Corporate Fraud, Governance, and Auditing

Marco Pagano
Università di Napoli Federico II, CSEF, EIEF, and Imperial College

Giovanni Immordino
Università di Salerno and CSEF

We analyze corporate fraud in a setting in which managers have superior information but are biased against liquidation because of their private benefits from empire building. This may induce them to misreport information and even bribe auditors when liquidation would be value-increasing. To curb fraud, shareholders optimally design corporate governance by jointly choosing audit quality and managerial compensation. We analyze how country-level rules affect these firm-level choices. Our analysis underscores that different country-level governance provisions have different effects on firm-level governance: Some act as substitutes of internal governance mechanisms, whereas others enhance their effectiveness and therefore complement them. (*JEL* G28, K22, M42)

Private benefits of control often bias managers in favor of corporate expansion plans, even when these are unprofitable, and against liquidation or restructuring decisions, even when these would be desirable. But shareholders can design firm-level governance so as to mitigate this managerial bias toward empire building and against efficient liquidation. To this purpose, they can use two main mechanisms. First, they can rely on monitoring, for instance, by appointing auditors and independent directors to verify the information provided by managers and oversee their decisions. Second, they can design the compensation of managers so as to induce them to provide truthful information on the firm's

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prospects and deter them from inducing auditors to validate false accounting data. To this purpose, one can combine a variety of contractual schemes, ranging from equity and option-based compensation to severance pay.

The design of firm-level governance does not occur in a void, however: Its effectiveness in controlling managerial incentives depends on country-level governance rules, that is, on the legal provisions that constrain the extraction of private benefits of control and those that enhance the reliability of the information reported by managers. The purpose of this article is to analyze how country-level rules affect firm-level governance and how they jointly affect managerial incentives and corporate investment decisions.

On the whole, our analysis underscores that different country-level governance provisions have different effects on firm-level governance: Some act as substitutes of internal governance mechanisms, whereas others enhance their effectiveness and therefore complement them. For instance, our model predicts that company-level spending on auditing should increase as a result of more stringent auditing regulation and decrease as a result of better shareholder protection. This distinction is relevant to a recent strand of empirical research that tests whether firm-level governance tends to substitute or complement country-level governance. For instance, Aggarwal et al. (2010) report "evidence that investment in internal governance and investor protection are complements rather than substitutes" (p. 3,167), as foreign firms invest less in governance mechanisms to protect minority shareholders than do comparable U.S. firms. Similarly, Doidge, Karolyi, and Stulz (2007) document a positive correlation between company-level governance scores and the country-level degree of shareholder protection in financially developed countries, though not in emerging market countries. However, these studies rely on firm-level indicators that mix together many different aspects of corporate governance. Conversely, our model suggests that the sign of the correlation between country- and company-level governance depends on the specific company-level governance provisions under investigation, for instance, those concerning managerial compensation and those concerning the role of auditors and independent directors.

We study these issues in a model in which managers' incentives may be misaligned from shareholders' interests for two reasons. First, because of the private benefits of empire building, they may have the incentive to misreport information about the profitability of investment and even to induce auditors to paint a rosier picture than warranted. Second, managers can reduce the expected profitability of investment by choosing a low level of (unobservable) effort. In this setting, we explore how the company's governance reacts to country-level governance rules.

We focus on two dimensions of company-level governance, namely, the design of managerial compensation and the quality of auditing. In this model, optimal compensation generally includes both a "payment for reporting bad news," which tends to mitigate the manager's empire-building incentives and can be interpreted as severance pay,[1] and a certain degree of pay-performance sensitivity to address the manager's incentive to shirk. But shareholders can reduce pay-performance sensitivity by raising auditing quality, thus substituting managerial compensation with more spending on audit services. The latter is taken to include not only checks by outside auditing firms but also verification of corporate accounts by internal auditors and independent directors: The informational basis of corporate policies can be improved by stepping up any of these activities.[2]

Firm-level compensation arrangements and audit quality are affected by country-level regulation. An improvement in shareholder protection tends to increase pay-performance sensitivity, while it triggers decreased reliance on audit quality. Conversely, stricter auditing regulation has opposite effects on the two dimensions of firm-level governance: It calls for lower pay-performance sensitivity but also for enhanced auditing quality so that it tends to be a substitute for managerial pay incentives and a complement for auditing quality. Finally, the reliance on severance pay is inversely related both with shareholder protection and with the stringency of auditing regulation.

Finally, we extend the analysis to the case in which audit fees can be made contingent on the congruence between the auditors' report and actual investment performance: Because shareholders will pay more for accurate reports than for inaccurate ones, state-contingent audit fees make auditors a more reliable guide to investment decisions and therefore induce shareholders to rely less on managerial compensation as a governance mechanism.

Our model of auditing is related to the analysis of Dye (1993). However, there, audit quality is assumed to be unobservable.[3] In contrast, in our model audit quality is observable: The agency problem arises

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[1] This result—that firms may want to pay managers for "bad news"—is already present in Levitt and Snyder (1997), Müller and Inderst (2010), Eisfeldt and Rampini (2008), and Laux (2008). We contribute to this strand of the literature by taking into account auditing quality as an additional firm-level choice variable and studying the effect of country-level regulation on firm-level governance choices.

[2] In the case of external auditors, audit quality can be improved by increasing the accuracy of verification, for instance, by requiring external confirmation of the company's credits, performing on-site inspections of inventories and directly interviewing managers and employees at various levels. In general, this greater verification effort by auditors involves costs in terms of man-hours by qualified personnel and other costs and so translates into steeper auditing costs for the customer company.

[3] In Dye (1993) this agency problem is solved by litigation, insofar as auditors have wealth that damaged clients can seize. Immordino and Pagano (2007) show how the agency problem can be tempered by regulations imposing minimum audit standards.

from the manager's superior information and imperfect alignment with shareholders, and it may extend to auditors if managers bribe them. Our problem is more akin to that studied by Kofman and Lawarrée (1993), where an imperfectly informed agent—the auditor—plays a useful role in monitoring a perfectly informed one—the manager—because his incentives are better aligned with those of the principal. The key difference is that in our setting country-level corporate governance affects the severity of managerial moral hazard and thereby optimal auditing intensity as well as executive compensation.[4]

Our article is also related to the recent literature on managerial fraud. Whereas our analysis takes into account that shareholders can restrain managers' incentives to engage in fraud both via the design of their compensation and via the intensity of auditing, related articles tend to concentrate on either one of these two levers separately: For instance, Goldman and Slezak (2006) focus on managerial compensation,[5] whereas Povel, Singh, and Winton (2007) analyze investors' monitoring effort.[6]

Finally, a growing body of empirical literature has investigated how the incidence of managerial fraud responds to firm-level governance and to auditing quality, broadly defined to include the monitoring activity of independent directors. In accordance with our view of auditing quality as a managerial discipline device, these articles document that earnings restatements are less frequent in firms whose board or audit committees include an independent director with financial expertise (Agrawal and Chada 2005) and the incidence of accounting fraud and earnings manipulation is lower in companies with more independent boards (Beasley 1996; Dechow, Sloan, and Sweeney 1996; Klein 2002). Another strand of the empirical literature has analyzed the relationship between managerial incentive pay and accounting fraud. Bergstresser and Philippon (2006), Burns and Kedia (2006), Kedia and Philippon (2009), and Peng and Röell (2008) document that high-powered incentive schemes are

[4] There are two other substantial modeling differences. First, Kofman and Lawarrée assume two types of auditors, a corruptible but costless internal auditor and an incorruptible but costly external one, whereas in our setting there is a single type of auditor, who is both costly and corruptible. Second, they make different assumptions regarding the state in which the manager has the incentive to bribe the auditor so that collusion can only occur in the good state, whereas under our assumptions it may only occur in the bad state.

