Incentives for Auditor Collusion in Pre-Sarbanes-Oxley Regulatory Environment

Abigail Brown

This article develops a single-play game theory model that looks at the strategic interactions between auditors and managers. The article adds to the literature by explicitly modelling the possibility of collusion in a context where the outcome is unverifiable and the manager has the possibility of funding side-payments in such a way that they have little effect on his personal payoff.

1 Introduction

The bankruptcy of Enron in 2001 and the resulting collapse of its auditor, Arthur Andersen, in 2002, have called into question the integrity of the financial audit process. Prior to the scandal, many assumed that either legal liability or reputational concerns would prevent the large audit firms from engaging in collusion with their clients. Enron and the many frauds that followed have undermined these assumptions. This article looks more closely at the basic interactions between auditor and manager. To do this I construct a game theoretic model of the strategic interaction between an auditor and the management she is hired to audit. 1 I focus narrowly on the issue of the auditor preventing the manager from intentionally misrepresenting the state of the company. I also strive to put as few restrictions as possible on the exact nature of the parameters used in the model, while still keeping the interaction recognisably that of a financial statement audit. The model therefore provides a starting point with which to gain some traction in understanding the incentives facing the audit profession.

I place my model in the context of a pre-Sarbanes-Oxley regulatory regime because the Sarbanes-Oxley provisions most relevant to the structure of the model add further complications to an already complicated relationship. 2 It seems worthwhile to understand better what was missing – if anything – from previous research that limited our understanding of the original auditor–manager dynamic.

Kornish and Levine (2004) examine auditor incentives post-Sarbanes-Oxley, and their work complements mine. They use a common agency model and view the manager and audit committees as competing principals for the auditor’s work. Their work looks ahead to the ways an independent audit committee whose interests are well aligned to shareholders might influence auditors’ incentives that encourages truth-telling and requires far less regulatory intrusion on the contracting between auditors and the other interested parties. My model offers a more sobering story should it turn out that audit committees are more inclined to act on behalf of management. It also connects the dual challenges of motivating effort on the parts of both auditor and manager and motivating truth-telling in both parties.

2 Review of the Theoretical Literature

There are two somewhat separate strands of theoretical research on auditor incentives: one in the academic accounting literature and one in the economics literature. Each area brings its own strengths to the specific question of understanding auditor collusion, though neither is entirely satisfactory. This article is an attempt to combine the useful insights of both strands of research and create a model that is useful to policy makers in understanding the real convicting incentives facing the profession.
DeAngelo (1981) argues that auditor size is a legitimate proxy for audit quality, since large firms have more reputation-based collateral on the line. She argues that if a firm is caught colluding with one client, the rest of its clients are likely either to switch to an audit firm with a better reputation, or to lower the ‘client-specific quasi-rents’ they are willing to pay. The more clients a firm has, the more quasi-rents are at risk if an audit firm loses its reputation: ‘[a]s a general proposition, auditors with a greater number of audit clients have reduced incentives to ‘cheat’ in order to retain any one client, ceteris paribus’ (DeAngelo, 1981: 191).

Dye (1993) also predicts that large firms will do better audits than small firms, but not to protect the quasi-rents that come from their reputation. Instead, he suggests that because the large firms are wealthier, they have a much greater exposure to liability if there is an audit failure, and therefore they have greater incentives to prevent such a failure. In essence, Dye assumes that smaller firms have binding liquidity constraints that effectively limit their liability and therefore they realise fewer benefits from performing a high quality audit. Dye’s model looks at the particular case of auditors not predicting an imminent bankruptcy – eg not issuing a going concern opinion when one is warranted. Because he limits his argument to going concern opinions, he reasonably assumes that all audit failures are detected by the market, but misinformation is costly even if it does not result in an unexpected bankruptcy. Therefore, a complete theoretical consideration of auditors’ incentives should take into account the possibility that not all misstatements of concern are eventually found by the market.

Both Dye and DeAngelo assume that the public can discern the cause of an audit failure. Audits could fail for three reasons: the auditor could perform an audit of appropriate intensity and miss the misstatement because it was not included in the material sampled; the auditor could perform a negligent audit—one that does not offer ‘reasonable assurance’ of discovering the misstatement—and therefore not find the misstatement; or the auditor could collude with management to release the misstated information. But almost all audit failures are not fully litigated in court and significant confusion about the auditor’s role in the failure can persist. Both authors’ arguments turn on the ability to make that distinction at least fairly accurately. It seems worthwhile to create a model that does not allow for such a distinction.

Furthermore, neither author directly addresses the possibility of explicit collusion between management and the auditor: Dye focuses instead on effort levels expended on the audit, and DeAngelo implicitly dismisses collusion as a real possibility for large audit firms. Given that there are legitimate worries, due to the recent scandals, that the large audit firms might have indeed colluded with the management of their clients to conceal fraud, it is important to include the possibility of management offering some sort of inducement to collusion and to be open-minded at the outset about the likelihood of any firm accepting it.

Antle (1985) formalises definitions of auditor independence. He defines auditors who have lost their independence as those who will accept side-payments from management in exchange for accepting the risk of collusion. He also distinguishes between ‘strongly independent’ auditors and those who are merely ‘independent’. A strongly independent auditor will choose the Nash equilibrium strategy that the principal would prefer. An independent auditor will merely choose from the possible equilibria that maximise her utility the one that best serves the principal (in a game that does not allow for side transfers). Antle shows that a strongly independent auditor is preferable to an independent auditor, who is preferable to a
non-independent auditor, in allowing the principal to motivate the manager more effectively. He also shows that optimal auditor contracts will vary depending on auditor type. While Antle speculates on how one might achieve an independent auditor, he leaves resolving the question to future research.

The principal-agent literature contributes complementary insights to those offered by Antle, DeAngelo, and Dye. Fundamentally, the financial reporting system is about helping to resolve the information asymmetry inherent between agents – the executive management of a corporation – and principals – the shareholder-owners of the corporation. The economic literature on principal-agent information problems predicts a wide variety of possible solutions to the problem of inducing agents to tell the truth about their private information. One of these solutions is to monitor the agent (Lazear, 1986; Jensen and Meckling, 1976; Alchian and Demsetz, 1972). In the financial reporting system, this is a role the auditor plays. The auditing is not done directly by the shareholder, however, so the shareholder must find a way to induce the auditor to do her job properly as well. This creates a three player problem that is often modelled as a principal-supervisor (or monitor)-agent problem. While most of the literature discusses these dynamics in terms of supervisors rather than auditors, the model transfers directly to an audit relationship.

The economics of a principal-supervisor (or monitor)-agent relationship that allows for the possibility of collusion between two of the parties has been studied by some, beginning with Tirole (1986) (see, for example, Olsen and Torsvik, 1998; Strausz, 1997; Laffont and Tirole, 1991). Like the models of DeAngelo (1981) and Dye (1993), there are also some important differences between the models used in the work following (Tirole, 1986) and models that would help elucidate the problems faced by shareholders, auditors, and public company management.

One fundamental difference between the work following Tirole (1986) and this article is that Tirole (1986) and others assume that the output of the agent is costlessly observable by all parties and that the asymmetric information rests in the agent’s productivity factor and effort levels. However, in public companies, the company’s financial outcome is not directly observable to outsiders. To mitigate this information problem, the agent (management) issues financial statements to convey information about the outcome to the principal (shareholders).

Tirole (1986) and others tackle the question of keeping a high-productivity agent from posing as a low-productivity agent and pocketing the rent that comes from exerting lower levels of effort than they are paid to exert. Here I address the question of how to keep management that presides over a poor outcome from posing as one presiding over a good outcome. Strausz (1997) does look at a principal-supervisor-agent model where the outcome is unmeasurable. In that paper, however, Strausz focuses on the possibility of collusion between the supervisor and the principal, where the two conspire to withhold incentive pay (or other rewards) rightfully earned by the agent. The possibility of such collusion in the case of public company financial statement auditing seems remote, given that shareholders are such an uncoordinated group. Strausz addresses briefly the possibility of collusion between supervisor and agent, but assumes that it is possible for the principal to write a collusion-proof contract with both parties.

It is not clear from experience that such a contract is feasible, however. Feess and Nell (2002) show that the optimal level of care in double moral hazard situations such as that of the auditor and manager can be reached if three conditions are met: a strict liability regime, the ability for the auditor and manager to make side payments,
and the existence of liability insurance for one of the players. In their model, they show that it is efficient to hold either the auditor or the manager strictly and solely liable for misstatements if the agent held liable can collect a side payment from the other agent for any misstatements the liable agent corrects. If the liable agent has access to fair insurance coverage, she will accept such a contract, since the insurance coverage will cover the contribution of the other agent to the risk of audit failure. The authors claim in the discussion of their model that such a scheme would also prevent collusion between the auditor and manager since ‘strict liability... automatically solves the truth-telling problem – since both agents take the total harm into account, neither can be better off by faking the results of the investigation’ (Feess and Nell, 2002: 416-417).

Feess and Nell’s model and discussion do offer a mechanism for inducing efficient effort levels and truth-telling, but this mechanism has a number of barriers to implementation. First, auditors are prohibited by their professional code of conduct from entering into contracts that are contingent upon the findings of their audit. Second, there is currently no real insurance available to auditors at the Big Four firms. Finally, we currently operate in a legal regime that sets a far higher bar of proof for plaintiffs. In some instances, plaintiffs must show that the auditor was negligent; in many others, they must prove recklessness or actual knowing participation. Even if the necessary legal changes were made and the insurance industry were to decide that auditors were insurable, we would need to reconsider the way the total harm of a misstatement are calculated. The research on the social aggregate cost of fraud is surprisingly thin, and it is far from clear how the total harm caused by a misstatement is related to the damages awarded in the civil system (Lev, 2003).

In addition to the problems resulting from having an incompletely observable outcome (as well as unobservable effort), public company financial statement audits have some unusual dynamics that make the relationship between shareholders and auditors different from a generic principal-agent relationship. First, all public companies are required to have an external audit performed annually, making the relationship a mandatory one. Second, management has in the past had the ability to hire and fire their auditor. While this has changed officially since Sarbanes-Oxley (it is now the Board’s responsibility to hire and fire), management probably still exerts significant influence on those decisions in many companies. Finally, as mentioned above, there are regulations that limit the types of contracts that auditors and management may enter into. These limitations may preclude the design of a collusion-proof contract.

