Career Concerns and Financial Reporting Quality*

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Abstract

Managerial career concerns could affect firm efficiency through financial reporting quality, but this important link has received relatively little attention in the literature. The present study examines this link by developing a model that has the following elements. A risk-neutral manager provides effort to increase the market value of the firm and to favorably influence the market assessment of the manager's ability. Depending on the magnitude of career concerns, the manager either under- or overinvests effort relative to an efficiency-maximizing level. The analysis identifies conditions under which higher-quality reporting induces the manager to invest more effort. Under these conditions, the model is extended to a setting in which the manager also chooses the quality of financial reporting at some cost. In doing so, the manager seeks to reduce distortion in their effort investment. The equilibrium reporting quality and effort investment are determined by a trade-off between them. In the presence of high uncertainty about the firm's future cash flows, if the manager's career concerns exceed a threshold, the manager underinvests in reporting quality and overinvests effort. The empirical implication is a negative relation between managerial career concerns and financial reporting quality. To a large extent, this is consistent with findings in prior empirical studies. Thus, the present study offers a theoretical explanation for the empirical findings as an equilibrium outcome.

Keywords: career concerns, financial reporting quality, efficiency
JEL classification: G14, M41

1. Introduction

Managers are concerned about the market perception of their ability because it affects their career prospects. Fama (1980) argues that managerial concerns about market assessments can be strong enough to control moral hazard problems without explicit incentive contracts. In contrast, Holmstrom (1982, reprinted in 1999) shows that although career concerns create effort incentives, efficiency losses persist because managers provide less effort than an efficiency-maximizing level. Prompted by these studies, researchers have examined the consequences of career concerns for managerial decision making in a variety of contexts. However, the effect of management's career concerns on financial reporting quality has received relatively little attention (Francis et al. 2008; Beyer et al. 2010). In this respect, two observations are in order. First, in the survey of Graham et al. (2005), executives note that concerns about career prospects and reputations are an important consideration in their decisions related to financial reporting quality. Second, it is well known that the quality of accounting information affects firm efficiency through the cost of capital and/or managers' decisions that change future cash flows (e.g., Lambert et al. 2007). Both imply that managerial career concerns are endogenously linked to firm efficiency through financial reporting quality. Although numerous prior studies have sought to better understand the efficiency implications of career concerns, this link has been left largely unexplored. For example, do highly career-concerned managers provide high- or low-quality information to the market when that information affects not only the market valuation of the firm but also the market assessment of their ability and thus their career prospects? If there is a relation between career concerns and information quality, what are the possible driving forces behind that relation?

To address these questions, I present a model in which financial reporting quality emerges as an equilibrium variable in the presence of managerial career concerns. In my model, all parties are risk-neutral. A firm manager, who is also the firm owner (i.e., an entrepreneur), is concerned about the current market price of the firm and the market assessment of their ability. The manager invests unobservable effort to develop a project. This project generates a future cash flow, which is the firm's only cash flow and stochastically increases with the manager's effort and unknown ability. After investing effort, the manager issues a public report, which is an estimate of the future cash flow. The precision of the noise contained in the report is defined as the informational quality of the firm report, or reporting quality for short. Based on this report, the firm may be traded to outside investors who can implement the project. If the project is implemented, the market assesses the manager's ability by updating beliefs about it on the basis of a subsequent realization of the project cash flow. If the project is not implemented, there is no cash flow, and the market assesses the manager's ability on the basis of the firm report. Taking reporting quality as given, the first part of this paper examines the manager's effort investment decision. The second part extends the model by allowing the manager to also choose reporting quality at some cost before providing effort. In this extended setting, I address the main question of the present study—that is, the effect of managerial career concerns on financial reporting quality and its efficiency implications.

The main results are as follows. For any given reporting quality, the manager has an incentive to use their effort investment to favorably influence the market assessment of their ability. This incentive, called a career-related effort incentive, increases with the magnitude of career concerns. The equilibrium efficiency is evaluated against the first-best benchmark, in which manager effort is publicly observable. The effort in the first-best case, referred to as the first-best effort, maximizes the expected firm value, net of the cost of effort, and is the efficiency-maximizing effort. An efficiency loss arises whenever the manager over- or underinvests effort, relative to the first-best effort to which the manager is unable to commit due to effort unobservability to outsiders (as in Holmstrom 1982). When choosing reporting quality, the manager seeks to reduce this efficiency loss that changes with the magnitude of their career concerns. Under certain conditions, if the magnitude of career concerns is greater (less) than a threshold, the equilibrium reporting quality is lower (higher) than the efficiency-maximizing reporting quality. This implies a *negative* relation between career concerns and reporting quality.

To understand the details of the main results, first let the quality of the firm report be given. The efficiency loss caused by effort unobservability can increase or decrease with the manager's career concerns. For the intuition, suppose that the manager has no career concerns. In this case, the manager underinvests effort. However, if the manager is concerned about career prospects, they seek to improve the market assessment of their ability by producing a greater cash flow. Because the firm cash flow increases with manager effort on average, the manager has an incentive to increase effort, and greater career concerns strengthen this effort incentive. Thus, when there is an effort underinvestment, an increase in career concerns improves equilibrium efficiency by alleviating the effort underinvestment. In the same vein, greater career concerns in the presence of an effort overinvestment amplify this overinvestment, and hence decrease equilibrium efficiency. I identify conditions under which higher-quality reporting also motivates the manager to invest more effort. This implies that reporting quality and career concerns are substitutes in their effects on the manager's effort incentives. This plays a key role in the second part of the paper in which reporting quality is endogenous.

When the manager chooses reporting quality, which is costly to improve, the manager considers the trade-off between reporting quality and effort. The fact that this trade-off depends on the magnitude of career concerns explains how the equilibrium reporting quality and effort differ from those in the first-best case. To elaborate, suppose that the manager has insufficient career concerns and suffers from effort underinvestment. In this case, the manager has an incentive to increase reporting quality; recall that higher-quality reporting induces the manager to provide more effort, which alleviates effort underinvestment and thus makes the manager better off. However, the manager does not increase reporting quality enough to eliminate effort underinvestment because the cost of reporting quality to do so would be too high. In equilibrium, the manager trades off the gain from a reduction in effort underinvestment against the loss from a reporting quality that is higher than the first-best reporting quality. This implies that an effort underinvestment coexists with an overinvestment in reporting quality. Next, suppose that the manager is excessively career-concerned. In this case, the equilibrium allocation of reporting quality and effort investment is the opposite. Because this manager suffers from effort overinvestment, they lower reporting quality below the first-best level to mitigate (but not eliminate) their effort overinvestment and thereby increase their equilibrium payoff. In summary, when the manager's career concerns are relatively small (large), the manager increases (decreases) reporting quality to reduce the loss from suboptimal effort investment. Thus, there is a negative relation between career concerns and reporting quality, which is largely consistent with empirical findings in the literature (e.g., Ali and Zhang 2015; Hazarika et al. 2012). Therefore, the present study offers a theoretical foundation for the empirically documented negative relation between managerial career concerns and financial reporting quality as an equilibrium outcome.

Below, section 2 explains this paper's contributions to the literature on career concerns. Section 3 presents the model. Section 4 derives the equilibrium effort and compares it with the efforts in several benchmarks. Section 5 provides comparative static analyses. Reporting quality is endogenous in section 6. Section 7 discusses prior empirical findings on the relation between career concerns and reporting quality. Section 8 concludes the paper.

2. Contributions and literature review

This study contributes to the literature by establishing an explicit link between managerial career concerns and financial reporting quality, and examining its efficiency implications. In doing so, I model reporting quality as an endogenous variable, not an exogenous parameter as in most previous models on career concerns. My model has two critical elements. First, outsiders cannot observe a firm manager's human capital investment, referred to as effort, to develop a project. Second, the project may be abandoned after a firm report is issued. Without either element, there would be no relation between career concerns and reporting quality in the model. The reason is that either the first-best case, in which ability assessment is a nonissue, prevails, or the market assesses manager ability using cash flow information, in which case the informational quality of the firm report is irrelevant. In essence, financial reporting quality has a dual role in determining firm efficiency. Ex post, it affects the efficiency of project implementation based on the firm report. Ex ante, it affects the manager's unobservable effort decision. The latter implies that reporting quality serves, in effect, as the manager's (second-best) optimal commitment device to control their effort incentives that create efficiency losses.

Prior analytical studies on managerial career concerns can be classified into two groups. First, treating career concerns as implicit incentives, agency studies examine their effects on contractual efficiency. Earlier studies include Gibbons and Murphy (1992), Meyer and Vickers (1997), Gompers and Lerner (2004), and Autrey et al. (2007). In Christensen et al. (2005), career concerns can lead to a demand for low-quality earnings information and improve efficiency. The idea is that manager ability, viewed as persistent noise in the firm's cash flow, can reduce the risk premium paid to the agent (also see Şabac 2008). Although the settings and mechanisms are different, this result is related to mine. Autrey et al. (2010) and Arya and Mittendorf (2011 and 2015) examine information aggregation or disaggregation in the presence of career concerns. Christensen et al. (2020) examine conditions under which the principal can use long-term renegotiable contracts to control the agent's implicit incentives. The key is whether the aggregation of non-contractible information is an incentive-sufficient aggregation to neutralize implicit incentives.

Initiated by Holmstrom's (1982) labor market model, studies in the second group examine managerial career concerns in market settings without considering agency problems inside the firm.

My study belongs to this group.[1] Dewatripont et al. (1999) show that (i) the covariance between a manager's ability and the likelihood ratio of the manager's output measure determines their effort incentive; and (ii) in the presence of a sufficient statistic for the inference of manager ability, other information is redundant because it does not alter the manager's effort incentive. These results do not hold in my model because of potential project abandonment. Specifically, in their model, there is *no* economic event which can make the manager's output measure unavailable, and thus the market always uses that measure to assess manager ability. This contrasts with my model, in which the firm issues a public report as an estimate of the project's future cash flow, and there is a positive probability that the expected cash flow, conditional on the report, is negative. In this case, the project is abandoned, and thus there is no cash flow. As a result, the market relies on the firm report in assessing manager ability. This is why the informational quality of the firm report plays a role in determining the manager's ex ante effort incentive to improve market assessment.

In Milbourn et al. (2001), a firm manager overinvests in the quality of a signal about the firm's future cash flow to improve the market perception of the manager's ability. The equilibrium signal quality increases with the manager's career concerns. In my model, by contrast, a manager's incentive to favorably influence the market perception of their ability arises when they invest effort to increase the future cash flow of a project, and the manager adjusts reporting quality to mitigate distortion in effort investment. The manager either under- or overinvests in reporting quality depending on the magnitude of career concerns. This leads to a negative relation between career concerns and reporting quality.[2]

Finally, numerous empirical studies find that financial reporting quality affects firm efficiency (e.g., Biddle et al. 2009, Balakrishnan et al. 2014, and Cheng et al. 2018), although they typically do not consider the effects of managerial career concerns on reporting quality. Without considering efficiency issues, several studies find evidence of a negative relation between career

[1] In adverse selection settings, Baker (2000) and Chen (2015) examine staged investments and risk-taking behaviors, respectively. Mukherjee (2008) and Kim (2017) study career concerns and firm-manager matching problems.

[2] Several studies examine career-concerned managers' ex post disclosure of private information, rather than ex ante production of information, and thus different forces are at work. Trueman (1986) shows that managers may provide earnings forecasts to signal their ability to receive value-relevant information early. Nagar (1999) establishes that career-concerned managers' risk aversion can prevent full disclosure (similar to disclosure costs in Verrecchia 1983). Career concerns also play important roles in other settings. Holmstrom and Ricart i Costa (1986) study the problem of misaligned risk preferences. Goel et al. (2004) examine career-concerned managers' resource allocation problems in multi-divisional firms. Song and Thakor (2006) show that career concerns can negatively affect the quality of information used in internal communications between CEOs and board members. Zhao (2013) and Chen et al. (2015) obtain a similar result when risk-averse managers are concerned about uncertainty in their performance measures.

concerns and reporting quality, consistent with this paper's result. Using the length of CEO tenure as a proxy for the magnitude of career concerns, Ali and Zhang (2015) find that CEOs manage earnings in their early years of service. Similarly, Hazarika et al. (2012) and Cella et al. (2017) show that earnings management is severe in the early years and then decreases over CEO tenure. Using media coverage to identify highly reputed superstar CEOs, Malmendier and Tate (2009) find that these CEOs, who tend to be highly sensitive to market assessments of their ability to deliver strong performance, are more likely to manage earnings than less reputed CEOs. Section 7 provides a more detailed discussion of empirical studies.

3. Model

The model is a two-stage game. All players have risk-neutral preferences, and the risk-free interest rate is zero. In the first stage, an owner-manager of a firm (i.e., an entrepreneur) provides effort to develop a project. For liquidity reasons, the owner-manager seeks to sell the project to outside investors for implementation. If the project is implemented, its future cash flow, z, will be realized in the second stage. For simplicity, let z be the sole cash flow of the firm, implying that selling the project is the same as selling the firm. This cash flow z has two random components x and a, i.e.,

$$z \equiv x + a, \tag{1}$$

where

$$x \sim N(e, h^{-1}) \text{ and } a \sim N(0, s^{-1}) \tag{2}$$

are independent random variables whose realizations are unknown to all parties in the model. The mean of x is the manager's effort, e, for project development and is unobservable to investors. Let $c(e)$ be the cost of effort, where c is an increasing convex function. To ensure $e > 0$, I assume that $c(0) = c'(0) = 0$ and $c'''(e) \geq 0$. The other component, a, is the cash flow contribution of the manager's ability to cash flow z. I call it manager ability for short, and set the mean of a to be zero without loss of generality. The two precisions, $h \equiv Var[x]^{-1} > 0$ and $s \equiv Var[a]^{-1} > 0$, are publicly known constants. In sum, the firm manager and outside investors share common prior beliefs about the distributions of x and a, except that only the manager knows their actual effort e.

Before a potential trade of the firm in the competitive market, the manager is required to issue a public report about the firm's future cash flow z. This report,

$$y \equiv z + \varepsilon, \tag{3}$$

is produced by the firm's financial reporting system. The noise contained in report y, $\varepsilon \sim N(0, q^{-1})$, is white noise, and its precision, $q \equiv Var[\varepsilon]^{-1} > 0$, is referred to as reporting quality. Initially, q is exogenous; later, in section 6, I will examine the manager's choice of q at some cost. After y is issued, investors decide whether to purchase the firm to implement the project. If implemented, the project will publicly generate cash flow z according to (1) in the second stage. Otherwise, the project can be abandoned at the end of the first stage, in which case there is no cash flow, irrespective of the manager's initial effort to develop the project.[3]

Last, to specify the manager's objective when providing effort in the first stage, I assume that the manager is concerned about the market value of the firm and the market assessment of their ability. The latter occurs in the form of updating the beliefs about manager ability a, either after the first stage (if the project is abandoned) or after the second stage (if it is implemented). Presuming that updated beliefs about the manager's ability affect their career prospects and future payoff, I call the manager's concerns about the market assessment *career concerns*. To formalize these ideas, let

$$W^m(\cdot) \equiv [V(\cdot) + \alpha A(\cdot)] - c(e) \tag{4}$$

be the manager's objective function when they invest effort e for project development, where $V(\cdot)$ is the expected market value of the firm, $A(\cdot)$ is the expected market assessment of manager ability a, and $\alpha > 0$ is a constant. Both $V(\cdot)$ and $A(\cdot)$ will be specified in section 4. The weight that the manager places on ability assessment relative to firm value, i.e., α, represents the magnitude of the manager's career concerns, attributed to their primitive preference. The game structure is common knowledge. Figure 1 depicts the timeline, and Appendix 1 provides a list of notations.

