The Economics of Auditor Capture*

Abigail Brown

Edmond J Safra Center for Ethics, Harvard University

abrown@ethics.harvard.edu

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Abstract

Many have blamed the frequent audit failures of the last decade in part on a loss of auditor independence. However, it has been difficult to determine whether lack of independence was a rational response to incentives or solely the result of psychological biases. Empirical investigations of the question have been inconclusive. This paper models the strategic interactions between a rational auditor and manager and explicitly defines the conditions under which the two will collude. It suggests that empirical research to date may not be identifying the model sufficiently to measure the intended relationships. First, the model demonstrates that if it were true that some auditor-client relationships involve bribes, then the use of revenues as a proxy for financial gain is invalid. Second, it shows that high quality audits and high reputation firms are distinct constructs with empirical implications. Furthermore, in a repeated play context, there does not need to be an explicit exchange of bribes to sustain a collusive equilibrium, suggesting that social norms and psychological biases reinforce rational action and allow profitable collusion to occur with little conscious intent.

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Accounting is the language of economic communication. Like any natural language, it can never be exact, and yet it is a necessary vehicle for contracts, compensation, regulatory compliance, and corporate strategy (Bushman and Smith, 2001). Auditors help ensure that this form of communication has some level of truth, coherence and communicativeness (Watts and Zimmerman, 1983). When accounting information lacks truth or coherence, it becomes increasingly difficult—and costly—to make sound investment decisions, incentivize intelligent decisions and hard work, or understand the competitive landscape.

Despite their importance to the integrity of the financial system, external financial statement auditors have participated in a long string of auditing failures, from the accounting scandals of the first years of the century (Jackson, 2006) to the less-publicized failures relating to the bankruptcy of Lehman Brothers, the collapse of Bear Sterns, and failures at subprime lenders, such as New Century (Sikka, 2009). Indeed, these are merely the successors to earlier accounting scandals that reach back to the beginning of mandatory disclosure and audits in the 1930's (Clikeman, 2009).

Are these audit failures due in part to auditor collusion with or capture by the management they are supposed to be monitoring? Though auditor independence and audit quality are of critical importance to the value of an audit, answering these questions has proven surprisingly difficult, both for academic investigators and for the market.

Romano (2005) catalogues 25 empirical studies on the literature on the connection between non-audit services (thought to be the primary vehicle for rational capture) and audit quality. Of these, 15 find no statistically significant relationship, three find that non-audit services improve audit quality, six find that non-audit services are associated with lower quality audits, and one finds a negative relationship only with non-Big Five firms. Romano herself takes this as evidence that non-audit services are not a problem and therefore should not be regulated. But given the high political and public policy stakes surrounding regulation of auditors and financial reporting, it is appropriate to consider the alternate hypotheses that

might lead to the inconclusive results of the empirical studies as they have been conducted to date.

This paper proposes a game theoretic model that considers the conditions under which a rational auditor might choose to collude with the manager in fraud. The model treats the auditor's decision to collude on purely rational grounds, in the spirit of Gary Becker's model of the economics of crime (Becker, 1968). The consequences of this modeling exercise suggest three conclusions.

First, when we consider the mechanisms by which a manager may induce his auditor to collude, it becomes evident that the value to an auditor of revenue from different engagements will not be equivalent: the profit margin of a collusive relationship will be much higher than that of a non-collusive relationship. Therefore, revenue is not necessarily a good proxy for inducements to collude, particularly when firms have heterogeneous clients. A Monte Carlo simulation of the data generation process demonstrates that the standard empirical approach that uses revenues to proxy for the likelihood of financial capture will generally find null results even when a large fraction of the audit population is engaged in collusion.

Second, while many assume that audit quality can be assured via market discipline of firms that provide unreliable audits, it is unlikely that an audit firm would choose to perform audits of equal quality in all situations if their clients are heterogeneous. Instead, firm *reputation*, a construct that is distinct from audit quality, is observable and is more likely the attribute that firms differentiate on. Therefore, reputation cannot on its own be used as a proxy for quality—either by the market or by empirical researchers—and, at a minimum, the client characteristics identified in the model must be adequately controlled for before one can identify the contribution the auditor makes to the quality of reporting in an individual engagement.

Finally, this work, in considering a rational basis for collusion, should be seen as complementary to work that examines the psychological bases for auditor capture (Moore et al., 2006; Bazerman and Tenbrunsel, 2011). In particular, the repeated play game results, where auditors choose to not audit in exchange for a rental cash flow, provides a scenario where there is no moment of explicit collusion, and therefore much of

the heavy lifting of maintaining a profitable and collusive relationship with a client can be done by the types of "moral seduction" processes described in Moore et al. (2006). Pairing the economic and psychological dynamics at play this way offer a plausible path to an "institutional corruption": the burden of corruption is removed from most day-to-day decision-making of an audit firm and instead is embedded in the institutional arrangements and corporate cultural norms, yet nonetheless results in a profitable arrangement for audit firms and managers at the expense of the integrity of public information in the market.

The rest of the paper is presented as follows: section 1 places this model into the context of the relevant accounting and economic literatures, section 2 presents the model, and section 3 discusses the implications of the model's results. Section 4 concludes.

1 Background

There are two ways in which an auditor might provide an unsatisfactory audit (from the perspective of a shareholder or the public): the auditor could shirk or she could collude. Similarly, there are two avenues by which auditors might have an incentive to resist either form of unsatisfactory behavior: reputation concerns and liability risk. DeAngelo (1981) argues that the "client-specific quasi-rents" earned through a high reputation provide sufficient incentives for (at least) large firms to remain independent and to conduct high quality audits. Datar and Alles (1999) formalize this notion in a model of auditor shirking. For reputation to be a sufficient motivator, the cost to an audit firm's reputation of an audit failure must be greater than any compensation the manager can provide. Both models cited assume that reputational costs from a failure are high, assuming that once an auditor has been found to be low quality in one engagement, her audits will be discounted for all clients going forward.