Most importantly of all, shareholders in public companies are an amorphous group and their ability to exert influence on their agents is diffuse and often indirect. In theory, their interests are supposed to be represented by a Board of Directors, which can more easily coordinate to oversee the executive management. In reality, however, there is a third principal-agent relationship occurring in public companies, that between the board and the shareholders. For the purposes of this analysis, I assume that the board has no meaningful ability to intervene in the relationship between auditor and manager.

Because of the inability of shareholders to explicitly coordinate in their interactions with the other players, the analysis below begins with a game between only two active players, the manager and the auditor. The details of how shareholders exert their influence on the game will be suppressed in this initial analysis.
3 Formal Model of Auditor-Manager Strategic Interactions

I model the manager’s and auditor’s decision process as an extended form, single-play, non-cooperative game. The game includes three actors: the manager, the auditor, and the market, where the manager and the auditor are the ones making active decisions. Throughout the analysis, I assume that no player is risk averse and all are profit maximising. The manager and the auditor play with perfect recall.

The game is played out sequentially over time. Figure 1 illustrates the order of play. Entries above the timeline are events that always happen, regardless of how the game plays out. Entries below the line occur in only some paths of play in the game.

![Figure 1: Timeline of auditing game](image)

In every game, the manager chooses a probability that the company’s outcome in the period is good. This choice is a costly investment for the manager, where a higher probability of a good outcome is costlier to achieve. After that effort has been expended on the part of the manager, the true state of the company is revealed privately to the manager. Then the manager issues financial statements that may or may not accurately reflect the true state of the company.

Because the model’s primary purpose is to help us understand the auditor’s incentives, some of the complexity of the manager’s decision process in the early stages of the game is suppressed so as to look at interesting aspects of the auditor’s decisions in as simple a way possible. To achieve this end, I am defining a ‘good’ outcome by construction as one where the manager cannot improve his expected payoff by reporting anything but the true outcome.

In more formal language, let $S_M$ be the strategy space for the manager, and $u_M(s_i)$ be the manager’s payoff for each strategy profile, $s_i = (s_M, s_A)$, played. The strategy $s^\text{truth}$ is defined as the set of strategy profiles where the probability of the manager reporting the true outcome is $\text{Prob}(\text{Truth}) = 1$. A company outcome is defined as ‘good’ iff:

$$u_M(s^\text{truth}) > u_M(s^j) \forall u_M(s^j_{\neq \text{truth}})$$

This is the case when telling the truth strictly dominates all other strategies for the manager.

Similarly, if the outcome is ‘bad’, the manager can do better, at least in some strategy sets, by misrepresenting the company’s outcome. How the manager decides the magnitude of the lie to tell, if he decides to lie, is not modelled here. Presumably,
the manager would craft his lie in such a way as to maximise his expected payoff, which would entail maximising his wage subject to crafting the lie to minimise likelihood of detection and/or penalties, should the lie be detected.

Once the manager has compiled his unaudited statements, the auditor conducts an audit of those statements. In the planning for the audit, the auditor chooses an audit intensity, which is defined as the probability that she will uncover a misstatement, conditional on its existence. A higher audit intensity costs more than a lower intensity. I assume that the audit intensity chosen is not observable or verifiable by anyone outside the audit firm.

After the audit is completed, the financial statements are released to the market. After time passes, subsequent events or new public information is used to update the market’s assessment of the validity of the financial statements. The market may or may not ever discover deliberate misinformation, if it exists.

A subset of the possible decisions and events could lead to additional actions by the auditor and the manager. If the true outcome of the company in that period is bad and management decides to try to conceal that fact by issuing misleading financial statements, the auditor could find a misstatement if her audit intensity is greater than zero. If the auditor does find the misstatement, the manager must decide whether or not to offer a bribe and the auditor decides whether or not to accept it. Then, if the bribe is refused, management must decide whether to give in to the auditor’s demands to fix the misstatement or to fire the auditor.

*Extensive form of game and model parameters*

The extensive form of the game is illustrated in Figure 2, with player payoffs spelled out in Table 1 and variable definitions collected in Table 2. At the start of the game, the manager exerts effort to set the probability, $\mu$, that the outcome is good. The outcome is bad with a probability of $(1 - \mu)$. The probability distribution of $\mu$ and the production function for $\mu$ are common knowledge.
After the manager has invested in a particular $\mu$ at a cost of $C^M_\mu$, where $C^M_\mu > 0$ and $C^M_{\mu\mu} > 0$, the manager learns of the actual outcome of the company in that period. I assume here that management has perfect information about the true outcome of the company and that information is private and attained costlessly. Management then has to decide whether or not to tell the truth about the outcome of the company in the financial statements. By construction, as discussed above, if the company’s true outcome is good, the choice is a trivial one and management tells the truth. The audit confirms management’s statements, regardless of audit’s intensity $\lambda$, and the manager receives a payoff of $W_H - C^M_\mu$. The auditor’s payoff is her fee less the cost of the audit production. The cost of the audit is a function of the audit intensity: $F - C^A(\lambda)$. The fee cannot be contracted as a function of $\lambda$ because of the assumption that $\lambda$ is unobservable and non-verifiable. However, since the magnitude of the fee will ultimately play a role in the auditor’s decision to accept the engagement, it will reflect an ex ante assessment of the likely level of $\lambda$. For the purposes of this initial analysis, however, it is treated as exogenous to the strategic interactions between auditor and manager once the engagement has been entered into.
If the true outcome is bad, management’s decision is no longer trivial. If he tells the truth, the auditor’s move does not affect the players’ payoffs. The manager’s payoff is now $W_L - C_M(\mu)$, where he gets a wage $W_L < W_H$, less the cost of his investment $C_M(\mu)$. The auditor’s payoff is still $F - C_A(\lambda)$, regardless of the level of $\lambda$ chosen. If the management decides to lie, and issues a statement that depicts the company’s outcome as good when it is actually bad, the game gets more complicated.

As implied above, the auditor can choose a varying level of $\lambda$, where $\lambda$ is equal to the probability the auditor will detect a misstatement, conditional on the existence of a misstatement.\(^7\) I assume that $\lambda \in [0, 1]$, and is limited only by cost, not technical feasibility. As with $C_M^A(\mu)$, $C_A^\lambda > 0$ and $C_A^{\lambda\lambda} > 0$. 

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Table 1: Payoff table

<table>
<thead>
<tr>
<th>Terminal Node</th>
<th>Manager Payoff</th>
<th>Auditor Payoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$W_H - C_M(\mu)$</td>
<td>$F - C_A(\lambda)$</td>
</tr>
<tr>
<td>2</td>
<td>$W_L - C_M(\mu)$</td>
<td>$F - C_A(\lambda)$</td>
</tr>
<tr>
<td>3</td>
<td>$W_H - C_M(\mu)$</td>
<td>$F - C_A(\lambda)$</td>
</tr>
<tr>
<td>4</td>
<td>$W_H - C_M(\mu) - P_M^M$</td>
<td>$F - C_A(\lambda) + P_M^M$</td>
</tr>
<tr>
<td>5</td>
<td>$W_L - C_M(\mu)$</td>
<td>$F - C_A(\lambda)$</td>
</tr>
<tr>
<td>6</td>
<td>$W_H - C_M(\mu) - kB$</td>
<td>$F - C_A(\lambda) + B$</td>
</tr>
<tr>
<td>7</td>
<td>$W_H - C_M(\mu) - kB - P_M^M$</td>
<td>$F - C_A(\lambda) + B - P_M^M$</td>
</tr>
<tr>
<td>8</td>
<td>$W_L - C_M(\mu)$</td>
<td>$F - C_A(\lambda)$</td>
</tr>
<tr>
<td>9</td>
<td>$W_H - C_M(\mu) - P_M^M$</td>
<td>$rF - C_A(\lambda)$</td>
</tr>
<tr>
<td>10</td>
<td>$W_L - C_M(\mu) - P_M^M$</td>
<td>$rF - C_A(\lambda) + R$</td>
</tr>
</tbody>
</table>

Table 2: Definitions of variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\mu$</td>
<td>Probability of a good client company outcome (from management’s perspective)</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>Probability of auditor finding misstatement conditional on its existence</td>
</tr>
<tr>
<td>$\rho$</td>
<td>Probability of market finding misstatement conditional on its existence</td>
</tr>
<tr>
<td>$W_H, S, L$</td>
<td>Wage management receives (amount depends on client company outcome)</td>
</tr>
<tr>
<td>$C_M^A, A$</td>
<td>Cost of effort exerted by manager as a function of $\mu$ or by auditor as a function of $\lambda$</td>
</tr>
<tr>
<td>$F, P_M^A, A$</td>
<td>Fee auditor receives for audit, A Penalty assessed manager and auditor respectively when a misstatement is discovered by market</td>
</tr>
<tr>
<td>$B$</td>
<td>Bribe</td>
</tr>
<tr>
<td>$R$</td>
<td>Reputational reward for auditor when market discovers misstatement after auditor is fired</td>
</tr>
<tr>
<td>$k$</td>
<td>Proportion of B deducted from manager’s payoff</td>
</tr>
<tr>
<td>$r$</td>
<td>Proportion of F auditor recovers when fired</td>
</tr>
</tbody>
</table>
If management decides to misrepresent the company’s true state, with a probability of \((1 - \lambda)\) the auditor will not catch the misrepresentation and the incorrect financial statement will be issued to the marketplace. The management will receive an initial payoff of \(W^H - C^M(\mu)\), on the basis of the contents of the financial statements, and the auditor will earn \(F - C^A(\lambda)\) for the audit. At a later date, however, the market may receive additional information about the validity of the financial statements and will discover the misstatement with a probability of \(\rho\). If the financial statements are found to be misleading by the market, both management and auditor are assessed a penalty. \(P^M\) and \(P^A\) respectively.\(^8\) If the misstatements are never found, the management and auditor keep their initial payoffs. Therefore, the expected value of the payoffs when a management cheats and the auditor misses the cheating are \(W^H - C^M(\mu) - \rho P^M\) for management and \(F - C^A(\lambda) - \rho P^A\) for the auditor.

If the auditor does find the misstatement, management must decide whether to correct the misstatement or offer the auditor a bribe. If the management makes the correction, the payoffs are the same as if management told the truth in the first place: management receives \(W^L - C^M(\mu)\) and the auditor receives \(F - C^A(\lambda)\).\(^9\)

The magnitude of any bribe offered by the manager to the auditor is endogenously determined. If the management decides to offer a bribe, management must therefore first decide how large a bribe to offer. The decision of the bribe’s size is determined by what the management believes about the final steps of the game and will be discussed once those steps have been laid out.

