Incentives for Auditor Collusion: 
An Auditor-Agent Game *

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Abstract

This paper develops a single-play game theory model that examines the strategic interactions between auditors and managers. This paper adds to the literature by explicitly modeling the possibility of collusion in a context where the outcome is unverifiable and the manager can fund side-payments in such a way that they have little effect on his personal payoff. It examines how the equilibrium solutions deviate from an efficient solution that takes into consideration the informational externalities that result from the audit process.

1 Introduction

The bankruptcy of Enron in 2001, the collapse of its auditor, Arthur Andersen, in 2002, and subsequent financial statement fraud scandals 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 and would cause them to audit effectively enough to prevent such catastrophic frauds. Enron and the many frauds that followed call for a re-examination of these assumptions.

This paper begins such a re-examination using a single period model of the strategic interaction between an auditor and the management she is hired

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to audit.\(^1\) The model focuses narrowly on the issue of the auditor preventing the manager from intentionally misrepresenting the state of the company. The model includes as few restrictions as possible on the exact nature of the parameters used in the model, while still keeping the interaction recognizably that of a financial statement audit. It therefore provides a starting point with which to gain some traction in understanding the incentives facing the audit profession.

This paper contributes to our understanding of the auditor–manager relationship in several important ways. Primarily, it offers a flexible, incentives-driven model of the conditions necessary for a manager to succeed in capturing his auditor. These conditions are manager–auditor pair specific, and so allow for future explorations of how audit firms might manage a heterogeneous client portfolio. It also demonstrates how audit intensity and independence are inter-related decisions, and should be considered in concert. Finally, this model is the only one, to my knowledge, that constructs a positive model of the auditor–manager relationship in a realistic regulatory and legal regime that includes all of the following components: an inability for shareholders to directly influence the contracts for the auditor, a mechanism for side payments from manager to auditor that could involve use of company resources, a non-verifiable outcome for the company, imperfect auditing, and an inability for the penalty system to determine the cause of the audit failure (i.e. collusion, negligence, incompetence or bad luck).

In addition to the particular variations on the principal-agent theme presented here, this paper discusses how the various equilibria deviate from a social optimum that takes into consideration information externalities in addition to the payoffs of shareholder, manager and auditor. When such externalities are considered, the optimal level of auditing and management effort differ relative even to the private preferences of the principal, let alone possible equilibrium levels.

When viewed from a principal-agent perspective, the financial reporting system has been created to resolve the information asymmetry inherent between agents—the executive management of a corporation—and principals—the shareholder-owners of the corporation. The 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 (See, for example, Alchian & Demsetz, 1972; Jensen & Meckling, 1976; Lazear, 1986). In the financial reporting system, this is a role an 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 modeled 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 & Torsvik, 1998; Strausz, 1997; Laffont & Tirole, 1991). Unfortunately, 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 much of the work following Tirole (1986) and this paper is that most models assume that the output of the agent is costlessly observable by all parties and that the asymmetric information lies 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 & Nell (2002) show that the optimal level of care and a truth-revealing mechanism 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. However, 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. And as this paper will show, in all likelihood we do not operate in a system with an alternative revelation mechanism.

A body of related work considers how to encourage the agent to report a private initial signal on the probable outcome of a project a time where the uninformed principal needs to make a decision about whether to continue or liquidate the project (Dessié, 2005; Acemoglu & Gietzmann, 1997; Acemoglu, 1997). This work is more aligned with the situation faced by shareholders of public companies, but it is limited to some extent by the way the problem is set up. In Dessié (2005), Dessié focuses on a closely related problem of preventing collusion between entrepreneurs and venture capitalists to the disadvantage of uninformed investors. She is able to construct a collusion-proof contract by sharing the liquidation or the final payoff with the venture capitalist in return for his making the appropriate liquidate/continue decision. In a going concern, however, any final payout occurs at an indefinite point in the future, potentially beyond the work lifespan of the auditor and manager, making it unlikely that there will ever be a moment of complete information for all players simultaneously upon which a contract can be drawn.

