simply equal to B, because F's payoff in the punishment path is zero.

The optimization program for the firm can now be written as

$$\max_{W,B,e}\ \pi_t(e) = [\mathbb{E}(V \mid s_g, e)\Pr(s = s_g) - \mu e B - W] + [\mu - w_b]$$

$$s.t. \begin{cases} \mu e B + W - c(e) + w_b = \mu & (IR) \\ \mu B = c'(e) & (IC) \\ \delta\pi_t(e)/(1-\delta) \geq B. & (DR) \end{cases}$$

Using (*IR*) and (*IC*) to eliminate W and B, one can rewrite the above problem as

$$\mathcal{P}^O : \begin{cases} \max_e \pi_t(e) = \mu e(g - i) + (1-\mu)(1-e)(b-i) - c(e) \\ \quad s.t.\ \delta\pi_t(e)/(1-\delta) \geq \mu^{-1}c'(e). & (DR^O) \end{cases}$$

[27] Again, the second-order condition is trivially satisfied as $c'' > 0$

[28] Because in equilibrium the raiders hold correct beliefs about the manager's effort level, one can set $e^* = e$.

[29] Note that the firm will also revert to its static best response and set $B = 0$.

[30] Here I focus on a continuation game where an opaque F hires A_t even on the punishment path. Observe that such a continuation game is payoff equivalent to the game where an opaque F stops hiring A_t following a deviation.

Let e^O (δ) be the solution to $\mathcal{P}^O$ for a given δ. Because $\pi_t(e)$ is increasing in e as long as the first best level is not reached (that is, $e < e^{FB}$), if e^{FB} is not feasible, e^O (δ) is simply the largest value of e that solves (DR^O). The following lemma characterizes the solution to $\mathcal{P}^O$.

Lemma 3. There exist values of δ, $\underline{\delta}^O$, and $\overline{\delta}^O$, and a function $\hat{e}^O : [0, 1) \to [1/2, 1]$, such that

$$e^O(\delta) = \begin{cases} 1/2 & \text{if } \delta \leq \underline{\delta}^O \\ \hat{e}^O(\delta) & \text{if } \underline{\delta}^O < \delta < \overline{\delta}^O \\ e^{FB} & \text{if } \delta \geq \overline{\delta}^O. \end{cases}$$

Moreover, $e^O(\delta)$ is continuous and (weakly) increasing.

For δ below a certain threshold, $\underline{\delta}^O$, (DR^O) is always binding, and the firm cannot credibly commit to any bonus payment. The firm can only sustain the minimal effort level, $e = 1/2$. As δ increases above $\underline{\delta}^O$, the left-hand side of (DR^O) increases for any given e, and relaxes the (DR^O) constraint. Thus, the largest value of e that satisfies (DR^O) also increases. This is represented by the function $\hat{e}^O(\delta)$. As δ exceeds a threshold, $\overline{\delta}^O$, the first best effort becomes feasible.

The characterization of e^O resembles a result in Baker et al. (1994). While studying the interaction between implicit contracts and explicit pay-per-performance contracts, they derive a similar optimal effort schedule when the firm can only rely on implicit incentives of bonus payments. I next analyze the case of a transparent firm that may augment career concerns incentives with incentives created through implicit contracts.

□ **Optimal contract in a transparent firm.** Analogous to the opaque case, the optimal contract under transparency maximizes the firm's profit in each generation subject to the (*IR*), (*IC*), and (*DR*) constraints. However, the optimization problem of a transparent firm differs from its opaque counterpart in several ways.

Because under transparency, A_t's wage is always bid up to his expected ability, F will match the offer but will make zero profit in period 2 (i.e., $\pi_2^t(e) = 0$). Also note that the expected payoff of A_t in period 2 is $\mathbb{E}\beta_F$ (which, due to the bidding competition, is equal to the prior expectation of A_t's ability (μ)). Therefore, the (*IR*) constraint requires $\mu e B + W - c(e) + \mathbb{E}\beta_F = \mu$.

The (*IC*) constraint (given by equation (9)) also differs from the opaque case because a transparent firm can augment implicit contracts with career concerns incentives.