These assumptions about the nature of reputation do not, however, seem to be true, *prima facie*. As discussed in the introduction, history is replete with high reputation firms caught in high profile audit

failures, where credible questions have been raised about the auditors competence and/or independence. While Arthur Andersen did collapse as a consequence of its failure with Enron, that may be due more to the specific problem of facing a criminal indictment (Jensen, 2006). Instead, the hits a firm takes to its reputation in the case of an audit failure may have financial consequences that are much more manageable. Partnoy (2006, 1999) argues in the case of credit ratings agencies—audit firms face a very similar circumstance—that when the certifying intermediary (i.e. credit rater or auditor) has a regulatory license, the consequence of reputational debasement are much reduced. Since an audit is necessary for equity issues to the capital markets, all companies wishing to issue equity will hire an auditor, regardless of the auditor's reputational signaling value. The highly restricted choice of auditors for large companies further diminishes the strength of any reputation costs (Nelson et al., 2008).

The role of legal liability in constraining auditor behavior has been explored in Dye (1993). Specifically, he predicts large firms will conduct a higher quality audit because they have exposure to greater liability, due to their "deep pockets", if there is an audit failure and therefore they have greater incentives to prevent such a failure. As with the reputation arguments, we need to be careful in assuming that legal liability is not a manageable cost, even for a firm that takes risks with some of its clients. While there is certainly the risk of a "tail event" (Talley, 2006) that could bring down a firm, the expected costs of litigation for an audit firm appear to be much more manageable (Cousins et al., 1999).

The economics literature does offer some suggestions for the requirements for successful prevention of collusion in more generic contexts, (see, for example, Tirole, 1986; Olsen and Torsvik, 1998; Laffont and Tirole, 1991), but these models are structured in such a way as to offer little guidance in the specific context of financial statement audits. These 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 challenge is to keep management that presides over a poor outcome from posing as one presiding over a good outcome, an inversion of the problem that concerns most of the

principal-supervisor-agent literature.

This paper examines the consequences of four institutional realities that affect the incentives of a financial statement auditor in ways that have not been fully realized by the extant literature:

- The true outcome of management's efforts is not consistently observable, at least in the time frame needed to resolve the contracts.
- If an honest auditor discovers a misstatement, the manager does not suffer penalties beyond the requirement to tell the truth. This allowance for "face saving" means that the auditor does not contribute to a revelation mechanism that would induce truth-telling from the manager (as will be proven below).
- If an audit failure is discovered, the market cannot tell whether it was due to bad luck despite a competent audit, negligence, or collusion. This assumption is valid since all or almost all failures end in out-of-court settlements that come with non-disclosure agreements, so there is little opportunity for the market to determine the level of the auditor's fault.
- In the case where a manager successfully colludes with his auditor, he does not recognize the full cost of the side-payment made to induce collusion.

When these institutional realities are taken into consideration, the model provides more guidance than do the current dominant models of auditors' strategic behaviors. It helps resolve the contradictory predictions and assessment of the problem among economic and psychological theory and empirical accounting research.

2 Formal model of auditor-manager strategic interactions

The game presented here analyzes the interactions of a manager and an auditor following the acceptance by the players of a contract offered by a representative of the shareholder. The relevant details of this contract are therefore treated as exogenous parameters throughout the model.

The manager's and auditor's decision processes are modeled as a noncooperative game. Initially, I assume a single-shot game, and then extend the basic analysis to a repeated-play situation. 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. At the start of the game, the manager chooses a costly effort investment that results in a probability that the company's outcome in the period is good. (The company can have one of two outcomes: good or bad.) After that effort has been expended, the true state of the company is revealed privately to the manager. The manager then issues financial statements that may or may not accurately reflect the true state of the company.

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. After the audit is completed, the financial statements are released to the market and the manager and auditor are paid. 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 of what size. Then the auditor decides whether or not to accept it. If the bribe is refused, the auditor forces a truthful statement.[1]

[1]The set of potential outcomes is simplified somewhat from real auditor-manager outcomes. In real life, the manager could refuse to correct a lie and the auditor could issue an unclean opinion; or, if the auditor refuses a bribe, either the manager could fire

Extensive form of game and model parameters

[Figure 1 about here.]

The extensive form of the game is illustrated in Figure 1, and variable definitions are collected in Table 1. At the start of the game, the manager exerts effort to set the probability, μ, that the outcome is good. The outcome is bad with a probability of $(1-\mu)$. The production function for μ is common knowledge, though the manager's choice of a particular μ is unobservable. After the manager has invested in a particular μ at a cost of $C^M(\mu)$, where $C^M_\mu > 0$, $C^M_{\mu\mu} > 0$, and $\lim_{\mu\to 1} C^M(\mu) = \infty$, 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. 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,[2] 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 cost of the audit is a function of the audit intensity, λ. The fee cannot be contracted as a function of λ because λ is unobservable and non-verifiable. However, since the magnitude of the fee determines the auditor's decision to accept the engagement, it will reflect an ex ante assessment of the likely level of λ. I assume that it is always sufficiently large that the expected value of the contract to the auditor is greater than or equal to her

the auditor or the auditor could choose to resign. In order for any of these outcomes to be non-trivially different to rational actors from the auditor forcing truth-telling, the model would need to be expanded significantly to be internally consistent, similar to the approach taken by Acemoglu and Gietzmann (1997). As none of these outcomes are of particular interest to informing the issues discussed here, I have chosen the parsimonious modeling route.