[5] Benmelech, Kandel, and Veronesi (2010) also focus on managerial compensation when managers can lie about the firm's growth prospects and show that in a dynamic setting it is optimal to index compensation both to the stock performance and to the company's earnings. Like Goldman and Slezak (2006), they do not consider monitoring as an additional governance tool.

[6] These articles differ from ours in other respects as well. In Goldman and Slezak (2006), equity-based compensation elicits managerial effort but also induces managers to manipulate earnings to boost stock prices, a possibility not consider in our model. Povel, Singh, and Winton (2007) focus on how investors' monitoring activity varies over the business cycle. They show that in booms investors exert less effort to verify managerial information so that the incidence of corporate fraud is greater in booms than in slumps, a prediction that Wang, Winton, and Yu (2010) show to be consistent with the evidence.

positively correlated with proxies for accounting fraud. The contribution of our article to this line of research is to show not only that the incidence of corporate fraud is affected by auditing quality and managerial compensation but that both of these aspects of firm-level governance are endogenous, being optimally chosen by shareholders in response to public policy parameters as previously explained.

The article is structured as follows. Section 1 sets out the model and its assumptions. Section 2 derives the optimal managerial compensation and auditing contract for each possible configuration of country-level governance parameters. Section 3 extends the analysis to the case in which audit fees can be made contingent on the firm's investment performance. Section 4 concludes. The proofs are in the Appendix.

1. The Model

Consider a firm worth V_0, whose continuation requires an expenditure of size I. Otherwise, the company is liquidated at its status-quo value V_0.[7] If shareholders decide to invest, the final value of the company changes to $V_1 = V_0 + \tilde{V} - I$, where $\tilde{V}$ is a random variable that equals $V_H > I$ in a good state occurring with probability p or $V_L < I$ in a bad state occurring with probability $1-p$. Thus, the investment I is profitable in the good state $s = H$ but not in the bad state $s = L$.

There are three players: (1) a manager (M), who determines the investment's success probability, p, by choosing effort $e \in \{0,1\}$ and submits a report $r_M \in \{H,L\}$; (2) the shareholders (S), who choose the manager's compensation and the firm's audit quality and decide whether or not to invest; and (3) an auditor, who if hired provides a report $r_A \in \{H,L\}$ of quality, q, for an audit fee, F.[8] We assume risk neutrality, no discounting, and limited liability of both managers and auditors. Moreover, for notational simplicity the manager's and auditor's reservation utility are set at zero.

The incentives of managers are misaligned from those of shareholders for two reasons. The first is "empire building": If the company continues to operate, its manager can divert corporate resources $D > 0$ to himself as private benefits, decreasing the company's value by the same amount,[9]

[7] Alternatively, the choice may be interpreted as one between an expansion plan and a status quo, where the firm continues to operate with its existing capital stock.

[8] For the definition of auditing quality, q, see Section 1.2 below. In the baseline model, for simplicity we assume the audit fee, F, to be independent of the state of the world. In Section 3 we show how the model's results are affected if the audit fee is allowed to be state-contingent.

[9] The results of the model would not be qualitatively affected by allowing for deadweight costs of managerial diversion. An increase in these deadweight costs is tantamount to a reduction in D within the current setting.

whereas under liquidation his private benefits are taken to be zero.[10] The second source of moral hazard is the conventional incentive problem due to unobservable effort e: If the manager chooses $e=0$, he bears no cost and the probability of the good state is $\underline{p}$; if instead he chooses $e=1$, he bears a private cost κ but raises the probability of the good state to $\bar{p}=\underline{p}+\Delta p$.

Shareholders can address these incentive problems using two instruments: the design of managerial compensation and the firm's audit quality. The incentive effects of managerial compensation are constrained by the fact that the manager has limited liability and no initial wealth, although his private benefits cannot be seized: Hence, his opportunistic behavior cannot be penalized by inflicting a negative compensation on him. But auditing too is an imperfect incentive device, because hiring an auditor requires paying a fee, F, to cover his cost. Moreover, the auditor provides an imperfect signal about the true state of the world, as will be explained in Section 1.2.

The unconditional expectation of the firm's incremental value is assumed to exceed the investment I: $\bar{V}-D=pV_H+(1-p)V_L-D>I$. Therefore, managerial diversion is not so large as to prevent the firm from investing, but it can lead to a misallocation of resources by inducing continuation even in the bad state.[11]

Because D is the maximum private benefit that the manager can extract without risking legal sanctions, it is an inverse measure of shareholder protection, namely, of the degree to which regulation and its enforcement constrain managerial opportunistic behavior, such as tunneling corporate resources via related party transactions. But shareholder protection is only one of the two dimensions through which legal institutions can affect the agency problem within the firm: The other dimension is the regulation of auditing, which sets penalties for unloyal auditors as well as for managers who attempt to bribe auditors. The stricter is auditing regulation, the larger is the fear of sanctions and therefore the "reservation bribe" that auditors will require from management to engage in fraud. So this reservation bribe, which we shall denote by B, can be viewed as a measure of the strictness of auditing regulation.

We shall refer to shareholder protection (inversely measured by D) and the strictness of auditing regulation (B) as the two dimensions of the *country-level* corporate governance because they are set by

[10] Our results survive even if the manager's private benefits are positive with liquidation, provided they are lower than with continuation.

[11] Under the opposite assumption, the unconditional value of the firm under continuation would be negative so that the firm would be liquidated too often, rather than too seldom as in our setting. But the basic logic of the model would be similar.

public policy and taken as given by firms. But, as already mentioned, shareholders also have two *firm-level* governance levers at their disposal to maximize the firm's expected continuation value. They can realign managers' incentives to their interest either via the design of their compensation package or by raising audit quality, q, such as by spending more resources on auditing or by appointing highly skilled independent directors. Our aim is to characterize the optimal design of firm-level governance—the joint choice of audit quality and managerial compensation—as a function of country-level governance parameters, that is, shareholder protection and strictness of auditing regulation.[12]

In the following subsections we describe the players' payoffs, the monitoring technology, and the time line of the game.

1.1 Payoffs

Under continuation the value of the company, net of the investment and audit cost, is

$$V_1^c = \begin{cases} V_0 + \tilde{V} - I - D - W & \text{under no audit,} \\ V_0 + \tilde{V} - I - D - W - F & \text{under audit,} \end{cases} \tag{1A}$$

where the manager's wage, $W = w(s,r_A,r_M)$, can be conditioned on the true state, as well as on the auditor's and manager's reports. If, instead, the company is liquidated, its final value is

$$V_1^l = \begin{cases} V_0 - W & \text{under no audit,} \\ V_0 - W - F & \text{under audit.} \end{cases} \tag{1B}$$

For simplicity, we assume the company's initial value, V_0, to be large enough that its final value is never negative.[13] The shareholders' payoff is the firm's final value:

$$\Pi^h = V_1^h, \tag{2}$$

where $h = c,l$. Shareholders have no private information about the company's final value. Since $\bar{V} - D > I$, lacking any other information, they will always opt for continuation even in the bad state, where this is inefficient. But they may improve their decision by using the reports of the manager and/or the auditor.