Acemoglu & Gietzmann (1997); Acemoglu (1997) are quite similar to the model presented here, though there are different, complementary emphases. The model in Acemoglu & Gietzmann (1997) has a similar outline as Dessié (2005), this time explicitly in the context of auditing a signal from management. In their model, there is a final payout (assuming the project is not liquidated on the basis of a poor prognosis reported by management), which, if below a “financial distress” threshold triggers the possibility of a lawsuit against the auditor. This ends up being functionally equivalent to the set-up here, where there is a probability of the market discovering a misstatement which triggers a lawsuit with certainty. Acemoglu and Gietzmann use their model to explore
how an imperfect legal system (auditors are sometimes sued even when they reported correctly) and a second productive role for auditors (that management and shareholders value equally) affect the contracts available to offer auditors. Here I focus on how the presence of justified penalties affects choice of manager effort and audit intensity.

Acemoglu (1997) uses an infinite horizon for the players, but does not allow for explicit side-contracting between auditor and manager. Instead, he focuses entirely on how credible threats of firing could cause career concerns for the auditor to act as an enforceable implicit contract that causes the auditor to collude with the manager. Acemoglu explores in far more depth than I do here how a firing threat might be credible. My model complements his by allowing for a variety of side-contracts, including but not limited to a firing threat. I also have manager effort affect the outcome of the company, rather than leaving it entirely to nature. This links the problem of designing a collusion-proof, truth-revealing contract to the original problem of discouraging shirking on the part of the agent.

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. Shareholders are not like the unitary principal assumed in generic models—they do not have the ability to contract directly with their agents. Instead, at least in the pre-Sarbanes-Oxley environment, the manager gets to hire and fire the auditor on behalf of the shareholders. Even now, management likely still exerts significant influence on those decisions in many companies.

Another quirk in the financial statement auditing system that may reduce its value below what is predicted by generic auditing models even when the auditor behaves as desired by the principal is that the agent does not necessarily suffer a penalty for misrepresenting the company’s outcome if he is caught by the auditor. There is no requirement for the auditor to reveal any issues that were resolved to the auditor’s satisfaction during the audit process. Management is only clearly exposed to additional penalties if someone other than the auditor is the one to discover and reveal the problem.

One simplifying aspect is that all public companies are required to have an external audit performed annually, making the relationship mandatory. 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 & Scharfstein, 1990). The
regulations requiring a financial statement audit can be considered a collective
solution to the commitment problems. This paper therefore assumes the exist-
ence of a relationship with an auditor and focuses instead on the efficiency
of the incentives in that relationship. One could view the commitment prob-
lems as shifting from a problem with the commitment to audit to one with the
commitment to audit effectively.

The models cited most frequently in the accounting literature are de-
signed to reflect more specifically the realities of financial statement auditors,
but they suffer from some unwarranted assumptions that overly influence the
conclusions drawn from the models. As a result, the models do not provide the
full scope for auditors acting as strategic, utility-maximizing agents who take
advantage of the full complement of contracting opportunities available to them.

Antle (1982) recognizes that much of the literature ignores the prob-
lem of auditors’ incentives and he sets out to write such a model. He runs
into problems, however, in finding a sub-game perfect equilibrium that allows
the principal to improve on the basic fixed salary, low-effort solution that the
introduction of auditing is supposed to achieve. It appears that some of his
problems derive from his not using symmetric information signals produced by
the agents’ activities as effectively as he might. Antle also backs off from using mixed strategies because of
the high level of complexity they would introduce (Antle, 1982, 523-524). The
model presented here solves this problem by subsuming the mixed strategies
into the definitions of audit intensity and manager effort.