It is important to note that the bribe (B) may or may not cost the management what is paid to the auditor – in many instances, some or all of the bribe could be financed through some form of misappropriating the company’s resources, either through direct, illicit transfers or through padded fees paid to the auditor. In other cases, there may be losses that occur through an inefficient transfer (eg costs associated with keeping the bribe secret), thereby causing the bribe to cost more to the management than it benefits the auditor. Unlike the previous literature, I account for that difference in the private costs and benefits of the bribe by multiplying the auditor’s benefit from the bribe by a scalar \(k \in \mathbb{R}^+\) when deducting the cost of the bribe to the manager, rather than the usual \(k \in [0, 1]\) applied to the manager’s cost of the bribe when modelling the auditor’s benefit from the bribe (Olsen and Torsvik, 1998; Laffont and Tirole, 1991). This is to allow the bribe to be both more costly and less costly to management than the value of its benefits to the auditor. It particularly allows for the case where \(k = 0\): the bribe does not cost management anything at all and is instead limited only by the company’s budget constraint. A full discussion of the possible nature of the budget constraint is not included in this analysis. I do however include the possibility that the company’s budget constraint is binding in the equilibrium analysis. The maximum amount the company can afford to pay the auditor (above and beyond the basic audit fee) is designated as \(B^{Max}\).

If the auditor decides to accept the bribe, the misleading financial statements are issued, the bribe is paid, and the market may or may not eventually discover the misstatement. In this case, the expected value of the payoffs are: \(W^H - C^M(\mu) - kB - \rho P^M\) for the manager and \(F - C^A(\lambda) + B - \rho P^A\) for the auditor. Note that as discussed earlier, the penalty for the auditor, \(P^A\), is the same regardless of the path taken to reach the point where the market discovers the misstatement. This is a somewhat strong assumption and will affect the equilibrium outcomes, but it is a
useful counterpoint to Dye (1993), DeAngelo (1981), and others whose arguments rest on the assumption that the penalties will be different.

If the auditor rejects the bribe, the management can then choose to either correct the misstatement or fire the auditor. If the management chooses to correct the misstatement, then the payoffs for the two players is the same as the other instances where management ends up revealing the bad outcome to the market.

If the manager fires the auditor, then he gets a clean opinion from another auditor but may bear some sort of penalty for that switch in his initial compensation. This penalty comes about because markets (and the board of directors) are aware of the switch but cannot determine whether that switch is due to management avoiding an adverse opinion or to other, legitimate causes. Therefore, the management’s reward in the case of a switch is \( W_S \) instead of \( W_H \), with a net payoff in the first period of \( W_S - C^M(\mu) \). The auditor, if fired, may not recover all (or any) of the audit fee but has already expended the cost of the audit. The reduction of the audit fee is modelled as \( rF \), where \( r \in [0, 1] \) and \( F \) is the original fee. In the second period, if the market discovers the fraud, the management receives a penalty and the auditor may receive a reputational reward (\( R \)), where \( R \geq 0 \), for the market learning that her firing was due to her resistance to management.

As before, if the market does not discover the fraud, the players are left with their initial payoffs. Because the market receives an additional signal about the interaction of management and auditor through the switch, however, I do not assume that the probability of the market finding the misstatement after it has been released is the same in this case as it is in the others. An auditor change may invite closer scrutiny of regulators or other players and increase the probability that the misstatement will be found after the statements have been released to the market. Therefore, the probability of discovery by the markets when the auditor is fired is designated as \( \rho_S \) and I assume that \( \rho \leq \rho_S \leq 1 \). The expected payoffs for the players if the management fires the auditor for refusing the bribe is therefore \( W_S - C^M(\mu) - \rho SP^M \) for the management and \( rF - C^A(\lambda) + \rho_S R \) for the auditor.

**Equilibrium strategies**

The equilibrium concept used to analyse the possible equilibrium strategies employed by the two players is a *sequential equilibrium*. A sequential equilibrium requires that the strategy profile and system of beliefs are consistent with each other and that they satisfy sequential rationality at every information set (Kreps and Wilson, 1982).

The game is solved in reverse order, starting with the decision whether or not to fire the auditor, given that she has refused a bribe (node M5 in Figure 2). At each step, the auditor and manager consider their *expected* payoffs, prior to the market’s move, since the market’s ‘move’, similar to moves of nature in other games, is not strictly a strategy, since the values of \( \rho \) and \( \rho_S \) are not responsive to the decisions made by the players.

**Firing stage**

If the game reaches node M5, the remaining plays are a proper subgame with perfect information. The manager must simply maximise his expected payoff by deciding whether to retain the auditor and acquiesce to the auditor’s demands to correct the misstatement, or to fire the auditor and issue the misleading statements (audited by another auditor—how the manager achieves that audit is not considered here).
The normal form of the firing subgame is presented in Figure 3. (In this and all subsequent normal form representations, the manager’s possible moves are listed down the left column and the auditor’s possible moves are listed across the top row.)

**Figure 3: Firing subgame in normal form**

<table>
<thead>
<tr>
<th>Move</th>
<th>Manager's Payoff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fire</strong></td>
<td>$W^S - C(\mu) - \rho SP^M$, $rF - C^A(\lambda) - \rho SR$</td>
</tr>
<tr>
<td><strong>No Fire</strong></td>
<td>$W^L - C(\mu)$, $F - C^A(\lambda)$</td>
</tr>
</tbody>
</table>

The manager will fire the auditor if the expected value of the payoff from firing the auditor is greater than the (certain) value of the payoff from correcting the statement. If the following ‘firing condition’ is true:

**Condition 1.** $W^S - W^L > \rho SP^M$

then the decision to fire the auditor strictly dominates retaining her. If the expected cost ($\rho SP^M$) of firing the auditor strictly exceeds the benefits ($W^S - W^L$), then the opposite strategy, retaining the auditor and correcting the misstatement, strictly dominates. The only instance in which strict dominance does not apply is in the unlikely scenario where $W^S - W^L = \rho SP^M$.

**Bribing stage**

Moving up the game tree to the next stage (nodes M4 and A4), the decision to try to bribe the auditor, and with how much, is more complicated than the first step of the backward induction. Determining the plausible equilibrium strategies at this stage do depend on the requirement of sequential rationality.

Node M4 in Figure 2 depicts the manager’s decision as binary, offer bribe/correct lie, to simplify the initial exposition of the game. In reality, the manager has a discreet choice, to correct the lie, versus a continuous set of choices, to offer bribe of magnitude $B$ where $B \in [0, B_{\text{Max}}]$. $B_{\text{Max}}$ is the feasible upper limit on the bribe size. The question, therefore, becomes, is there a value, or range of values, of $B$ where the manager wants to offer a bribe the auditor is willing to accept?

Because the choices at this stage of the game depend on the choices that will be made if the game continues to the point where the manager needs to decide whether to fire the auditor, there are two possible normal forms of the bribing subgame. The relevant game depends on whether Condition 1, the firing condition, holds true. The two forms are described in Figures 4(a) and 4(b).

**Figure 4: Bribing subgames in normal form.**

<table>
<thead>
<tr>
<th>Bribing strategy</th>
<th>Manager's Payoff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accept bribe</strong></td>
<td>$W^H - C^M(\mu) - kB - \rho P^M$, $F - C^A(\lambda) + B - \rho P^A$</td>
</tr>
<tr>
<td><strong>Reject bribe</strong></td>
<td>$W^S - C(\mu) - \rho SP^M$, $rF - C^A(\lambda) - \rho SR$</td>
</tr>
<tr>
<td><strong>Correct lie</strong></td>
<td>$W^L - C(\mu)$, $F - C^A(\lambda)$</td>
</tr>
<tr>
<td><strong>Reject bribe</strong></td>
<td>$W^L - C(\mu)$, $F - C^A(\lambda)$</td>
</tr>
</tbody>
</table>
I begin with the analysis of the game if the firing condition holds. In this situation, the manager has a dominant strategy at the bribing stage, which makes the analysis simpler.

**Proposition 1.** In the bribing subgame in Figure 4(a), where the firing condition holds true, there exists at least one \( B \in [0, B_{\text{Max}}] \) such that the manager’s strategy of choosing ‘Bribe’ with \( \text{Prob}(\text{Bribe}) = 1 \) is a strictly dominant strategy.

**Proof.** The assumption that the firing condition holds means that \( W^S - W^L > \rho_s P_M \).

Adding \( W^L - C(\mu) - \rho_s P_M \) to both sides of the inequality shows that strategy profile (bribe, fire; accept bribe) is an improvement over either (correct lie, fire; accept bribe) or (correct lie, fire; reject bribe): \( W^S - C(\mu) - \rho_s P_M > W^L - C(\mu) \).

Set \( B = 0 \). If \( B = 0 \), the manager’s payoff in (bribe, fire; accept bribe) is \( W^H - C(\mu) \). The definition of \( \rho_s \) asserts that \( \rho_s \geq \rho \) and the definition of \( W^S \) asserts that \( W^H \geq W^S \). Therefore, \( W^H - C(\mu) - \rho_s P_M \geq W^S - C(\mu) - \rho_s P_M \). And since \( W^S - C(\mu) - \rho_s P_M > W^L - C(\mu) \), strategy profile (bribe, fire; accept bribe) also improves on both (correct lie, fire; accept bribe) and (correct lie, fire; reject bribe) for at least one \( B \in [0, B_{\text{Max}}] \). Therefore, if the firing condition holds, the manager has no incentive to deviate from the strategy (bribe, fire; *), regardless of the auditor’s strategy. ■

The auditor’s decision process is more complicated, and introduces another condition that will determine which strategy profile is the equilibrium outcome.

**Proposition 2.** In the bribing subgame in Figure 4(a), where the firing condition holds true, the strategy profile (bribe, fire; accept bribe) will be the equilibrium strategy if the following condition holds true:

**Condition 2.** \( \rho_s P_A + \rho_s R - (1 - r)F \leq \min(\frac{1}{\kappa} (W^H - W^S - (\rho_s + \rho) P^M), B_{\text{Max}}) \)

Furthermore, the bribe offered will be \( B \in [P^A + \rho_s R - (1 - r)F, \ min(\frac{1}{\kappa} (W^H - W^S - (\rho_s + \rho) P^M), B_{\text{Max}})] \)

**Proof.** Given that the manager’s strategy will be (bribe, fire; *) regardless of the auditor’s strategy when the firing condition holds true (Proposition 3), the auditor need only choose the strategy (accept bribe|bribe, fire) or (refuse bribe|bribe, fire) that nets her the greatest payoff. The auditor will choose (accept bribe|bribe, fire), if \( F -
\[ C^A(\lambda) + B - \rho P^A > rF - C^A(\lambda) + \rho R. \] By rearranging terms, the auditor will therefore choose (accept bribe|bribe, fire) if \( B > \rho P^A + \rho R - (1-r)F \).