Finally, the punishment payoff of the firm is also affected by transparency. Under the grim trigger strategies, the manager reverts to his static best response, and responds only to the career concerns incentives if the firm reneges on its bonus payments.[31] In other words, on the punishment path $e = e^C$, the effort level sustained through career concerns.[32] Because the raiders bid the expected value of the manager, F and A_t jointly create a surplus of $\pi_t(e^C) + \mu$, where $\pi_t(e^C) = E(V \mid s_g, e^C) \Pr(s = s_g) - c(e^C)$. Because F must offer μ to A_t to match his outside option, F's payoff in every generation on the punishment path is $\pi_t(e^C)$. The (*DR*) constraint requires that F's continuation payoff in equilibrium ($\delta\pi_t(e)/(1-\delta)$) must be at least as large as its payoff from defection ($B + \delta\pi_t(e^C)/(1-\delta)$).

Similar to the opaque case, using (*IR*) and (*IC*) to eliminate W and B, the optimization problem of a transparent firm can be written as

$$\mathcal{P}^T : \begin{cases} \max_e \pi_t(e) = \mu e(g-i) + (1-\mu)(1-e)(b-i) - c(e) \\ s.t.\ \delta\left[\pi_t(e) - \pi_t(e^C)\right]/(1-\delta) \geq \mu^{-1}(c'(e) - \kappa(e)),\ \ \forall e > e^C. \end{cases} \qquad (DR^T)$$

Analogous to the previous section, let e^T (δ) be the solution to $\mathcal{P}^T$ for a given δ. Under Assumption 4, $c' - \kappa$ is increasing and convex. Hence (DR^T) has similar characteristics as (DR^O), implying

[31] Similar to the opaque case, F will set $B = 0$ on the punishment path.

[32] This argument relies on the fact that under transparency, the raiders can observe the history of the game, and therefore are aware of the past deviation. Hence, they hold a correct belief about the manager's effort level on the punishment path.

that e^O and e^T must have similar characteristics. Lemma 4 characterizes the optimal effort level in a transparent firm.

Lemma 4. There exist values of δ, $\underline{\delta}^T$, and $\overline{\delta}^T$, and a function $\hat{e}^T : [0, 1) \to [1/2, 1]$, such that

$$e^T(\delta) = \begin{cases} e^C & \text{if } \delta \le \underline{\delta}^T \\ \hat{e}^T(\delta) & \text{if } \underline{\delta}^T < \delta < \overline{\delta}^T \\ e^{FB} & \text{if } \delta \ge \overline{\delta}^T. \end{cases}$$

Moreover, $e^T(\delta)$ is continuous and (weakly) increasing.

Similar to the opaque case, for low values of δ ($\delta \le \underline{\delta}^T$), it is not possible for F to sustain any bonus payment. Consequently, A_t only faces career concerns incentives, and exerts the career concerns-based effort level e^C. For $\delta > \underline{\delta}^T$, the maximum bonus level that F can sustain increases with δ. Therefore, the associated effort level represented by the function $\hat{e}^T(\delta)$ is also increasing in δ. As δ reaches a threshold $\overline{\delta}^T$, the first best effort level becomes feasible.

Using the characterizations of the optimal effort levels under both opaqueness and transparency, I now explore the question of the optimal disclosure policy.

□ **The optimal disclosure policy.** For a given value of δ, the optimal disclosure policy of the firm is the one that maximizes the associated profit level. Because π_t is an increasing function of e ($\forall\, e \le e^{FB}$), it is enough to compare the two functions $e^O(\delta)$ and $e^T(\delta)$.[33] This comparison, in turn, depends on which of the two dynamic restriction constraints is binding at a given δ. Observe that one can write the (DR^T) constraint as

$$\frac{\delta}{1-\delta}\pi_t(e) \ge \frac{1}{\mu}c'(e) + \Delta(e, \delta), \tag{11}$$

where $\Delta(e, \delta) := \frac{\delta}{1-\delta}\pi_t(e^C) - \frac{1}{\mu}\kappa(e)$. So, (DR^T) $(or(DR^O))$ is binding if $\Delta(e, \delta) > (or <)\ 0$, and the characteristics of $\Delta(e, \delta)$ determine the optimal transparency decision of the firm. In fact, the nature of Δ depends on whether the bonus payments substitute (or complement) career concerns. The following propositions characterize the optimal disclosure policy of the firm under each of these two cases. Define δ^C as the value of δ at which an opaque firm can sustain the career concerns level of effort, that is, $e^O(\delta^C) = e^C$.