Possibly the two most influential articles to the accounting field that
relate to the consideration of auditors’ ability to mitigate information asymme-
try are DeAngelo (1981) and Dye (1993). Both frame their arguments through
the lens of the debate over whether audit firm size contributes to audit quality
or simply anti-competitive behavior. DeAngelo (1981) argues that the “client-
specific quasi-rents” earned through a high reputation provide sufficient incen-
tives for (at least) large firms to remain independent and to conduct high quality
audits. Dye (1993) also predicts that large firms will do better audits than small
firms, but not for the same reasons as DeAngelo gives. Instead, he predicts they
will conduct a better audit because they have a much greater exposure to lia-
ibility 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 bind-
ing liquidity constraints that effectively limit their liability and therefore they realize fewer benefits from performing a high quality audit.

While both papers offer important insights into the incentive-aligning potentials of reputation and legal liability, both are too restrictive to fully explore the nature of the incentives. Most importantly, neither author allows for side-payments between manager and auditor to compensate for the additional risk the auditor is taking on by ignoring a discovered misstatement. Both authors’ models rely on the belief that the consequences to the auditor of getting caught is in some important way “very large” and therefore beyond compensation. DeAngelo assumes that a firm’s other clients will respond to an auditor getting caught in ways that have real financial consequences to the firm. Likewise, Dye assumes that potential legal liabilities are actually large enough to cause firm wealth to be a binding constraint in the case of smaller firms. While both authors are certainly correct in some instances—audit firms have suffered dire consequences in the case of some audit failures—the expected costs of getting caught are likely considerably lower. Not all discovered audit failures suffer the same high level of consequences, and it is reasonable to expect that there is not a 100% chance of getting caught. The expected costs, not the realized ones are what will drive auditor behavior. Given that they are probably considerably smaller, it is plausible that managers may find a way to fund compensation for those expected costs.

In a related problematic assumption, 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.

My model assumes a pre-Sarbanes-Oxley regulatory regime. The Sarbanes-Oxley provisions most relevant to the structure of the model (e.g. an independent audit committee is now formally responsible for hiring the auditor) add
further complications to an already complicated relationship. It seems worthwhile to understand better what was missing—if anything—from previous research that limited our understanding of the original auditor–manager dynamic. Furthermore, it is not at all clear that these changes alter the dynamics significantly.

Kornish & Levine (2004) do look at 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 approach 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. And unlike Kornish & Levine (2004), 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 Formal model of auditor-manager strategic interactions

Because of the inability of shareholders to explicitly coordinate, 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 analysis. The manager’s and auditor’s decision processes are modeled as an extended form, single-play, noncooperative 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 and behaving strategically. Throughout the analysis, I assume that all players are risk neutral and profit maximizing. The manager and the auditor play with perfect recall.

The game is played out sequentially over time. 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 (and costlessly) 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 $u_M(s_i)$ is 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:

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

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 modeled here. Presumably, the manager would craft his lie in such a way as to maximize his expected payoff, which would entail maximizing his wage subject to crafting the lie to minimize likelihood of detection and/or penalties, should the lie be detected.\textsuperscript{5}

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 here 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.\( ^7 \)

**Extensive form of game and model parameters**

The extensive form of the game is illustrated in Figure 1, 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, though the manager’s choice of a particular \(\mu\) is unobservable. After the manager has invested in a particular \(\mu\) at a cost of \(C_M(\mu)\), where \(C_M(\mu) > 0\) and \(C_M^{\mu} > 0\), 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, 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: \(F - C_A(\lambda)\). The fee cannot be contracted as a function of \(\lambda\) because of the assumption that \(\lambda\) is unobservable and nonverifiable. 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 \(W^L < W^H\),
<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Probabilities</strong></td>
<td></td>
</tr>
<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><strong>Payoff components</strong></td>
<td></td>
</tr>
<tr>
<td>$W^{W.H.S.L}$</td>
<td>Wage management receives (amount depends on client company outcome)</td>
</tr>
<tr>
<td>$C^{M.A}$</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>$F$</td>
<td>Fee auditor receives for audit</td>
</tr>
<tr>
<td>$P^{M.A}$</td>
<td>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><strong>Scalars</strong></td>
<td></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>

Table 2: Definitions of variables
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. I assume that $\lambda \in [0, 1]$, and is limited only by cost, not technical feasibility. As with $C^M(\mu)$, $C^A_\lambda > 0$ and $C^A_{\lambda\lambda} > 0$.