The manager is willing to offer a bribe of any size that maintains (bribe, fire) as a strictly dominant strategy and that does not motivate the auditor to accept the bribe unless the manager does better with strategy profile (bribe, fire; accept bribe) than with profile (bribe, fire; reject bribe). For the manager not to wish to change his strategy to (correct lie, fire) if the auditor chooses (accept bribe), the following must be true: \( W^L - C(\mu) - kB - \rho P^M > W^L - C(\mu) - \rho P^M \). Given that \( W^S - C(\mu) - \rho P^M > W^L - C(\mu) - \rho P^M \), is binding. By rearranging terms, the manager will be willing to offer a bribe, \( B \in [0, \min (\frac{1}{\lambda} (W^H - W^S - (\rho_s + \rho)P^M), B^{\text{max}})] \).

Therefore, there is a value \( B \) such that \( B \geq \rho P^A + \rho R - (1-r)F \) and \( B \leq \min (\frac{1}{\lambda} (W^H - W^S - (\rho_s + \rho)P^M), B^{\text{max}}) \) if \( \rho P^A + \rho R - (1-r)F \leq \min (\frac{1}{\lambda} (W^H - W^S - (\rho_s + \rho)P^M), B^{\text{max}}) \).

If \( B \leq \frac{1}{\lambda} (W^H - W^S - (\rho_s + \rho)P^M) \), the manager would prefer for the strategy profile to be (bribe, fire; accept bribe) since \( W^H - C(\mu) - kB - \rho P^M > W^S - C(\mu) - \rho P^M \). Therefore \( B \) will be set such that \( B \in [\rho P^A + \rho R - (1-r)F, \min (\frac{1}{\lambda} (W^H - W^S - (\rho_s + \rho)P^M), B^{\text{max}})] \).

Turning now to the analysis of the bribing subgame when the firing condition does not hold true, there is no longer a clear dominant strategy for the manager to follow. Instead, both players will receive the same pair of payoffs for all strategies except (bribe, correct lie; accept bribe): the manager receives \( W^L - C^M(\mu) \) and the auditor receives \( F - C^A(\lambda) \).

**Proposition 3.** The strategy profile (bribe, correct lie; accept bribe) will be the equilibrium strategy profile for the bribing subgame iff the following condition is met:

**Condition 3.** \( \rho P^A \leq \min (\frac{1}{\lambda} (W^H - W^L - \rho P^M), B^{\text{max}}) \)

Furthermore, the bribe offered will be set such that \( B \in [\rho P^M, \min (\frac{1}{\lambda} (W^H - W^L - \rho P^M), B^{\text{max}})] \). If Condition 3 does not hold, the manager will be indifferent to offering a bribe that is rejected by the auditor (ie \( B < \rho P^A \)) and correcting the lie.

**Proof.** If the firing condition does not hold, the auditor will reject all bribe offers that do not improve on her payoff of \( F - C^A(\lambda) \) that she gets when the lie is corrected (either before or after a bribe is proffered). Therefore for the auditor to accept a bribe, \( F - C^A(\lambda) + B - \rho P^A > F - C^A(\lambda) \) must be true. Simplifying the expression, the auditor will accept the bribe iff \( B > \rho P^A \).
For the manager to offer a bribe large enough that the auditor is willing to accept it, $W^H - C^M(\mu) - kB - \rho P^M > W^L - C^M(\mu)$ must be true. Simplifying the expression, the manager is willing to pay $B$ such that $B \in [0, \min(\frac{1}{\bar{k}}(W^H - W^L - \rho P^M), B^{Max})]$. Therefore, there is a feasible $B$ such that the equilibrium strategy profile for the bribing subgame is (bribe, correct lie; accept bribe) iff $\rho P^A \leq \min(\frac{1}{\bar{k}}(W^H - W^L - \rho P^M), B^{Max})$. Directly following, the $B$ chosen if Condition 3 holds is $B \in [\rho P^M, \min(\frac{1}{\bar{k}}(W^H - W^L - \rho P^M), B^{Max})]$. ■

Intuitively, whether or not the firing condition is met, the manager will offer a bribe that the auditor accepts if the manager can ‘afford’ a bribe that is large enough to compensate the auditor for the risks she is taking. The off-the-equilibrium-path values matter, however, in setting the parameters that determine when (bribe, *; accept bribe) is the equilibrium strategy profile.

The subgame discussed so far is a game of perfect information, played sequentially, so there are dominant pure strategy equilibria that determine unambiguously the outcome of the game if the node M4 is reached (ie if the auditor discovers a misstatement). Which equilibrium is dominant depends on the values of various parameters. Therefore, the rest of the game can be analysed looking at the three possible outcomes reached by the bribing subgame – correcting the lie, bribing the auditor, or firing the auditor – irrespective of the path taken to get there. In other words, it does not matter which of the ‘correct lie’ terminal nodes (5 or 8) is reached; nor does it matter to the rest of the analysis whether the firing condition is met if the auditor is successfully bribed.

The rest of this analysis, therefore, will look separately at three ‘scenarios’. The first considers the scenario where the equilibrium strategy profile is either (correct lie, correct lie; refuse bribe) or (offer bribe, correct lie; refuse bribe): where the manager corrects the lie found by the auditor. I call this scenario the ‘compliant manager’ scenario. The second considers the scenario where the equilibrium strategy profile is either (offer bribe, fire; accept bribe) or (offer bribe, correct lie; accept bribe). This is the ‘auditor collusion’ scenario. The final scenario is the one where the equilibrium strategy profile is (offer bribe, fire; refuse bribe). It is where the manager fires the auditor if the auditor discovers the misstatement. I call it the ‘opinion shopping’ scenario.

**Compliant manager scenario**

In this scenario, neither the bribing condition nor the firing condition is met, and the game ends with the manager agreeing to correct the misstatement if the course of play results in the auditor finding a misstatement. Figure 5 repeats, in a reduced form, the extensive form game tree displayed in Figure 2. Figure 5 suppresses the bribing subgame, along with the market moves, and replaces it with the expected payoffs that will result from parameter values that lead to the ‘compliant manager’ scenario.
The play of this portion of the game is affected somewhat by the construction of the definition of ‘good’ and ‘bad’ outcomes. In order for the manager’s strategy to always tell the truth to be the strictly dominant strategy for all ‘good’ outcomes and for it to not be the strictly dominant strategy for all ‘bad’ outcomes, the manager’s expected payoff or telling the truth must be less than the expected payoff for lying. For that to be the case,

\[ W^H - C^M(\mu) - \lambda(W^H - W^L) - (1-\lambda)\rho P^M > W^L - C(\mu). \]

More succinctly, that means that \( W^H - W^L > \rho P^M \).

**Proposition 4.** Given that \( W^H - W^L > \rho P^M \) by construction, the manager can always do at least as well by lying if there is a bad outcome. Therefore, he will never tell the truth if the outcome is bad.

**Proof.** Assume that the manager will tell the truth with a probability of \( \alpha \in [0, 1] \) in the instance where the company’s outcome is bad. To conform to the assumption of sequential rationality, the manager will chose a value of \( \alpha \) that maximises his expected payoff given that he has reached the node M3 (ie a bad outcome has been realised). His expected payoff is

\[ \Pi^M = \alpha[W^L - C^M(\mu)] + (1-\alpha)[W^H - C^M(\mu) - \lambda(W^H - W^L) + (1-\lambda)\rho P^M]. \]

The derivative of his payoff with respect to \( \alpha \) is:

\[ \Pi^M_\alpha = -(1-\lambda)(W^H - W^L + \rho P^M) \leq 0 \quad \forall \lambda \in [0, 1]. \]

Since the manager’s marginal payoff is monotonically decreasing for all values of \( \lambda \), a corner solution prevails, and the manager will select \( \alpha = 0 \) and always lie about his bad outcome (except in the unlikely case when \( \lambda = 1 \) in which case, the manager is indifferent to which value of \( \alpha \) he chooses).
Given that the manager’s strategy (tell truth|bad outcome) is strictly dominated, regardless of the level of audit intensity, we can determine the players’ ex ante payoffs, given that the conditions are met for the ‘compliant manager’ scenario. For the two players, the ex ante payoffs are therefore:

**Manager’s Payoff 1.** \( W^H - C^M(\mu) - (1-\mu)[\lambda (W^H - W^L) + (1-\lambda)\rho P^M] \)

**Auditor’s Payoff 1.** \( F - C^A(\lambda) - (1-\mu)(1-\lambda)\rho P^A \)

The first two terms of the manager’s payoff are the payoff if there is a good business outcome or the manager gets away with lying in the financial statements. The final term is the expected cost to the manager of getting caught, weighted by the probability the manager will try to cheat: the first term within the brackets is the cost of getting caught by the auditor times the probability of getting caught by the auditor and the second term is the cost of getting caught by the market times the probability of first not getting caught by the auditor and then getting caught by the market. The auditor’s payoff is similarly straightforward: it is the audit fee less the cost of the audit and less the expected cost of the market finding a misstatement. The expected cost is calculated by multiplying the actual penalty when caught times the product of the probabilities that there is a bad business outcome (and therefore the manager introduces a misstatement into the financial statements), the auditor fails to find the misstatement, and the market does manage to find it.

Given that I am assuming that the players are well-informed about the parameters of their own and their opponent’s payoffs, if the expected value of the payoff is less than the player’s reservation payoff, the player will refuse to play the game. The auditor can refuse to play by resigning from an audit (or refusing to accept the client in the first place). The manager can refuse to play by resigning as manager of the client company, hiring a different auditor before the start of the audit, or, in some cases, taking the company private.

If the players decide to move forward with the game, we can now determine how the manager and the auditor will set their individual effort levels: the manager will choose \( \mu \) and the auditor will choose \( \lambda \). Because the audit must, by definition, follow the determination of the true outcome of the company, management always has the first player advantage and can choose his effort level based on his assessment of how the auditor will respond to his effort. The auditor can only maximise her payoff subject to her assessment of the manager’s investment decision. Auditors can never do better than react to management’s choice of \( \mu \), since they have no credible way of committing to an alternative value of \( \lambda \). Even in a repeated game, auditors cannot use a reputation for a different value of \( \lambda \), as long as the assumption that \( \lambda \) is not observable or verifiable by an outside party holds true. If there were a way for auditors to commit to a value of \( \lambda \) before the start of the game, they would generally choose a higher value for \( \lambda \) than described below, though a detailed discussion of their first-move choices of \( \lambda \) is beyond the scope of this article. The strategies of both players are determined by backward induction, so I begin by looking at the auditor’s decision, taking the value of \( \mu \) as given.