[2]Following Tirole (1986), 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.

reservation wage and hence that the contract has been accepted. As a consequence, for the purposes of this model, the fee is exogenous and invariant to the choices made within the scope of the model.

[Table 1 about here.]

If the true outcome of the company in this period is bad, management's decision is no longer trivial. If he tells the truth, 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 λ 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 λ, where λ is equal to the probability the auditor will detect a misstatement, conditional on the existence of a misstatement. I assume that there is either one or no misstatement. As with $C^M(\mu)$, $C^A_\lambda > 0, C^A_{\lambda\lambda} > 0$, and $\lim_{\lambda \to 1} C^A(\lambda) = \infty$.

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 ρ. While ρ is an exogenous parameter in this model, it could well be a function of the size or method of the misstatement, the reputations of auditor and manager, and other factors that would vary from auditor-client pair to auditor-client pair. It would also depend upon the regulatory regime, the funding of government securities oversight bodies, and even such factors as the quality and freedom of the country's investigative business reporters, whistle-blower protection laws, etc.

If the financial statements are found to be misleading by the market, both management and auditor

are assessed a penalty, with the present values 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 $W^H - C^M(\mu) - \rho P^M$ for management and $F - C^A(\lambda) - \rho P^A$ for the auditor.

I impose one assumption on the nature of the manager's penalty and wage structure: $W^H - W^L > \rho P^M$. If this assumption did not hold true, the manager would face a direct revelation mechanism, and would never have an incentive to lie in the first place. In such a situation, the auditor becomes irrelevant, as does the question of collusion.

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 $F - C^A(\lambda)$. Since 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.

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.

As noted above, 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. 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 $k \in [0, 1]$. This allows the bribe to be less costly to management than the value of

its benefits to the auditor. 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.

If the auditor rejects the bribe, the management is then forced to correct the lie and issue a truthful statement. Again, the payoffs for the two players is the same as the other instances where management ends up revealing the bad outcome to the market.

The dotted lines at the terminal nodes of Figure 1 highlight the information states available to an outside observer, such as an empirical researcher, after all play has been completed. Of particular interest is the indistinguishability of the two states where a misstatement has been discovered *ex poste* by the market: we are unable to parse bad luck and collusion. Furthermore, we cannot distinguish directly the difference between honest reports of good outcomes, dishonest reports of good outcomes that are the consequence of bad luck in the case of an honest auditor, and dishonest reports of good outcomes that are the consequence of collusion between auditor and manager.

Equilibrium strategies

The equilibrium concept used to analyze the possible equilibrium strategies employed by the two players is a *sequential equilibrium* (Kreps and Wilson, 1982). 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, is not responsive to the decisions made by the players. The game is solved by backwards induction. It is played in three stages: management invests effort, the auditor selects an audit intensity, and the players chose their strategies in the event the auditor discovers a lie. The following analysis therefore treats them in reverse order.

Lie discovery After the discovery of the lie, the two players have to decide how to respond (nodes M4 and A4). Here, the manager has a discreet choice, to correct the lie, versus a continuous set of choices, to offer bribe of magnitude B where $B \in \mathbb{R}^+$. The question 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?

Both players will receive the same pair of payoffs for all strategies except (bribe; accept bribe): the manager receives $W^L - C^M(\mu)$ and the auditor receives $F - C^A(\lambda)$. The equilibrium conditions will therefore depend on whether the strategy profile (bribe; accept bribe) offers an improved payoff for both players.

Proposition 1. *The strategy profile (bribe; accept bribe) will be the equilibrium strategy profile for the bribing subgame iff the following condition is met:*

Condition 1. $\rho P^A \leq \frac{1}{k}(W^H - W^L - \rho P^M)$

Furthermore, the bribe offered will be set such that $B \in [\rho P^M, \frac{1}{k}(W^H - W^L - \rho P^M)]$. *If Condition 1 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 to correcting the lie without offering a bribe.*

Proof. See Appendix A. □

Intuitively, 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 rest of this analysis, therefore, will look separately at two scenarios, whose dominance is determined by whether or not condition 1 holds. The first considers the scenario where the equilibrium strategy profile is either (correct lie; refuse bribe) or (offer bribe; refuse bribe): where the manager ultimately corrects the lie if it is found by the auditor. I call this scenario the "compliant manager" scenario. The second considers the scenario where the equilibrium strategy profile is (offer bribe; accept bribe). This is the "collusive auditor" scenario.

Compliant manager scenario In this scenario, the bribing condition is not met, and the game ends with the manager correcting the misstatement if the course of play results in the auditor finding a misstatement.

Proposition 2. *Given that $W^H - W^L > \rho P^M$ by assumption, 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. See Appendix A. □

An important implication of proposition 2 is that in this setting, an auditor does not contribute at all to the manager's incentive to tell the truth to begin with. This is a direct consequence of the "face saving" confidentiality that auditors provide. Instead, the auditor only increases the incentive pressure on the manager to pick a higher μ to begin with. To see how, we can determine the players' ex ante payoffs, given that the condition is met for the "compliant manager" equilibrium. 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 (by the auditor or the market), weighted by the probability of a bad outcome. 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 that the auditor failed to discover.