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 $WH - C^M(\mu)$, 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. 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 $WH - C^M(\mu) - \rho P^M$ 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 $WL - C^M(\mu)$ and the auditor receives $F - C^A(\lambda)$. 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 (e.g. 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 deducing 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 modeling the auditor’s benefit from the bribe (Olsen & Torsvik, 1998; Laffont & 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, and it particularly allows for the case where $k = 0$ and 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, he then 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 $W^H$, where $W^S \leq W^H$, with a net payoff in the first period of $W^S - C^M(\mu)$. 

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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 modeled 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 the real cause of her firing.

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 $rF - C^A(\lambda) + \rho_SR$ for the auditor.

**Equilibrium strategies**

The equilibrium concept used to analyze 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 1). 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 maximize his expected payoff by deciding whether to retain the auditor and acquiesce to
Figure 2: Firing subgame in normal form.

<table>
<thead>
<tr>
<th>Action</th>
<th>Manager's Payoff</th>
<th>Auditor's Payoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>$W^S - C(\mu) - \rho SP^M$</td>
<td>$rF - C^A(\lambda) - \rho SR$</td>
</tr>
<tr>
<td>No fire</td>
<td>$W^L - C(\mu)$</td>
<td>$F - C^A(\lambda)$</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 $W^S - W^L = \rho SP^W$.14

**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 1 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 $B \in [0, B^{Max}]$. $B^{Max}$ 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 3(a) and 3(b)

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

(a) Normal form of bribing subgame, for all values of $B \in [0, B^{Max}]$, when firing condition holds true (i.e. $WS - WL > \rho SP$).

(b) Normal form of bribing subgame, for all values of $B \in [0, B^{Max}]$, when firing condition does not hold true (i.e. $WS - WL < \rho SP$).

Figure 3: Bribing subgames in normal form.
makes the analysis simpler.

**Proposition 1.** In the bribing subgame in Figure 3(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 $W_S - W_L - (\rho S + \rho P_M) > \rho S P_M$. Adding $W_L - C(\mu) - (\rho S + \rho P_M)$ to both sides of the inequality shows that strategy profile (bribe, fire; reject 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 $W_H - C(\mu) - \rho P_M$. 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, $W_H - C(\mu) - \rho P_M \geq W_S - C(\mu) - \rho S P_M$. 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 3(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.** $\rho P_A + \rho S R - (1-r)F \leq \min\left(\frac{1}{\kappa}(W_H - W_S - (\rho S + \rho)P_M), B_{\text{Max}}\right)$

Furthermore, the bribe offered will be $B \in [P_A + \rho S R - (1-r)F, \min\left(\frac{1}{\kappa}(W_H - W_S - (\rho S + \rho)P_M), B_{\text{Max}}\right)]$.

**Proof.** Given that the manager’s strategy will be (bribe, fire; *) regardless of the auditor’s strategy when the firing condition holds true (Proposition 1), 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 $F - C^A(\lambda) + B - \rho P_A > r F - C^A(\lambda) + \rho S R$. By
rearranging terms, the auditor will therefore choose (accept bribe|bribe, fire) if
\[ B > \rho P^A + \rho S R - (1 - r)F. \]

The manager is willing to offer a bribe 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:
\[ WH - C(\mu) - kB - \rho P^M > WS - C(\mu). \]
For the manager to be happy the auditor accepts the bribe offered, the following must be true:
\[ WH - C(\mu) - kB - \rho P^M > WS - C(\mu) - \rho S P^M. \]

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

Condition 3. \( \rho P^A \leq \min\left(\frac{1}{k}(WH - WL - \rho P^M), B^{Max}\right) \)

Furthermore, the bribe offered will be set such that \( B \in [\rho P^M, \min\left(\frac{1}{k}(WH - WL - \rho P^M), B^{Max}\right)] \). If Condition 3 does not hold, the manager will be indifferent to offering a bribe that is rejected by the auditor (i.e. \( B < \rho P^A \)) 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 $B \in [0, \min(\frac{1}{k}(W^H - W^L - \rho P^M), B_{\text{max}})]$.