The ex ante expected payoffs are what the auditor uses to set her optimal audit intensity, \( \lambda \). For payoffs given in this scenario, the auditor sets \( \lambda \) such that:

**Auditor’s Optimal Choice 1.** \( C^A_{\lambda} = (1 - \mu)\rho P^A \)
where $\mu^*$ is the manager’s optimal value of $\mu$. The dynamics of this scenario are well understood in the literature and the profession: the auditor sets her audit intensity proportionate to her estimation that the company has a poor outcome and therefore the manager could be lying in the financial statements, $(1 - \mu^*)$, and the expected cost to her of missing a misstatement, $\rho P^A$. Given that the manager can be secure in his first-move advantage, he optimises his expected payoff by treating $\lambda$ as a function of $\mu$. In scenario 1, management sets $\mu$ such that:

$$C^M_\mu = \lambda(W^H - W^L) + (1 - \lambda)\rho P^M - (1 - \mu)\lambda(W^H - W^L) - \rho P^M$$

This expression for $C^M_\mu$ can be rearranged and simplified to:

**Manager’s Optimal Choice1.** $C^M_\mu = \lambda \xi (W^H - W^L) + (1 - \lambda)\rho P^M$

where

$$\xi = 1 + \left( 1 - \mu \right) \frac{\partial \lambda}{\partial (1 - \mu)}$$

or

$$\xi = 1 + \eta_{1-\mu}$$

where $\eta_{1-\mu}$ is the elasticity of the auditor’s effort level to an increased risk of a poor business outcome and therefore an increased risk of the existence of a misstatement. This result sets the optimal value of $\mu$ higher than it would be if the manager did not take into consideration his effect on the auditor’s effort level. How much higher depends on the elasticity of effort.

**Opinion shopping scenario**

If the auditor refuses the bribe offered by management, and the manager fires the auditor in order to get a clean opinion from a more willing auditor, the expected payoffs are illustrated in Figure 6 (similar to that in Figure 5).
Since Proposition 4 still holds true, the manager will always lie if his company’s outcome is ‘bad’. The logic of how the players select $\mu$ and $\lambda$ is the same as in the first scenario. Therefore, the players’ ex ante expected payoffs are:

**Manager’s Payoff 2.** $W^H - C^M(\mu) - (1-\mu)[(\lambda(W^H - W^S - \rho SP^M) + (1-\lambda)\rho P^M]$

**Auditor’s Payoff 2.** $F - C^A(\lambda) - (1-\mu)[(\lambda((1-r)F - \rho SR) + (1-\lambda)\rho P^A]$

For this set of payoffs, the auditor sets her optimal $\lambda$ such that:

**Auditor’s Optimal Choice 2.** $C^A_\lambda = (1-\mu^*) (\rho P^A + \rho SR - (1-r)F)$

The auditor’s audit intensity will decrease relative to that in the first scenario due to the fear of being fired, unless the auditor believes that there is a significant expected payoff to the market determining she had been fired because she refused to give ground to her client, $\rho SR$. Again, auditors seem to be aware of this dynamic and frequently claim that they are ‘damned if you do, damned if you don’t’, since they lose a client, and often their fee, when they find a misstatement and get sued by share holders if they don’t find the misstatement. Furthermore, since $C^A_\lambda$ is assumed to be positive, if $(1-r)F > \rho P^A + \rho SR$, there is no solution to the equation above and the auditor’s best choice will be the corner solution where $\lambda = 0$.

The manager optimises his level of effort, taking into consideration the auditor’s response to his choice in the same way he did in the first scenario. His optimal $\mu$ is therefore set such that:

**Manager’s Optimal Choice 2.** $C^M_\mu = \lambda \xi(W^H - W^S - \rho SP^M) + (1- \lambda \xi)\rho P^M$

where $\xi$ is defined the same way as it was in the compliant manager scenario. The interpretation of the manager’s optimal effort in scenario 2 is similar to that in scenario 1. Because in this scenario condition 1 is met, the first term on the left-hand side of the manager’s optimum in 2 is smaller than the parallel term in scenario 1. This means that the manager will set his effort level, $\mu$, lower than he would if he could not fire his auditor.
**Collusive auditor scenario**

As in the previous two scenarios, the collusive auditor scenario’s expected payoffs are illustrated in Figure 7.

**Figure 7: Reduced extensive form auditing game if the bribing subgame resolves in the ‘collusive auditor’ scenario**

\[ WH - CM(\mu), \quad F - CA(\lambda) \]

The logic used to solve the game under this scenario is the same as in the other two scenarios. Proposition 4 still holds true, so the players’ ex ante expected payoffs are:

**Manager’s Payoff 3.** \( WH - CM(\mu) - (1 - \mu) [\lambda(kB) + \rho P^M] \)

**Auditor’s Payoff 3.** \( F - CA(\lambda) + (1 - \mu) (\lambda B - \rho P^A) \)

For this set of payoffs, the auditor sets her optimal \( \lambda \) such that:

**Auditor’s Optimal Choice 3.** \( \lambda_A = (1 - \mu^*) B \)

This scenario is noteworthy in that the auditor’s decision is no longer driven by the cost of getting caught, but instead by the size of the bribe on offer. Certainly, the cost of getting caught is implicitly included here, since the bribe must be greater than the expected value of the cost of getting caught. But the dynamic has changed from one of the auditor trying to protect herself from the fury of the market to one of pursuing a share of the rents that the management is appropriating.

In this scenario, management will set \( \mu \) such that:

**Manager’s Optimal Choice 3.** \( CM = \lambda \zeta(kB) + (\rho P^M) \)

where again \( \zeta \) is the same as it was defined in the first scenario. Important to note is that in the special case where \( k = 0 \) the manager will set his effort level at the same, lower level he would set if there were no auditing at all. If \( k \) is positive, the manager’s effort will increase, but given that \( kB < WH - WL - \rho P^M \) for the ‘collusive auditor’ scenario to be the equilibrium scenario, it would not increase to the level where it would be if the auditor were incorruptible.
4 Policy Implications
This model provides a framework for understanding more fully the possible effects of a policy change on audit intensity, manager effort levels, and information quality in the market. The strategic interactions described in the game allow us to consider more than the intuitive first-order effects of, for example, a change in the magnitude of a penalty. Moreover, we can consider more precisely the socially desirable levels of auditing. In addition to considering the private benefits from the audit intensity, we can account for the positive externalities associated with an equilibrium strategy by constructing a measure of information ‘quality’, defined as the ex ante probability that a company will release an accurate picture of its financial position.

Information quality
Information quality can be thought of as the ex ante probability, $\theta$, that any financial statement, given a set of equilibrium conditions, will report the true outcome. The value of information quality depends on the value the market participants put on that information. Note that market participants may be shareholders, prospective shareholders, employees, management of competitors, or anyone who values accurate information about the company for any reason. Let $v_i$ be the amount market participant $i$ is willing to pay to have $S^r = S^t$, where $S^r$ is the reported state of the company and $S^t$ is the true state of the company. The market therefore values a particular level of information quality as

$$V = \theta \sum_{i=1}^{N} v_i$$

If $\theta$ is the ex ante probability of a true report and if the equilibrium conditions in the compliant manager scenario apply, then $\theta = 1 - (1-\mu)(1-\lambda)$. In the other scenarios, $\theta = \mu$.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Compliant Manager</th>
<th>Opinion Shopping</th>
<th>Collusive Auditor</th>
</tr>
</thead>
<tbody>
<tr>
<td>true outcome disclosed</td>
<td>$1-(1-\mu)(1-\lambda)$</td>
<td>$\mu$</td>
<td>$\mu$</td>
</tr>
<tr>
<td>bad outcome disclosed</td>
<td>$(1-\mu)\rho$</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>false &amp; discovered</td>
<td>$1-\mu(1-\lambda)\rho$</td>
<td>$(1-\mu)\rho + (1-\lambda)\rho$</td>
<td>$(1-\mu)\rho$</td>
</tr>
<tr>
<td>false &amp; not discovered</td>
<td>$1-\mu(1-\lambda)(1-\rho)$</td>
<td>$(1-\mu)(1-\rho)(1-\lambda(1-\rho))$</td>
<td>$(1-\mu)(1-\rho)$</td>
</tr>
</tbody>
</table>

Table 3 spells out the probability of any engagement falling into a variety of categories, conditional on which equilibrium conditions hold. Note that the market cannot differentiate between the contribution of $\mu$ and the contribution $\lambda$ to the quality of information in the marketplace unless $\rho$ is known, since only rates of discovered fraud and honestly disclosed ‘bad’ outcomes are seen by the market.16

Socially optimal outcome
The equilibrium strategies solved in the first part of this article solve for the privately optimal strategies for the two active players. They say nothing about what is socially optimal. This section looks at how society’s interests compare with the equilibrium outcomes and which levers might be available to policy makers to align social and private interests.
There are four components to this problem that a social planner would need to
consider to maximise overall wealth. There are the individual payoffs of auditor and
manager, the profits of the company that has hired the manager, and the aggregate
value attached to the quality of information released by the company by all market
participants.

\[ \Pi_{\text{society}} = \Pi_{\text{manager}} + \Pi_{\text{auditor}} + \Pi_{\text{company}} + V \]

where \( V \) is the value of information quality above and beyond the value realised by
the auditor, manager or company.

The profit of the company for these purposes can be thought of being some
generic function of \( \mu, f(\mu) \), less the expected value of the payoffs to auditor and
manager. I am assuming that the wages and fees are a frictionless transfer of wealth
from company to manager and auditor and that penalties are a frictionless transfer
from manager and auditor to the company. The portion of the bribe not paid by the
manager is paid for by the company, and again I am assuming a frictionless transfer
for simplicity. The only exception to all the elements of the auditor and manager
payoffs being straight transfers is in the opinion shopping scenario. The reputation
benefits the auditor receives when the market discovers she was fired for trying to get
the manager to correct a misstatement is gathered from the auditor’s entire future
portfolio. In general, the social optimum analysis of the opinion shopping scenario is
more complex and less satisfying than the other scenarios, because the scenario has
suppressed the complication of the manager finding a second auditor to issue a clean
opinion.