Proposition 2 (Optimal disclosure: substitutes case). If $\mu \le 1/2$, so that the bonus payments substitute career concerns, the optimal disclosure policy is transparency if $\delta \le \delta^C$, and opaqueness otherwise. Moreover, a transparent firm never offers any bonus payments.

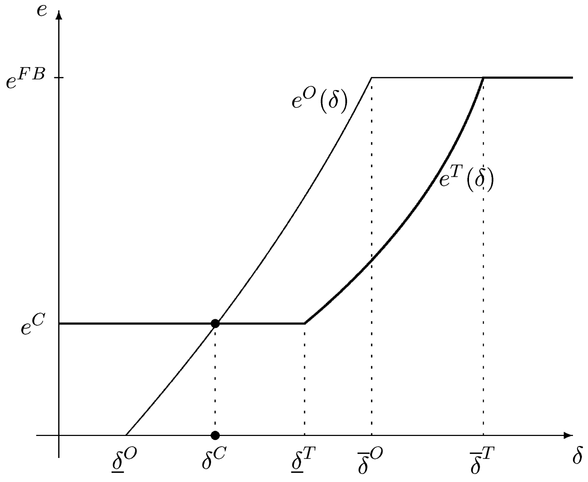
Proposition 2 suggests that when bonus payments substitute career concerns incentives, the optimal disclosure policy follows a cutoff rule. The firm prefers to be transparent only if δ is less than a threshold, δ^C. Moreover, the value of δ^C is sufficiently small, such that it precludes the possibility of sustaining any implicit contract under transparency. This implies that when bonus payments substitute career concerns, the manager is exposed to either career concerns incentives or implicit incentive contracts, but it is never the case that both incentives are present simultaneously. This case is represented in Figure 2.

The intuition for Proposition 2 follows from two observations. First, the firm prefers to be transparent only if it can combine the two types of incentives, and relax the (IC) constraint by doing so. When the bonus payments substitute career concerns, the gain in effort due to a higher bonus is dampened in a transparent firm by weaker career concerns incentives. Hence, once δ reaches a level where the firm can sustain the same level of effort under transparency as it can under opaqueness, the firm cannot profit from augmenting career concerns with implicit contracts. Therefore, there is no case for transparency. As $e^O(\delta^C) = e^T(\delta^C) = e^C$, F will only be transparent for $\delta \le \delta^C$.

[33] Even though an opaque firm can earn a retention profit (see Section 3), this effect is neutralized through the manager's (IR) constaint (see programs $\mathcal{P}^O$ and $\mathcal{P}^T$).

FIGURE 2

THE OPTIMAL EFFORT UNDER OPAQUENESS AND TRANSPARENCY ($\mu < \frac{1}{2}$)



Second, the firm never combines the two types of incentives because the minimum δ required to combine the two forms of incentives ($\underline{\delta}^T$) is greater than the δ at which the firm can implement a career concerns level of effort under opaqueness (δ^C). Because $e^C \in (1/2, e^{FB})$, (DR^O) must bind when $e^O(\delta^C) = e^C$, that is, $\delta^C/(1-\delta^C) = c'(e^C)/\mu\,\pi_t(e^C)$. Also, $\underline{\delta}^T$ is the maximum value of δ at which no bonus payment is feasible. So, the right-hand side of (DR^T) must be tangential to the left-hand side expression at $\underline{\delta}^T$, that is, we must have

$$\frac{\underline{\delta}^T}{1-\underline{\delta}^T} = \frac{c''(e^C) - \kappa'(e^C)}{\mu\pi_t'(e^C)} > \frac{c''(e^C)}{\mu\pi_t'(e^C)} > \frac{\delta^C}{1-\delta^C}. \tag{12}$$

The first inequality follows because $\kappa'(e) < 0$ when $\mu < 1/2$. The latter is implied by the fact that as π_t is concave and c' is convex, at $e = e^C$, $\mu^{-1}c'(e)$ must intersect $\delta^C\,\pi_t(e)/(1-\delta^C)$ from below. So, $\underline{\delta}^T > \delta^C$.

This intuition breaks down if the two types of incentives are complements.