Therefore, there is a feasible $B$ such that the equilibrium strategy profile for the bribing subgame is (bribe, correct lie; accept bribe) iff $\rho P^A \leq \min(\frac{1}{k}(W^H - W^L - \rho P^M), B_{\text{max}})$. Directly following, the $B$ chosen if Condition 3 holds is $B \in [\rho P^M, \min(\frac{1}{k}(W^H - W^L - \rho P^M), B_{\text{max}})]$. \hfill \Box

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 (i.e. if the auditor discovers a misstatement). \footnote{Which equilibrium is dominant depends on the values of various parameters. Therefore, the rest of the game can be analyzed 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 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
Figure 4: Reduced extensive form auditing game if the bribing subgame resolves in the “compliant manager” scenario

shopping” scenario. The final scenario is 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.

**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 4 repeats, in a reduced form, the extensive form game tree displayed in Figure 1. Figure 4 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 for telling the truth must be less than the expected payoff for lying. For that to be the case,

\[ W^H - W^L > \rho P^M. \]
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 choose a value of $\alpha$ that maximizes his expected payoff given that he has reached the node M3 (i.e. a bad outcome has been realized). 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). \hfill \Box

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 cost of the market finding a misstatement times the probability 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, but
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 de-
termine 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 com-
pany, 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 ef-
fort. The auditor can only maximize 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 paper. 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 op-
timal audit intensity, $\lambda$. For payoffs given in this scenario, the auditor sets $\lambda$
such that:

**Auditor’s Utility Maximizing 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, $\rho P^A$.16
Given that the manager can be secure in his first-move advantage, he optimizes his expected payoff by treating $\lambda$ as a function of $\mu$. In scenario 1, management sets $\mu$ such that:

**Manager’s Utility Maximizing Choice 1.**

$$C_{\mu}^M = \lambda \xi (W^H - W^L) + (1 - \lambda \xi) (\rho P^M)$$

where

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

or

$$= 1 + \eta_{\lambda,1-\mu}$$

where $\eta_{\lambda,1-\mu}$ 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 5 (similar to that in Figure 4. 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.**

$$W^H - C^M(\mu) - (1 - \mu)[\lambda(W^H - W^S - \rho S P^M) + (1 - \lambda)\rho P^M]$$

**Auditor’s Payoff 2.**

$$F - C^A(\lambda) - (1 - \mu)[\lambda((1 - r)F - \rho S R) + (1 - \lambda)\rho P^A]$$

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

**Auditor’s Utility Maximizing Choice 2.**

$$C^A_\lambda = (1 - \mu^*) (\rho P^A + \rho S R - (1 - r)F)$$
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, \(\rho_S R\). 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 shareholders if they don’t find the misstatement. Furthermore, since \(C_A^\lambda\) is assumed to be positive, if \((1 - r)F > \rho_P M + \rho_S R\), there is no solution to the equation above and the auditor’s best choice will be the corner solution where \(\lambda = 0\).