With the expected payoffs for the equilibrium, we can now determine how the manager and the auditor will set their individual effort levels: the manager will choose μ and the auditor will choose λ. 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 maximize her payoff subject to her assessment of the manager's investment decision. Auditors can never do better than react to their assessment of management's choice of μ, since they have no credible way of committing to an alternative value of λ. Even in a repeated game, auditors cannot use a reputation for a different value of λ, as long as the assumption that λ is not observable or verifiable by an outside party holds true. The strategies of both players are again determined by backward induction, so I begin by looking at the auditor's decision, taking the value of μ as given.

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

Auditor's Utility Maximizing Choice 1. $C_{\lambda}^{A} = (1 - \mu^{\circ})\rho P^{A}$

where μ° is the manager's optimal value of μ in the compliant manager scenario. 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, $(1 - \mu^{\circ})$, and the expected cost to her of missing a misstatement, ρP^{A}.

Given that the manager can be secure in his first-move advantage, he optimizes his expected payoff by treating λ as a function of μ. In scenario 1, management sets μ 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 intensity 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 μ higher than it would be if the manager did not take into consideration his effect on the auditor's intensity level. How much higher depends on the elasticity of audit intensity.

Collusive auditor scenario The logic used to solve the game under this scenario is the same as in the first scenario. Proposition 2 still holds true, so the players' ex ante expected payoffs are:

Manager's Payoff 2. $W^H - C^M(\mu) - (1-\mu)[\lambda(kB) + \rho P^M]$

Auditor's Payoff 2. $F - C^A(\lambda) + (1-\mu)(\lambda B - \rho P^A)$

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

Auditor's Utility Maximizing Choice 2. $C^A_\lambda = (1-\mu^*)B,$

where μ^* is the equilibrium effort level of the manager in the collusive auditor scenario. 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 consequences of an audit failure to one of pursuing a share of the rents that the management may be appropriating. Furthermore, this equilibrium predicts that auditors chasing rents will actually audit with greater intensity than will those in a compliant manager equilibrium. This finding may not hold true in a repeated game, though, as will be explored in the next section.

In this scenario, management will set μ such that:

Manager's Utility Maximizing Choice 2. $C_{\mu}^{M} = \lambda\xi(kB) + (\rho P^{M})$

where again ξ 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.

Repeated play

Auditors and managers are almost never in a single-shot game. Many companies have only had one audit firm their entire history as public companies. Therefore, it is important to consider how the dynamics of the game might change given a repeated relationship. To build the repeated play model from the foundations of the fundamental dynamics set out in the single play game, consider first the consequences of a manager deciding to offer a different sort of side-contract to induce collusion: rather than transfer the full bribe amount in the current period, he offers the auditor an on-going engagement with sufficient profit margins to ensure that the discounted present value of the engagement is equal to (or greater than) the B solved for in the previous section. Importantly, the engagement is one that is at the management's discretion.

This repeated engagement may be simply a continuation of the audit relationship with a fee that includes a rent, or it may be a separate engagement for non-audit services of one sort or another, again where the profit margin would need to be significant enough to have a bribe component. It would be for a service that would, under normal circumstances, be re-engaged routinely but could be terminated or renegotiated by the manager. There may be some chance that the relationship would be cancelled in any given year via external factors but that risk would be factored into the valuation of this ongoing relationship.[3] We could

[3]For example, the manager may eventually quit or be fired and the new management may decide to cancel the contract.

describe the value of such an income stream to the auditor thus:

$$V_R = \sum_{t=1}^{\infty} \delta^t R = \frac{\delta R}{1-\delta},$$

where the discount factor, δ, includes both the discount for the time value of money (r) and the risk of exogenous cancellation (c):

$$\delta = \frac{1-c}{1+r}.$$

R is the rental income diverted to the auditor in each period.

Note, it is quite conceivable that a manager in a compliant manager equilibrium may contract with his auditor for consulting services that would assist in his efforts to maximize the chances of a good outcome. It would be difficult for an outside observer, including board members, shareholders and empirical accounting researchers, to tell the difference between such a relationship and one where the consulting services are a vehicle for a bribe. The only difference between the two is that the manager in a compliant equilibrium will have no interest in agreeing to a contract that contains excess fees for the auditor. Given that consulting contracts are not commodities in most cases, it would be difficult or impossible for an outsider to tell whether the price being charged were a fair market value or not.

Assuming the on-going payments to the auditor are indeed a form of bribe, as before, the manager will recognize some fraction, l, of the cost of these rents in his own payoff function, where $0 \leq l \leq k$. I allow here for the possibility that a stream of revenue may be easier for the manager to finance than a one-off bribe would be, and therefore that the costs he recognizes are a smaller fraction of the total cost than in the single play game. At most, he is indifferent between the two mechanisms, since he can always chose to finance each payment of the revenue stream in an identical manner as he would in the single-play game.

In the next period, I assume that the exogenous parameters of the game remain constant from period to period, and also that the chance parameters (μ, λ and ρ) result in draws independent from those the period before. However, the auditor now has an income stream V_R that will normally continue indefinitely,

but which the manager can choose not to renew. So after the audit has been conducted and the financial statements have been issued, the manager now has an additional decision to make: whether or not to renew the contract that generates V_R. This changes the set of options available to the manager downstream of the auditor discovering a misstatement. To solve the repeated game equilibrium, therefore, we need to investigate how that renewal decision feeds back into the previous strategy choices.

First, the manager lives up to his promise to renew the contract paying rents in "uneventful" plays of the game if the auditor uses a grim-trigger strategy: if the manager defects, any future attempts to achieve the collusive equilibrium in that auditor-manager pair can be credibly denied by the auditor, given that the manager can no longer be trusted to follow through with full payment of the bribe. (Note, for these results to be relevant for empirical consideration, it does not have to be a unique equilibrium, merely a plausible one.)