Proposition 3 (Optimal disclosure: complements case). If $\mu > 1/2$, so that the bonus payments complement career concerns, the optimal disclosure policy need not follow a cutoff rule, and even a transparent firm may offer bonus payments. In particular, depending on the parameter values, each of the following disclosure policies can be optimal:

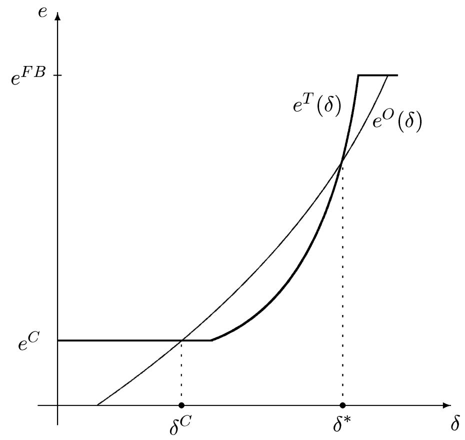
(i) transparency for all $\delta \in (0, 1)$; transparent firms offer bonus payments whenever feasible;
(ii) there exists a value of δ, δ^*, such that transparency is optimal if $\delta \leq \delta^C$ or $\delta \geq \delta^*$; opaqueness is optimal otherwise. Moreover, a transparent firm offers bonus payments only if $\delta \geq \delta^*$;
(iii) transparency if $\delta \leq \delta^C$ and opaqueness otherwise. Moreover, a transparent firm never offers any bonus payments.

The fact that each of these three disclosure policies can be optimal implies that the "substitute case" characterization of the optimal policy may or may not hold when the incentives are complements.[34] In the complements case, the impact of an increase in δ on effort can be stronger

[34] Note that Proposition 3 does not claim that for any parameter value, one of these three policies is necessarily optimal. It leaves open the possibility that for some parameter values, the optimal policy is different from all the three policies described here.

FIGURE 3

THE OPTIMAL EFFORT UNDER OPAQUENESS AND TRANSPARENCY ($\mu > \frac{1}{2}$, case (ii))



under transparency than under opaqueness (due to the enhanced career concerns that follow from a higher bonus payment). In such a setting, if a transparent firm can initiate bonus payments at a δ where an opaque firm cannot sustain the career concerns level of effort (that is, $\underline{\delta}^T < \delta^C$), then the firm will never resort to opaqueness. Moreover, the firm will offer bonus payments for all $\delta > \underline{\delta}^T$. This is case (i).

In contrast, when $\underline{\delta}^T > \delta^C$, for a discount factor "moderately" greater than δ^C, transparency is clearly dominated. However, if the marginal impact of δ on effort is higher when the firm is transparent, there may exist a value of $\delta > \delta^C$, say, δ^*, where the firm can credibly offer enough bonus such that the induced optimum effort under transparency becomes equal to the optimal effort under opaqueness. For discount factors higher than δ^*, transparency is the optimal disclosure policy. Observe that, in this case, $\forall \delta > \delta^*$, a transparent firm offers bonus payments, that is, combines career concerns with implicit incentive contracts. This is case (ii) (see Figure 3). If δ^* is sufficiently large such that an opaque firm can implement the first best effort at δ^* (i.e., $\delta^* > \overline{\delta}^O$), the optimal disclosure policy follows a cutoff rule, and it resembles the case of substitutes. In this scenario (case (iii)), even when δ has a stronger impact on effort under transparency, the optimal effort under transparency never catches up with the optimal effort under opaqueness for any $\delta > \delta^C$.

6. Empirical implications

■ Propositions 2 and 3 are instructive in understanding the role of the worker's expected prior ability in determining the firm's disclosure policy. This section draws out the key empirical implications of these two propositions, and also highlights a few interesting comparative statics results.