The manager optimizes 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 Utility Maximizing Choice 2.**

\[
C_M^\mu = \lambda \xi (W^H - W^S - \rho_S P^M) + (1 - \lambda \xi) \rho P^M
\]

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...
Figure 6: Reduced extensive form auditing game if the bribing subgame resolves in the “collusive auditor” scenario

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, µ, 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 6. 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. $W^H - C^M(µ) - (1 - µ)[λkB + ρP^M]$

Auditor’s Payoff 3. $F - C^A(λ) + (1 - µ)(λB - ρP^A)$

For this set of payoffs, the auditor sets her optimal λ such that:

Auditor’s Utility Maximizing Choice 3. $C^A_λ = (1 - µ^*)B$

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.17 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 Utility Maximizing Choice 3.**

$$C^M_{\mu} = \lambda \xi(kB) + (\rho P^M)$$

where again $\xi$ 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 $kB < W^H - W^L - \rho P^M$ 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.

### 3 Efficiency Implications

The preceding model says nothing at all about efficiency. This section explores the socially optimal levels of audit intensity and manager effort. In addition to considering the private benefits to the shareholders 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 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.\(^{18}\)

### Socially optimal outcome

There are four components to this problem that a social planner would need to consider to maximize overall wealth. There are the individual payoffs of auditor and manager, the profits of the company that has hired the manager (which is distributed to shareholders), and the aggregate value attached to the quality of information released by the company by all market participants.

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

where \( V \) is the value of information quality above and beyond the value realized 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 made by a frictionless transfer. 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.**

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

If a hypothetical social planner was able to set the values of $\mu$ and $\lambda$ (thereby by-passing 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 the quality of information were not linked with the 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 noisy signal of 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:

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

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.

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

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 socially 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 realizing 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. There is no attempt for a central benign planner to set manager effort levels. There is, however, an attempt through 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. Figure 7 offers a visual representation of both of the mechanisms where the auditor has an effect:
Figure 7: Diagram of company outcomes and information quality

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.

To determine the optimal level of auditing in this case, we can optimize the social objective function with respect to $\lambda$ treating $\mu$ as a function of $\lambda$. Generically, the first order condition is:

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

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,

\[
\frac{\partial \Pi_{society}}{\partial \mu} > 0.
\]

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 where in the initial analysis the optimal intensity was zero. Instead, the optimal audit intensity would be:

\[
C^A_\lambda = (-C^M_\mu + f_\mu + \sum_{i=1}^{N} v_i \frac{k B}{C^M_\mu})
\]

The socially optimal level of audit intensity in all equilibria will be reached when the private optimization calculations equal the social optimization calculations.

**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 summarizes the various equilibrium conditions that must hold for each of the three scenarios to be the result of the players’ equilibrium strategies.

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 an 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.

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<table>
<thead>
<tr>
<th>Compliant Manager</th>
<th>Opinion Shopping</th>
<th>Collusive Auditor Fire / No Fire</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Firing condition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$W^S - W^L &gt; \rho SP^M$</td>
<td>False</td>
<td>True</td>
</tr>
<tr>
<td><strong>Bribing condition (a)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\min\left(\frac{1}{H}(W^H - W^S - (\rho S + \rho P^M), B^{Max}) \geq \rho P^A + \rho S R - (1 - r)F\right)$</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td><strong>Bribing condition (b)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\min\left(\frac{1}{L}(W^H - W^L - \rho P^M), B^{Max} \right) \geq \rho P^A$</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td><strong>“Bad” outcome possible</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$W^H - W^L &gt; \rho P^M$</td>
<td>True</td>
<td>True</td>
</tr>
</tbody>
</table>

Table 4: Summary of conditions met under each scenario

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.

4 Conclusions

The model presented here is a representation of a single-play version of the interaction between one auditor and manager pair. One contribution of this model is to provide the tools to examine under what conditions a manager will induce his auditor to collude.

Both sides of the “bribing condition” offer useful insights. Even if management’s net expected gain from introducing a misstatement is relatively small, and even if the penalties for an auditor if she is caught colluding are large, we can still expect collusion to occur if the probability of getting caught is small or if the manager can compensate the auditor with company resources.
The nature of the financing mechanisms managers have available to them becomes increasingly important when considering the game if it is played repeatedly, as is usually the case. It is unlikely that the manager would compensate the auditor with cash in the current period. Far more likely, if managers are at all successful in inducing collusion, they will include in their inducement the offer of future work. 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.