If the auditor discovers a misstatement in a period where she is receiving the rent cash flow, the manager no longer needs to offer an additional bribe to induce continued collusion. Instead, he can threaten to remove the current cash flow if she attempts to force a correction, resulting in the same payoff that was dominated in the earlier round by the offer of the rent cash flow. Given the nature of the present value of constant cash flows over time, it is still valued at $\frac{\delta R}{1-\delta}$, so the auditor would still prefer to collude with management if he is committing fraud. However, unlike the single play game, the auditor will receive this cash flow regardless of whether or not she actually finds another instance of fraud. This leads to an important difference in behavior from the single play equilibrium results:

Proposition 3. *In a repeated play game that resolves in a bribing equilibrium where the bribe is financed by a stream of rents, V_R, the auditor will always set her audit intensity to zero: $\lambda = 0$.*

Proof. See Appendix A □

The basic intuition here is that because the auditor no longer needs to discover fraud as a pre-condition to sharing in the rents the manager gains from fraud, she no longer has any incentive to invest in audit intensity. Note that pre-payment of a bribe will *not* work in the single-play game, since it would not be sequentially rational for the auditor to set $\lambda = 0$ without the future cash flow at risk. If a manager were to attempt a pre-payment, the auditor would invest in the audit intensity solved for in the previous section and then hold up the manager for an additional bribe.

Now that the game is a repeated play, however, the audits performed by the auditor offer no additional risk of financial consequences to the manager, and he will now behave as if he were not being audited at all, setting his own effort levels to the lower level implied by

$$C_{\mu}^{M} = \rho P^{M}$$

which is less than that expended in the single-play case. These shifts in investment by both the manager and auditor have two, countervailing effects on their respective payoff functions and their relative strengths will determine whether this form of side contracting will be attractive to the auditor-manager pair in a collusive auditor equilibrium. First, the costs both actors face for their effort or intensity investments decline. Second, the risk of facing a penalty in the case of a misstatement discovered by the market increases slightly, since the decreased manager effort will lead to an increase in the likelihood of a bad outcome and ultimately the discovery of a misstatement. The per-period payoffs in this scenario are:

Manager's Payoff 3. $w^{H} - C^{M}(\hat{\mu}) - lR - (1 - \hat{\mu})\rho P^{M}$

Auditor's Payoff 3. $F - C^{A}(0) + R - (1 - \hat{\mu})\rho P^{A}$

With these payoffs, we can then compare the relative net present value to the players of choosing a scheme where the bribe is paid through a rental cash flow to that of playing the single-play game repeatedly with a bribing equilibrium. In both situations (and in the compliant auditor equilibrium), we can assume the same exogenous continuation rate, thus facilitating comparisons in net present value.

Proposition 4. *Managers and auditors in a collusive equilibrium will choose to finance that collusion with a cash flow rather than with one-off bribes if the following condition is met:*

Condition 2.

$$\frac{1}{l}\left[C^M(\mu^*) - C^M(\hat{\mu})\right] + \left[C^A(\lambda^*) - C^A(0)\right] + (\frac{k}{l} - 1)\left[(1-\mu^*)\lambda^* B^*\right] \geq (\mu^* - \hat{\mu})\rho(P^M + P^A),$$

*where terms with a * are the equilibrium solutions to the single-play scenario and those with aˆ are those to the repeated play scenario. If the condition is met then the per-period size of the cash flow will take a value*

$$R \in \Big[(1-\mu^*)\lambda^* B^* - (\mu^* - \hat{\mu})\rho P^A - \left[C^A(\lambda^*) - C^A(0)\right],$$
$$\frac{1}{l}\left[C^M(\mu^*) - C^M(\hat{\mu}) + (\mu^* - \hat{\mu})\rho P^M + k(1-\mu^*)\lambda^* B^*\right]\Big]$$

Proof. See Appendix A □

Condition 2 is met when the effort and intensity investment savings, along with any reduction in the financing rate the manager faces (i.e. the extent to which $l < k$), outweigh the increased costs associated with the expected penalties that flow from lower manager effort. It seems plausible that the condition may well be met in at least some cases and therefore the implications of such a form of financing collusion must be considered when testing the question empirically.

This equilibrium may help explain the "expectation gap" phenomenon that has persisted in the auditing profession for decades (Koh and Woo, 1998). Auditors assert, contrary to their mandate in the Securities Acts of 1933 and 1934, that it is not their responsibility to look for fraud by executive management, even as such an insistence costs the profession reputationally. Furthermore, the phenomenon has persisted despite frequent attempts to "close the expectation gap" by tightening auditing standards (Guy and Sullivan, 1988; Public Oversight Board, 1993). If the most profitable course of action is to not audit top management, in at least some engagements, however, the expectation gap could be a useful tool to help create norms within

an auditing firm that discourage skepticism and make those involved in captured engagements less likely to question the lack of meaningful investigation of top management's statements.

3 Implications

The preceding model provides us with some insights into the equilibrium conditions needed to sustain collusion between a manager and his auditor. In a single play game, such compensation must come in the form of a bribe, which, if reported as a fee to the audit firm, we would expect to see as spikes in the amount paid to an auditor that correlates to a measure of audit quality or to an incidence of audit failure. As a consequence, a regression of a measure of audit quality on revenues paid to auditors would yield an inverse relationship between fees and quality if some of the auditor-client pairs were colluding. The existing literature adopts this identification strategy (e.g. Reynolds and Francis, 2001; DeFond et al., 2002; Frankel et al., 2002; Ashbaugh et al., 2003; Chung and Kallapur, 2003; Gul et al., 2007).