First, among the firms that cannot attract enough talent/ability, or those that operate in an environment where talent is scarce (that is, low μ), there is a negative correlation between their reputation concerns (δ) and the level of transparency they adopt. However, this need not be the case among the firms that do attract highly talented/able workers (that is, operate where μ is high). Second, among the firms with high reputation concerns (that is, high δ), transparency is more likely where talent/ability is easy to attract (high μ). Finally, among the opaque firms, a moderate increase in the availability of talent (so that opaqueness remains optimal) increases the bonus payments. Due to the dynamic restriction constraint, bonus payments are bounded above by the discounted value of the firm's profit stream. This comparative statics result follows from the fact that the firm's per-period profit is increasing in μ.[35]

Although measuring firm transparency is in general difficult, it is possible to find examples of transparent and opaque organizations in specific settings. Massa et al. (2006) study mutual funds' choices of whether to identify a particular individual as the head of a mutual fund or to list the fund as being anonymously "team managed." One major implication of the choice is the information available to the labor market about the performance of the fund manager. Fund performance is, of course, publicly observable. So, identifying a particular individual as heading the fund allows the labor market a clear observation regarding individual-level performance. The recent increase in "team-managed" funds documented by Massa et al. suggests that career concerns incentives have weakened in this industry. In such a context, one can gather data on the prevalence and strength of implicit contracts in this industry in order to inform the tradeoffs I discuss here.

To test the specific comparative statics of my model in the context of mutual fund managers, one needs to develop empirical measures of δ and μ. Fund liquidation probabilities may offer a way to assess the relative importance of present versus future cash flows (see Getmansky et al., 2004) for a study of liquidation rates of different types of hedge funds). However, measuring *ex ante* expected managerial ability may prove difficult. One may look for variations in demographic characteristics of managers that may be correlated with the manager's *ex ante* ability, conditional on the fact that the individual has already been hired as a manager. Variations in the firms' investments in human capital may also capture variations in ability.

How does a firm's optimal disclosure policy change with μ and σ^2, *keeping* δ *fixed*? The result, however, is often ambiguous. To see this, consider the case where $\mu > 1/2$. Under transparency, μ and/or σ^2 reduce both sides of the dynamic restriction constraint.[36] Therefore, their net impact on the optimal effort level (e^T) is unclear, and one cannot predict how δ^* changes with μ and σ^2. Similarly, when $\mu < 1/2$, an increase in μ increases both career concerns-based effort (e^C) and optimal effort under opaqueness (e^O). Thus, the impact of μ and/or σ^2 on δ^C is also ambiguous. However, an increase in σ^2 makes transparency more likely (when $\mu < 1/2$) because e^C increases with σ^2, but e^O remains unaltered.

7. Discussion and conclusion

■ I present a model where a firm augments career concerns incentives with incentives created through implicit contracts. In this context, the disclosure of the agent's productivity information involves a crucial tradeoff. Transparency enhances career concerns incentives, but reduces the firm's ability to sustain implicit contracts.

I show that implicit contracts weaken (or substitute) career concerns if the prior expectation about worker ability is low, and vice versa. The nature of interaction between these two sources of incentives plays an important role in the firm's disclosure decisions. When these incentives are substitutes, the optimal disclosure policy follows a cutoff rule where a patient firm always opts for opaqueness. Also, a transparent firm never offers implicit incentives. In contrast, when the incentives are complements, the disclosure decision need not follow a cutoff rule. Moreover, there can exist environments where even a patient firm finds it optimal to be transparent, and augments career concerns incentives with implicit contracts.

In order to highlight the interaction between career concerns and implicit contracts, I have considered an environment where explicit contracts are assumed to be infeasible. However, explicit contracts are not inconceivable in the Milbourn framework. For example, one might assume that investment is verifiable, and therefore the firm might offer an explicit contract based

[35] By the same logic, bonus payments are not influenced by the variance of the talent pool (σ^2) because this does not affect the per-period profit of the firm.

[36] Both $\pi_t(e^C)$ and κ increase with μ and σ^2.

on the implementation of the project. Such an assumption is even more plausible in a transparent firm where the project outcome can be observed by a third party.[37] What are the consequences of allowing explicit contracts in this model? Because the managers are risk neutral and they are not liquidity constrained, explicit contracts can completely solve the moral hazard problem, and neither implicit contracts nor career concerns are necessary to provide incentives. But if one considers a richer setting where explicit contracts are not sufficient to ensure the first best, there may still be room for both implicit contracts and career concerns incentives, and the tradeoff with transparency remains relevant. For example, if the manager is risk averse, career concerns incentives may offer a better insurance to the manager through an intertemporal allocation of risk (see Mukherjee, 2005a); also, there is a role for implicit incentives if the contractible performance measure is not perfectly aligned with the firm's objective (Baker et al., 1994). The interaction result (Proposition 1) does not change. This result is solely driven by the effect of the manager's effort on the strength of career concerns incentives, and this effect does not change in the presence of explicit contracts. Also, the qualitative nature of the disclosure policy (Propositions 2 and 3) does not change either, because it is driven by the interaction result (which, as I have argued above, is immune to the presence of the explicit incentives).