Before proceeding, note the following. First, report y provides no direct information about manager ability a, but it indirectly provides information about a through its information about cash flow z that includes a.[4] Given that y provides information about firm cash flow, y can be viewed

[3] As an exit strategy, project abandonment is pervasive in the real world (Trigeorgis 1996; Kodukula and Papudesu 2006). In the accounting literature, with no consideration of managerial career concerns, Caskey and Hughes (2012) study the effects of fair-value accounting on project selection/continuation, and Hughes and Pae (2014) consider project abandonment in the context of ex post disclosure of private information.

[4] This accords with current financial reporting systems in which manager ability is not reported separately. Lev and Zarowin (1999) note that a deficiency of the current systems is their inability to fully reflect intangibles, such as human resources (e.g., manager ability), R&D, and brands that affect firm value. Ittner and Larcker (1998) and Eccles et al. (2001) find evidence that non-financial factors, such as customer satisfaction, employee training, and corporate governance, are not fully recognized in corporate financial reports. Hayes and Schaefer (1999) use stock price changes to

as accounting earnings and q as earnings quality. Although not explicitly modeled, reporting quality should be broadly interpreted to include factors improving the informativeness of the firm report. For example, it could represent the effectiveness of internal controls, audit committees, and external auditing, all of which help the firm provide high-quality information to the market.

Second, I consider an entrepreneurial firm to avoid potential agency issues inside the firm.[5] While this is similar to Holmstrom (1982) and Dewatripont et al. (1999), there are key differences. The first difference is that a manager's *sole* incentive in their models is to improve the labor market perception of manager ability, whereas the manager in my model has *dual* concerns in that the manager cares about both the market price of the firm and the market assessment of their ability, with $\alpha > 0$ being the relative importance of the ability assessment. Using the current notation, one can view the manager in their models as providing effort to maximize $\alpha A(\cdot) - c(e)$. The second difference is that the firm publicly issues a report y as an estimate of the project's future cash flow z. Due to the normality of (z, y), there is a possibility that the project is abandoned for some values of y, in which case there is no cash flow, and thus only y can be used in the market assessment of manager ability. This possibility of project abandonment is critical in my model. Specifically, section 4 will show that if cash flow z were *always* available (as with the manager output measure in Holmstrom 1982 and Dewatripont et al. 1999), the manager's career concerns would have *no* bearing on reporting quality because the market does not use report y in assessing the manager's ability.[6]

4. Analysis

Firm valuation and ability assessment

I start with the competitive market value of the firm, given a report y in the first stage. To compute the expected future cash flow of the firm (in the case of project implementation), investors

estimate the contribution of manager ability to firm value.

[5] Adding an owner-manager relationship to the present model would significantly complicate the analysis and create tractability problems. Nonetheless, I conjecture that the economic forces behind this paper's main result, the relation between career concerns and reporting quality, would remain qualitatively unchanged. For details, see Appendix 2, where I discuss modeling choices and potential extensions of the current model.

[6] As (1) and (3) show, report y is noisier information than cash flow z about manager ability a. In my model, z would always be available if the project were always implemented. In that case, z would play the same role as that of the manager output measure in Holmstrom (1982) and Dewatripont et al. (1999). Moreover, the fact that z is a sufficient statistic for the inference of a would make y and its informational quality irrelevant to the manager's career-related effort incentive. See the benchmark of no project abandonment in section 4 for more details about this matter.

need information about the prior mean of $z \equiv x + a$, which is the manager's effort $e > 0$. Because e is unobservable, they use a conjecture of e, denoted as $e^c > 0$. Given y and e^c, let $\pi(y, e^c)$ be the market expectation of z. According to the Bayes rule,

$$\pi(y, e^c) \equiv E[z \mid y, e^c] = \beta y + (1 - \beta)e^c, \tag{5}$$

where $\beta \equiv Cov[z, y] / Var[y] = Var[z] / Var[y] = q / (t + q) \in (0, 1)$, and $t \equiv Var[z]^{-1} = hs / (h + s)$ is the precision of total cash flow z. Using the fact that $\pi(y, e^c)$ increases with y, I define y^o, referred to as the cutoff report, to be the value of y that satisfies $\pi(y, e^c) = 0$. That is,

$$y^o \equiv (1 - \beta^{-1})e^c < e^c, \tag{6}$$

where the inequality is because $\beta \in (0, 1)$ and $e^c > 0$. If $y > y^o$, competitive investors purchase the firm at the price of $\pi(y, e^c) > 0$ and implement the project. On the other hand, if $y \leq y^o$, the firm value is zero and there is no trade because, given $\pi(y, e^c) \leq 0$, it is optimal to abandon the project to avoid a future expected loss. In sum, given y and e^c, the firm value in the competitive market is

$$\max\{0, \pi(y, e^c)\} = \begin{cases} 0 & \text{for all } y \leq y^o \\ \pi(y, e^c) = \beta y + (1-\beta)e^c > 0 & \text{for all } y > y^o. \end{cases} \tag{7}$$

This resembles Merton's (1974) result that a levered-firm's equity value is equivalent to a call option value. In essence, the option to abandon an unprofitable project in the present model plays the same role as that of shareholder limited liability in Merton's model.

How the market revises its beliefs about the manager's ability, a, is stated below.

PROPOSITION 1. *For any given y and e^c, the market assesses manager ability as follows.*

(i) *If $y > y^o$ is reported in the first stage, and z is realized in the second stage,*

$$E[a \mid y, z, e^c] = E[a \mid z, e^c] = \gamma(z - e^c), \tag{8a}$$

where $\gamma \equiv Cov[a, z] / Var[z] = Var[a] / Var[z] = h / (h + s) \in (0, 1)$. The sensitivity of the ability assessment to $(z - e^c)$ increases with h, but decreases with s.

(ii) *If $y \leq y^o$ is reported in the first stage, the expectation of a is revised downward to*

$$E[a \mid y, e^c] = \gamma\beta(y - e^c) < 0, \tag{8b}$$

where $\gamma\beta = Cov[a, y] / Var[y] = Var[a] / Var[y] \in (0, 1)$. The sensitivity of the ability assessment to $(y - e^c)$ increases with q and h, but decreases with s.

Recall that if $y > y^o$, the project is implemented in the first stage, and its cash flow, $z \equiv x + a$, is realized in the second stage. Although both y and z are available to update beliefs about a, the market does not use y because y merely adds noise to z and thus is less informative about a than is z. Given that e^c is the conjectured prior mean of z, $(z - e^c)$ can be viewed as a cash flow surprise. Because z is positively correlated with a, as captured by $\gamma > 0$, and the prior mean of a is zero, a positive (negative) surprise leads to an upward (downward) revision in the market expectation of a. However, because $\gamma < 1$, this revision is not one-to-one. Intuitively, the market attributes only a fraction of the surprise to a because a deviation of x from its prior mean may be also responsible for the surprise. For the effects of h and s on the sensitivity of the market assessment of manager ability, which is γ, consider $h / s = Var[a] / Var[x]$. When this ratio increases, a surprise is more likely caused by a deviation of a from its prior mean than by a deviation of x from its conjectured prior mean e^c. Thus, the ability assessment, $E[a \mid z, e^c]$, changes more in response to the surprise.

Next, recall that if $y \leq y^o$, the project is abandoned in the first stage. Because there is no cash flow, the market uses report y to update its beliefs about manager ability a. Interpreting y as earnings and given that e^c is the market prior expectation of y, $(y - e^c) < 0$ can be viewed as a negative earnings surprise, where the inequality is because $y \leq y^o$ $(< e^c)$. Because y is positively correlated with a (as captured by $\gamma\beta > 0$), beliefs are revised downward (i.e., $E[a \mid y, e^c] < 0 = E[a]$). The sensitivity of the ability assessment to an earnings surprise increases with earnings quality q. The intuition is that as q increases, y becomes more informative about $z \equiv x + a$ and thus about a. Similar to part (i), the assessment's sensitivity to a surprise increases with the ratio h / s.

Now consider the manager's expectation of the market assessment of their ability *after* the manager has invested e and reported y in the first stage. If $y \leq y^o$, the assessment is $E[a \mid y, e^c]$ stated in (8b). If $y > y^o$, the assessment is $E[a \mid z, e^c] = \gamma(z - e^c)$ stated in (8a), which is based on the cash flow z realized in the second stage. Because z is unknown in the first stage, the manager takes expectation of this assessment with respect to z conditional on y. In doing so, the manager uses their *actual* effort e because the distribution of z is determined by its true mean e, not by e^c. This yields

$$E[\gamma(z - e^c) \mid y, e] = \gamma[\beta y + (1 - \beta)e - e^c] = E[a \mid y, e^c] + \gamma(1 - \beta)(e - e^c).$$

If the manager has provided an effort e greater (less) than e^c, the manager thinks that, on average, z will be greater (less) than e^c. The above expression shows that the manager's expectation of the ability assessment in that case is greater (less) than the assessment based on y only, which is the first term, $E[a \mid y, e^c]$. In sum, given (e, e^c, y), the manager's beliefs about the market assessment of their ability are:

$$E[a \mid e, e^c, y] = \begin{cases} E[a \mid y, e^c] = \gamma\beta(y - e^c) & \text{for all } y \leq y^o \\ E[\gamma(z - e^c) \mid y, e] = \gamma\beta(y - e^c) + \gamma(1-\beta)(e - e^c) & \text{for all } y > y^o. \end{cases} \tag{9}$$

Equilibrium effort

Recall that the manager invests effort e to develop a project at the beginning of the first stage before issuing y. This means that when determining e, the manager considers the expectation of their payoffs over for all possible values of y. Specifically, using (7) and (9) yields the expected firm value, $V(\cdot)$, and the expected market assessment of the manager's ability, $A(\cdot)$, as follows:

$$V(e, e^c) \equiv \int_{-\infty}^{\infty} \left[\max\{0, \pi(y, e^c)\}\right] \phi(y \mid e) dy = \int_{y^o(e^c)}^{\infty} \pi(y, e^c) \phi(y \mid e) dy \tag{10}$$

$$A(e, e^c) \equiv \int_{-\infty}^{\infty} E[a \mid e, e^c, y] \phi(y \mid e) dy = \gamma(e - e^c)\left(\beta + (1-\beta)[1 - \Phi(y^o(e^c) \mid e)]\right). \tag{11}$$

In the above, it is explicit that (i) y^o depends on the conjectured effort, e^c; (ii) the project is not implemented when $y \leq y^o$; and (iii) the density and distribution functions of y, i.e., ϕ and Φ, depend on the actual effort, e. Thus, the manager's effort investment problem in the first stage is:

$$\max_{e \geq 0} \; W^m(e, e^c) \equiv V(e, e^c) + \alpha A(e, e^c) - c(e). \tag{12}$$

PROPOSITION 2. *There exists a unique equilibrium effort*, $e^* > 0$, *which is the value of e satisfying*

$$MB^* \equiv MB^n + \alpha A_e = c'(e), \tag{13}$$

where

$$MB^n \equiv \left.\frac{\partial V(e, e^c)}{\partial e}\right|_{e = e^c} = \beta[1 - \Phi(y^o(e) \mid e)] > 0 \tag{14a}$$

and

$$A_e \equiv \left.\frac{\partial A(e, e^c)}{\partial e}\right|_{e = e^c} = \gamma\left\{\beta + (1-\beta)[1 - \Phi(y^o(e) \mid e)]\right\} > 0. \tag{14b}$$

The manager provides a positive amount of effort, $e^* > 0$, to develop a project even though it may be subsequently abandoned. In equilibrium, the marginal benefit of effort, MB^*, has two components, MB^n and αA_e. First, the manager has an incentive to increase the expected firm value,

$V(e, e^c)$. Because the cutoff report, $y^o(e^c)$, and the firm value conditional on y, $\pi(y, e^c)$, do not depend on e, the effect of the manager's effort e on $V(e, e^c)$ is only through the distribution of y. Specifically, because e increases the probability that y exceeds $y^o(e^c)$, in which case the firm is traded at a positive price,

$$\frac{\partial V(e,e^c)}{\partial e} = \beta\left[1-\Phi(y^o(e^c) \mid e)\right]. \tag{15}$$

Second, the manager has an incentive to provide effort to improve the expected market assessment of their ability, $A(e, e^c)$. The effect of e on $A(e, e^c)$ is

$$\frac{\partial A(e,e^c)}{\partial e} = \gamma\left\{\beta + (1-\beta)[1-\Phi(y^o(e^c) \mid e)]\right\} + \gamma(e-e^c)(1-\beta)\phi(y^o(e^c) \mid e). \tag{16}$$

Investors rationally anticipate the manager's aforementioned effort incentives. In equilibrium, their conjecture of effort must be the same as the manager's actual effort, i.e., $e^c = e$. Imposing this condition on (15) and (16) yields $MB^n > 0$ and $A_e > 0$, stated in (14a) and (14b), respectively.

Benchmarks

To sharpen the intuition for Proposition 2, I consider three benchmarks, which can be regarded as special or limiting cases. They are also useful for the analysis in sections 5 and 6.

The first-best case ($e^c = e$)

Suppose that manager effort is *observable* to outside investors, in which case $e^c = e$. In this benchmark, referred to as the first-best case, the expected firm value equals $V(e) \equiv V(e, e)$, where $V(e, e)$ is the same as $V(e, e^c)$ stated in (10) except that $e^c = e$. Next, the expected market assessment of manager ability equals its prior mean, which is zero; note that $A(e, e^c) = 0$ if $e^c = e$ in (11). Hence, career concerns are a nonissue in the first-best case. Both imply that the manager's payoff differs from $W^m(e, e^c)$ stated in (12), and thus the manager's effort investment problem in the first-best case is:

$$\max_{e\geq 0}\; W(e) \equiv V(e) - c(e) = \int_{y^o(e)}^{\infty} \pi(y,e)\phi(y \mid e)dy \;-c(e). \tag{17}$$

A unique solution, referred to as the first-best effort and denoted as $e^f > 0$, is characterized by

$$MB^f \equiv \frac{\partial V(e)}{\partial e} = [1-\Phi(y^o(e) \mid e)] = c'(e). \tag{18}$$

The first-best marginal benefit of effort, MB^f, equals the probability that the firm is traded and thus the project is implemented. When this probability changes, the first-best effort changes.