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[12] The assumption that shareholders can design the firm's governance presupposes that ownership is not so dispersed as to prevent them from pursuing their common interest. Otherwise, even the design of the managerial pay package and the choice of auditors would be captured by the manager, thereby making agency problems more severe, as argued by Bebchuk and Fried (2004).

[13] The model could easily accommodate the case in which the company goes bankrupt when investment is undertaken in the bad state. In this case, because of limited liability shareholders would get a zero payoff from their holdings.

Unlike shareholders, the manager has perfect knowledge of the company's final value V_1^c under continuation. Since in this case he also gains the private benefit, D, his utility is

$$U = W + D \cdot 1_c, \tag{3}$$

where 1_c is an indicator function equal to one under continuation and zero under liquidation.

1.2 Auditing

When they cannot trust the manager's report, shareholders may wish to elicit information from an auditor. Auditors have a costly technology that helps to determine how continuation will affect the company's value, and they use it to produce a report, $r_A \in \{H,L\}$.[14] An audit varies in quality, depending on the procedures adopted by the auditor (e.g., external confirmation of accounting data). We denote audit quality by $q \in [0,1]$, where higher q corresponds to a more precise signal, $\sigma \in \{H,L\}$, about the company's final value but implies a higher cost according to function $C(q)$, which is continuous, increasing, and convex in q, with $C(0) = 0$ and $\lim_{q \to 0} C'(q) = 0$. The idea that audit quality is a choice variable is consistent with the evidence surveyed by Francis (2004), who documents that clients can raise audit quality by picking auditing firms that are larger or more specialized in their industry.

The auditor's signal, σ, is perfectly accurate when the state is H, but it may be inaccurate if the state is L. Formally, the conditional probabilities of the auditor's report being correct are

$$\begin{aligned} &\Pr(\sigma = L | s = L, q) = q, \\ &\Pr(\sigma = H | s = H, q) = 1. \end{aligned} \tag{4}$$

This assumption is quite natural in our context, where the manager observes the true state of nature and wishes the firm to continue: In the good state the manager will convey to the auditor the evidence in his possession to show that continuation is worthwhile, and by the same token he will not caution the auditor against any mistake that he may make when the state is bad. This can be thought of as a reduced form of a communication stage between the manager and the auditor.

Audit quality is contractible so that the auditor's fee, $F(q)$, can be conditioned on it. To meet the participation constraint of auditors,

[14] Outside auditors assess the reliability of the historical and prospective information provided by the company's accountants and deliver this "certified" information to investors who use it to evaluate the company. As in Dye (1993), these two phases (data validation and valuation) are collapsed into a single step by viewing the auditor's report as an assessment of the company's value.

their fee must cover their costs, that is, $F(q) \geq C(q)$. We assume competition between auditors.[15]

If the auditor discovers that the firm's incremental value is low ($\sigma = L$), the manager may attempt to bribe him into reporting the good state instead ($r_A = H$). Bribery cannot occur when the auditor has observed a favorable signal ($\sigma = H$), because in this case the auditor's report would be favorable to continuation anyway.[16] As already explained, the auditor has a reservation bribe: He will not lie unless he gets at least a bribe B, which reflects the severity of penalties for fraudulent behavior and the effectiveness of their enforcement, as well as reputational concerns and ethical standards. The actual bribe is determined by a take-it-or-leave-it offer:[17] The manager pays the reservation bribe B and gains the surplus stemming from the more likely continuation. Note that the reservation bribe B may also reflect an expected penalty inflicted on the manager if caught attempting to corrupt the auditor—a penalty that Karpoff, Lee, and Martin (2008) show to be quite sizeable for U.S. managers.[18] In any event, because of the linearity of the manager's and auditors' payoffs, the total expected penalty inflicted on both parties if fraud is detected is what matters. When indifferent, the manager is assumed to prefer not to bribe the auditor. If the auditor does not accept the bribe, he will misreport the state of the world only by mistake, wrongly reporting $r_A = H$ in the bad state. This occurs with probability $(1-p)(1-q)$, where $1-p$ is the probability of the bad state and $1-q$ is the probability of a mistaken signal.

1.3 Time line

There are five dates, as shown in Figure 1. At date 1, shareholders choose the manager's compensation contract and decide the audit quality, q (possibly equal to zero if no auditor is hired).

At date 2, the manager chooses the effort level, $e \in \{0,1\}$, paying a cost κ if he chooses high effort. This choice determines the likelihood of the good state and therefore the incremental value of the company under continuation.

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[15] The model could easily allow for auditors' rents arising from market power. The only significant effect of this would be that the manager's ability to bribe auditors would be correspondingly reduced, because the danger of losing a higher fee would induce auditors to behave better.

[16] We exclude that the auditor might blackmail the manager when the signal is positive so as to obtain a bribe also in the good state of nature. Assuming that such blackmail is punished if detected, the manager would have every incentive to report evidence of it so that auditors will refrain from such behavior.

[17] This assumption is made only for simplicity. Allowing for more general assumptions about the bargaining power of the manager and the auditor would leave the equilibrium qualitatively unaffected.

[18] They show that, when identified as responsible for financial misrepresentation by the SEC or the Department of Justice, managers face significant disciplinary penalties: The majority of them are fired and subjected to heavy fines and restrictions on shareholdings and on subsequent employment, whereas 28% of them face criminal penalties, including jail sentences.

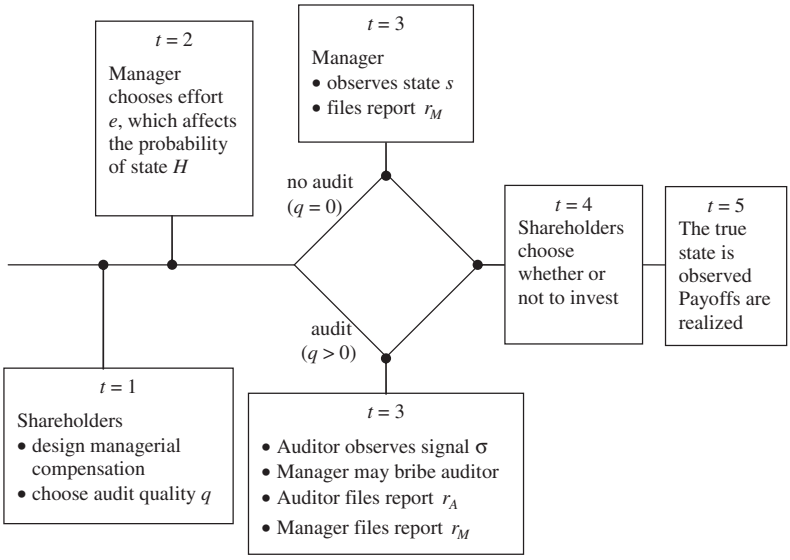

Figure 1
Time line.

At date 3, the firm's manager observes the state of nature and sends a report, $r_M \in \{H,L\}$, to the shareholders. If no auditor was hired at date 2, this is the only information received by shareholders. If, instead, an auditor was hired, he observes the signal, $\sigma \in \{H,L\}$, and sends a report, $r_A \in \{H,L\}$, to shareholders, possibly misreporting the signal in exchange for a bribe by the manager.

At date 4, the shareholders make their investment choice based on the reports that they have received.

At date 5, the true state is observed by all players, state-contingent contracts are executed, and payoffs are realized.