Leaving aside the problems with the opinion shopping scenario, in general the
only portions of the social objective function that are not canceled out as transfers
between the different groups within the objective function are the costs expended by
the manager and auditor to produce \( \mu \) and \( \lambda \), respectively, the profit made by the
company and the value of the information quality.

**Compliant Manager Scenario**

If the compliant manager equilibrium conditions hold, the social objective function is

**Social Objective Function 1.**

\[ \Pi_{\text{society}} = -C^M(\mu) - C^A(\lambda) + f(\mu) + (1 - (1 - \mu)(1 - \lambda)) \sum_{i=1}^{N} v_i \]

If a hypothetical social planner was able to set the values of \( \mu \) and \( \lambda \) (thereby
bypassing the strategic interactions between the two players), the optimal investment
decisions of both players are defined implicitly by

**Optimal Manager Effort 1.** \( C^M_{\mu} = f_{\mu} + (1 - \lambda) \sum_{i=1}^{N} v_i \)

This result demonstrates that the optimal investment of manager effort is greater than
it would be if the manager were compulsively honest and therefore if the quality of
information were not linked with the company’s outcome.

**Optimal Audit Intensity 1.** \( C^A_{\lambda} = -(1 - \mu) \sum_{i=1}^{N} v_i \)
The audit intensity is only valuable to the extent there is an incentive for the manager to lie.

**Opinion Shopping Scenario**

The opinion shopping scenario is more complicated. To help keep it simple, I assume here that, as in the other scenarios, all components of the two players payoffs except for their cost functions are frictionless transfers between the various players. The information quality metric and company profits are constructed the same way as well. But none of these capture the value of the market observing an auditor change: even though it occurs when the information contained in the financial statement is misleading, it is nonetheless valuable to have a clear indicator that there is a problem with the statement. To account for this, I construct another element $V_s$, which is similar to the information quality metric and captures the expected value market participants gain from observing a switch:

$$V_s = (1-\mu)\sum_{i=1}^{N} v_i^s$$

where presumably the value of observing a switch is no greater than being told the correct information in the financial statement, so $v_i \geq v_i^s$.

With this additional component, the social objective function is

Social Objective Function 2.

$$\Pi_{society} = -C_M(\mu) - C_A(\lambda) + f(\mu) + \mu \sum_{i=1}^{N} v_i + (1-\mu)\sum_{i=1}^{N} v_i^s$$

The optimal investment levels are defined by:

Optimal Manager Effort 2. $C_M^\mu = f(\mu) + \sum_{i=1}^{N} [v_i - (1-\lambda) v_i^s]$]

Once again, the optimal investment level for the manager is greater than it would be were he compulsively honest.

Optimal Audit Intensity 2. $C_A^\lambda = (1-\mu)\sum_{i=1}^{N} v_i^s$

For every value of $\mu$, the optimal audit intensity here is less than or equal to the optimal audit intensity in the compliant manager scenario, since they contribute only to the possibility of an auditor switch, not directly to financial statement quality.

**Collusive Auditor Scenario**

In the final scenario, the social objective function is:
Social Objective Function 3. \( \Pi_{society} = -C^M(\mu) - C^A(\lambda) + f(\mu) + \mu \sum_{i=1}^{N} v_i \)

The optimal value of manager effort is defined by

Optimal Manager Effort 3. \( C^M_{\mu} = f\mu + \sum_{i=1}^{N} v_i \)

Note that the difference is the greatest in this scenario between the optimal effort investment and what would be optimal were the manager compulsively honest. The solution for the auditor is a corner solution

Optimal Audit Intensity 3. \( \lambda = 0 \)

In this case, the auditor adds no social value.

One interesting result of the part of the analysis is that regardless of the equilibrium strategy, if the manager has an incentive to lie, the optimal investment in manager effort will appear to the company and manager as excessive. If policy makers were to be successful in achieving these optimal results, they should expect to hear complaints from corporate interests that the regulations or risk of penalties create an onerous burden on the executive and are not cost-effective. The constituency that benefits from information quality is quite diffuse and many realising the benefits may not be able to trace their improved fortunes to its origin in the manager’s increased efforts. As a result, there are significant political economy barriers to achieving good policy in this arena.

Centrally planned audit intensity

The above discussion of the socially optimal levels of \( \mu \) and \( \lambda \) is useful but artificial. In the US at least, there is no attempt for a central benign planner to set manager effort levels. There is, however, an attempt through generally accepted audit standards to approximate, at least, a centrally planned audit intensity. In this case, we can look at how optimal audit levels change once managers’ effort levels are set privately and therefore respond to the audit intensity.

In this case, auditors contribute value through two mechanisms. They add to managers’ incentives to exert effort and they contribute directly to information quality in the compliant manager equilibrium scenario. To determine the optimal level of auditing in this case, we can optimise the social objective function with respect to \( \lambda \) treating \( \mu \) as a function of \( \lambda \). Generically, the first order condition is:

\[
C^A_{\lambda} = \frac{\partial \Pi_{society}}{\partial \lambda} + \frac{\partial \Pi_{society}}{\partial \lambda} \frac{\partial \mu}{\partial \lambda}
\]

If \( \mu \) is produced at the socially optimal level, the second part of the right hand side will zero out, and the optimal audit intensity will be the same as in the previous section. Manager effort is likely under-produced, since even if the manager’s contract is well designed, it will be designed by the company, which will not consider the
positive externality created by the contribution manager effort makes to information quality. In such a case,
\[
\frac{\partial \Pi_{\text{society}}}{\partial \lambda} > 0
\]
If \(\lambda\) is not responsive to the manager’s choice of \(\mu\),
\[
\frac{\partial \mu}{\partial \lambda} > 0
\]
as well, and the optimal audit intensity is greater than it would be if we could set \(\mu\) at the socially optimal level.
This is the case even in the instance of the collusive auditor scenario wherein the initial analysis the optimal intensity was zero. Instead, the optimal audit intensity would be:
\[
C_{\lambda}^A = (-C_{\mu}^M + f_{\mu} + \sum_{i=1}^{N} v_i \frac{kB}{C_{\mu}^M})
\]
The socially optimal level of audit intensity in all equilibria will be reached when the private optimisation calculations equal the social optimisation calculations.
Figure 8 offers a visual representation of both of the mechanisms where the auditor has an effect: the incentive effect and the information quality effect. Increasing the incentive effect will push the dotted line that divides ‘good’ outcomes from ‘bad’ to the right, increasing the fraction of ‘good’ outcomes. The information quality will increase by growing the size of ‘true outcome reported’ circle. It will do this both through an increase in good outcomes and an increased fraction of bad outcomes reported honestly.
Optimal equilibrium conditions

The social planner need not stop at determining the optimal audit intensity given an equilibrium outcome. Which outcome is the equilibrium is, of course, of great policy interest as well. Table 4 summarises the various equilibrium conditions that must hold for each of the three scenarios to be the result of the players’ equilibrium strategies.

### Table 4: Summary of conditions met under each scenario

<table>
<thead>
<tr>
<th>Condition</th>
<th>Compliant Manager</th>
<th>Opinion Shopping</th>
<th>Collusive Auditor Fire/No Fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firing condition</td>
<td>False</td>
<td>True</td>
<td>True / False</td>
</tr>
<tr>
<td>$W^c - W^d &gt; psPM$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bribing condition (a)</td>
<td>False</td>
<td>False</td>
<td>Indet./ True</td>
</tr>
<tr>
<td>$\min (1(k(W^c - W^d - (\rho^s + \rho)p^m), \beta^{obs} \geq p^d) + \rho^d R_{1(F)} (1-\rho^d) )$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bribing condition (b)</td>
<td>False</td>
<td>False</td>
<td>Indet./ True</td>
</tr>
<tr>
<td>$\min (\frac{1}{2}(W^d - W^c - \rho P^m), \beta^{obs} \geq p^m)$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘Bad’ outcome possible</td>
<td>True</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>$W^a - W^b &gt; \rho P^m$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

While I will not prove it formally here, it is fairly clear that the socially optimal equilibrium outcome is the compliant manager scenario. Society gets an automatic extra benefit for every level of audit intensity greater than zero through the improved quality of information. The incentive effects are greater as well (holding all else constant).

There are several avenues to achieving the equilibrium that results in the compliant manager. Policy makers could raise penalties, improve post-release detection rates, increase the scrutiny of the manager for making an auditor change, and restrict financing mechanisms for bribes. Changes in any combination of these tactics would tend to push auditor-client pairs that are on the margins of an equilibrium strategy towards the ‘compliant manager’ scenario – or towards the scenario where the manager never has an incentive to lie and therefore the audit adds no value.

But given the potential significant heterogeneity in auditor and manager characteristics, chances are that a blanket policy change, such as a change in penalties
for getting caught in a lie, will have very different effects on different auditor-client pairs, depending on their original equilibrium strategies and how close they are to shifting strategies. To see the complexity of the consequences of a policy change, I look at one example, the issue of proportionate liability.

**Proportional liability**

A major legal question being debated today since PSLRA implemented a proportionate liability standard in 1995 is how to determine the proportion of damages that is assigned to auditors (or other gatekeepers). Determining the correct course from an incentives perspective is not a straight-forward task, but the model presented here can help at least in defining the issues.

How the penalty apportionment affects the decisions of the two players is critically dependent on their equilibrium strategies. A marginal change in the apportionment of the total plaintiff award (which will have countervailing effects on the penalties recognised by each player) will have either a marginal effect on the optimisation decisions made by each player, which can be understood through a comparative statics analysis, or it will shift the entire game to a new equilibrium strategy.

If some large portion of the total damages were charged to the manager, and if it were to have the effect of making \( W^H - W^L < \rho P^M \), therefore removing the incentive for the manager to lie in the first place, that would clearly be an efficient solution and would allow us to do away with the requirement for an external audit (since there would be no fraud to find).\(^{18}\)

However, through damage caps, liquidity constraints, risk aversion, or other barriers, it may not be possible to ensure that \( W^H - W^L < \rho P^M \). Living, therefore, in a world in which we need to introduce auditors, the question becomes how to best motivate both actors to perform their jobs in as efficient manner as possible through the manipulation of penalty sizes exacted on one actor or the other.

**Compliant manager comparative statics**

If the conditions are such that the ‘compliant manager’ equilibrium conditions are met, and that the parameters are such that there is room for the penalty parameters to change without shifting the game to a different equilibrium strategy, a comparative statics analysis of a change in the proportion of a total penalty on the investment decisions of both players can help us understand the optimal proportion of penalties.