COROLLARY 1. *The first-best effort, e^f, decreases with q.*

As the firm report becomes more precise about the future cash flow of the firm, the probability of trade decreases. This reduces MB^f and hence the first-best effort. For the intuition, let $e > 0$ be given and consider two limiting cases. If $q \to 0$, y is pure noise. Therefore, investors always ignore y and purchase the firm to implement the project because $E[z] = e > 0$. This is reflected in $y^o \to -\infty$. Next, if $q \to \infty$, y perfectly reveals the future cash flow. Thus, the project is implemented only when y is positive. This is reflected in $y^o \to 0$, in which case the probability of project trade is $[1 - \Phi(0 \mid e)] < 1$. The key is that increased efficiency in project implementation through a more precise firm report decreases the probability of project trade, and this incentivizes the manager to provide less effort ex ante. Figure 2 depicts the first-best effort, e^f, as a decreasing function of q. The dashed horizontal line is the level of the first-best effort when y is perfect information; that is, e^f converges to this level as $q \to \infty$. The other elements of Figure 2 will be explained later.

No career concerns ($\alpha = 0$)

Suppose that the manager has *no* career concerns, i.e., $\alpha = 0$. Because the manager only seeks to increase the expected firm value, the marginal benefit of effort reduces to MB^n in (14a). Therefore, the effort provided by the manager with no career concerns, denoted as e^n, is characterized by

$$MB^n \equiv \beta[1-\Phi(y^o(e) \mid e)] = c'(e). \tag{19}$$

Comparing (19) and (18) reveals that $MB^n = \beta \cdot MB^f < MB^f$ (because $\beta < 1$) and thus $e^n < e^f$. That is, relative to the first-best case, an underinvestment of effort always occurs, which is a typical moral hazard problem arising from effort unobservability in the absence of career concerns. As will be shown in section 5, this contrasts with the fact that a manager with career concerns ($\alpha > 0$) may under- or overinvest effort, depending on the magnitude of career concerns (see Lemma 1).

COROLLARY 2. *The effort provided by the manager with no career concerns, e^n, increases with q.*

This result follows because the marginal benefit of effort under no career concerns, $MB^n = \beta \cdot MB^f$, increases with reporting quality q; it can be shown that as q increases, the increase of $\beta = q / (t + q)$ dominates the decrease of MB^f. Although Corollary 2 implies that effort underinvestment decreases when q increases, it cannot be eliminated; recall that $e^n < e^f$ for any finite q. In Figure 2, e^n is depicted as an increasing function of q and is located below e^f. As $q \to 0$, $e^n \to 0$ because $MB^n \to 0$. As $q \to \infty$, $MB^n = \beta \cdot MB^f \to MB^f$. This explains why both e^n and e^f converge to the effort level represented by the dashed horizontal line in Figure 2.

Two more points are noteworthy. First, a manager without career concerns provides less effort than a career-concerned manager does, i.e., $e^n < e^*$. This is because the latter manager has an additional incentive to improve the market assessment of ability; recall that $MB^n < MB^* \equiv MB^n + \alpha A_e$, where $\alpha > 0$ and $A_e > 0$. Second, with *no* uncertainty about manager ability, e^* would be the same as e^n. To see why, note that if $s \equiv Var[a]^{-1} \to \infty$ and thus $\gamma = h / (h + s) \to 0$, MB^* reduces to MB^n, implying that $e^* \to e^n$. Intuitively, because the distribution of a in this case degenerates to its prior mean, the market would not update its beliefs about a. Accordingly, the manager would not consider the market assessment of ability. In sum, if $s \to \infty$, career concerns would be a nonissue.

No project abandonment ($q = 0$)

Suppose that the project is *always* implemented. Although this is a *hypothetical* case in that the project is abandoned whenever $y \leq y^o$, it helps highlight the role of project abandonment in the present model and contrast the equilibrium effort with that in prior models which effectively assume no abandonment.

COROLLARY 3.

(i) *For any given y, the project is always implemented if and only if* $q = 0$.

(ii) *With no project abandonment,* $e^* \leq e^f$ *if and only if* $\alpha\gamma \leq 1$.

Part (i) states that no abandonment is equivalent to no information, implying that it cannot coexist with an informative y. The proof is simple. If y is pure noise ($q = 0$), investors ignore y and use their conjecture of the project's expected future cash flow, which is $e^c > 0$. Thus, the project is always implemented. To show the converse, suppose contrarily that $q > 0$. Then, the expected cash flow must be negative for some y, in which case the project is abandoned. This is a contradiction.

Using part (i), one can replace no project abandonment in part (ii) with $q = 0$. Then, Proposition 2, with $q = 0$ (and thus $\beta = 0$ and $y^o = -\infty$), implies that the equilibrium effort, e^*, must be characterized by

$$\alpha\gamma = c'(e). \tag{20}$$

In the same vein, with $q = 0$ (and thus $y^o = -\infty$) in (18), the first-best effort, e^f, must be given by

$$1 = c'(e). \tag{21}$$

Part (ii) directly follows from the comparison of (20) and (21). The key implication of part (ii) is that if there were no project abandonment and thus cash flow information were always available, the manager would only consider the market assessment of ability. Proposition 1(i) shows that this assessment does not use y and thus is *independent* of reporting quality. Hence, as shown in (20), the manager's effort incentive solely depends on their career concerns, α, and the sensitivity of the ability assessment to cash flow information, γ, such that if $\alpha\gamma$ is less (greater) than 1, the equilibrium effort is less (greater) than the first-best effort. In Figure 2, no project abandonment is represented by $q = 0$. The current ordering of effort at $q = 0$, i.e., $e^* < e^f$, depicts the case in which $\alpha\gamma < 1$ holds. If $\alpha\gamma > 1$, the ordering of e^* and e^f at $q = 0$ would be reversed, i.e., $e^* > e^f$.

Corollary 3 is closely related to Dewatripont et al. (1999). Generalizing Holmstrom (1982), they use a two-period model in which a manager's *sole* effort incentive is to increase the labor market assessment of their ability. Their model can be translated into the present setting, such that (i) the manager output measure in their model corresponds to the project cash flow z, and (ii) with *no* early information about z, the project is *always* implemented. This means that the manager in their model can be viewed as maximizing $\alpha A(e, e^c) - c(e)$, where $A(e, e^c) = \gamma(e - e^c)$. Under the normality assumption, it is easy to verify that their characterization of equilibrium effort (p. 187), $\alpha Cov[a, f_e / f] = c'(e)$, where f is the density of z and $f_e \equiv \partial f / \partial e$, is identical to (20). The difference is the role of $\alpha > 0$. Holmstrom (1982) and Dewatripont et al. (1999) use α as a discount factor, in which case $\alpha \leq 1$. Because $\gamma \in (0, 1)$, $\alpha\gamma < 1$. Thus, as Corollary 3(ii) shows, effort underinvestment *always* occurs in their models. This leads to Holmstrom's remark that although career concerns provide an effort incentive without incentive contracting (as argued by Fama 1980), effort underinvestment is inevitable in general.

In contrast, the manager in my model has *dual* concerns, and $\alpha \in (0, \infty)$ represents the magnitude of career concerns relative to the manager's concerns about firm value. Unlike in this benchmark, when the project may be abandoned for some y, the manager with dual concerns considers how their effort investment affects both the expected firm value and the manager's ability assessment. In that case, unlike Corollary 3(ii), an effort overinvestment can occur even when $\alpha\gamma$

< 1. Moreover, because reporting quality affects both the equilibrium and first-best efforts (Proposition 2 and Corollary 1), it is also a critical factor in determining whether effort is under- or overinvested. The next section formalizes these observations.

5. Comparative statics and efficiencies

I now return to the original setup in which (unlike the previous benchmarks) a manager with career concerns provides unobservable effort to increase both the firm value and ability assessment under possible project abandonment. I first examine how the equilibrium effort, e^* characterized in Proposition 2, changes with career concerns α and reporting quality q. The key is how α and q affect the marginal benefit of effort, $MB^* \equiv MB^n + \alpha A_e$. To facilitate discussion, I hereafter refer to MB^n as the manager's effort incentive to increase firm value, and αA_e as the manager's career-related effort incentive.

PROPOSITION 3.

(i) *e^* increases with α.*

(ii) *e^* increases with q if*

$$t \leq q \text{ and } \alpha\gamma \leq 1. \tag{22}$$

The intuition for part (i) is simple. Greater career concerns increase the manager's career-related effort incentive and hence the equilibrium effort. In Figure 2, this implies that, for any given q, the distance between e^* and e^n, which are the equilibrium efforts when $\alpha > 0$ and when $\alpha = 0$, respectively, becomes larger as α increases.

For the effect of reporting quality on the equilibrium effort, first recall from Corollary 2 that it has a positive effect on the incentive to increase firm value (MB^n). However, the effect on the career-related effort incentive (αA_e) is ambiguous in general. This makes it difficult to determine the effect of reporting quality on the manager's overall effort incentives (MB^*). In particular, the ambiguity is due to a negative effect of q on A_e through a decrease in the probability of project implementation, $1 - \Phi(\cdot)$.[7]

[7] I thank a reviewer for directing my attention to this point. However, this negative effect does not imply that A_e decreases with q because q also has a positive effect on A_e, which might be dominant. In fact, if the uncertainty about manager ability is either sufficiently large or sufficiently small, the net effect of q on A_e is either positive or negligible. In either case, MB^* increases with q. Otherwise, it is difficult to determine whether A_e increases or decreases with q. An analysis of this matter is available upon request.

Part (ii) identifies sufficient (*but not necessary*) conditions under which the net effect of reporting quality on the marginal benefit of effort is positive, and thus e^* increases with q. Although these conditions impose restrictions on the parameter space, they still allow the possibility that (i) the manager may be concerned more about the ability assessment than about firm value, and (ii) the manager may under- or overinvest effort. These possibilities are critical to the subsequent analysis, especially when reporting quality is endogenous in section 6. Below, I elaborate on the economic implications of the two conditions stated in (22).

Given the definitions of $t \equiv Var[z]^{-1}$ and $q \equiv Var[\varepsilon]^{-1}$, the first inequality, $t \leq q$, requires that the variance of the firm's future cash flow, z, is greater than that of the measurement error, ε.[8] An implication is that $\beta = q \, / \, (t + q) \geq 1/2$. This means that when forming an expectation of the firm's future cash flow, $E[z \mid y, e^c] = \beta y + (1 - \beta)e^c$, investors place a greater weight on the firm report, y, than on their conjecture of the prior mean cash flow, e^c. As a result, y has a greater impact on the market valuation of the firm when $t \leq q$ than when $t > q$.

The second inequality, $\alpha\gamma \leq 1$, is the same as the condition in Corollary 3(ii) under which the equilibrium effort in the case of no project abandonment is less than the corresponding first-best effort. Because the sole effort incentive in that case is to improve ability assessment, this condition may be reasonable. Indeed, as noted previously, Holmstrom (1982) and Dewatripont et al. (1999) use α as a discount rate, in which case $\alpha \leq 1$ and thus $\alpha\gamma \leq 1$; recall that $\gamma \in (0, 1)$. In contrast, I use $\alpha \in (0, \infty)$ as the magnitude of career concerns relative to the concerns about firm value. Restating $\alpha\gamma \leq 1$ as $\alpha \leq 1 \, / \, \gamma = 1 + s \, / \, h$, note that because $s > 0$ and $h > 0$, the upper bound of α is strictly greater than 1. Therefore, under $\alpha\gamma \leq 1$, it is still possible that the manager may be concerned more about career prospects than about firm value. As will be clear in the subsequent analysis, if the inequality is reversed, i.e., if $\alpha\gamma > 1$, then (i) effort is always overinvested, and (ii) the manager's equilibrium payoff always decreases with α. In contrast, with $\alpha\gamma \leq 1$, it can be shown that, depending on parameter values, the manager may under- or overinvest effort, and the payoff may increase or decrease with the magnitude of career concerns.

To summarize, when report y plays an important role in firm valuation, and the manager's concerns about ability assessment may be greater or less than their concerns about firm value, an increase in reporting quality has a positive effect on the equilibrium effort. Figure 2 depicts e^* as

[8] A priori, y can be a precise estimate of a highly volatile z, or an imprecise estimate of a less volatile z.

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an increasing function of q. The dashed vertical line is $q = t$, and thus the space of (q, e) to the right of this line is relevant to the analysis under the condition of $t \leq q$. Proposition 3(i) implies that a decrease in career concerns α shifts the graph of e^* downward. In the limit, if $\alpha \rightarrow 0$, then $e^* \rightarrow e^n$ for all q. In contrast, as implied by (18), a change in α has no effect on the graph of e^f.

I next examine the equilibrium efficiency relative to the first-best efficiency. I first compare the equilibrium and first-best efforts, e^* and e^f, for which α is critical.

LEMMA 1. *For any given q, there exists a unique value of α, denoted as* $\alpha^f(q) \in (0, 1 / \gamma)$, *such that* $e^* < e^f$ *if and only if* $\alpha < \alpha^f(q)$. *When* (22) *holds,* $\alpha^f(q)$ *decreases with q.*

Figure 3 shows that $\alpha^f(q)$ is the critical value of career concerns α, below (above) which the manager underinvests (overinvests) effort. Higher-quality reporting decreases $\alpha^f(q)$ for two reasons, which can be easily explained in Figure 3. Proposition 3(ii) shows that if (22) holds, it shifts the graph of e^* upward. Corollary 1 shows that as q increases, e^f moves down. Both imply that $\alpha^f(q)$ decreases with q. Envisioning the space of (q, α), it is also easy see that $\alpha^f(q)$ partitions this space into two subspaces, in which effort underinvestment occurs if (q, α) is located below $\alpha^f(q)$, whereas effort overinvestment occurs if (q, α) is located above $\alpha^f(q)$. This property will be useful in the analysis of equilibrium efficiency.

To examine the manager's equilibrium payoff, I return to (10) and (11), evaluate $V(e, e^c)$ and $A(e, e^c)$ at $e = e^c = e^*$, and define

$$V(e^*) \equiv V(e^*, e^*) \text{ and } A(e^*) \equiv A(e^*, e^*)$$

as the equilibrium expected firm value and the equilibrium expected market assessment of manager ability, respectively. Because $e = e^c = e^*$, $A(e^*) = 0$. This means that the manager's attempt to affect the market assessment is in vain; instead, as shown below, it leads to an ex ante welfare loss. This is reminiscent of Stein (1989), in which rational investors are not fooled, but managers behave myopically. Because competitive investors' equilibrium payoff is zero, the manager's welfare loss is also a social welfare loss in my model. Next, using (12), I obtain the manager's equilibrium payoff,

$$W^m(e^*, e^*) = V(e^*, e^*) + \alpha A(e^*, e^*) - c(e^*) = V(e^*) - c(e^*) \equiv W^*. \quad (23)$$

Last, evaluating $W(e)$ stated in (17) at $e = e^f$ yields the first-best payoff,

$$W(e^f) = V(e^f) - c(e^f) \equiv W^f. \quad (24)$$

It is clear in the above analysis that the equilibrium and first-best payoffs, W^* and W^f, are the values of the *same* function, $W(e) = V(e) - c(e)$, evaluated at *different* values of $e = e^*$ and e^f. The next corollary follows from Proposition 3(i), Lemma 1, and the fact that e^f is independent of α.