The model here highlights two problems with this underlying identification strategy, however. First, the fees collected from an audit conducted under the compliant manager scenario are not fixed at some uniform market rate: they are a function of the risk of the client and the potential penalties associated with an audit failure. We would expect, therefore, that audit fees would vary, possibly considerably, with a heterogeneous client base, even when collusion does not occur, as merely a consequence of the fee, F, which would have to vary to cover the different costs of different clients' risk. This is even more the case with non-audit fees, when the range of services offered by accounting firms are very broad and incur different costs to the audit firm to execute. There is no ex ante reason to presume that bribes would be of a size that would ensure they would stand out among the noise of different, but competitively priced, engagements.

The second and more pressing problem with the identification strategy is that raised by the repeated play analysis where the bribe is now funded by an ongoing stream of rental payments. Even if one-off

bribes would stand out in a data set of fees, it is much less likely that engagements with excess profits whose net present value constitute a bribe will be identified when looking at revenues alone. Furthermore, these excess fees will be paid regardless of the manager's current period needs to cover up a misstatement: if an auditor-manager pair is in a collusive equilibrium in a repeated play game where the collusion is financed via a cash flow, the rents will be paid regardless of whether the manager is currently attempting fraud.

To illustrate these identification difficulties, I conduct a Monte Carlo simulation. Using the revenue formation process suggested by the model above, I generate a universe of 10,000 audit observations, half of which operate under the repeated play collusive equilibrium and half of which are in the compliant manager equilibrium, with variables for the revenues received (the sum of the competitive price to required to assure auditor participation and the rents, if any) and the incidence of a market discovery of an audit failure. From these observations, I draw fifty independent samples of 1000 observations and run a logistic regression of audit failures as a function of revenues on each sample. Table 2 summarizes the sign and statistical significance of the fifty runs. The details of the experiment are in Appendix B.

[Table 2 about here.]

In this experiment, the overwhelming majority of regressions produce statistically insignificant results, even though fifty percent of the audit-client pairs in the underlying data were in a collusive equilibrium. This highlights the identification problem in the existing literature: regardless of the underlying truth of the extent of collusion in the financial statement audit industry, empirical tests of the relationship between fees and audit quality measures are likely to give null results. In order to test empirically for the presence of collusion, researchers need to design their empirical models in such a way that they are able to extract a proxy for the profits of an engagement from the fee data. This is a considerably more difficult to achieve, given the lack of data on profits, but without sufficient control of the cost portion of the revenues, reliable empirical identification will remain elusive.

One avenue forward is suggested by an approach taken as a "robustness check" in DeFond et al. (2002). In this paper, the authors use a set of independent variables to predict audit and non-audit fees in a first stage regression. They then use a variety of functional forms of the difference between the actual and expected fees as the independent variable of interest in a second stage regression on their measure of audit quality. In my model, those "excess revenues" would be equivalent to the bribe portion of the total revenue and therefore offers an important fix to the problem. However, the measure of audit quality they are investigating is the auditor's willingness to issue a going concern audit opinion. This is a context where one is least likely to see management inducing collusion with on-going contracts, since if the auditor truly believes the company is not a going concern, she will not accept the promise of future payments as sufficient compensation for the risk of getting caught as they are unlikely to be made good. Their lack of significant findings in their robustness check regression, therefore, should not be considered dispositive.

Audit quality and firm reputation

The above analysis considers auditor-client diads independently from each other. In practice, of course, the same audit firm has relationships with hundreds or thousands of clients, and how firms aggregate these client relationships into a portfolio is of interest as well. We now have a tool with which to think about this aggregation process and to more clearly distinguish between the notion of firm reputation and individual audit quality.

A commonly accepted definition of audit quality is the one proposed in DeAngelo (1981): "The quality of audit services is defined to be the market-assessed joint probability that a given auditor will *both* (a) discover a breach in the client's accounting system, and (b) report the breach" (DeAngelo, 1981, 186). The model presented here highlights an ambiguity in this definition: it does not explicitly state whether the joint probability is conditional on the existence of a misstatement to find or not. Implicitly, it appears that

the definition is intended to be conditioned on the existence of a breach, for the definition does not include the role variations in client risk play in an unconditional probability.

This distinction between the conditional and total probabilities does suggest a possible resolution: define *audit quality* as the joint probability of discovery and reporting a breach, conditional on the breach's existence, and define a firm's average unconditional joint probability of discovery and reporting a breach as the firm's *reputation*. These two constructs can be defined precisely in the terms of the model developed here. Audit quality is λ if the auditor–manager pair fall into the compliant manager equilibrium and zero otherwise. Audit firm reputation is defined as

$$Reputation := 1 - \frac{1}{n}\left[\sum_{i=1}^{a}(1-\mu_i)(1-\lambda_i)\rho_i + \sum_{i=a+1}^{n}(1-\mu_i)\rho_i\right]$$

where the auditor-client pairs of the firm $(1, a), (a+1, n)$ fall into the compliant manager and collusive auditor (however financed) scenarios, respectively. Auditors can manage their reputations through choosing a combination of audit quality levels and types of clients.

These definitions lead to some observations. First, audit quality and audit firm reputation are related but distinct constructs. Since audit quality is not observable by the market, it is not rational for a firm to specialize in a particular audit quality level unless all clients are homogeneous. Instead, firms specialize in a reputation level and manage their portfolio of clients accordingly. As a result, high reputation firms may on occasion choose a client with whom they may collude, and in the instances in which that client has a bad outcome, the audit quality provided by the firm would be zero.