2. Optimal Managerial Compensation and Auditing

We now turn to the optimal design of firm-level governance, namely, the joint choice of managerial compensation and auditing quality. The design of firm governance determines the reliability of the information reported by the manager and/or the auditor so that depending on the chosen governance, shareholders may wish to condition their investment decision on (1) the manager's report, r_M, alone, (2) the auditor's report, r_A, alone, or (3) neither of the two. Below we will show that to ensure the truthfulness of each of these reports, shareholders must rely on different managerial compensation schemes. Moreover, it is always optimal to trust either the report of the manager or that of the auditor—never

both of them: Intuitively, if a truthful report can be elicited from the manager, an additional report from the auditor will be redundant, the manager being perfectly informed about the true state of nature.

In what follows, we proceed in three steps. First, we identify the efficient compensation scheme to induce truth-telling by the manager: In this case, being redundant, the auditor will not be hired. Second, we identify the efficient managerial compensation and audit quality to induce truth-telling by the auditor (preventing any collusion with the manager). Thirdly, we characterize the parameter region in which each of these two firm-level governance designs yields the largest payoff for shareholders. In the derivations, we shall assume the tie-breaking rule that, whenever indifferent, managers and auditors tell the truth rather than lying.

2.1 Truth-telling by the manager

Recall that in general managerial compensation is $w(s,r_A,r_M)$, namely, it is conditioned on the true state and on the auditor's and manager's reports. If the manager can be induced to tell the truth, no auditor is hired and the manager's compensation becomes $w(s,r_M)$. We denote by $w^s_{r_M}$ the payment made to the manager in state s when he reported r_M. Hence, shareholders must choose two payments, w^H_H and w^L_L, to compensate a manager who reports the true state ($r_M = s$) and two payments, w^H_L and w^L_H, for a manager who reports the wrong state ($r_M \neq s$).

If the manager truthfully reports the good state, shareholders will invest and earn $V_0 + V_H - I - D - w^H_H$; if, instead, the manager truthfully reports the bad state, shareholders will liquidate the firm and earn $V_0 - w^L_L$. Assuming that the manager's compensation is also set so as to elicit the high effort level $e = 1$, the good state will occur with probability $\bar{p}$. Hence, the shareholders' expected profit is

$$\Pi(r_M) = \max_{w^H_H, w^L_H, w^H_L, w^L_L} V_0 + \bar{p}\left(V_H - I - D - w^H_H\right) - (1-\bar{p})w^L_L, \tag{5}$$

where the managerial compensation $\left\{w^H_H, w^L_H, w^H_L, w^L_L\right\}$ is chosen to meet the following constraints:

$$\begin{aligned}
IC_L &: w^L_L \geq w^L_H + D,\\
IC_H &: w^H_H + D \geq w^H_L,\\
IC_e &: w^H_H - w^L_L + D \geq \frac{\kappa}{\Delta p},\\
PC_M &: \bar{p}\left(w^H_H + D\right) + (1-\bar{p})w^L_L - \kappa \geq 0,\\
LL &: w^H_H \geq 0,\ w^L_H \geq 0,\ w^H_L \geq 0,\ w^L_L \geq 0,
\end{aligned}$$

where IC_L and IC_H are the manager's incentive compatibility constraints ensuring truth-telling in the bad and good states, respectively; IC_e is the incentive compatibility constraint that elicits high effort; PC_M is the manager's participation constraint; and LL are his limited liability constraints.[19]

It is immediate that the efficient compensation scheme requires setting both w_L^H and w_H^L equal to zero (the manager should not be compensated when lying): Otherwise, the incentive compatibility constraints would be harder to meet. Efficiency also requires that both the IC_L and IC_e constraints should be binding so that $w_L^L = D$ and $w_H^H = \kappa/\Delta p$.[20] Intuitively, the efficient compensation scheme ensures truth-telling by the manager by giving him a payment D when he reports the bad state and deters him from shirking by paying him $\kappa/\Delta p$ in the good state. Under this scheme, in the bad state his pay equals D if he tells the truth: He would obtain the same amount in the form of private benefit if he lied but being indifferent he reports truthfully (by our tie-breaking rule). In the good state, he earns both the payment $\kappa/\Delta p$ from shareholders and the private benefit, D, so that again truth-telling is assured.[21]

This compensation scheme can be implemented by a mix of a performance-based compensation package and a severance payment. The performance-based portion of the manager's compensation is given by the payments that he gets upon continuation: a positive payment, $\kappa/\Delta p$, when the company's value is high ($V_0 + V_H - I - D$ in the good state) and no payment when the company's value is low ($V_0 + V_L - I - D$ in the bad state). Besides, the manager receives D if he reports the bad state and thus induces no continuation: This can be interpreted as a severance payment received upon the firm's liquidation; alternatively, if the firm survives as a going concern, even if the investment I is not undertaken, the payment D to the manager can be viewed as his base compensation if the company does not expand.

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[19] To make the problem interesting, we assume that it is efficient to elicit effort by the manager, namely, that a shareholder's expected profits are higher if he exerts high effort rather than shirking. This requires his compensation to be higher if he exerts high effort: $\bar{p}(w_H^H + D) + (1 - \bar{p})w_L^L - \kappa \geq \underline{p}(w_H^H + D) + (1 - \underline{p})w_L^L$. Rearranging this expression, one obtains the constraint IC_e shown above.

[20] It is easy to verify that if the IC_e constraint is binding, then the PC_M constraint is slack. Indeed, if the PC_M constraint were binding, to satisfy the IC_e constraint the manager would have to be paid a negative compensation when truthfully reporting bad news ($w_L^L < 0$), which would violate both the truth-telling constraint IC_L and the limited liability constraint LL.

[21] Notice that shareholders have no choice but to leave private benefit D to the manager in the good state, because by assumption it cannot be seized. This private benefit helps satisfy the manager's participation constraint.

Proposition 1
To ensure truth-telling and elicit effort by the manager, he must be given an incentive payment, $w_H^H = \kappa/\Delta p$, in the good state and a severance pay, $w_L^L = D$, in the bad state.

Therefore, worse country-level shareholder protection (higher private benefits D) implies a larger severance pay. The result that severance pay is an efficient mechanism to elicit bad news from a CEO is also present in Levitt and Snyder (1997), Müller and Inderst (2010), Eisfeldt and Rampini (2008), and Laux (2008). In all these studies, severance pay induces truth-telling by compensating the manager for his dismissal and/or loss of private benefits.

Whereas our model shares with these articles the insight that managers must be compensated not only for their effort but also for "reporting bad news," it differs from them because it also allows for delegated monitoring as an alternative governance device and shows that the latter can dominate severance pay from the shareholders' standpoint: As we shall see in the next section, this happens when country-level governance rules are sufficiently strong.

2.2 Truth-telling by the auditor

Truth-telling by auditors requires that managers have no incentive to bribe them. This is always the case if the penalties against fraudulent auditing (whether aimed at auditors themselves or at the manager) are so large as to exceed the manager's private benefits of control, that is, if $B \geq D$. But even if this condition does not hold, we shall see that managers can be deterred from bribing auditors by a large enough severance pay, that is, a payment conditional on auditors correctly reporting the bad state (and thus inducing liquidation when appropriate).