A firm can also provide incentives in the Milbourn framework by creating a "bonus pool" —a possibility not fully explored in my model. Instead of committing to a lump-sum wage (W), the firm can commit to disburse a fixed amount W, but retain discretion on how to distribute it between the manager and some third party. This allows the firm to credibly commit to reward the manager a varying amount between 0 and W, depending on his performance. This mechanism can implement a positive effort level even in a one-shot interaction.[38] However, because the firm must incur the cost of the pool irrespective of the manager's performance, a bonus pool is not necessarily the most efficient way to implement effort. This opens up room for implicit contracts and career concerns in the optimal incentive provision. The qualitative nature of my results continues to hold in such a scenario.

Several extensions of this model can be considered. In this model, the manager is equally productive with the firm and the raiders. One may argue that raids are more likely only if the manager is more productive with the raiders than with his initial employer.[39] Mukherjee (2005b) shows that the main insights of this article carry through in such environments, but transparency becomes more likely to be the optimal disclosure policy. Transparency removes adverse selection problems associated with turnover. Because the raiders compete to win the manager, under symmetric information they bid more aggressively. Consequently, they offer the entire matching gains to the manager. The firm can extract such gains up front and enhance its profit. One may also assume that the managers cannot observe the complete history of the game depending on the firm's transparency decision. Transparency might also affect the firm's ability to observe the manager's actions, and may create countervailing incentives (see Prat, 2005). It might be interesting to explore the consequences of such assumptions.

This analysis only attempts to extend our understanding on how the interaction between career concerns and implicit contracts may shape a firm's optimal transparency decision. The trade-off discussed in this article need not be the sole driver of a firm's disclosure policy. However, it is still likely to play a significant role, because the practice of augmenting career concerns with implicit contracts is widespread is some industries (e.g., finance, IT, etc.), and there is suggestive evidence that firms may indeed profit by doing so.

[37] Even if the project outcome remains intrinsically nonverifiable, a third party can testify in pay disputes brought to court.

[38] This idea is related to MacLeod (2003) (also see Rajan and Reichelstein, 2006). I am thankful to an anonymous referee for pointing out this issue.

[39] See Lazear (1986) for a discussion on this issue. Lazear considers an environment where the manager can be more productive either with his initial employer or with the raider. In such an environment, raids are successful only when the manager is more productive with the raiders.

Appendix

■ This appendix contains proofs omitted in the text.

Proof of Lemma 3. **Step 1.** Let $\overline{\delta}^O$ be the value of δ at which $\delta\pi(e^{FB})/(1-\delta) = \mu^{-1} c'(e^{FB})$. As the right-hand side of (DR^O) at $e = e^{FB}$ increases with δ, $\forall\delta \geq \overline{\delta}^O$, e^{FB} is feasible. Also, by the same token, for any $\delta < \overline{\delta}^O$, e^{FB} is not feasible.

Step 2. Note that $\pi_t(1/2) = 0$ as $E(V) = 0$ and $c(1/2) = 0$ by construction. So (DR^O) is trivially satisfied at $e = 1/2$. Consider the value of δ at which $\delta\pi(e)/(1-\delta)$ is tangent to $\mu^{-1} c'(e)$ at $e = 1/2$, and denote it as $\underline{\delta}^O$. Due to concavity of $\pi_t(e)$, at $\delta = \underline{\delta}^O$, $\delta\pi(e)/(1-\delta) \leq \mu^{-1}c'(e)\forall e$, with equality holding at $e = 1/2$. As $\delta\pi(e)/(1-\delta)$ is increasing in δ, $\forall\delta \leq \underline{\delta}^O$, $e^O(\delta) = 1/2$.