Indeed, if some clients do choose a reputable auditor to signal their honesty, high reputation audit firms will be in demand from honest—or at least low-risk—clients (i.e. those with a very high μ). It is possible to construct scenarios where such firms may be able to maintain a lower overall audit failure rate than firms with a lower reputation even if the high reputation firm always colludes and the low reputation never does. Nonetheless, investors are still rational to trust the financial statements coming from clients of

the high reputation firm over those coming from the low reputation firm. Furthermore, regulators would also be rational to focus their attention on clients of the low reputation firm, possibly lowering the risk of ex-post discovery for those clients of the high reputation firm and therefore further contributing to that firm's reputation.

This dynamic creates the possibility for positive feedback loops that might create a far more complex competition environment than has been traditionally assumed. A potentially fruitful direction for future research would investigate the consequences of firms managing simultaneously the values of λ_i, μ_i, and ρ_i, and the relative payoffs to audit firms investing in audit technology, client recruitment, selection, and retention procedures, and currying favor—and trust—with entities that might discover audit failures ex-post.

4 Conclusion

The model presented here offers an explanation of why we may not see evidence of collusion in empirical studies, even as known scandals and our understanding of the psychology of the relationship between auditors and mangers would suggest that there is indeed a problem with auditor capture, if not explicit bribery. This paper provides much needed theoretical underpinnings to explain the mixed empirical results and suggests a possible direction for fruitful research.

This work also highlights the potential for complexity in the competition for clients, as firms may have the potential to simultaneously manage their reputation while pursuing rents from collusion. The parameters treated as exogenous for the purposes of deriving the equilibrium conditions explored here are also potentially under the audit firms' partial control, as they balance their client portfolios, participate in rule-making, and invest in various attempts to influence regulators via the political process.

A Appendix: Mathematical proofs

Proof of Proposition 1. 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 prefer to offer a bribe than report the true poor outcome, $W^H - C^M(\mu) - kB - \rho P^M > W^L - C^M(\mu)$ must be true. Therefore, there is a feasible B such that the equilibrium strategy profile for the bribing subgame is (bribe; accept bribe) iff $\rho P^A \leq \frac{1}{k}(W^H - W^L - \rho P^M)$. Directly following, the B chosen is $B \in [\rho P^M, \frac{1}{k}(W^H - W^L - \rho P^M)]$. □

Proof of Proposition 2. 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 α 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 α is: $\Pi^M_\alpha = -(1-\lambda)(W^H - W^L + \rho P^M) \leq 0 \quad \forall \quad \lambda \in [0, 1]$. Since the manager's marginal payoff is monotonically decreasing for all feasible values of λ, a corner solution prevails, and the manager will select $\alpha = 0$ and always lie about his bad outcome. □

Proof of Propostion 3. The auditor's expected, per-period payoff is: $F - C^A(\lambda) - (1-\mu)\rho P^A + R$. She will attempt to set marginal payoff equal to zero, $-C^A_\lambda = 0$, but our assumptions about the audit cost function state that $C^A_\lambda > 0 \; \forall \lambda$, which forces the auditor into a corner solution where $\lambda = 0$. □

Proof of Proposition 4. For a manager to prefer financing collusion via a rental payment stream:

$$\frac{\delta}{1-\delta}\left(w^H - C^M(\mu^*) - (1-\mu^*)(k\lambda^* B^* + \rho P^M)\right) \leq \frac{\delta}{1-\delta}\left(w^H - C^M(\hat{\mu}) - lR - (1-\hat{\mu})\rho P^M\right)$$

(I assume for notational convenience but with no loss of generality that the manager faces the same discount rate as the auditor.) This condition can be reduced to a maximum value of R:

$$R \leq \frac{1}{l}\left((C^M(\mu^*) - C^M(\hat{\mu})) + (\mu^* - \hat{\mu})\rho P^M + k(1-\mu^*)\lambda^* B^*\right)$$

For the auditor to prefer this financing mechanism, she must make at least as much in expected net present value as she would if there were a one-off bribe, to ensure that the collusion equilibrium remains her dominant strategy:

$$\frac{\delta}{1-\delta}\left(F - C^A(\lambda^*) + (1-\mu^*)(\lambda^* B^* - \rho P^A)\right) \leq \frac{\delta}{1-\delta}\left(F - C^A(0) + R - (1-\hat{\mu})\rho P^A\right)$$

This can then be reduced to derive the minimum value of R: $R \geq (1-\mu^*)\lambda^* B^* + (\mu^* - \hat{\mu})\rho P^A - (C^A(\lambda^*) - C^A(0))$. These restrictions on the feasible values of R do not form an empty set as long as Condition 2 is met. □

B Appendix: Monte Carlo technical details

The Monte Carlo simulations' data creation was done in Mathematica, and the resulting 50 data sets were analyzed in Stata. The data creation is guided by the results derived in the main paper for the necessary fees and side payments required to ensure the auditor is willing to participate in either a compliant manager or collusive auditor relationship, however, the selection of exogenous parameters is fairly arbitrary. The Mathematica code and the resulting 50 data sets are available from the author upon request.

To generate the 10,000 simulated observations, the cost function for an audit was set as:

$$C(\lambda) = a - b\ln(1-\lambda)$$

as this has the requisite properties. Each auditor-client diad has a different cost function, where $a \sim U(10, 100)$ and $b \sim U(5000, 80000)$. The auditor penalty was created to have some relation to the size of the engagement, but also some consistency across all engagements. To achieve this, I calculate the cost of an audit that has a 95% chance of discovering a misstatement (C_i), if one exists. I also calculate the mean of the costs generated ($\bar{C}$). The penalty for each audit failure is then set at a multiple of their average:

$$P_i^A = 10 \times \frac{C_i + \bar{C}}{2}$$

All clients set $\mu = 0.8$ and all misstatements face the same risk of ex post discovery, $\rho = 0.2$.