COROLLARY 4. *For any given q,*

(i) $W^* < W^f$ *except for* $\alpha = \alpha^f(q)$;

(ii) W^* *increases with* α *if and only if* $\alpha < \alpha^f(q)$.

Efficiency losses are inevitable, except for the knife-edge case of $\alpha = \alpha^f(q)$. This is because, for any given $\alpha \neq \alpha^f(q)$, the equilibrium effort, e^*, differs from the first-best effort, e^f, and e^f is the unique maximizer of $W(e) = V(e) - c(e)$. To see how the equilibrium payoff, W^*, changes with the magnitude of career concerns α, note that although α has no direct effect on W^*, it affects W^* through its effect on the equilibrium effort, e^*. Specifically,

$$\frac{dW^*}{d\alpha} = \left[\frac{\partial V(e^*)}{\partial e^*} - c'(e^*)\right]\frac{\partial e^*}{\partial \alpha}. \tag{25}$$

Proposition 3(i) shows that e^* increases with α. Next, $W(e) = V(e) - c(e)$ attains a unique maximum at $e = e^f$. Therefore, the expression inside the brackets is positive if and only if $e^* < e^f$. Lemma 1 shows that if $\alpha < \alpha^f(q)$, there is effort underinvestment, i.e., $e^* < e^f$, and hence (25) is positive, implying that the equilibrium payoff increases with the magnitude of career concerns. The intuition is that an increase in α induces the manager (who underinvests effort) to provide more effort. This reduces effort underinvestment, and as a result, W^* increases. Conversely, if $\alpha > \alpha^f(q)$, the manager overinvests effort, and thus (25) is negative. The intuition is that an increase in α amplifies effort overinvestment. As a result, W^* decreases.

6. Endogenous reporting quality

Thus far, reporting quality q has been an exogenous parameter. I now extend the model by allowing the manager to choose q at some cost before providing effort e. This choice is denoted as q^E and referred to as equilibrium reporting quality. I focus on how q^E differs from the first-best (efficiency-maximizing) reporting quality, denoted as q^F, depending on the magnitude of the manager's career concerns α.

Before proceeding, two remarks are in order. First, as noted in section 3, the reporting quality in my model, q, should be broadly interpreted. It represents the overall effectiveness of a firm's reporting system that provides financial information to various stakeholders. When report y is interpreted as accounting earnings, q includes accounting rules and policies, financial statement readability, various mechanisms to discourage manipulation of earnings information (e.g., internal controls, audit committees, and external auditing), and information intermediaries (e.g., investment banks in initial public offerings). Information about these factors is publicly available, and the market uses it to assess financial reporting quality.[9] In the present model, as will be shown, reporting quality plays the role of an ex ante commitment device because the manager can use it to indirectly control their effort incentives. Given that it is costly to improve reporting quality, equilibrium reporting quality can be viewed as the manager's (second-best) optimal commitment.

Second, potential project abandonment is crucial to the comparison of the first-best and equilibrium reporting qualities, (q^E, q^F). In section 4, Corollary 3(i) showed that no abandonment is equivalent to no firm report, i.e., $q = 0$. This implies that, in the absence of project abandonment, reporting quality a nonissue.

I now introduce more structure into the model to ensure the existence of equilibrium and first-best reporting qualities. First, there is a minimum requirement on the informational quality of report y, denoted as $q_m > 0$. That is, y cannot be pure noise. Let $\eta(q) \equiv k_m + k(q)$ be the cost of producing y that has quality $q \geq q_m$, where k_m is a positive constant denoting the cost of q_m, and k is an increasing convex function with $k(q_m) = k'(q_m) = 0$. Second, I employ the two conditions stated in (22), under which the equilibrium effort e^* increases with reporting quality q.[10]

Henceforth, I write e^* as $e^*(q, \alpha)$ to be explicit about the effects of q and α on the equilibrium effort. In the same vein, I write the first-best effort e^f as $e^f(q)$. Similarly, let $V(q, e)$ denote

[9] This justifies the assumption that q is observable. Accounting rules and policies are disclosed in financial statements. The identities and qualifications of audit committee members, external auditors, and investment banks are public information. The Sarbanes-Oxley Act requires that management and external auditors evaluate and disclose the effectiveness of internal controls. Evidence suggests that effective audit committees and internal controls enhance the quality of financial reports (Doyle et al. 2007; Krishnan 2005; Ashbaugh-Skaife et al. 2008). More prestigious and reputable auditors and investment banks improve the informativeness of corporate financial reports (Teoh and Wong 1993; Fang 2005; Jo et al. 2007; Francis and Wang 2008; Lee and Masulis 2011).

[10] To be more precise, (22) needs technical modifications due to the minimum reporting quality. First, $t \leq q$ needs to be changed to $t \leq q_m$, so that any q ($\geq q_m$) satisfies $t \leq q$. Second, $\alpha\gamma \leq 1$ needs to be modified to $\alpha \leq \alpha^f(q_m)$, where $\alpha^f(q)$ is defined in Lemma 1. Recall from Proposition 3(i) that, for any given q, e^* increases with α. Thus, $\alpha \leq \alpha^f(q_m)$ has an implication that if $q = q_m$, $e^* < e^f$ for any given α. However, as will be shown, equilibrium reporting quality is higher than q_m, in which case e^* can be greater or less than e^f depending on α because $\alpha^f(q)$ decreases with q (Lemma 1).

$V(e, e^c)$ stated in (10), with $e = e^c$ and q being made explicit as an argument of V. Last, let $W(q, e) \equiv V(q, e) - c(e)$.

Applying the above notation to (23) and (24) yields that the first-best and equilibrium payoffs, gross of the cost of reporting quality $\eta(q) \equiv k_m + k(q)$, are $W(q, e^f(q))$ and $W(q, e^*(q, \alpha))$, respectively. The first-best reporting quality maximizes the first-best net payoff, $W(q, e^f(q)) - \eta(q)$, whereas the equilibrium reporting quality maximizes the manager's net payoff, $W(q, e^*(q, \alpha)) - \eta(q)$.

PROPOSITION 4.

(i) *The first-best reporting quality, q^F, is the value of q ($> q_m$) that satisfies*

$$\frac{\partial V(q, e^f(q))}{\partial q} - k'(q) = 0. \tag{26}$$

(ii) *The equilibrium reporting quality, q^E, is the value of q ($> q_m$) that satisfies*

$$\left\{\left[\frac{\partial V(q, e^*(q,\alpha))}{\partial e^*} - c'(e^*(q,\alpha))\right]\left(\frac{\partial e^*(q,\alpha)}{\partial q}\right)\right\} + \left[\frac{\partial V(q, e^*(q,\alpha))}{\partial q} - k'(q)\right] = 0. \tag{27}$$

Equations (26) and (27) are the first-order conditions for q^F and q^E, respectively, and they have solutions greater than the minimum reporting quality. For part (i), consider the first-best gross payoff, $W(q, e^f(q)) = V(q, e^f(q)) - c(e^f(q))$. This payoff increases with q. In particular, because the first-best effort maximizes $W(q, e)$ for any given q, reporting quality q changes $W(q, e^f(q))$ only through its direct effects on the expected firm value, $V(q, e^f(q))$. Recall that $V(\cdot)$ is the expected value of the market price of the firm conditional on report y, which is $\max\{0, \pi(\cdot)\}$. Thus, q affects $V(\cdot)$ in two ways. First, given y, it affects the positive market price of the firm, $\pi(\cdot)$, through an increase in the weight β that investors place on y. On average, this effect is positive. Intuitively, when the reports indicating positive expected cash flows become more precise, investors pay more on average. The second effect of q on $V(\cdot)$ is through the variance of $y \equiv z + \varepsilon$, which decreases with q. This effect is negative because $\max\{0, \pi(\cdot)\}$ is convex in y. The proof shows that the net effect of q on $V(\cdot)$ is positive. The marginal benefit of reporting quality in the first-best case is traded off against its marginal cost in determining the first-best reporting quality, q^F.

The trade-off between the equilibrium payoff, $W(q, e^*(q, \alpha)) = V(q, e^*(q, \alpha)) - c(e^*(q, \alpha))$, and the cost of reporting quality differs from that in the first-best case. Similar to the trade-off in the first-best case, the expression inside the second brackets in (27), $\partial V(\cdot) / \partial q - k'(q)$, shows the

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trade-off arising from the direct effects of q on $V(\cdot)$, except that $V(\cdot)$ is evaluated at the equilibrium effort, $e^*(q, \alpha)$. The expression inside the curly brackets in (27) is an *adjustment* to this trade-off. This is due to the *indirect* effect of q on $W(q, e^*(q, \alpha))$ through $e^*(q, \alpha)$; recall from Proposition 3 that $e^*(q, \alpha)$ increases with q and α. Here, the magnitude of career concerns α is critical. Lemma 1 shows that if α exceeds $\alpha^f(q)$, then $e^*(q, \alpha) > e^f(q)$. Thus, $[\partial V(\cdot) / \partial e^* - c'(\cdot)] < 0$, implying that the adjustment is negative. However, if α is less than $\alpha^f(q)$, the converse is true, i.e., the adjustment is positive. In sum, because of this adjustment, the equilibrium marginal benefit of reporting quality is different from that in the first-best case, and this makes q^E different from q^F.

In the above analysis, note that the magnitude of α is critical to the *direction* of adjustment. For the intuition, recall that the equilibrium effort changes with α, but the first-best effort does not. As a result, the distortion in the manager's effort investment and thus their incentive to reduce this distortion change with α. Exploiting this fact, I now examine how the equilibrium reporting quality differs from the first-best quality, depending on the magnitude of the manager's career concerns.

A bit more notation helps facilitate the analysis. First, given the first-best and equilibrium reporting qualities q^F and q^E (characterized in Proposition 4), let

$$e^F \equiv e^f(q^F) \text{ and } e^E \equiv e^*(q^E, \alpha) \tag{28}$$

be the first-best and the equilibrium efforts, respectively, where $e^f(q)$ solves (18) for any given q and $e^*(q, \alpha)$ solves (13) for any given (q, α). Next, let

$$F \equiv (q^F, e^F) \text{ and } E \equiv (q^E, e^E) \tag{29}$$

denote the first-best and equilibrium allocations of reporting quality and effort, respectively. Last, define α^F to be the critical value $\alpha^f(q)$ corresponding to the first-best reporting quality, i.e.,

$$\alpha^F \equiv \alpha^f(q^F). \tag{30}$$

PROPOSITION 5. *Suppose that* $Var[z]$ *is sufficiently large. A necessary and sufficient condition for* $q^E < q^F$ *and* $e^E > e^F$ *is* $\alpha > \alpha^F$.

As a circumstance in which career concerns can explain how the equilibrium and first-best allocations differ, I consider a sufficiently large variance of the firm cash flows for the following reasons. First, it ensures the uniqueness of the first-best reporting quality against which the equilibrium reporting quality is to be compared. Second, the importance of firm report y as an estimate of the firm's future cash flow is heightened when there is high uncertainty in that cash flow.

The results in section 5 and Proposition 4 collectively provide the key intuition. Recalling that $\alpha^f(q)$ induces the first-best effort for a given q, consider a manager who has career concerns $\alpha^F \equiv \alpha^f(q^F)$. If the manager chooses q^F, the equilibrium effort is $e^*(q^F, \alpha^F) = e^f(q^F) \equiv e^F$. Because this is the first-best allocation that maximizes the manager's payoff, $W(q, e) - \eta(q)$, they have no incentive to change. That is, the first-order conditions for q^E and q^F are identical, and thus the equilibrium and first-best allocations, E and F, are the same. Except for the case of $\alpha = \alpha^F$, the two allocations differ because the manager has an incentive to improve the efficiency in effort investment by choosing a reporting quality different from q^F. The fact that $e^*(q, \alpha)$ increases with α and q is critical here. Consider a manager who has $\alpha > \alpha^F$. If the manager chooses $q \geq q^F$, $e^*(q, \alpha) > e^f(q^F)$ because $q \geq q^F$ and $\alpha > \alpha^F$. In this case, the manager decreases q to a level below q^F because doing so reduces effort overinvestment. Although there is a loss from an underinvestment in reporting quality (relative to q^F), the gain from a reduction in the effort overinvestment is greater, and thus the manager's payoff increases. This is why the equilibrium reporting quality, q^E, is lower than the first-best quality, q^F. The equilibrium effort corresponding to q^E, i.e., $e^E \equiv e^*(q^E, \alpha)$, remains greater than the first-best effort e^F. This is because to remove this effort overinvestment, the manager would need to lower q^E too much from q^F, in which case the loss from suboptimal reporting quality would be too large. In sum, when $\alpha > \alpha^F$, the manager trades off reporting quality against their effort decision, which leads to an equilibrium allocation of $q^E < q^F$ and $e^E > e^F$. When $\alpha < \alpha^F$, the incentives are reversed. The manager chooses a reporting quality higher than the first-best quality to alleviate (but not eliminate) the efficiency loss caused by effort underinvestment. This leads to an equilibrium allocation of $q^E > q^F$ and $e^E < e^F$.

In Figure 4, the equilibrium effort provided by a manager who has $\alpha = \alpha^F$ is $e^*(q, \alpha^F)$. Represented by the dashed curve, it must pass through the first-best allocation, $F \equiv (q^F, e^F)$, because the manager chooses q^F and $e^*(q^F, \alpha^F) = e^F$. Consider a manager who has $\alpha > \alpha^F$. This manager's effort, $e^*(q, \alpha)$, must be located above $e^*(q, \alpha^F)$ because $e^*(q, \alpha)$ increases with α. As explained above, the manager has no incentive to choose q^F. If they do, their equilibrium effort would be $e^*(q^F, \alpha)$, in which case allocation G prevails, and the loss arising from effort overinvestment, $e^*(q^F, \alpha) > e^F$, would be too large. Instead, the manager lowers reporting quality to q^E, with which their effort is reduced to $e^E = e^*(q^E, \alpha)$. Hence, the equilibrium allocation, $E \equiv (q^E, e^E)$, must be located northwest of F. Although not depicted in Figure 4, if $\alpha < \alpha^F$, the equilibrium allocation must be located southeast of F, where overinvestment in reporting quality and effort underinvestment occur.

7. Discussion

Proposition 5 generates the main empirical prediction of this study that financial reporting quality is *negatively* related to managerial career concerns. Specifically, highly career-concerned managers, who tend to overinvest effort to establish and strengthen their reputations, are likely to choose low-quality reporting systems. In contrast, less career-concerned managers are expected to do the opposite. A key result behind this prediction is that high-quality reporting increases effort incentives. Proposition 3(ii) establishes this result under certain conditions. However, a caveat is that one cannot a priori rule out the possibility that high-quality reporting might decrease effort incentives, in which case the prediction would be a positive relation between career concerns and reporting quality.[11] This suggests that, ultimately, their relation (if any) may be an empirical question. I thus examine if there is empirical evidence on this relation.