To look directly at the effects of proportional liability, I rewrite \( P^M \) and \( P^A \) such that \( P^M = \alpha P \) and \( P^A = (1-\alpha)P \), where \( P \) is the total damages awarded to plaintiffs and \( \alpha \) is the fraction of those damages assigned to the manager.\(^{19}\)

**Manager’s response**

The effect of an incremental change in \( \alpha \) on the manager’s effort level is:

\[
\mu_{\alpha} = \frac{\rho P \left( 1 - \lambda \right) - \left( 1 - \mu \right) \phi(1-\alpha)P_{C^M_{\lambda}}}{C^M_{\mu} + (W^H - W^L - \rho \alpha P) \left( \frac{1-\alpha}{C^M_{\lambda}} \right) \left( 2 - \frac{(1-\mu) \phi(1-\alpha) PC^A_{\lambda}}{(C^A_{\lambda})^2} \right)} \bigg|_{\lambda=\lambda^*}
\]
Taking advantage of the fact that the expression is evaluated at $\lambda^*$, we can use the implicit definition of $\lambda^*$, $C^A_{\lambda} = (1-\mu)\rho(1-\alpha)P$ to respell the expression more succinctly:

$$\mu_\alpha = \frac{\rho P \left( (1 - \lambda) - \frac{C^A_{\lambda}}{C^M_{\lambda \lambda}} - (W^H - W^L - \rho \alpha P) \frac{(1-\mu)}{C^A_{\lambda \lambda}} \left( 2 - \frac{C^A_{\lambda} C^A_{\lambda \lambda}}{(C^A_{\lambda \lambda})^2} \right) \right)}{C^M_{\mu \mu} + (W^H - W^L - \rho \alpha P) \rho (1 - \alpha) P \frac{C^A_{\lambda}}{C^M_{\lambda \lambda}} \left( 2 - \frac{C^A_{\lambda} C^A_{\lambda \lambda}}{(C^A_{\lambda \lambda})^2} \right)} \bigg|_{\lambda = \lambda^*}$$

**Auditor’s response**

The auditor is affected by a change in $\alpha$ through two avenues: a direct reduction of her own penalty $(1-\alpha)P$ and a potential change in the manager’s effort level, $\mu$. Therefore, the total effect on the auditor from a change in $\alpha$ is:

$$\frac{d\lambda}{d\alpha} = \frac{\partial \lambda}{\partial \mu} \frac{\partial \mu}{\partial \alpha} + \frac{\partial \lambda}{\partial \alpha} = -\frac{\rho(1 - \alpha)P}{C^A_{\lambda \lambda}} \mu_\alpha - \frac{(1 - \mu_\alpha)\rho P}{C^A_{\lambda \lambda}}.$$

**Directions of responses**

The signs of both expressions are indeterminate and depend in large part on the exact nature of the auditor’s cost function. To gain some traction on this problem, therefore, I consider two plausible functional forms for the auditor’s cost function. The function is either a logarithmic function of the form

$$C^A_{\lambda}(\lambda) = c - b \ln(1 - \lambda) \quad (1)$$

or the related rational algebraic function

$$C^A_{\lambda}(\lambda) = c + \frac{b}{(1 - \lambda)^n} \quad (2)$$

where $n \geq 1$.

**Equation 1 properties**

$$\frac{C^A_{\lambda}}{C^A_{\lambda \lambda}} = 1 - \lambda$$

and

$$\frac{C^A_{\lambda} C^A_{\lambda \lambda}}{(C^A_{\lambda \lambda})^2} = 2$$

**Equation 2 properties**
The possible combinations of responses of the players to a change in $\alpha$, given the auditor’s cost function is of either of the above types, are summarised in proposition 5.

**Proposition 5.** Plausible conditions could exist such that the two players would respond to an increase in $\alpha$ in any of the following combinations:

- $\mu_\alpha > 0$ and $\lambda_\alpha < 0$
- $\mu_\alpha = 0$ and $\lambda_\alpha < 0$
- $\mu_\alpha < 0$ and $\lambda_\alpha < 0$
- $\mu_\alpha < 0$ and $\lambda_\alpha = 0$
- $\mu_\alpha < 0$ and $\lambda_\alpha > 0$

**Proof.** The combination of $\mu_\alpha \geq 0$ and $\lambda_\alpha > 0$ is not a possible response, since $\forall \mu_\alpha \geq 0,$

$$- \frac{\rho(1 - \alpha)P}{C_{\lambda\lambda}^A} u_\alpha - \frac{(1 - \mu)\rho P}{C_{\lambda\lambda}^A} < 0$$

by the assumption that $C_{\lambda\lambda}^A > 0$ and the definitions of $\mu$, $\rho$, $\alpha$ and $P$.

We would expect to see $\mu_\alpha > 0$ when the auditor’s cost function is of the form (2) above and

$$n + 1 > \frac{W^H - W^L}{\rho(1 - \alpha)P} \frac{\rho \alpha P}{\rho(1 - \alpha)P}$$

If $\mu_\alpha > 0$, then $\lambda_\alpha < 0$ for the reasons discussed above. An auditor cost function of the form (2) will ensure that the denominator of the manager’s response is unequivocally positive, since

$$1 \geq 2 - \frac{C_{\lambda\lambda}^A}{(C_{\lambda\lambda}^A)^2} > 0$$

and all of the other components of the denominator are positive either by definition or by the conditions necessary to have the compliant manager scenario be the dominant equilibrium strategy. The condition $n + 1 > \frac{W^H - W^L}{\rho(1 - \alpha)P}$ ensures that the numerator is positive.
The pair $\mu_a = 0$ and $\lambda_\alpha < 0$ results when the auditor’s cost function is the form (1) above. It is easy to see that $\mu_a = 0$ by substituting in the expressions for $\frac{c^I}{c^P}$ and $\frac{c^{(1)}_c}{c^{(1)}_d}$ given above. If $\mu_a = 0$, then

$$\frac{d\lambda}{d\alpha} = -\frac{(1-\mu)\rho P}{c^{(1)}_{\lambda \lambda}},$$

which is clearly negative.

The manager’s response to an increase in penalty proportion is negative when the auditor’s functional form is of type (2) and

$$n + 1 < \frac{W^H - W^L - \rho \alpha P}{\rho(1-\alpha)P},$$

by the same logic discussed above when the response was positive. In that case, the auditor’s response to a change will also be negative if

$$-\mu_\alpha < \frac{1-\mu}{1-\alpha}.$$

If that is not the case, $\lambda_\alpha \geq 0$. ■

These results are interesting because of their very indeterminacy. It is clear that because of the strategic interactions between auditor and manager that understanding the first-order, intuitive effects of a change in proportion of penalty are not sufficient to understand the behaviour of the two players. If policy makers increase the proportion of the penalty assigned to the manager in an attempt to eliminate the incentive to lie and they are not successful in causing a change in equilibrium strategy, they may end up reducing both players’ investments and lowering overall welfare!

Given that understanding the effect of a change in penalty proportion is tricky because of the countervailing forces, there is more to be learned by considering the related problem of the effect on each player’s choices of raising first the manager’s penalty and then the auditor’s penalty.

An increase in the manager’s penalty has straightforward, clear consequences: the manager will increase his efforts and the auditor will, in response, decrease her audit intensity. The manager’s response is

$$\mu_{PM} = \frac{\rho(1-\mu) + (1-\lambda) \frac{c^I}{c^P}}{(W^H - W^L - \rho P^M) \frac{c^{(1)}_c}{c^{(1)}_d}} > 0$$

The sign of the expression is clearly positive, since every component of the expression is positive, either by definition, assumption, or equilibrium condition.

Unlike in the proportional liability question, the auditor’s response is only affected through the manager’s changed behavior. Since the manager increases $\mu$ and $\lambda_\mu < 0$, $\lambda_{PM} < 0$. 
If we look instead at a marginal increase in the auditor’s penalties, we also get fairly unambiguous results. This time, both players will increase their investments. The manager’s effort change is:

\[
\mu_{PA} = \frac{(1 - \mu)\rho(W^H - W^L - \rho P^M)\left(2 - \frac{C^M C^A}{C^M_C^A}\right)}{C^M C^A + \rho P^A(W^H - W^L - \rho P^M)\left(2 - \frac{C^M C^A}{C^M_C^A}\right)} > 0
\]

as long as the auditor’s cost function is of the types considered above. The auditor’s overall change in \(\lambda\) is also positive in response to an increase in \(P^A\):

\[
\frac{d\lambda}{dP^A} = \frac{(1 - \mu)\rho C^M_{\mu \lambda} C^A_{\lambda \lambda} + \rho P^A(W^H - W^L - \rho P^M)\left(2 - \frac{C^M C^A}{C^M_C^A}\right)}{C^M C^A + \rho P^A(W^H - W^L - \rho P^M)\left(2 - \frac{C^M C^A}{C^M_C^A}\right)} > 0
\]

again, as long as the auditor’s cost function is of the types considered above.

Therefore, if policy makers are confident that most or all auditor-client pairs are operating under the compliant manager scenario and that the manager’s penalty, for whatever reason, cannot be set high enough to preclude the need for auditors, increasing auditor penalties is a more unambiguously effective way to improve the information quality and company profits. This conclusion is parallel to those drawn by DeAngelo (1981) and Dye (1993), since both authors predict that larger firms’ effective penalties are larger, due either to larger risk of litigation or to increased reputational capital on the line, and therefore the information quality of the resulting engagements are higher.

**Collusive auditor scenario**

The picture changes, however, if the compliant manager strategy is not the equilibrium strategy. The comparative statics for the opinion shopping scenario are complex and highly indeterminate, so I will not go through the analysis here. The analysis of the collusive auditor scenario is relatively straightforward, however, and illustrative.

Policy makers following the rule of thumb proposed above that raising penalties on auditors is the more effective approach to improving information and corporate profits will cause very different responses in those cases where the collusive auditor strategy is dominant. Increasing penalties on auditors will only cause them to demand larger bribes from management – which may come primarily out of the pockets of shareholders – until the equilibrium strategy shifts to one other than the collusive auditor strategy. While increasing auditor penalties might be effective in forcing a change in strategies, the most effective way is to shift more of the liability onto the manager, since an increase in \(\alpha\) will decrease the amount the manager is willing to pay by \(C^P_{\rho \tau}\) (recall that \(k \in [0, 1]\)) whereas it will only lower the amount the auditor is willing to accept by \(\rho P\).