Recall that, unlike managers, auditors can be mistaken in the bad state, even when they truthfully report their signal, σ; hence, the manager's compensation must be conditioned not only on the true state (H or L) but also on whether the bad state is correctly identified by the auditor. In other words, now the manager's pay depends on the state of nature *and* on the auditor's report: $w(s,r_A)$. This can take three values: w_H if the auditor correctly reports the good state, w_L^q if the auditor correctly reports the bad state (which happens with probability q), and w_L^{1-q} if the auditor mistakenly reports the good state (which happens with probability $1-q$).

Using this notation, and assuming that the manager's compensation is set so as to elicit high effort, the shareholders' expected profit becomes

$$\begin{aligned}\Pi(r_A) = \max_{w_H, w_L^{1-q}, w_L^q, q} \; & V_0 + \bar{p}(V_H - I - D - w_H) \\ & + (1-q)(1-\bar{p})(V_L - I - D - w_L^{1-q}) - q(1-\bar{p})w_L^q - F,\end{aligned} \tag{6}$$

where the managerial compensation, $\left\{w_H, w_L^{1-q}, w_L^q\right\}$, and the audit quality, q, in expression (6) are chosen to meet the following constraints:

$$NB: w_L^q \geq w_L^{1-q} + D - B,$$

$$IC_e: (w_H + D) - \left[qw_L^q + (1-q)(w_L^{1-q} + D)\right] \geq \frac{\kappa}{\Delta p},$$

$$PC_A: F \geq C(q),$$

$$PC_M: \bar{p}(w_H + D) + q(1-\bar{p})w_L^q + (1-\bar{p})(1-q)(w_L^{1-q} + D) - \kappa \geq 0,$$

$$LL: w_H \geq 0,\ w_L^q \geq 0,\ w_L^{1-q} \geq 0.$$

The "no-bribe" constraint NB states that the manager's compensation must deter him from inducing the auditor to misreport in the bad state (by paying him the "reservation bribe" B); IC_e is the incentive compatibility constraint that elicits high effort from the manager; PC_A and PC_M are the auditor's and manager's participation constraints, respectively; and LL are the manager's limited liability constraints.

The following proposition characterizes the optimal firm-level governance arrangements.

Proposition 2
The compensation and audit quality that ensure truth-telling by the auditor and elicit effort by the manager differ across parameter regions as follows:

1. If country-level governance is good ($D \leq B$), shareholders choose audit quality q^* defined by $\bar{p}D + (1-\bar{p})(I - V_L + D) = C'(q^*)$ and give the manager incentive compensation in case of continuation ($w_H = \kappa/\Delta p - q^* D$ in the good state and $w_L^{1-q} = 0$ in the bad one) and no severance pay in case of liquidation ($w_L^q = 0$).
2. If country-level governance is poor ($D > B$), shareholders choose audit quality q^{**} defined by $\bar{p}B + (1-\bar{p})(I - V_L + B) = C'(q^{**})$ and give the manager incentive compensation in case of continuation ($w_H = \kappa/\Delta p - q^{**} B$ in the good state and $w_L^{1-q} = 0$ in the bad one) and severance pay in case of liquidation ($w_L^q = D - B$).

This proposition contains a number of predictions. First, the two firm-level governance mechanisms—managerial pay and audit quality—are substitutes: Choosing a higher audit quality (measured by q^* or q^{**} depending on the parameter region) allows shareholders to lower the manager's pay in the good state (w_H) and therefore weakens the pay-performance sensitivity of managerial compensation.[22]

[22] The pay-performance sensitivity of managerial pay can be increased by raising the portion of stocks and options in total compensation, so as to induce the manager to exert effort and take risk, as shown in the classic articles by Smith and Stulz (1985), Hall and Murphy (2000), and Dittmann and Maug (2007).

Table 1
Response of company-level governance variables to country-level regulation

	Region (1): Good Country-Level Governance ($D < B$)		Region (2): Poor Country-Level Governance ($B < D$)	
Improvement in:	Shareholder protection (lower D)	Auditing regulation (higher B)	Shareholder protection (lower D)	Auditing regulation (higher B)
Severance pay (w_L^q)	No effect	No effect	−	−
Payment in the good state (w_H)	+	No effect	No effect	−
Audit quality (q)	−	No effect	No effect	+

Second, Proposition 2 allows us to explore how firm-level governance reacts to changes in country-level regulation, as captured by the parameters D and B. These comparative statics results are summarized in Table 1, which considers the responses of three firm-level variables: the severance pay, w_L^q, the payment in the good state, w_H, and the audit quality, q. The table also distinguishes between the two parameter regions considered in Proposition 2: region (1), which captures a situation of good country-level governance (high B, i.e., strict regulation of auditing) and/or strong shareholder protection (low D, i.e., low private benefits); and region (2), which conversely captures a situation of poor country-level corporate governance.

In region (1), the manager is given no severance pay because his private benefits, D, fall short of the auditor's reservation bribe, B: He could not induce the auditor to lie even if he were to offer him the entire private benefits of control. In this region, an increase in private benefits, D, has a beneficial incentive effect: It spurs the manager to exert more effort so that shareholders can reduce the manager's compensation in the good state. Hence, as shown in Table 1, better shareholder protection (lower D) calls for greater incentive pay: They are complements.

In contrast, in this region audit quality is a substitute for shareholder protection: Better auditing, q^*, is required to keep a manager with larger private benefits, D, in check. Finally, the regulation of auditing (B) has no effect on firm-level variables.

In region (2), instead, country-level governance is poor: The manager's private benefits, D, exceed the auditor's reservation bribe, B, so that shareholders must worry about the danger of the auditor colluding with the manager and misreporting in the bad state. To deter such collusion, shareholders must give the manager a severance payment. However, the amount of such pay is inversely related both to the degree of shareholder protection and to the strictness of auditing regulation (as w_L^q varies directly with D and inversely with B): As country-level governance improves along either one of these dimensions, less needs to be paid to the manager to deter him from attempting to bribe the firm's

auditors. Better auditing regulation also enables shareholders to pay the manager less in the good state (higher B requires lower w_H): Knowing that auditors are harder to bribe in the bad state, managers will work harder to increase the likelihood of the good state.

Hence, in region (2), strict auditing regulation substitutes as an incentive device for managerial compensation. But, it has the opposite effect on audit quality: The optimal audit quality, q^{**}, is increasing in the stringency of auditing regulation. Intuitively, if the law punishes corrupt auditors more severely, shareholders will rely on them more because they are more trustworthy monitors of management.

2.3 Optimal choice of managerial compensation and auditing

We are now equipped to characterize the optimal governance regime in each parameter region. Building on Propositions 1 and 2, we can establish when shareholders prefer to elicit truth-telling from the manager, the auditor, or neither. Their payoffs in these three cases are, respectively, denoted by $\Pi(r_M)$, $\Pi(r_A)$, and $\Pi(\emptyset)$, whose maximal values are derived in the Appendix. The expected payoff $\Pi(\emptyset)$ is simply the company's unconditional value if investment is always undertaken, so that the manager invariably appropriates the private benefit, D, at the shareholders' expense. Hence, this expected payoff is strictly lower than $\Pi(r_M)$: It entails a worse investment decision but the same shareholder loss, D. Hence, uninformed investment is never optimal. This result (shown in the Appendix) is nontrivial because in our model investment has positive NPV if undertaken with no information.