Before proceeding, recall that the present model considers an entrepreneurial firm with no agency problem. Introducing an agency relationship into the model would require an analysis of the owner's problem to design an optimal incentive contract and an optimal reporting system under the manager's incentive compatibility and participation constraints. Nonetheless, I conjecture that the economic forces determining the relation between career concerns and reporting quality in the present model (whether it be positive or negative, as noted above) are likely to be preserved. The basic reasoning is as follows (see Appendix 2 for more details). As long as an optimal contract under a reporting system does not fully control the manager's effort incentives, there will be an under- or overinvestment of effort, and it will also depend on the manager's career concerns. This prompts the owner to adjust the reporting system (and the corresponding optimal contract) to induce an effort closer to the first-best level. When choosing an optimal reporting system/quality, the owner considers the trade-off between the expected firm value net of the expected compensation to the manager that includes their cost of effort, and the cost of reporting quality. This trade-off is similar to that in the present model in which the manager uses reporting quality as a mechanism to improve the efficiency in their effort investment. This suggests that the main economic forces behind the relation between reporting quality and managerial career concerns in this agency

[11] As noted in footnote 7, when (22) does not hold, reporting quality might have a positive or negative effect on effort incentives. However, even when this effect is negative and thus there is a positive relation between career concerns and reporting quality, the reason to adjust reporting quality would remain the same—that is, to improve the efficiency in effort investment. For example, when a manager with excessive career concerns overinvests effort, they choose a reporting quality higher than the first-best level to reduce their effort investment.

model are likely to be similar to those in the present model of an entrepreneurial firm. Thus, in the following discussion of empirical findings, I do not distinguish entrepreneur-type or employee-type managers.

To a large extent, career/reputation concerns reflect an individual's personal preferences. My model captures this with a weight that a manager places on the market assessment of the manager's ability in their objective function. Although the notion is clear, it may be difficult to measure the magnitude of career concerns in empirical research. A frequently used proxy is the length of CEO tenure. The idea is that relative to long-tenured CEOs, newly-appointed CEOs tend to be more concerned about the market and shareholder assessment of their abilities because they have stronger incentives to establish themselves in the firm. Given this idea, the findings of Ali and Zhang (2015) and Hazarika et al. (2012) that earnings management tends to be pronounced in the early years of CEO tenure and then diminishes, can be interpreted as consistent with the main prediction of the present study—that is, a negative relation between managerial career concerns and reporting quality.[12]

The above idea on the relation between CEO tenure and career concerns, however, is not unanimously supported. For example, Francis et al. (2008) and Milbourn (2003) argue that, compared with short-tenured CEOs, long-tenured CEOs tend to be more concerned about the market perception of their management skills and talents. The idea is that these CEOs are relatively well established and highly reputed, and thus have more to lose if their managerial capabilities are downgraded. Baginski et al. (2018) note that, in general, tenure length can have a *non-monotonic* relation with managerial career concerns. Using multiple measures of career concerns, rather than a single tenure-based measure, several studies on management earnings guidance find that overall, career concerns tend to be associated with less informative guidance (e.g., Pae et al. 2016; Baginski et al. 2018; Bochkay et al. 2019).[13] In this respect, Francis et al. (2008) and Malmendier and Tate

[12] Here, a presumption is that financial reporting quality and earnings management are negatively related. As elaborated in section 6, the reporting quality in my model represents the overall effectiveness of a firm's information system that provides a financial report to outsiders who use it to estimate the firm's future cash flows. Earnings management typically refers to manipulation of earnings information through accruals and/or real activities, which are not explicitly modeled in this study. However, to the extent that a higher-quality reporting system as a part of corporate governance is more effective in discouraging earnings management through intense monitoring, it seems reasonable to presume that they are negatively related. This presumption is supported by empirical evidence (e.g., Malmendier and Tate 2009).

[13] Similar to the argument in footnote 12, a presumption is that, ceteris paribus, high-quality reporting systems enhance the quality of voluntarily provided earnings guidance. This is supported by empirical studies (e.g., Baginski et al. 2018).

(2009) are also noteworthy. Using media coverage, they find that highly reputed CEOs, who are under greater pressure to deliver strong firm performance, tend to provide lower-quality earnings information. Collectively, a number of empirical studies suggest that, regardless of the length of tenure at a particular firm or over their career horizon, managers seeking to establish themselves or to protect their established reputations tend to be more sensitive to market assessments of their ability, and these career/reputational concerns may have a negative effect on reporting quality. In this study, I offer a theoretical explanation that this negative effect may emerge from the optimal decision to improve firm efficiency in the presence of managerial career concerns.

Last, although I focus on career concerns as a determinant of financial reporting quality, there could be confounding factors that are not considered in the present study, but likely to interact with managerial career concerns in affecting reporting quality. They include (i) manager status in the firm, such as corporate founders (Milbourn 2003), management entrenchment (Shleifer and Vishny 1989 and Berger et al. 1997), internally-promoted or outside-hired CEOs (Milbourn 2003 and Pae et al 2016), CEO duality (i.e., the CEO of a firm is also the chairperson of its board), and interlocking directorates (Hallock 1997); (ii) governance characteristics, such as board composition (Hermalin and Weisbach 1988 and 1998) and the influence of institutional investors; and (iii) firm/industry characteristics related to the difficulty of CEO replacement (Taylor 2010).

8. Summary

Managers' concerns about career prospects and reputations are an important determinant of corporate financial reporting quality that affects firm efficiency. A natural question arises as to the endogenous effect of career concerns on reporting quality and its efficiency implications. The prior literature on career concerns has paid relatively little attention to this question, despite its importance. In the current study, I address the question by developing a model in which a career-concerned manager provides effort and chooses the informational quality of a financial report. Like any analytical study, my model is a metaphor for reality. The key is whether the tensions created in the model and the consequent equilibrium are plausible. In this respect, the economic forces behind the results—the manager's dual concerns about firm value and the market perception of the manager's ability, effort incentives to increase both, and the role of reporting quality in affecting effort incentives—are intuitively appealing.

Depending on the magnitude of career concerns, the manager's equilibrium effort can be greater or less than the efficiency-maximizing level. In the presence of an effort overinvestment (underinvestment), the equilibrium efficiency decreases (increases) with career concerns. Under certain conditions, higher-quality reporting motivates the manager to increase effort. This implies that, depending on the direction of the distortion in effort investment, an improvement in reporting quality can either increase or decrease the equilibrium efficiency.

I address the main question of this paper in the extended model in which the manager chooses the level of reporting quality at some cost. Although there is no incentive problem associated with this choice, the manager does not choose the first-best reporting quality because they use reporting quality to improve the efficiency of their effort investment. Equilibrium allocation depends on how the manager balances the efficiencies in reporting quality and effort. To highlight the informational role of the firm's financial report, I consider a circumstance in which the firm's future cash flow has large uncertainty. In this case, if the manager is highly career-concerned, they choose a reporting quality lower than the first-best level because the gain from reducing effort overinvestment is greater. If the manager is less career-concerned, they opt for a reporting quality higher than the first-best level to mitigate effort underinvestment. In either case, the equilibrium does not achieve the first-best outcome in effort investment and reporting quality, inevitably leading to an efficiency loss.

Appendix 1

List of notations

Notation	Description
e	The manager's effort to create a project, whose cost equals $c(e)$
$z = x + a$	The firm's future cash flow when the project is implemented
$x \sim N(e, h^{-1})$	A cash flow component, whose mean equals manager effort e
$a \sim N(0, s^{-1})$	A cash flow component representing manager ability
$y = z + \varepsilon$	A public report issued by the firm prior to a potential trade of the firm
$q = Var[\varepsilon]^{-1}$	The quality of firm report y
$V(\cdot)$	The expected firm value in the competitive capital market
$A(\cdot)$	The expected market assessment of manager ability a
α	The magnitude of the manager's career concerns
$W^m(\cdot) = V(\cdot) + \alpha A(\cdot) - c(e)$	The manager's objective function when q is exogenous
e^c	The market conjecture of manager effort e
$\pi(y, e^c) = E[z \mid y, e^c]$	The expected cash flow of the firm, given y and e^c
y^o	The cutoff report that satisfies $\pi(y, e^c) = 0$
MB^*	The equilibrium marginal benefit of effort
MB^n	The marginal benefit of effort when the manager has no career concerns (i.e., when $\alpha = 0$)
A_e	The equilibrium effect of manager effort e on the market assessment of manager ability a
e^*	The equilibrium effort when the manager has career concerns α and reporting quality is q
MB^f	The marginal benefit of effort in the first-best case
e^f	The first-best effort when reporting quality is q
e^n	The equilibrium effort when the manager has no career concerns (i.e., when $\alpha = 0$)
$W(e) = V(e) - c(e)$	The first-best payoff function when q is exogenous
$W^f = W(e^f)$	The first-best payoff when q is exogenous
$W^* = W(e^*)$	The manager's equilibrium payoff when q is exogenous
$\alpha^f(q)$	Career concerns that induce the manager to provide the first-best effort e^f given q
$\eta(q) = k_m + k(q)$	The cost to produce report y whose quality is q

$W(q, e) - \eta(q)$	The payoff function given (q, e) when both q and e are endogenous
q^F	The first-best reporting quality
e^F	The first-best effort corresponding to q^F
$F = (q^F, e^F)$	The pair of the first-best reporting quality and effort
q^E	The equilibrium reporting quality
e^E	The equilibrium effort corresponding to q^E
$E = (q^E, e^E)$	The pair of the equilibrium reporting quality and effort

Appendix 2

Discussion of modeling choices, alternative assumptions, and extensions

This Appendix discusses some of the modeling assumptions and potential extensions of the model for future research. First, cash flow z is publicly realized at the end of the game. One could alternatively assume that z is realized after the game is over, and that the ability assessment in the second stage is based on a noisy signal about z, e.g., $z' \equiv z + \zeta$ with ζ being white noise. Given the risk neutrality assumption, this would not qualitatively change the main results. Next, x and a are additive in generating z. This structure is common in prior studies,[14] allowing the interpretation that for any given x, a larger value of a represents a greater contribution of manager ability to the firm cash flow z. An alternative would be a multiplicative form, e.g., $z = x{\cdot}a$. Under the normality assumption, however, this form creates tractability problems in Bayesian updating of the beliefs about a conditional on y or (y, z). Furthermore, given the normality of (x, a), it is problematic to interpret a larger value of a as a greater contribution to z; e.g., when x is negative, a large positive a makes z more negative.

Second, to focus on a career-concerned manager's effort and reporting quality decisions, I restrict the role of outside investors to project/firm valuation. In reality, project implementation often requires capital, and investors may provide this capital in exchange for a fraction of firm ownership. These features can be incorporated into the present model without qualitative changes in the main results, except that the cutoff report above which investors supply capital would be greater than y^o characterized in (6).

Third, the magnitude of the manager's career concerns α is public information in the model. Managers in the real world, however, may have private information about their career plans—for example, private motives to search for new career opportunities or to retire at a certain age. This creates a typical adverse selection problem. In this respect, it might be interesting to extend the present model to a setting in which reporting quality plays the role of a signaling device for managers' private information about their career concerns. Also, note that the manager's career concerns and uncertainty about their ability, i.e., α and s, are two independent parameters in the present model. Although this has been commonplace in the analytical literature (e.g., Holmstrom 1982,

[14] See, for example, Holmstrom (1982), Gibbons and Murphy (1992), Hermalin and Weisbach (1998), Dewatripont et al. (1999), Nagar (1999), Gompers and Lerner (2004), Autrey et al. (2007), and Arya and Mittendorf (2011, 2015).

Prendergast and Stole 1996, Dewatripont et al. 1999, Milbourn et al. 2001, and Song and Thakor 2006), these two may be related. To enhance the realism of the model, one may allow α and s to be related, possibly in a stochastic manner.[15] However, a caveat from the discussion of empirical studies (section 7) is that it is a priori unclear how α and s are to be related. For instance, consider young rookie CEOs, whose managerial skills and talents are less known, and well-established reputable CEOs, whose management abilities are relatively well known because they have been assessed for a longer period. Ceteris paribus, whether the former or latter CEOs are more sensitive to market assessments is unclear. In addition, the relation between α and s, if any, is likely to be context-specific and affected by the manager/firm/industry characteristics mentioned in section 7. In summary, care needs to be taken in modeling a relation between α and s.

Last, to focus on the interaction between a firm manager and outside investors, I assume away potential agency issues inside the firm, similar to Holmstrom (1982), Prendergast and Stole (1996), Dewatripont et al. (1999), and Milbourn et al. (2001). In contrast, as noted in section 2, some prior studies mainly focus on the implications of career concerns (as implicit incentives) for incentive contracting in agency settings (e.g., Gibbons and Murphy 1992; Christensen et al. 2005). Although introducing the additional layer of an agency relationship into the present model would complicate the analysis, the main economic forces underlying the relation between career concerns and reporting quality are likely to be preserved. In this regard, it may be interesting to verify this conjecture by extending the present model to include an owner-manager relationship. In this extension, although all parties are risk-neutral, a "selling-the-firm" contract, under which the entire firm ownership is given to the manager at a fixed fee prior to their effort investment (Shavell 1979), is unlikely to achieve the first-best outcome. In particular, after buying the firm, the manager, as the new owner of the firm, would face the same problems as those in the current model in which the first-best outcome is unattainable (except for a knife-edge case). Although the principal's problem to design an optimal incentive contract is likely to be tricky due to potential project abandonment, the risk-neutral limited-liability agency model of Innes (1990) could be consulted. Specifically, he considers a setting in which (i) a manager has no career concerns, (ii) a gross profit that stochastically increases with manager effort is always positive, and (iii) reporting quality is a nonissue. In this setup, he shows that the effort induced by an optimal profit-sharing contract is

[15] I thank the two anonymous reviewers for bring this point to my attention.

less than the first-best level. Even though it is unclear how the optimal incentive contract in Innes (1990) would change if it is adapted to include managerial career concerns and project abandonment, I speculate that, in general, the second-best equilibrium effort would be different from the first-best level. An investigation of the efficiency-enhancing role of reporting quality in this setting may be an interesting extension of the present study.