Management could increase the value of future work if he is able to offer future non-audit work as well. There is currently a ban on some types of non-audit work that might compromise the auditor’s independence from a psychological or professional perspective. However, from an economic perspective, any work, regardless of its nature, potentially compensates the auditor for collusion providing she is capturing some form of rents. The current ban, therefore, should have little effect on management’s ability to find a financing mechanism to induce collusion.

This raises an interesting potential modification of the model. As it currently stands, the model predicts that auditors will audit most intensively in the collusive auditor scenario so that the auditor gets to claim a share of the rents the manager is capturing through misinformation. However, if the bribe takes the form of the discounted present value of future work, the auditor’s intensity decision will change. In this case, since the default option is to renew the audit contract, the auditor receives this value whether or not she actually finds the misstatement. In such a scenario, her audit intensity would go to zero (or as close to zero as she could attain without attracting regulatory scrutiny).

Furthermore, if we had a legal system that could perfectly determine whether auditors had engaged in knowing collusion with their clients, and if the laws that require such knowledge to trigger liability were to stand, auditors in the compliant manager scenario would have no incentive to audit with any intensity. If perennial attempts to limit auditor liability still further except in cases of clear collusion were to succeed, they could unintentionally lift many of the incentives in place to audit with intensity.
Audit firms are engaged in these interactions with many clients simultaneously. Because some of the important parameters that determine which equilibrium prevails in an auditor-client pair are individual to that pair, it is entirely plausible that there is heterogeneity in equilibria across an audit firm’s portfolio of clients. It does not seem plausible that, as DeAngelo (1981) suggests, audit firms specialize in a particular level of audit quality, since audit quality is unobservable and unverifiable. Instead, firms will manage their portfolio to maintain their chosen level of reputation—a notion linked to quality, perhaps, but not equal to it. Recall Table 3: a firm’s reputation is likely determined in large part by the rate at which its clients’ statements are discovered false, which is summarized for individual clients in the third line of the table. This probability is affected by the audit intensity, the manager’s effort, and the probability of getting caught. In particular, if a firm is able to attract low risk clients—those with a low probability of a bad outcome—it can collude more often with other clients while holding its reputation constant. Indeed, it is perfectly possible for a firm that always colludes but only has low risk clients to sustain a better reputation than a firm that never colludes but has high risk clients.

This model provides a useful foundation for such considerations of audit firm portfolios, competition for clients, and other extensions. 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.

References


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**Notes**

1For ease of exposition, throughout the paper the auditor is “she” and the manager is “he.”

2In 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.

3Antle is quite explicit in this paper about the problems with his modeling attempt. Unfortunately, he does not explain fully in the paper his choices regarding the parameter, z (the signal observed by all players), which for all but one instance on page 522 he assumes away. From what I can infer from his use in this one instance, he does not fully exploit its potential in constructing an example that achieves the results he is searching for.

4Because Dye’s model requires a client company’s failure to trigger liability, 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 consideration the possibility that not all misstatements of concern are eventually found by the market.

5They do have effects on the size of penalty both players suffer when caught in a misstatement, but my model does not get down to this level of detail.

6Ng (1978) develops a detailed model of the attributes of a reporting function preferred by a manager.

7The assumption of discrete, binary options for the financial statements (i.e. 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).

8I 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.
For the sake of simplicity, I assume that there is either one or no misstatement.

I will leave the exact nature of this penalty vague, though in practice it could involve some combination of financial and reputational penalties. The placeholders $P^M$ and $P^A$ do, however, include an inter-temporal discount factor to simplify the notation.

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.

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.

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.

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 $W^S - W^L = \rho S P W$.

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

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 $C^A > 0$. 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.

Similarly to the situation in the compliant manager scenario, there will be a solution to the auditor’s optimum in the 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.

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.

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.