Therefore, the relevant comparison is between $\Pi(r_M)$ and $\Pi(r_A)$, where each of these is evaluated based on the optimal compensation and auditing choices described in Propositions 1 and 2. A key condition in this comparison is whether auditing is cost-efficient compared to eliciting truthful revelation from managers, when audit quality is set optimally at q^* in the region $B > D$ (the most favorable one to auditing). The relevant condition is

$$(1-\bar{p})(1-q^*)(V_L - I) + q^* D - C(q^*) > 0. \tag{8}$$

If this condition is met, shareholders will choose to hire an auditor ($\Pi(r_A) > \Pi(r_M)$) at least for some parameters. Otherwise, auditing will always be dominated ($\Pi(r_A) < \Pi(r_M)$) and shareholders will rely on the manager, using severance pay to ensure his truthfulness.

Proposition 3

Shareholders always base their investment decision on either the auditor's or the manager's report. The indifference condition $\Pi(r_M) = \Pi(r_A)$ implicitly defines a threshold, B_0, (defined by (A4) in the appendix) for the reservation bribe, B, where $B_0 < D$. Two cases can arise: (1) If

condition (8) holds and $B > B_0$, shareholders base the investment decision on the auditor's report; (2) otherwise, shareholders base their investment decision on the manager's report.

To grasp the economic significance of this proposition, it is useful to assume a quadratic auditing cost function $C(q) = q^2/2$. Under this assumption, condition (8) holds for a large enough value of the private benefit, D, that is, for sufficiently poor shareholder protection.[23] In this situation, auditing *can* be more cost-efficient than eliciting truth-telling from the manager. But, for auditors to be actually superior providers of information to shareholders, auditing regulation must be sufficiently strict; specifically, Proposition 3 tells us that the auditors' reservation bribe, B, must exceed B_0.

Hence, Proposition 3 underscores that auditing regulation is critical to ensure the reliability of auditors in investment decisions: In a country in which the regulation against fraudulent auditing is so weak that $B < B_0$, shareholders will prefer to elicit truth-telling by the manager, compensating him with a severance payment. If, instead, auditing regulation improves so as to increase the reservation bribe, B, above the threshold, B_0, shareholders will hire an auditor and rely on his report for their investment decision rather than on the manager's report.

2.4 Model predictions and empirical evidence

It is useful at this point to summarize the predictions from the model and see how they relate to the existing evidence and which directions they suggest for future research. The hallmark of our model is that it predicts how changes in country-level institutions and laws should affect the governance choices at the firm level.

First, as illustrated in Table 1, our model predicts that improvements in country-level shareholder protection should call for greater reliance on managers' incentive pay in countries with better institutions and have no effect in weak-governance countries. This prediction broadly accords with the evidence reported by Doidge, Karolyi, and Stulz (2007), who, using various measures of governance, find that the correlation between company-level governance ratings and country-level shareholder protection standards is positive for countries with developed financial markets, whereas it is low or absent for countries with less-developed markets.[24]

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[23] In this example, condition (8) becomes $[D + (1 - \bar{p})(V_L - I)]^2 > 2(1 - \bar{p})(I - V_L)$, which is met for D large enough.

[24] Specifically, they use three different sets of company-level governance measures: (1) the Credit Lyonnais Securities Asia (CLSA) scores for less developed countries, based on financial analysts' assessment of seven company characteristics (management discipline, financial transparency, independence, accountability, responsibility, fairness, and social responsibility); (2) the S&P ratings for both developed and less-developed countries, which are based on the number of items disclosed in firms' annual reports and standard regulatory filings (regarding financial transparency and disclosure, board and management

The latter finding is consistent with the evidence in Aggarwal et al. (2010), who suggest that in countries with low investor protection it is suboptimal for firms to invest in governance as much as U.S. firms do. The evidence for complementarity between country-level shareholder protection and company-level governance is also confirmed by the results in Klapper and Love (2004) and Durnev and Kim (2005), who find that subjective measures of firm-level governance quality (based on Credit Lyonnais Securities Asia scores) are larger in countries with better legal environments. However, the company-level corporate governance indicators used in these studies conflate many different aspects of governance, without singling out the pay-performance sensitivity of managers' pay or, for that matter, any other specific aspect of managerial compensation.

A second prediction of the model is that more stringent audit regulation (e.g., greater penalties for audit fraud) should lead to greater reliance by companies on auditing services, in the sense of greater audit quality and more spending on audit fees, especially if country-level corporate governance is weak. This is consistent with evidence in Francis and Wang (2008), who report that "Big 4" auditors impose higher earnings quality and more accounting conservatism on clients' financial reports in response to stricter auditing regulation, such as greater ability to sue auditors for negligence and regulatory sanctions for auditors' misconduct. Similarly, Francis, Khurana, and Pereira (2003) explore how a developed private-sector auditing profession affects reporting outcomes and document higher average financial reporting and disclosure quality in countries with more developed auditing infrastructures and better enforcement of auditing regulation.

A third prediction of our model is that managerial severance pay should be used only in countries with poor shareholder protection and/or weak auditing regulation, because in these countries it is most important to "compensate managers for telling bad news," given that they can draw high private benefits from overinvestment. By the same token, improvements in country-level governance should lead to lower reliance on severance pay in managerial compensation. Unfortunately, so far no empirical studies have investigated how managerial severance pay varies in response to country-level shareholder protection and auditing regulation.

More generally, the predictions of our model suggest that, when analyzing the response of company-level governance to a country's regulation, it is important to distinguish between changes in shareholder protection and changes in the regulation of auditing: For instance, the

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stricture and process, ownership structure, and investor relations); and (3) the FTSE-Institutional Shareholder Services (ISS) governance scores for developed countries, which are assigned based on whether companies meet minimally acceptable on a number of internal governance dimensions (board, audit, charter bylaws, antitakeover provisions, executive and director compensation, qualitative factors, ownership, and director education).

model suggests that, in poor-governance countries, reforms that reinforce shareholder protection should have no effect on the audit quality chosen by firms, whereas reforms that promote the loyalty of auditors should encourage companies to step up monitoring activities in their governance.

3. Allowing for Auditors' State Contingent Fees

In the model analyzed in Section 2, the auditors' fee was assumed to be fixed, as normally observed in practice, rather than conditional on the ex post accuracy of the audit report. In this section, we allow for state-contingent audit fees and show that they enable shareholders to increase audit quality, shift compensation from the manager to the auditor, and earn higher expected profits. This is because shareholders can more effectively elicit truth-telling from auditors by paying a state-contingent audit fee than by giving managers a severance pay large enough to deter them from bribing auditors.

Recall that, unlike managers, auditors can be mistaken in the bad state, even when they truthfully report their signal, σ; hence, the auditor's compensation must be conditioned not only on the true state (H or L) but also on whether the bad state is correctly identified by the auditor. In other words, now the auditor's fee depends on the state of nature, on the auditor's report, and on the quality of audit: $F = f(s,r_A,q)$. This can take three values: F if the auditor correctly reports the good state, F^q if the auditor correctly reports the bad state, and F^{1-q} if the auditor mistakenly reports the good state.