Appendix 3

Proofs

Proof of Proposition 1

Given any e^c, note that (a, y, z) is a normal vector, whose mean and covariance matrix are, respectively, $(0, e^c, e^c)$ and

$$\begin{pmatrix} \sigma_{aa} & \sigma_{ay} & \sigma_{az} \\ \sigma_{ya} & \sigma_{yy} & \sigma_{yz} \\ \sigma_{za} & \sigma_{zy} & \sigma_{zz} \end{pmatrix} = \begin{pmatrix} s^{-1} & s^{-1} & s^{-1} \\ s^{-1} & h^{-1}+s^{-1}+q^{-1} & h^{-1}+s^{-1} \\ s^{-1} & h^{-1}+s^{-1} & h^{-1}+s^{-1} \end{pmatrix}.$$

Computing conditional expectations $E[a \mid y, z, e^c]$ and $E[a \mid y, e^c]$ yields the expressions stated in (8a) and (8b); I omit derivations because they are well known; for example, see Greene (2012, 1042). Given the definitions of β and γ, differentiating $\gamma\beta$ and γ with respect to q, h, and s, respectively, establishes the comparative static properties of and $E[a \mid y, z, e^c]$ and $E[a \mid y, e^c]$. ■

Proof of Proposition 2

Let $\Phi_e \equiv \partial\Phi(y \mid e) / \partial e$. Differentiating $V(e, e^c)$ stated in (10) with respect to e yields

$$\begin{aligned} \frac{\partial V(e,e^c)}{\partial e} &= \int_{y^o(e^c)}^{\infty} \pi(y,e^c)\frac{\partial\phi(y\mid e)}{\partial e}dy = \int_{y^o(e^c)}^{\infty}\pi(y,e^c)d\Phi_e \\ &= \Big[\pi(y,e^c)\Phi_e\Big]_{y^o(e^c)}^{\infty} - \int_{y^o(e^c)}^{\infty}\Phi_e d\pi(y,e^c) \qquad \text{(C1)} \\ &= \beta\int_{y^o(e^c)}^{\infty}\phi(y\mid e)dy = \beta\Big[1-\Phi(y^o(e^c)\mid e)\Big], \end{aligned}$$

where I use (5), $\pi(y^o(e^c), e^c) = 0$, and the facts that

$$\Phi_e \equiv \frac{\partial\Phi(y\mid e)}{\partial e} = -\phi(y\mid e) \quad \text{and} \quad \lim_{y\to\infty}[\pi(y, e^c)\phi(y \mid e)] = 0. \qquad \text{(C2)}$$

Differentiating $A(e, e^c)$ stated in (11) with respect to e yields

$$\frac{\partial A(e,e^c)}{\partial e} = \gamma\Big(\beta+(1-\beta)\Big[1-\Phi(y^o(e^c)\mid e)\Big]\Big)+\gamma(e-e^c)(1-\beta)\frac{\partial[1-\Phi(y^o(e^c)\mid e)]}{\partial e}. \qquad \text{(C3)}$$

Imposing the equilibrium condition, $e = e^c$, on (C1) and (C3) and rearranging terms, I obtain

$$\begin{aligned} \left.\frac{\partial W^m(e,e^c)}{\partial e}\right|_{e=e^c} &= \left.\frac{\partial V(e,e^c)}{\partial e}\right|_{e=e^c} + \alpha\left.\frac{\partial A(e,e^c)}{\partial e}\right|_{e=e^c} - c'(e) \\ &= \underbrace{\underbrace{\beta\Big[1-\Phi(y^o(e)\mid e)\Big]}_{MB^n} + \alpha\underbrace{\gamma\Big(\beta+(1-\beta)\Big[1-\Phi(y^o(e)\mid e)\Big]\Big)}_{A_e}}_{MB^*} - c'(e). \end{aligned}$$

Setting the above expression to be zero yields the first-order condition stated in (13). In addition, using the facts that $y^o < e$,

$$\frac{\partial\phi(y\,|\,e)}{\partial e} = -\frac{\partial\phi(y\,|\,e)}{\partial y} \text{ and } \frac{\partial y^o}{\partial e} = 1-\beta^{-1}, \tag{C4}$$

it is easy to verify that $[1 - \Phi(y^o(e) \mid e)]$, the only function of e included in MB^*, is a concave function with the following properties:

$$\lim_{e\to 0}\,[1 - \Phi(y^o(e) \mid e)] = \frac{1}{2} \text{ and } \lim_{e\to\infty}\,[1 - \Phi(y^o(e) \mid e)] = 1. \tag{C5}$$

Combining these properties of $[1 - \Phi(y^o(e) \mid e)]$ with the conditions for $c(e)$ stated in the model, it is easy to verify that (i) the second-order condition is satisfied, and (ii) due to the Intermediate Value Theorem, there exists a unique value of $e \in (0, \infty)$ that satisfies the first-order condition. ■

Proof of Corollary 1

I omit the derivation of the first-order condition for (17), which is stated in (18), and the verification of the second-order condition because they are similar to the proof of Proposition 2. Given the second-order condition, it suffices to show that MB^f stated in (18) decreases with q. After replacing e^c in (6) with e,

$$\frac{\partial\Phi(y^o(e)\,|\,e)}{\partial q} = \left[\frac{\partial\Phi}{\partial y^o}\frac{\partial y^o}{\partial\beta}\frac{\partial\beta}{\partial q} + \frac{\partial\Phi}{\partial p}\frac{\partial p}{\partial q}\right] = \frac{1}{2}\phi(y^o(e)\,|\,e)e\beta^{-2}\beta_q > 0, \tag{C6}$$

where

$$p \equiv Var[y]^{-1} = (t^{-1}+q^{-1})^{-1} = \frac{tq}{t+q} \tag{C7}$$

and I use the facts that

$$\frac{\partial\Phi(y\,|\,\cdot)}{\partial y} = \phi(y\,|\,\cdot) \text{ and } \frac{\partial\Phi(y\,|\,\cdot)}{\partial p} = \frac{p^{-1}}{2}(y-e)\phi(y\,|\,\cdot). \tag{C8}$$

(C6) implies that

$$\frac{\partial MB^f}{\partial q} = \frac{\partial}{\partial q}\left(\left[1-\Phi(y^o(e)\,|\,e)\right]\right) < 0. \blacksquare$$

Proof of Corollary 2

I need to show that MB^n stated in (19) increases with q. Note that

$$\frac{\partial MB^n}{\partial q} = \frac{\partial}{\partial q}\left(\beta\left[1-\Phi(y^o(e)\,|\,e)\right]\right) = \beta_q\left[1-\Phi^o(\cdot)\right] - \beta\Phi^o_q(\cdot) > 0. \tag{C9}$$

The proof for the above inequality is omitted here because it is a simple modification of the proof of Proposition 2(i) in Hughes and Pae (2014). ■

Proof of Corollary 3

(i) The result follows because the project is implemented if and only if $y > y^o \equiv (1 - \beta^{-1})e^c$. First, suppose that $q = 0$. Because $t \equiv Var[z]^{-1} > 0$, $\beta = q / (t + q) = 0$ and $y^o = -\infty$ for any given $e^c > 0$. Therefore, the project is always implemented. Next, to show the converse, suppose contrarily that $q > 0$. Because $t \equiv Var[z]^{-1} < \infty$, $\beta = q / (t + q) > 0$. Hence, y^o must be finite for any given e^c. Because y follows a normal distribution, there exists a non-empty set of y satisfying $y \leq y^o$. Thus, the project is abandoned with a positive probability, which is a contradiction.

(ii) The proof is provided in the main text. ■

Proof of Proposition 3

To simplify notation in this proof, let

$$\Phi^o \equiv \Phi(y^o(e) \,|\, e) \ and \ \phi^o \equiv \phi(y^o(e) \,|\, e)$$

and subscripts "α" and "q" denote the partial derivative with respect to α and q, respectively. Given the second-order condition, the effect of α or q on e^* is the same as its direct effect on MB^* stated in (13).

(i) It is clear that

$$MB_\alpha^* \equiv \frac{\partial MB^*}{\partial \alpha} = \gamma\left(\beta + (1-\beta)[1-\Phi^o]\right) > 0.$$

(ii) I rewrite MB^* as

$$MB^* = (1-\alpha\gamma)MB^n + \alpha\gamma\left\{MB^n + \left(\beta + (1-\beta)[1-\Phi^o]\right)\right\}.$$

Partially differentiating MB^* with respect to q and rearranging terms using (C9) yield

$$MB_q^* \equiv \frac{\partial MB^*}{\partial q} = (1-\alpha\gamma)\underbrace{\left(\beta_q\left[1-\Phi^o\right] - \beta\Phi_q^o\right)}_{M} + \alpha\gamma\underbrace{\left(\beta_q - \Phi_q^o\right)}_{N}. \quad \text{(C10)}$$

It needs to be shown that when (22) holds, (C10) is positive. Because $\alpha > 0$ and $\gamma \in (0, 1)$, the second condition in (22) reduces to $\alpha\gamma \in (0, 1]$. Hence, it suffices to show that $M > 0$ and $N > 0$.

(C9) shows that $M > 0$. Next, to show that $N > 0$, I use (C6) and rearrange terms. Then,

$$N = \beta_q - \Phi_q^o = \beta_q - \frac{1}{2}\phi^o e \beta^{-2}\beta_q = \beta_q\left[1 - \frac{1}{2}\phi^o e\beta^{-2}\right].$$

Because $\beta_q > 0$, it follows that $N > 0$ if the expression inside the brackets is positive. Note that

$$1-\frac{1}{2}\phi^o e\beta^{-2}=1+\frac{1}{2\beta}\phi^o\cdot(y^o-e)\geq 1+\phi^o\cdot(y^o-e)>[1-\Phi^o]\left[1+\frac{\phi^o}{1-\Phi^o}\cdot(y^o-e)\right]$$
$$=[1-G^o]\left[1+\frac{g^o}{1-G^o}\cdot u^o\right]=[1-G^o]\left[1+H(u^o)\cdot u^o\right]>0, \tag{C11}$$

where I use: (i) (6) with e^c being replaced with e for the first equality; (ii) the condition $t \leq q$ for the first inequality; and (iii) the fact that $\Phi^o \in (0,1)$ for the second inequality. For the remaining parts in (C11), recall that y is a normal random variable with a mean e and a standard deviation $\sigma_y \equiv p^{-1/2}$, where p is stated in (C7). Thus,

$\phi(y \mid e) = [g(u) / \sigma_y]$ and $\Phi(y \mid e) = G(u)$, (C12)

where g and G are the density and distribution functions of a standard normal random variable u, respectively. For the second and third equalities in (C11), I use (C12) and definitions

$$u^o \equiv \frac{y^o-e}{\sigma_y} \quad \text{and} \quad H(u)\equiv\frac{g(u)}{1-G(u)}. \tag{C13}$$

From Greene (2012, 836),

$0 < [H(u)]^2 - H(u)u < 1$ for any u,

which implies that

$1 + H(u^o)u^o > 0.$

This explains the last inequality in (C11). ■

Proof of Lemma 1

Let q be given. At $\alpha = 0$, e^* $(= e^n) < e^f$. Next, (13), (14a), (14b) and (18) collectively show that $MB^* > MB^f$ at $\alpha = 1 / \gamma$, which implies that $e^* > e^f$ at $\alpha = 1 / \gamma$. Because e^* is continuous and monotonically increases with α (Proposition 3(i)), the Intermediate Value Theorem implies that there exists a unique value α^f between $\alpha = 0$ and $\alpha = 1 / \gamma$ such that $e^* < e^f$ if and only if $\alpha < \alpha^f$.

Next, because $e^* = e^f$ at $\alpha = \alpha^f$, it follows that α^f must satisfy:

$MB^*(\alpha^f, q) = MB^f(q)$. (C14)

Treating α^f as an implicit function of q, I differentiate both sides of (C14) with respect to q:

$$MB_\alpha^*\frac{\partial\alpha^f}{\partial q}+MB_q^*=MB_q^f. \tag{C15}$$

Because

$$MB_\alpha^*>0,\ MB_q^*>0 \text{ under (22), and } MB_q^f<0, \tag{C16}$$

$\alpha^f = \alpha^f(q)$ must decrease with q. ■

Proof of Corollary 4

(i) When $\alpha \neq \alpha^f(q)$,

$$W^* \equiv V(e^*) - c(e^*) < V(e^f) - c(e^f) = W(e^f) \equiv W^f, \tag{C17}$$

where the inequality is because $W(e) = V(e) - c(e)$ attains its unique maximum at $e = e^f \neq e^*$.

(ii) Considering that e^* depends on α,

$$\frac{dW^*}{d\alpha} = \left(\frac{\partial}{\partial e^*}[V(e^*) - c(e^*)]\right)\frac{\partial e^*}{\partial \alpha}. \tag{C18}$$

The sign of (C18) follows from Proposition 3(i) and Lemma 1. ■

Proof of Proposition 4

In the proofs of Propositions 4 and 5, I define

$\Omega(q, e) \equiv W(q, e) - \eta(q)$,

where $W(q, e) \equiv V(q, e) - c(e)$ and $\eta(q) \equiv k_m + k(q)$ are the same as those in the main text.

(i) Differentiating $\Omega(q, e^f)$ with respect to q yields

$$\frac{d\Omega(q,e^f)}{dq} = \left\{\left[\frac{\partial V(q,e^f)}{\partial e^f} - c'(e^f)\right]\frac{\partial e^f}{\partial q}\right\} + \left[\frac{\partial V(q,e^f)}{\partial q} - k'(q)\right] = \frac{\partial V(q,e^f)}{\partial q} - k'(q), \tag{C19}$$

where the expression inside the curly brackets is zero because e^f maximizes $V(q, e) - c(e)$ for any given q. Next, for any given (q, e),

$$\frac{\partial V(q,e)}{\partial q} = \frac{1}{2tq}\phi(y^o(e) \mid e) > 0 \cdot \tag{C20}$$

I omit the proof of (C20) because it is a straightforward modification of the proof of Proposition 4(i) in Hughes and Pae (2014).

To examine the last expression in (C19), I substitute e with e^f in (C20), as well as in (6) for y^o, along with the fact that y is a normal random variable with mean e^f and precision p stated in (C7). After rearranging terms,

$$\frac{\partial V(q,e^f)}{\partial q} = \frac{1}{2tq}\phi(y^o(e^f) \mid e^f) = \frac{1}{2\sqrt{2\pi t}}D(q,t)\cdot \exp[f(q,e^f)], \tag{C21}$$

where

$$D(q,t) \equiv \sqrt{\frac{1}{q(t+q)}} \text{ and } f(q,e^f) \equiv -\frac{(e^f)^2}{2}\frac{t(t+q)}{q}. \tag{C22}$$

First, consider $q = q_m$. Collectively using (C19), $k'(q_m) = 0$, (C21), and (C22) yields

$$\left.\frac{d\Omega(q,e^f)}{dq}\right|_{q=q_m} = \frac{1}{2\sqrt{2\pi t}} D(q_m,t)\cdot \exp[f(q_m,e^f(q_m)] - 0 > 0. \tag{C23}$$

Second, let $q \to \infty$. Using (18), it is easy to verify that the corresponding first-best effort e^f is characterized by $[1 - \Phi(0 \mid e)] = c'(e)$. Now note in (C22) that (i) $D(q, t) \to 0$, and (ii) $f(q, e^f)$ remains finite because e^f solving $[1 - \Phi(0 \mid e)] = c'(e)$ is finite and $[(t + q) / q] \to 1$. Thus, given that $k'(q) > 0$ for all q,

$$\lim_{q\to\infty}\frac{d\Omega(q,e^f)}{dq} = 0 - \lim_{q\to\infty}k'(q) < 0. \tag{C24}$$

Combining the Intermediate Value Theorem with (C23) and (C24), it follows that there exists a value $q \in (q_m, \infty)$ at which (C19) = 0 and $\Omega(q, e^f)$ attains a local maximum. If this value of q is unique, it is the first-best reporting quality, q^F. If there are multiple values of such q, one can pick q^F to be the value of q at which $\Omega(q, e^f)$ attains a global maximum.