As with the compliant manager scenario, looking at the penalties for manager and auditor separately is more illuminating. An increase in the manager’s penalty causes an increase in the manager’s effort and a decrease in the audit intensity:
An increase in the auditor’s penalty will depend on how responsive $B$ is to the increased risk. If for some reason the manager is already offering more than the minimum required to gain the auditor’s cooperation, $\frac{\partial \mu}{\partial p^M} = 0$. If the constraint is binding but the equilibrium strategy does not change, $\frac{\partial \mu}{\partial p^M} > 0$. The comparative statics for the two players are therefore:

$$\mu_{pM} = \frac{\rho}{C_{\lambda}^M + \frac{B^2}{\lambda^2} \left( 2 - \frac{C_{\lambda}^M}{C_{\lambda}^A} \right)} > 0$$

$$\lambda_{pM} = -\frac{B}{C_{\lambda}^A} \mu_{pM} < 0$$

The sign for the change in $\lambda$ will depend on whether the increased bribe or the increased manager effort (and resulting reduced likelihood that there is a misstatement to find) dominate the auditor’s response. In the special case where $k = 0$, the manager will not respond to an increase in auditor penalties and the auditor will increase her audit intensity (assuming $B$ is adjusted to accommodate the increased risk).

In general, the lesson from this comparative statics exercise is that policy changes will have heterogeneous effects, depending on the equilibrium strategies employed by auditor-client pairs and on the specific parameters of each game. Changing policy to correct the suboptimal incentives in one pair may worsen the incentives for another pair. Having audits performed by large firms with more to lose may in many cases have the positive social effects that DeAngelo (1981) and Dye (1993) predict, while at the same time worsening the social consequences of the audit in the instances where a manager draws heavily on his company’s resources to induce collusion in his auditor.

5 Conclusions
The model presented here offers insights into some questions and, equally valuably, it points in the direction of many more interesting questions. The model is a representation of a single-play version of the interaction between one auditor and manager pair. The parameters used in the model are quite broad and flexible. Therefore, fruitful avenues of consideration go in three directions. First, the generic parameters included here could take a number of forms in the real world. The existing literature and practical experience give some direction to their forms. Second, audit firms are engaged in these interactions with many clients simultaneously. The firms’ ability to design a portfolio of clients might affect the values they assign to the parameters of the game and may therefore change the choices they make with individual clients. Finally, the game may be played repeatedly with each client. Repeated games, particularly those with an indefinite number of repetitions, allow for different, more cooperative behaviors to emerge. While I do not formally model a
repeated game here, there are ways to incorporate much of the nature of the repetition into the single-play game parameters.

The theories proposed by DeAngelo (1981) and Dye (1993), discussed earlier, can both be seen as more specific models of aspects of the model presented here. Relating DeAngelo’s focus on reputation to the model presented here is a good illustration of how parameter specifics, client portfolios, and repeated plays of the game all extend on the model, yet can be captured approximately in the model as it stands. According to DeAngelo, an audit firm’s reputation might allow the firm to capture additional ‘client specific quasi-rents’ in their fee. I have not tried to model how the auditor’s fee is determined in this game except to note that it must be greater than the expected costs of the audit (including the risk of an audit failure) in order for the auditor to accept the engagement. It is reasonable to expect, however, that audit firms with higher reputations can negotiate a fee with a larger profit margin, thereby capturing quasi-rents. One aspect of the ‘penalty’ associated with getting discovered in an audit failure by the market could be the loss of some of that profit margin in all future engagements due to the loss of reputation associated with the audit failure. The penalty is determined by the market for audits, not by a prosecutor or regulator, but it is no doubt nonetheless incorporated in audit firms’ risk assessments in any engagement.

Dye (1993) focuses more on the explicit legal penalties associated with an audit. His work explores the possibility of small firms’ liquidity constraints effectively limiting the possible size of the penalty that can be assessed against them while large firms are not similarly constrained. The model here captures those possibilities and, as discussed in the previous section, the equilibrium scenario is partially determined by the size of the penalty faced by the auditor if she fails to prevent a misstatement that is later discovered by the market. If small firms are indeed facing smaller penalties because they are judgement-proof past a point then my model concurs with Dye’s analysis that small firms would invest less in audit intensity.

My work expands on theirs by allowing for the possibility that management may find ways to compensate for the additional risks auditors take on if they collude with management. Both the losses associated with reputation loss and with securities litigation are very large, and probably far larger than the private benefit gotten by management from the deception. But the manager may have financing options that allow him to compensate the auditor fully with little cost to himself. The repeated nature of the game in real situations offers a variety of financing options to the manager. Assuming that the auditor earns profits, at least in expectation, from every play of the game, the future stream of revenues from the relationship with the client are valuable to the auditor – potentially, quite valuable. The penalties to switching auditors between engagements seem to be different than those associated with switches mid-audit, so a manager may be quite credible in his threat to refuse to re-engage the auditor (or to refuse to engage her for non-audit services) even if the firing condition is not met. Avoiding the loss of those future revenue streams may go a long way in providing the necessary inducement to get the auditor to ignore any misstatements she finds in her audit.

Some of the results of the equilibrium analysis are artifacts of some of my modeling choices, and these should be noted. These choices highlight some possible problems with previous models, but they may not fully capture the real nature of auditor–manager interactions and therefore may make the model’s predictions misleading. One important choice, discussed earlier, is that I do not allow for differences between the penalties associated with audit failure discoveries related to
whether the auditor colluded with management or missed them innocently. This is contrary to the assumptions in other models.

Another modeling choice that merits note is the assumption that the manager suffers no extra penalty when his auditor discovers a misstatement and he agrees to correct it. He receives a lower payoff than he would if he were successful in his lie, but loses no more than he would have if he had told the truth in the first place. This is a key difference between my model and many of the traditional principal-agent models in the economics literature that include a monitor or audit component and it weakens the incentive effect of the auditor. This assumption is justified in part by the single-play assumption: I am ignoring all possible future interactions between manager and auditor. But if the manager’s reputation with his auditor is jeopardised by her discovery of a misstatement and if that change in their relationship significantly affects future plays of the game, the manager’s decisions about whether to tell the truth initially might well change. I believe that this assumption, at minimum, is usefully provocative, and at most is in line with actual experiences.

More generally, this model offers a simple framework in which to consider questions such as sources of manager leverage over auditors or appropriate liability standards. It does not presume the infeasibility of mutually acceptable bribes, and it highlights the importance of how such bribes might be financed. Finally, it draws attention to the question of risk of detection and the possible difficulty the market or regulators may have in identifying the contribution auditors make to the quality of information in the market, since separating their contribution from rates of manager honesty and from ex post detection rates is not feasible with publicly available information.

Notes

* Many thanks to Ann and Jim Rothenberg for their generous funding of the dissertation award that made this work possible. Thanks also to Jim Hosek and Eric Talley for their helpful comments on earlier drafts.
1 For ease of exposition, throughout the paper the auditor is ‘she’ and the manager is ‘he’.
2 The provision most relevant to the model is the increased power of the audit committee. In Sarbanes-Oxley, the audit committee is now responsible for hiring and firing the auditor. There are also independence requirements for the audit committee, increasing the likelihood that its incentives are not aligned completely with management.
3 This is one interpretation of Dye’s model, since he does not explicitly discuss going concern opinions. He does require a client company’s failure to trigger liability, so even if the particulars of the case were about earnings manipulation that made the bankruptcy of the company a surprise, it would still conform to the specifications of his model.
4 There is a theme in the principal-agent literature about the difficulty of a principal committing to audit the agent at the level necessary to induce the desired behavior (Khalil, 1997; Hart, 1995; Bolton and Scharfstein, 1990). The regulations requiring a financial statement audit make this a non-issue, though perhaps there remains a commitment problem in hiring a competent (and therefore expensive) auditor.
5 The assumption of discrete, binary options for the financial statements (ie good outcome and bad outcome) in the model force this outcome. In reality there is often a negotiation between manager and auditor and the financial statements often end up reflecting a compromise between the two parties (Antle & Nalebuff, 1991).
6 I assume there are no false positives that do not get resolved over the course of the audit, so that in this analysis the auditor never commits a Type I error.
7 For the sake of simplicity, I assume that there is either one or no misstatement.
8 I will leave the nature of this penalty vague at this point – the placeholders $P^M$ and $P^A$ do, however, include an inter-temporal discount factor to simplify the notation.
9 I assume that, given this is a single period game and given that auditors observe client confidentiality if the manager acquiesces to changes demanded by the auditor, the manager suffers
no consequences from getting caught by the auditor except for receiving the payoff associated with reporting a poor outcome.

10 A third possibility, accepting an adverse opinion, is assumed away here because of regulatory restrictions on listing on major stock exchanges with an adverse opinion.

11 Attaining such a clean opinion may be a complicated procedure where management plays a similar game with another audit firm, but for this analysis, I assume that such an opinion can be found but that the market is aware that an auditor switch has been made.

12 Because the policy relevance of considering the equilibriums associated with an exact equality of payoffs is essentially nil, I will not carry the feasible equilibriums in that situation through the analysis. However, in solving this subgame, all possible pure and mixed strategies would qualify as equilibriums if \( W^S - W^L = \rho SP^W \).

13 This statement is not completely precise, since in an equilibrium where a bribe is offered and accepted, there may be more than one value of the bribe that could achieve that equilibrium.

14 For almost all allowable values of the parameters, the above equation is the optimum, since most allowable values of the left-hand side of the equation will result in \( C^A_\lambda > 0 \). The only exception to this are the unlikely cases where \( \rho = 0, \ P^A = 0, \) or \( \mu = 1 \). In such instances, \( \lambda \) would clearly be set to 0.

15 Similarly to the situation in the compliant manager scenario, there will be a solution to the auditor’s optimum in collusive auditor scenario except where \( \mu = 1 \). In this instance, once again, \( \lambda \) would clearly be set to 0, and the management would never have need to bribe his auditor.

16 And it is possible that the market cannot tell which outcomes are ‘bad’ in a manager’s eyes, thereby making restatements the only group that the market can distinguish.

17 This is ignoring the reputational penalties that are transferred, most likely with friction, to other clients, current and future. Assuming those penalties away helps make this analysis tractable and concise.

18 As with this entire paper, I am only considering the auditor’s role as monitor of the information quality released by the executive manager. Should the auditor provide other services, as is likely the case, there would still be a role for external auditing, though perhaps one that could be taken care of entirely through private contracting.

19 This analysis ignores the effects insurance might have. The presence of insurance, particularly insurance purchased by the company to cover the manager’s liability, and the related moral hazard that attends insurance, may well change the results presented here significantly.

References