Using this notation, the shareholders' problem in Section 2.2 now becomes

$$\Pi(r_A) = \max_{w_H, w_L^{1-q}, w_L^q, q, F, F^{1-q}, F^q} V_0 + \bar{p}(V_H - I - D - w_H - F) + (1-q)(1-\bar{p})(V_L - I - D - w_L^{1-q} - F^{1-q}) - q(1-\bar{p})(w_L^q + F^q), \tag{9}$$

where the managerial compensation, $\left\{w_H, w_L^{1-q}, w_L^q\right\}$, the audit quality, q, and the audit fees, $\left\{F, F^{1-q}, F^q\right\}$, in expression (9) are chosen to meet the following constraints:

$$NB: w_L^q + F^q \geq (w_L^{1-q} + D) + (F^{1-q} - B),$$

$$IC_e: (w_H + D) - \left[q w_L^q + (1-q)(w_L^{1-q} + D)\right] \geq \frac{\kappa}{\Delta p},$$

$$LL_A: F \geq C(q),\ F^{1-q} \geq C(q),\ F^q \geq C(q),$$

$$PC_M: \bar{p}(w_H + D) + q(1-\bar{p}) w_L^q + (1-\bar{p})(1-q)(w_L^{1-q} + D) - \kappa \geq 0,$$

$$LL_M: w_H \geq 0,\ w_L^q \geq 0,\ w_L^{1-q} \geq 0.$$

These constraints differ from those of the problem analyzed in Section 2 because the "no-bribe" constraint *NB* now states that the manager's compensation and also the auditor's fee can be used to deter illegal agreements between the two: The inequality states that the sum of the payoffs accruing to the manager and the auditor under no bribing (the left-hand side) must at least equal the sum of their payoffs under bribing (the two terms in brackets on the right-hand side). The difference with the *NB* constraint in Section 2 can be seen most clearly by rewriting it as $w_L^q \geq w_L^{1-q} + D - (B + F^q - F^{1-q})$, where the term in brackets replaces B in the old constraint: Intuitively, for the auditor to lie, the manager must pay the reservation bribe, B, and also compensate him for the fee increase, $F^q - F^{1-q}$, that he would obtain if loyal. LL_A are the auditor's limited liability constraints.

The following proposition describes how state-contingent audit fees change the optimal firm-level governance compared to the case of fixed audit fees.

Proposition 4
If auditors' fees can be state-contingent, the optimal policy compares as follows with that described in Proposition 2 for the case of fixed audit fees:

1. If country-level governance is good ($D \leq B$), shareholders choose the same audit quality, (noncontingent) audit fees, and manager compensation as in Proposition 2.
2. If country-level governance is poor ($D > B$), shareholders choose higher audit quality, lower incentive compensation for the manager in case of continuation, no severance pay in case of liquidation, and a higher fee for the auditor who correctly reports the bad state, resulting in higher expected profits.

Hence, when country-level governance is good, incentives for the manager and the auditor to collude are so low that contingent audit fees do not make a difference: The auditor keeps being paid a fixed fee, and the manager keeps being paid only in the good state, with no severance pay in case of liquidation. In contrast, the ability to fine-tune fees based on the auditors' performance makes a difference when country-level governance is poor so that manager-auditor collusion is a real danger: By allowing shareholders to discipline auditors more effectively, it prompts them to rely more on auditors than on managers in their decision, compared to the fixed-fee case.[25]

[25] One may wonder what would happen in this model if the shareholders and the manager were to engage in some sort of auction-type contest to secure the services of the auditor: Just as the managers may attempt to bribe the auditor to misreport the bad state, shareholders may offer to reward him for truthful reporting of this state. However, in contrast to managers, shareholders do not know which state has

4. Conclusions

This article presents a model of managerial fraud in which managers possess superior information about the prospects of the company but, owing to the private benefits from empire building, have a bias against the liquidation of the firm. This may prompt them to misreport their information or even bribe auditors when liquidation would be optimal. We use the model to study how shareholders should design firm-level corporate governance so as to curb managerial fraud, along two dimensions: the quality of auditing and the design of managerial compensation.

Our main contribution is to characterize how both of these aspects of firm-level governance respond to changes in public policy parameters, namely, the degree of shareholder protection and the stringency of auditing regulation. Reforms that improve shareholder protection should increase the performance sensitivity of managerial pay, while inducing shareholders to spend fewer resources on auditing. Conversely, reforms that improve auditing regulation have opposite effects on the two dimensions of firm-level governance: They should reduce pay-performance sensitivity, while encouraging shareholders to spend more resources on auditing, thus acting as a substitute for managerial pay incentives and a complement for auditing quality. Finally, the reliance on severance is inversely related both with shareholder protection and with the stringency of auditing regulation.

This variety of predictions highlights that, in studying the response of company-level governance to country-level regulation, it is important to distinguish the effects of shareholder protection from those of the regulation of auditing. This is particularly relevant at a time when the regulation of auditing is being tightened as a result of increased public criticism of the long-lasting and potentially collusive relationships between auditors and the companies they are supposed to scrutinize: "Countries around the world are preparing reforms designed to force boards to switch auditors more frequently following a backlash against the audit profession's failure to give warning of the financial crisis." (*Financial Times* 2012).

Appendix

Proof of Proposition 2

First, it is easy to show that if the IC_e constraint is binding, then the PC_M constraint must be slack. Next, it is immediate that w_L^{1-q} should be set equal to zero in both parameter

occurred and was observed by the auditor. Hence, the best they can do in such an "auction-like contest" is to condition their bid for the manager's honesty on the ex post performance of the investment. But this is precisely what they do when offering a state-contingent fee to the auditor. Hence, the results that would obtain are exactly those that we derive in Proposition 4.

regions and competition ensures that the auditor's participation constraint PC_A is binding. The other choice variables differ across regions:

1. If $D \leq B$, since $w_L^{1-q} = 0$, the NB constraint is slack. Hence, $w_L^q = 0$ from the LL constraint. Next, by replacing $w_L^{1-q} = w_L^q = 0$ in IC_e taken with equality, we get $w_H = \kappa/\Delta p - qD$. Substituting these values for the optimal managerial compensation, $\left\{w_L^{1-q}, w_L^q, w_H\right\}$, in the shareholders' expected payoff (6) and taking the first-order condition with respect to q, one obtains implicitly the optimal audit quality q^* in this region: $\bar{p}D + (1-\bar{p})(I - V_L + D) = C'(q^*)$.
2. If $D > B$, the NB constraint is binding. Hence, recalling that $w_L^{1-q} = 0$, the payment to the manager if the auditor correctly reports the bad state is $w_L^q = D - B$. Next, by replacing $w_L^{1-q} = 0$ and $w_L^q = D - B$ in IC_e taken with equality, we get $w_H = \kappa/\Delta p - qB$. Substituting these values for the optimal managerial compensation, $\left\{w_L^{1-q}, w_L^q, w_H\right\}$, in the shareholders' expected payoff (6) and taking the first-order condition with respect to q, one obtains implicitly the optimal audit quality q^{**} in this region: $\bar{p}B + (1-\bar{p})(I - V_L + B) = C'(q^{**})$. ■