(ii) Differentiating $\Omega(q, e^*)$ with respect to q yields

$$\frac{d\Omega(q,e^*)}{dq} = \left\{\left[\frac{\partial V(q,e^*)}{\partial e^*} - c'(e^*)\right]\frac{\partial e^*}{\partial q}\right\} + \left[\frac{\partial V(q,e^*)}{\partial q} - k'(q)\right]. \tag{C25}$$

Below, I repeatedly use the results that (i) $\partial e^* / \partial q > 0$ (Proposition 3(i)); and (ii) e^f is the unique maximizer of $[V(q, e) - c(e)]$ for any given q. In addition, when necessary, I write e^* as $e^*(q, \alpha)$ and e^f as $e^f(q)$ as in the main text to be explicit about q and α.

Consider $q = q_m$. Given the assumption $\alpha \le \alpha^f(q_m)$, $e^*(q_m, \alpha) \le e^f(q_m)$. Hence,

$$\frac{\partial V(q_m,e^*(q_m,\alpha))}{\partial e^*} - c'(e^*(q_m,\alpha)) \ge \frac{\partial V(q_m,e^f(q_m))}{\partial e^*} - c'(e^f(q_m)) = 0.$$

In addition, $\partial V(q, e) / \partial q > 0$ for any q and e due to (C20), and $k'(q_m) = 0$. Thus,

$$\left.\frac{d\Omega(q,e^*)}{dq}\right|_{q=q_m} > 0. \tag{C26}$$

Next, let $q \to \infty$. Using (13), it is easy to verify that the corresponding equilibrium effort e^* is characterized by $[1 - \Phi(0 \mid e)] + \alpha\gamma = c'(e)$. For any α, this effort e^* is greater than the first-best effort e^f that solves $[1 - \Phi(0 \mid e)] = c'(e)$; see the proof of part (i) for the characterization of e^f when $q \to \infty$. This means that the expression inside the curly brackets in (C25) is negative when $q \to \infty$. For the remaining terms in (C25), I use (C20) with $e = e^*$, i.e.,

$$\frac{\partial V(q,e^*)}{\partial q} = \frac{1}{2tq}\phi(y^o(e^*) \mid e^*). \tag{C27}$$

Using the fact that e^* solving $[1 - \Phi(0 \mid e)] + \alpha\gamma = c'(e)$ is finite, (C27), and following the same steps used in the proof of part (i), it is easy to verify that

$$\lim_{q\to\infty} \frac{d\Omega(q,e^*)}{dq} < 0. \tag{C28}$$

Applying the Intermediate Value Theorem to (C26) and (C28) shows that there exists a value $q^E \in (q_m, \infty)$ at which (C25) equals zero and $\Omega(q, e^*)$ attains a maximum. ■

Proof of Proposition 5

I first state two results that will be used in this proof. First, replace e^c with e in (6) and substitute y^o into (C20). Differentiating the resulting expression with respect to e and rearranging terms yield

$$V_{qe} \equiv \frac{\partial^2 V(q,e)}{\partial q \partial e} = \beta^{-1} p(y^o - e)\phi(y^o(e) \mid e) < 0, \tag{C29}$$

where p is given in (C7) and the inequality is because $y^o < e$.

Second, if $t = Var[z]^{-1}$ is sufficiently small, $d\Omega / dq = \partial V(q, e^f) / \partial q - k'(q)$ stated in (C19) decreases with q. For proof, let $t \to 0$ and note that, given the convexity of k, this result holds if $\partial V(q, e^f) / \partial q$ stated in (C21) is non-increasing in q. The latter can be easily verified by using (C22) along with the following facts: as $t \to 0$,

$D(q, t) \to 1 / q$, $f(q, e^f) \to 0$, $\partial D(q, t) / \partial q \to -q^{-1/2}$, and $df(q, e^f) / dq \to 0$ for any q.

Also recall from the proof of Proposition 4(i) that (C19) = 0 at $q = q^F$. Thus, when t is sufficiently small, (C19) < 0 if and only if $q > q^F$. This implies that q^F is a unique solution to (C19) = 0. Below, I prove the result stated in Proposition 5 for any q^E solving (C25).

Consider $\alpha > \alpha^F$. I will show that (C25) evaluated at any q greater than q^F is negative, which implies that q^E satisfying (C25) = 0 must be less than q^F. Let $q > q^F$ be given. Note that

$$e^*(q, \alpha) > e^*(q, \alpha^F) > e^*(q^F, \alpha^F) = e^f(q^F) \equiv e^F, \tag{C30}$$

where the first inequality is because $\alpha > \alpha^F$, the second inequality is because $q > q^F$, and the last equality is due to the definition $\alpha^F \equiv \alpha^f(q^F)$. Given this ordering,

$$\frac{\partial V(q,e^*(q,\alpha))}{\partial e^*}-c'(e^*(q,\alpha))<\frac{\partial V(q^F,e^*(q,\alpha))}{\partial e^*}-c'(e^*(q,\alpha))$$
$$<\frac{\partial V(q^F,e^F)}{\partial e^*}-c'(e^F)=0, \tag{C31}$$

where the first inequality is because $q > q^F$ and (C29), the second inequality is because $e^*(q, \alpha) > e^F$ shown in (C30), and the last equality follows because e^F maximizes $V(q^F, e) - c(e)$. In addition,

$$\frac{\partial V(q,e^*(q,\alpha))}{\partial q}-k'(q)<\frac{\partial V(q,e^F)}{\partial q}-k'(q)<\frac{\partial V(q^F,e^F)}{\partial q}-k'(q^F)=0, \tag{C32}$$

where the first inequality is because of (C29) and $e^*(q, \alpha) > e^F$ in (C30), the second inequality is because (C19) < 0 for all $q > q^F$, and the last equality is because q^F is the unique solution to (C19) = 0. Then, (C31) and (C32) in conjunction with $\partial e^* / \partial q > 0$ imply that (C25) evaluated at any q greater than q^F is negative. Hence, q^E satisfying (C25) = 0 must be less than q^F.

When $\alpha < \alpha^F$, one can follow the same steps as in the above proof (with all the inequalities being reversed) to verify that (C25) evaluated at any q less than q^F is positive. This implies that any q^E satisfying (C25) = 0 must be greater than q^F.

To establish the ordering of $e^F \equiv e^f(q^F)$ and $e^E \equiv e^*(q^E, \alpha)$, consider $\alpha > \alpha^F$, in which case $q^E < q^F$ as shown above. Below, I will show that if $e^E \leq e^F$, there is a contradiction. Suppose that $e^E \leq e^F$. Then, the first term in (C25) evaluated at (q^E, e^E) is positive because

$$\frac{\partial V(q^E,e^E)}{\partial e^*}-c'(e^E)>\frac{\partial V(q^F,e^E)}{\partial e^*}-c'(e^E)\geq\frac{\partial V(q^F,e^F)}{\partial e^*}-c'(e^F)=0, \tag{C33}$$

where the first inequality is because of $q^E < q^F$ and (C29), the second inequality is because of the supposition $e^E \leq e^F$, and the last equality is because e^F maximizes $V(q^F, e) - c(e)$. Now recall that (q^E, e^E) is an equilibrium allocation. Thus, (C25) evaluated at (q^E, e^E) must be zero. Given (C33), this implies that the second term in (C25) evaluated at (q^E, e^E) must be negative. However,

$$\frac{\partial V(q^E,e^E)}{\partial q}-k'(q^E)\geq\frac{\partial V(q^E,e^F)}{\partial q}-k'(q^E)>0, \tag{C34}$$

where the first inequality is because of the supposition $e^E \leq e^F$ and (C29), and the second inequality is because $q^E < q^F$ (recall that q^F is the unique solution to (C19) = 0 and (C19) > 0 for all $q < q^F$). This contradicts that (q^E, e^E) is an equilibrium allocation. That is, if $\alpha > \alpha^F$, $e^E > e^F$ must hold.

Similarly, if $\alpha < \alpha^F$, $q^E > q^F$ as shown above. Following the same steps as in the above proof (with all the inequalities being reversed), it is easy to show that there is a contradiction if $e^E \geq e^F$. That is, $e^E < e^F$ must hold in this case. ■

References

Ali, A., and W. Zhang. 2015. CEO tenure and earnings management. *Journal of Accounting and Economics* 59: 60-79.

Ashbaugh-Skaife, H., D. W. Collins, W. R. Kinney, and R. LaFond. 2008. The effect of SOX internal control deficiencies and their remediation on accrual quality. *The Accounting Review* 83: 217-50.

Arya, A., and B. Mittendorf. 2011. The benefits of aggregate performance metrics in the presence of career concerns. *Management Science* 57: 1424–37.

Arya, A., and B. Mittendorf. 2015. Career concerns and accounting performance measures in non-profit organizations. *Accounting, Organizations and Society* 40: 1-12.

Autrey, R. L., S. S. Dikolli, and D. P. Newman. 2007. Career concerns and mandated disclosure. *Journal of Accounting and Public Policy* 26: 527–54.

Autrey, R. L., S. S. Dikolli, and D. P. Newman. 2010. Performance measure aggregation, career incentives, and explicit incentives. *Journal of Management Accounting Research* 22: 115-31.

Baginski, S., J. Campbell, L. Hinson, and D. Koo. 2018. Do career concerns affect the delay of bad news disclosure? *The Accounting Review* 93 (2): 61-95.

Baker, M. 2000. Career concerns and staged investment: evidence from the venture capital industry. Working paper, Harvard University.

Balakrishnan, K., J. E. Core, and R. S. Verdi. 2014. The relation between reporting quality and financing and investment: Evidence from changes in financing capacity. *Journal of Accounting Research* 52: 1-36.

Berger P. G., E. Ofek, and D. L. Yermack. 1997. Managerial entrenchment and capital structure decisions. *Journal of Finance* 52 (4): 1411-38.

Beyer, A., D. Cohen, T. Lys, and B. Walther. 2010. The financial reporting environment: Review of the recent literature. *Journal of Accounting and Economics* 50: 296-343.

Biddle, G., G. Hilary, and R. Verdi. 2009. How does financial reporting quality relate to investment efficiency? *Journal of Accounting and Economics* 48: 112-31.

Bochkay, K., R. Chychyla, and D. Nanda. 2019. Dynamics of CEO disclosure style. *The Accounting Review* 94: 103-40.

Caskey, J., and J. S. Hughes. 2012. Assessing the impact of alternative fair value measures on the efficiency of project selection and continuation. *The Accounting Review* 87 (2): 483-512.

Cella, C., A., Ellul, and N. Gupta. 2017. Learning through a smokescreen: Earnings management and CEO compensation over tenure. Working paper, Indiana University.

Chen, Q., S. S. Dikolli, and W. Jiang. 2015. Career-risk concerns, information effort, and optimal pay-for-performance sensitivity. *Journal of Management Accounting Research* 27 (2): 165-95.

Chen, Y. 2015. Career concerns and excessive risk taking. *Journal of Economics & Management Strategy* 24: 110–30.

Cheng, Q., B. W. Goh, and J. B. Kim. 2018. Internal control and operational efficiency. *Contemporary Accounting Research* 35: 1102-30.

Christensen, P. O., G. A. Feltham, and F. Sabac. 2005. A contracting perspective on earnings quality. *Journal of Accounting and Economics* 39: 265–94.

Christensen, P. O., H. Frimor, and F. Sabac. 2020. Real incentive effects of soft information. *Contemporary Accounting Research* 37 (1): 514–41.

Dewatripont, M., I. Jewitt, and J. Tirole. 1999. The economics of career concerns, part I: Comparing information structures. *Review of Economic Studies* 66: 183–98.

Doyle, J. T., W. Ge, and S. McVay. 2007. Accruals quality and internal control over financial reporting. *The Accounting Review* 82: 1141-70.

Eccles, R. G., R. H. Herz, E. M. Keegan, and D. M. H. Phillips. 2001. *The value reporting revolution*. New York: John Wiley & Sons.

Fama, E. 1980. Agency problems and the theory of the firm. *Journal of Political Economy* 88: 288-307.

Fang, L. H. 2005. Investment bank reputation and the price and quality of underwriting services. *Journal of Finance* 60: 2729-60.

Francis, J., A. H. Huang, S. Rajgopal, and A.Y. Zang. 2008. CEO reputation and earnings quality. *Contemporary Accounting Research* 25: 109-47.

Francis, J., and D. Wang. 2008. The joint effect of investor protection and Big 4 audits on earnings quality around the world. *Contemporary Accounting Research* 25: 157-91.

Gibbons, R., and K. Murphy. 1992. Optimal incentive contracts in the presence of career concerns: Theory and evidence. *Journal of Political Economy* 100: 468-505.

Goel, A. M., V. Nanda, and M. P. Narayanan. 2004. Career concerns and resource allocation in conglomerates. *Review of Financial Studies* 17: 99–128.

Gompers, P., and J. Lerner. 2004. *The venture capital cycle*. Cambridge, MA: MIT Press.

Graham, J. R., C. R. Harvey, and S. Rajgopal. 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics* 40: 3-73.

Greene, W. H. 2012. *Econometric Analysis*, 7th ed. Upper Saddle River, NJ: Prentice Hall.

Hallock, K. F. 1997. Reciprocally interlocking boards of directors and executive compensation. *Journal of Financial and Quantitative Analysis* 32 (3): 331-44.

Hayes, R. M., and S. Schaefer. 1999. How much are differences in managerial ability worth? *Journal of Accounting and Economics* 27: 125-48.

Hazarika, S., J. M. Karpoff, and R. Nahata. 2012. Internal corporate governance, CEO turnover, and earnings management. *Journal of Financial Economics* 104: 44-69.

Hermalin, B. E., and M. S. Weisbach. 1988. The determinants of board composition. *Rand Journal of Economics* 19 (4): 589-606.

Hermalin, B. E., and M. S. Weisbach. 1998. Endogenously chosen boards of directors and their monitoring of the CEO. *American Economic Review* 88: 96-118.

Holmstrom, B. 1999. Managerial incentive problems: A dynamic perspective. *Review of Economic Studies* 66: 169-82.

Holmstrom, B. 1982. Managerial incentive problems—A dynamic perspective. *Essays in Economics and Management in Honor of Lars Wahlbeck*. Swedish School of Economics.

Holmstrom, B., and J. Ricart i Costa. 1986. Managerial incentives and capital management. *Quarterly Journal of Economics* 101: 835-60.

Hughes, J. S., and S. Pae. 2014. Discretionary disclosure and efficiency of entrepreneurial investment. *Contemporary Accounting Research* 31: 982-1007.

Innes, R. D. 1990. Limited liability and incentive contracting with ex-ante action choices. *Journal of Economic Theory* 52: 45-67.

Ittner, C. D., and D. F. Larcker. 1998. Are nonfinancial measures leading indicators of financial performances? An analysis of customer satisfaction. *Journal of Accounting Research* 36 (Supplement): 1-35.