Step 3. $\forall\delta \in (\underline{\delta}^O, \overline{\delta}^O)$, consider the values of e that solve DR^O with equality. Because $\pi_t(e)$ is concave and $\mu^{-1} c'(e)$ is convex (by Assumption 1), there are at most two feasible values of e that solve $\delta\pi_t(e)/(1-\delta) - \mu^{-1} c'(e) = 0$, and I have already shown that $e = 1/2$ is one of them. Moreover, as $\underline{\delta}^O < \delta < \overline{\delta}^O$, $\exists$ a value of e, say $\hat{e}^O(\delta) \in (1/2, e^{FB})$ that solves (DR^O) with an equality. Step 4 establishes this claim.

Step 4. Recall that at $\delta = \underline{\delta}^O$, $\delta\pi_t(e)/(1-\delta)$ is tangent to $\mu^{-1}c'(e)$ at $e = 1/2$. As $\delta\pi_t(e)/(1-\delta)$ is continuous and increasing in δ, for any $\delta = \delta\prime > \underline{\delta}^O$, $\exists$ an $\epsilon > 0$ depending on δ, such that the (DR^O) is slack at $e = \epsilon + 1/2$. So $\delta\pi_t(e)/(1-\delta) - \mu^{-1} c'(e) > 0$ at $e = \epsilon + 1/2$. But $\delta\pi_t(e)/(1-\delta) - \mu^{-1} c'(e) < 0$ at $e = e^{FB}$ because $\delta < \overline{\delta}^O$. Now, by the Mean Value Theorem, I claim that $\exists$ a value of e, say $\hat{e}^O(\delta) \in (1/2, e^{FB})$, where $\delta\pi_t(e)/(1-\delta) - \mu^{-1} c'(e) = 0$.

Step 5. As $\forall\ e < e^{FB}$, $\pi_t(e)$ is increasing in e, $e^O(\delta)$ is the highest value of e that solves (DR^O) with an equality. Hence for $\forall\delta \in (\underline{\delta}^O, \overline{\delta}^O)$, $e^O(\delta) = \hat{e}^O(\delta)$. It remains to show that $e^O(\delta)$ is continuous and weakly increasing in δ.

Step 6. As the right-hand side of (DR^O) is increasing in δ, so is $\hat{e}^O(\delta)$. This implies that $e^O(\delta)$ is weakly increasing in δ . To show that $e^O(\delta)$ is continuous, I claim that $\hat{e}^O(\delta)$ is continuous and $\hat{e}^O(\delta) \to 1/2$ (*or* e^{FB}) as $\delta \to \underline{\delta}^O$(*or* $\overline{\delta}^O$). The continuity of $\hat{e}^O(\delta)$ follows from the fact that $\pi_t(e)$ is continuous. The limit results can be obtained by applying the Implicit Function Theorem on the function $\delta\pi_t(e)/(1-\delta) - \mu^{-1} c'(e) = 0$ at the neighborhoods of $(e = 1/2, \delta = \underline{\delta}^O)$ and $(e = e^{FB}, \delta = \overline{\delta}^O)$. *Q.E.D.*

Proof of Lemma 4. This proof is similar to the one above and, hence, it is omitted here. The only difference to note is that due to transparency, the firm can rely on career concerns incentives even when it cannot sustain any implicit contract. Hence, the minimum level of effort that the firm can elicit is e^C. *Q.E.D.*

Proof of Proposition 2. **Step 1.** I have already argued that $\underline{\delta}^T > \delta^C$ (see equation (12)). That is, the minimum δ at which a transparent firm can sustain any bonus payment is greater than the level of δ at which the opaque firm can sustain the career concerns level of effort.