Proof of Proposition 3

First of all, we show that eliciting truth-telling from the manager always dominates using no information. Recall that, in general, managerial compensation is $w(s,r_A,r_M)$, namely, it is conditioned on the true state and on the auditor's and manager's reports. If shareholders use no outside information, the manager's compensation becomes $w(s)$. In other words, shareholders must choose two payments w_H and w_L to compensate the manager in the good and in the bad state, respectively. Assuming that the manager's compensation is also set so as to elicit the high effort level $e = 1$, the good state will occur with probability $\bar{p}$. Hence, the shareholders' expected profit is

$$\Pi(\emptyset) = \max_{w_H, w_L} V_0 + \bar{p}(V_H - I - D - w_H) - (1-\bar{p})(V_L - I - D - w_L),$$

where the managerial compensation $\{w_H, w_L\}$ is chosen to meet the following constraints:

$$\begin{aligned} IC_e &: w_H - w_L \geq \kappa/\Delta p, \\ PC_M &: \bar{p}(w_H + D) + (1-\bar{p})(w_L - D) - \kappa \geq 0, \\ LL &: w_H \geq 0,\ w_L \geq 0, \end{aligned}$$

where IC_e is the incentive compatibility constraint that elicits high effort; PC_M is the manager's participation constraint; and LL are his limited liability constraints. It is immediate that the efficient compensation scheme requires setting $w_L = 0$ and $w_H = \kappa/\Delta p$. Substituting these payments in the shareholders' expected profit yields:

$$\Pi(\emptyset) = V_0 + \bar{p}(V_H - I - D - \kappa/\Delta p) - (1-\bar{p})(V_L - I - D).$$

Instead, Propositions 1 and 2 yield the following expression for shareholders' expected profits conditional on the manager's and auditor's reports, respectively:

$$\begin{aligned} \Pi(r_M) &= V_0 + \bar{p}(V_H - I - D - \kappa/\Delta p) - (1-\bar{p})D, \\ \Pi(r_A) &= V_0 + \bar{p}(V_H - I - (1-q^*)D - \kappa/\Delta p) \\ &\quad + (1-\bar{p})(1-q^*)(V_L - I - D) - C(q^*) \end{aligned} \tag{A1}$$

if $D \leq B$ and

$$\begin{aligned} \Pi(r_A) &= V_0 + \bar{p}(V_H - I - D - \kappa/\Delta p + q^{**}B) \\ &\quad + (1-\bar{p})[(1-q^{**})(V_L - I - D) - q^{**}(D - B)] - C(q^{**}), \end{aligned} \tag{A2}$$

if $D > B$, where q^* and q^{**} are defined by Proposition 2. Since $V_L - I < 0$, it follows that $\Pi(r_M) > \Pi(\emptyset)$. Hence, disregarding both reports is never optimal.

We now want to distinguish between the parameter region in which shareholders prefer to elicit truth-telling from the manager and the region in which they want to elicit truth-telling from the auditor. Subtracting $\Pi(r_M)$ from $\Pi(r_A)$ in (A1) and rearranging terms yields the condition under which shareholders want to elicit the truth from the auditor. If $D \leq B$, this condition is inequality (8) in the text. If, instead, $D > B$, the relevant condition is obtained by subtracting $\Pi(r_M)$ from $\Pi(r_A)$ in (A2) and rearranging terms

$$(1-\bar{p})(1-q^{**})(V_L - I) + q^{**}B - C(q^{**}) > 0. \tag{A3}$$

There are two cases to be considered, depending on whether or not condition (8) holds.

If condition (8) holds and $D \leq B$, shareholders will rely on auditing, setting audit quality at q^*. Then, by continuity, condition (A3) also holds for $B \to D^-$. Using the envelope theorem, the derivative of expression (A3) with respect to B is equal to $q^{**} > 0$. Therefore, as B decreases below D, at some point inequality (A3) turns into an equality for a threshold B_0 defined by

$$B_0 \equiv \frac{(1-\bar{p})(1-q^{**}(B_0))(I - V_L) + C(q^{**}(B_0))}{q^{**}(B_0)}, \tag{A4}$$

where $q^{**}(B_0)$ is obtained by setting $B = B_0$ in the optimal audit quality condition $\bar{p}B + (1-\bar{p})(I - V_L + B) = C'(q^{**})$ from Proposition 2. Therefore, shareholders will still rely on the auditor's report in the interval $[B_0, D)$. For $B < B_0$, instead, $\Pi(r_A) < \Pi(r_M)$ so that shareholders elect to rely on the manager's report and no longer hire an auditor ($q = 0$).

If, instead, condition (8) does not hold, then, by the previous argument, condition (A3) does not hold either, and therefore for any value of B shareholders choose to rely on the manager's report and will not hire an auditor. ■

Proof of Proposition 4

From the constraints, it is immediate that to minimize shareholders' costs w_L^{1-q} should be set equal to zero, whereas F^{1-q} and F should be set equal to $C(q)$ in both parameter regions. The other choice variables differ across regions:

1. If $D \leq B$, it is optimal to set $w_L^q = 0$ and $F^q = C(q)$ so that the NB constraint is slack. Next, replacing $w_L^{1-q} = w_L^q = 0$ in IC_e (taken with equality) yields $w_H = \kappa/\Delta p - qD$. Substituting these values for the optimal managerial compensation $\left\{w_L^{1-q}, w_L^q, w_H\right\}$ and for the optimal audit fees $\left\{F, F^{1-q}, F^q\right\}$ in the shareholders' expected payoff (9) and taking the first-order condition with respect to q, one obtains implicitly the optimal audit quality q^* in this region: $\bar{p}D + (1-\bar{p})(I - V_L + D) = C'(q^*)$, as in Proposition 2.
2. If $D > B$, the NB constraint is binding. Hence, recalling that $w_L^{1-q} = 0$ and $F^{1-q} = C(q)$, the payment to the manager if the auditor correctly reports the bad state is $w_L^q = D - B - F^q + C(q)$. Next, by replacing $w_L^{1-q} = 0$ and $w_L^q = D - B - F^q + C(q)$ in IC_e taken with equality, we obtain $w_H = \kappa/\Delta p - q(B + F^q - C(q))$. Now notice that an increase in F^q implies a precisely offsetting increase in w_L^q and a decrease in w_H. Therefore, it is optimal to rely only on audit fees to satisfy the NB constraint and the IC_e constraint. Hence, we have $w_H = \kappa/\Delta p - qD$, $w_L^q = 0$, and $F^q = C(q) + D - B$. Substituting the values for the optimal managerial compensation, $\left\{w_L^{1-q}, w_L^q, w_H\right\}$, and for the optimal audit fees, $\left\{F, F^{1-q}, F^q\right\}$, in the shareholders' expected payoff (9) we obtain

$$\begin{aligned}\Pi(r_A) = {} & V_0 + \bar{p}(V_H - I - D - w_H - \kappa/\Delta p + qD) + \\ & + (1-q)(1-\bar{p})(V_L - I - D) - q(1-\bar{p})(D - B) - C(q).\end{aligned} \tag{A5}$$

Notice that, if in expression (A5) audit quality q is set at the same level q^{**} as in Proposition 2, shareholders' expected profits $\Pi(r_A)$ would be higher than in the corresponding expression (A2). A fortiori, the expected profits will be at least as high if in expression (A5) audit quality, q, is set at its optimal level q^{***}, which is implicitly given by the first-order condition $\bar{p}D + (1-\bar{p})(I - V_L + B) = C'(q^{***})$ and is clearly larger than q^{**}. This shows that both expected profits and audit quality are larger under state-contingent audit fees than under fixed ones.

Going back to the manager's compensation, his payment in the good state is $w_H = \kappa/\Delta p - q^{***}D$, which is strictly smaller than the corresponding expression in Proposition 2, that is, $\kappa/\Delta p - q^{**}B$, because we are in the region $D > B$ and $q^{***} > q^{**}$. Moreover, as shown previously, with state-contingent audit fees there is no severance pay ($w_L^q = 0$) and the auditor's fee is larger when he reports correctly in the bad state ($F^q = C(q) + D - B > F^{1-q} = C(q)$). ■

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