Jo, H., Y. Kim, and M. S. Park. 2007. Underwriter choice and earnings management: Evidence from seasoned equity offerings. *Review of Accounting Studies* 12: 23-59.

Kim, E. 2017. The market for reputation: Repeated matching and career concerns. Working paper, Carnegie-Mellon University.

Kodukula, P., and C. Papudesu. 2006. *Project valuation using real options: A practitioner's guide*. J. Ross Publishing.

Krishnan, J. 2005. Audit committee quality and internal control: An empirical analysis. *The Accounting Review* 80: 649-75.

Lambert, R., C. Leuz, and R. E. Verrecchia. 2007. Accounting information, disclosure, and the cost of capital. *Journal of Accounting Research* 45 (2): 385-420.

Lee, G., and R. W. Masulis. 2011. Do more reputable financial institutions reduce earnings management by IPO issuers? *Journal of Corporate Finance* 17: 982-1000.

Lev, B., and P. Zarowin. 1999. The boundaries of financial reporting and how to extend them. *Journal of Accounting Research* 37: 353-85.

Malmendier, U., and G. Tate. 2009. Superstar CEOs. *Quarterly Journal of Economics* 124 (4): 1593-1638.

Merton, R. C. 1974. On the pricing of corporate debt: The risk structure of Interest rates, *Journal of Finance* 29: 449-70.

Meyer, M. A., and J. Vickers. 1997. Performance comparisons and dynamic incentives. *Journal of Political Economy* 105: 547-81.

Milbourn, T. T. 2003. CEO reputation and stock-based compensation, *Journal of Financial Economics* 68: 233-62.

Milbourn, T. T., R. L. Shockley, and A. V. Thakor. 2001. Managerial career concerns and investments in information. *Rand Journal of Economics* 32: 334-51.

Mukherjee, A. 2008. Career concerns, marching, and optimal disclosure policy. *International Economic Review* 49: 1211-50.

Nagar, V. 1999. The role of manager's human capital in discretionary disclosure. *Journal of Accounting Research* 37 (Supplement): 167-81.

Pae, S., C. J. Song, and A. C. Yi. 2016. Career concerns and management earnings guidance. *Contemporary Accounting Research* 33: 1172-98.

Prendergast, C., and L. Stole. 1996. Impetus youngsters and jaded old-timers: Acquiring a reputation for learning. *Journal of Political Economy* 104: 1105-34.

Sabac, F. 2008. Dynamic incentives and retirement. *Journal of Accounting and Economics* 46: 172-200.

Shavell, S. 1979. Risk sharing and incentives in the principal and agent relationship. *Bell Journal of Economics* 10: 55-73.

Shleifer, A., and R. W. Vishny. 1989. Management entrenchment: The case of manager-specific investments. *Journal of Financial Economics* 25 (1): 123-39.

Song, F., and A. V. Thakor. 2006. Information control, career concerns, and corporate governance. *Journal of Finance* 61: 1845–96.

Stein, J. C. 1989. Efficient capital markets, inefficient firms: A model of myopic corporate behavior. *Quarterly Journal of Economics* 104: 655-69.

Taylor, L. A. 2010. Why are CEOs rarely fired? Evidence from structural estimation. *Journal of Finance* 65: 2051-87.

Teoh, S. H., and T. J. Wong. 1993. Perceived auditor quality and the earnings response coefficient. *The Accounting Review* 68: 346-66.

Trigeorgis, L. 1996. *Real options: Managerial flexibility and strategy in resource allocation*. MIT Press.

Trueman, B. 1986. Why do managers voluntarily release earnings forecasts? *Journal of Accounting and Economics* 8: 53–71.

Verrecchia, R. 1983. Discretionary disclosure. *Journal of Accounting and Economics* 5: 179-94.

Zhao, R. 2013. Innovation, information quality and career concerns. Working paper, Carnegie Mellon University.

Figure 1 Timeline

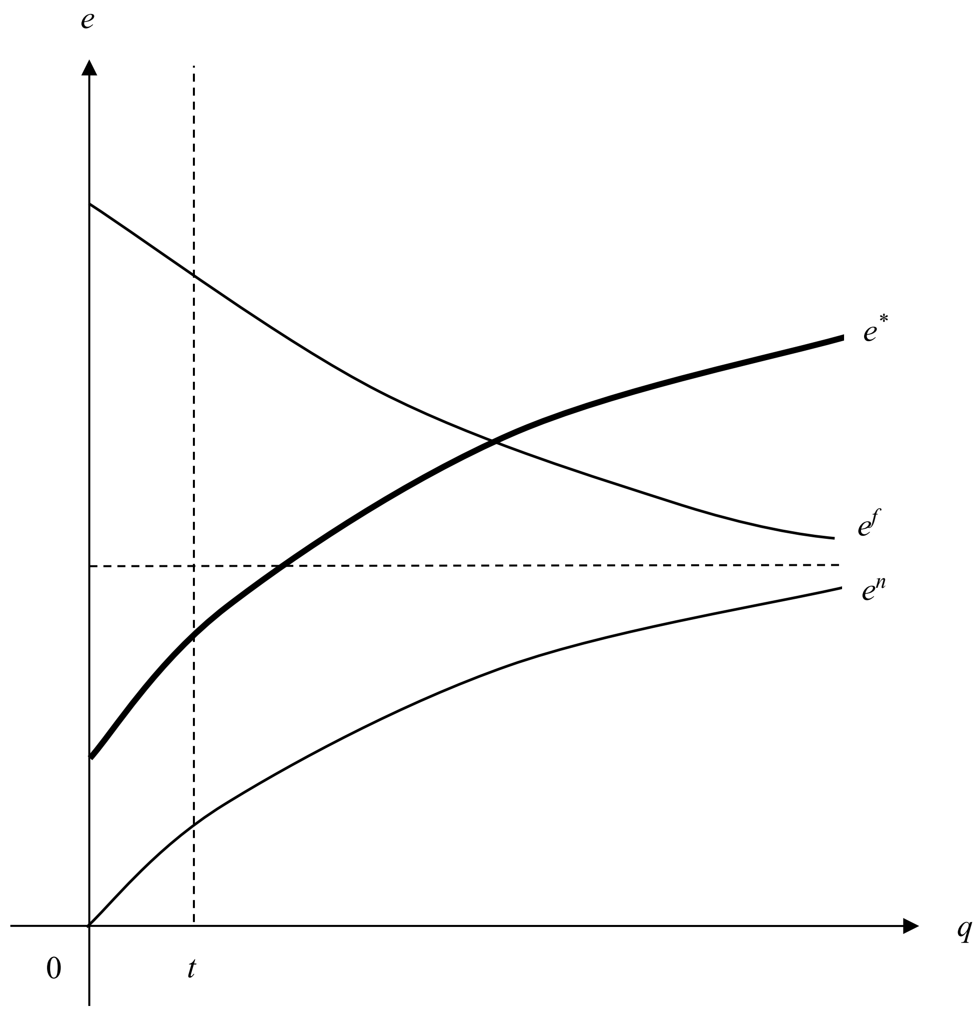
Stage 1

- The manager provides effort $e > 0$ to create a project.
- The firm issues a public report y. Based on y, competitive investors may purchase the firm (project).
- If the firm is not traded, the project is abandoned, and the market assesses the manager's ability, a, on the basis of y.
- If the firm is traded, the project is implemented.

Stage 2

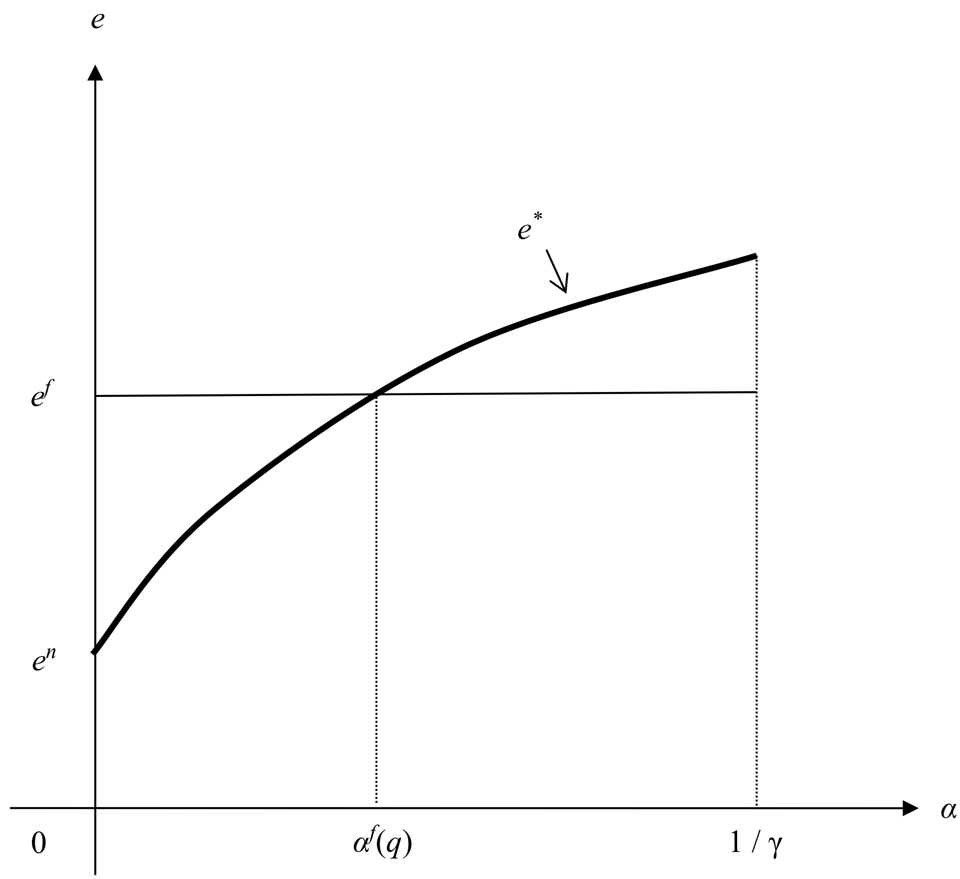
- If the project is implemented in the first stage, the firm's cash flow, z, is realized.
- The market assesses the manager's ability, a, on the basis of y and z.

Figure 2 Effort as a function of reporting quality



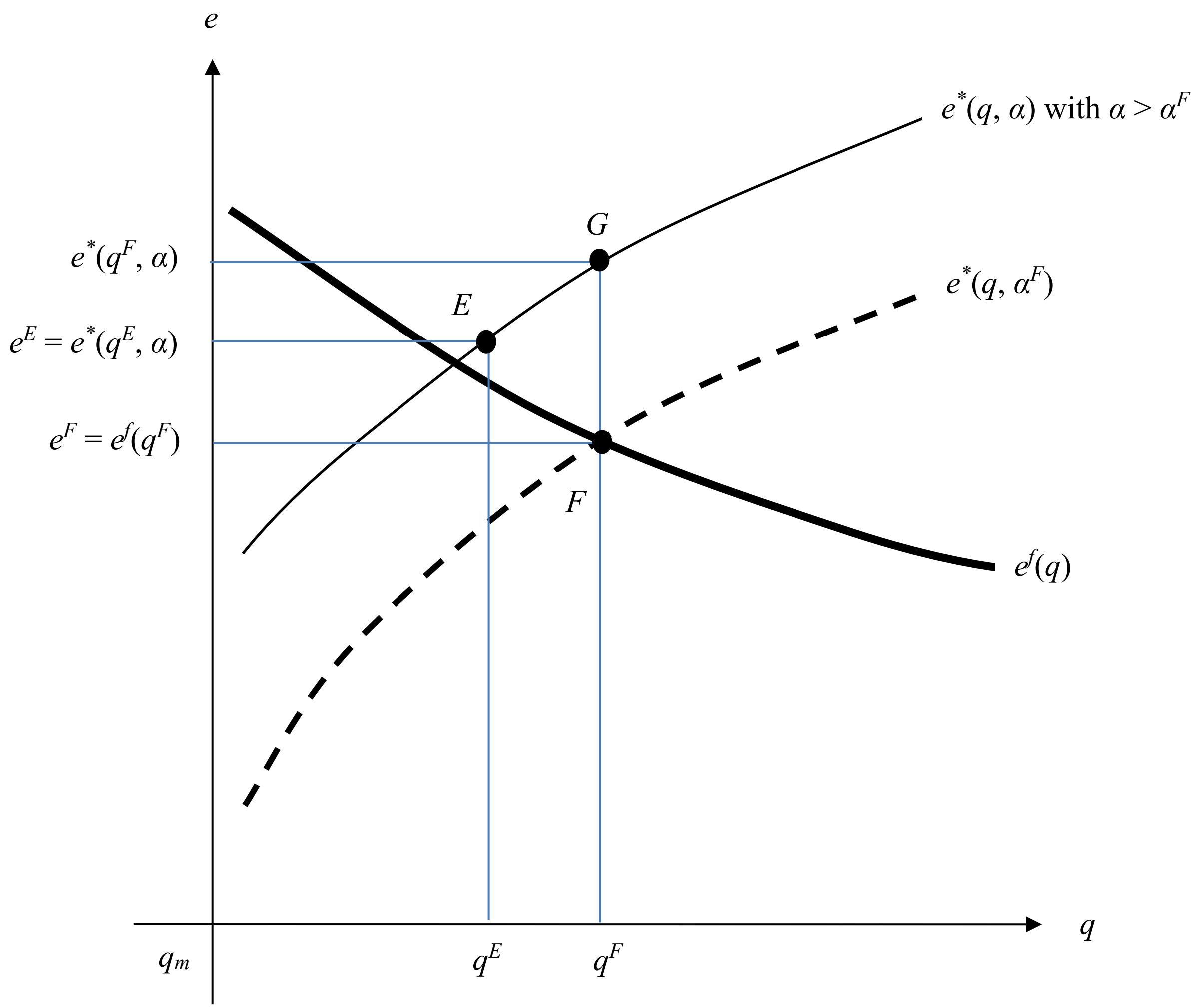
Notes: See Appendix 1 for the list of notations. With the magnitude of managerial career concerns α being fixed, the equilibrium effort, e^*, the first-best effort, e^f, and the effort under no career concerns, e^n, are depicted as functions of reporting quality q. The dashed vertical line is $q = t$, and thus the space of (q, e) to the right of this line satisfies the condition $t \leq q$. The dashed horizontal line represents the level of effort when $q \rightarrow \infty$.

Figure 3 Equilibrium effort as a function of managerial career concerns



Notes: See Appendix 1 for the list of notations. With reporting quality q being fixed, the equilibrium effort, e^*, is an increasing function of α that represents the magnitude of career concerns.

Figure 4 Equilibrium effort and reporting quality



Notes: See Appendix 1 for the list of notations. For a given reporting quality q, the first-best effort is $e^f(q)$. When the manager has career concerns α, the equilibrium effort for a given reporting quality q is $e^*(q, \alpha)$. The pair of the first-best reporting quality and effort is $F \equiv (q^F, e^F)$, and the equilibrium pair of reporting quality and effort is $E \equiv (q^E, e^E)$.