Step 2. Next, I claim that $\forall\delta > \delta^C$, $e^O(\delta) > e^T(\delta)$. Because $\underline{\delta}^T > \delta^C$, and e^O is increasing, for $\delta \in (\delta^C, \underline{\delta}^T]$, $e^O(\delta) > e^O(\delta^C) = e^T(\delta) = e^C$. But even $\forall\delta > \underline{\delta}^T$, (DR^T) is a tighter constraint than (DR^O) and, therefore, $e^O(\delta) > e^T(\delta)$. To see this, rewrite (DR^T) as $\frac{\delta}{1-\delta}\pi_t(e) \geq \mu^{-1}c'(e) + \Delta(e,\delta)$. So (DR^T) is a tighter constraint compared to (DR^O) iff $\Delta(e,\delta) > 0$. Because $e^O(\delta)$ and $e^T(\delta)$ are both continuous, and $e^O(\underline{\delta}^T) > e^T(\underline{\delta}^T)$, there exists an $\epsilon > 0$ such that $e^O(\underline{\delta}^T + \epsilon) > e^T(\underline{\delta}^T + \epsilon)$. So it must be the case that $\forall\delta \in (\underline{\delta}^T, \underline{\delta}^T + \epsilon)$, $\Delta(e^O(\delta), \delta) > 0$. For $\mu \leq 1/2$, $\Delta(e,\delta)$ is increasing in both e and δ. So, $\forall\delta > \underline{\delta}^T$, $\Delta(e^O(\delta), \delta) > 0$, and hence, (DR^T) is a tighter constraint than (DR^O).

Step 3. Combining the observations in Steps 1 and 2, one gets $e^T(\delta) \geq$ or $< e^O(\delta)$ according to whether $\delta <$ or $\geq \delta^C$. That is, F prefers transparency iff $\delta \leq \delta^C$. Moreover, F can combine implicit contract based incentives with career concerns incentives only if $\delta > \underline{\delta}^T$. Because $\underline{\delta}^T > \delta^C$, and at any $\delta > \delta^C$, F prefers to be opaque, F never combines the two forms of incentives in equilibrium. *Q.E.D.*

Proof of Proposition 3. I provide the proof by showing that each of the three disclosure policies mentioned in the proposition can be optimal depending on the underlying parameter values. The claim about the cutoff rule and the use of bonuses in a transparent firm follows from disclosure policies (i) and (ii). The proof is given in the following steps.

Step 1. There exist parameter values such that if $\hat{e}^T$ intersects $\hat{e}^O$ at a point (e, δ) where $e \in (e^C, e^{FB})$, it must be the case that $\hat{e}^{T\prime}(\delta) > \hat{e}^{O\prime}(\delta)$. Assume that $\hat{e}^T$ intersects $\hat{e}^O$ at a point (e_1, δ_1) where $e_1 \in (e^C, e^{FB})$. The proofs of Lemma 4 and Lemma 3 imply that (DR^O) and (DR^T) must hold with equality at (e_1, δ_1). Thus, $\hat{e}^{O\prime}(e^*) = \pi_t(e_1)/[(1-\delta_1)^2[\mu^{-1}c''(e_1) - \delta_1\pi_t'(e_1)/1-\delta_1]]$, and $\hat{e}^{T\prime}(e^*) = [\pi_t(e_1) - \pi_t(e^C)]/[(1-\delta_1)^2[\mu^{-1}(c''(e_1) - \kappa'(e_1)) - \delta_1\pi_t'(e_1)/(1-\delta_1)]]$. But $\kappa' > 0$ as $\mu \geq 1/2$. Therefore, $\hat{e}^{T\prime}(e^*) > \hat{e}^{O\prime}(e^*)$ if $\kappa'(e)$ is sufficiently large ($\forall e \in (e^C, e^{FB})$), and $\pi_t(e^C)$ is sufficiently small.

Step 2. If $\mu > 1/2$, $\kappa' > 0$. Thus, the inequality presented in equation (12) does not hold. Both $\delta^C > \underline{\delta}^T$ and $\delta^C < \underline{\delta}^T$ cases are possible.

Step 3. Each of the three disclosure policies can be optimal whenever $\hat{e}^{T\prime}(e^*) > \hat{e}^{O\prime}(e^*)$. More specifically, when $\delta^C > \underline{\delta}^T$, transparency always dominates (this is case (i)). When $\delta^C \leq \underline{\delta}^T$ the firm prefers the transparent $\forall\delta < \delta^C$ and it cannot sustain any bonus payment. However, there may exist a δ large enough, say δ^*, such that $\hat{e}^T$ intersect $\hat{e}^O$ from below. As $\hat{e}^T$ can intersects $\hat{e}^O$ only from below, $\forall\delta > \delta^*$, $\hat{e}^T$ lies above $\hat{e}^O$; thus, transparency dominates (this is case (ii)). One obtains case (iii) when $\delta^* > \overline{\delta}^O$. *Q.E.D.*

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