To generate the auditors' intensity levels, I solve the following calculation for each λ_i:

$$\frac{b_i}{1 - \lambda_i} = (1 - \mu)\rho P_i^A$$

i.e. the Auditor's Utility Maximizing Choice 1. This value then gets fed back into the cost function to generate $C(\lambda_i)$.

To calculate the current period payment of the rental stream that functions as a bribe, I assumed an interest rate in each period of 7 percent and a cancellation risk rate of 10 percent. In each case, therefore, to calculate the necessary value transfer for collusion to occur, I solved for B_i:

$$\rho P_i^A = \left(\frac{1.1}{0.93} - 1\right) B_i$$

The actual amount of rental cash flow required to induce collusion, is less than B_i, however, because of the cost savings to the auditor of setting $\lambda = 0$. So the value added to the auditor revenues in the case of a collusive equilibrium is therefore:

$$R_i = B_i + b_i \ln(1 - \lambda_i).$$

The final component needed to construct the overall revenues for each engagement is the fee, F. Using the participation constraint implied in the compliant manager equilibrium, the fee equals:

$$F_i = C(\lambda_i) + (1 - \mu)\rho P_i^A.$$

Therefore, for all compliant manager relationships, the revenue used is F_i and the audit intensity is λ_i. For those in a collusive relationship, the revenue is $F_i + R_i$ and $\lambda = 0$.

Each observation is then randomly selected to an equilibrium, with each observation having a 50 percent chance of being collusive. The reports of the companies are determined by their equilibrium and the values of μ and λ_i. For all companies releasing a misstatement, regardless of their equilibrium relationship with their auditor, they are caught with probability $\rho = 0.2$ and an audit failure is recorded (1 if a failure is identified, 0 if no failure is identified, either because it does not exist or because it was not discovered). These audit failures become the dependent variable in the logistic regression.

To create the 50 data sets used, I draw 1000 observations from the 10,000 observations randomly and repeated this procedure a total of 50 times, with replacement. In general, the data sets have observed audit failure rates of between 3 and 4 percent. Once the data were imported to Stata, I ran a logistic regression of the audit failures as a function of the revenues received on each of the 50 data sets, the signs and significance of which are reported in the body of the paper.

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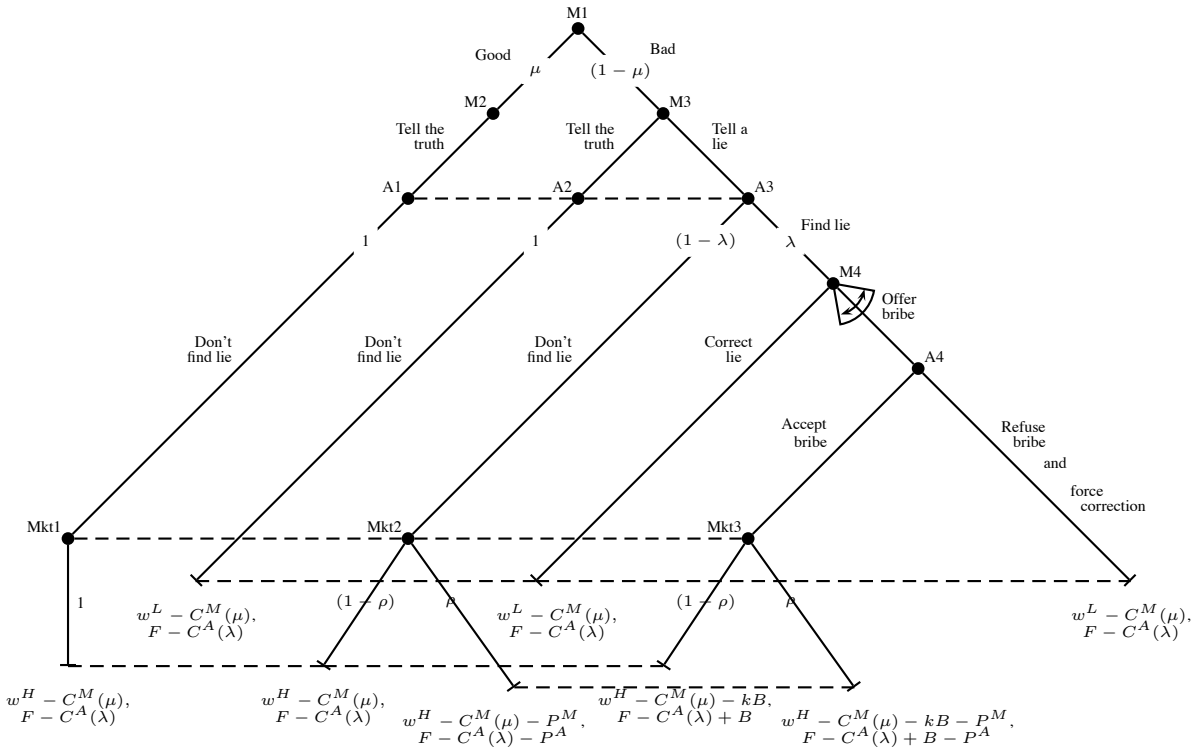

Figure 1: Auditing game

Variable	Definition
Probabilities	
μ	Probability of a good client company outcome (from management's perspective)
λ	Probability of auditor finding misstatement conditional on its existence
ρ	Probability of market finding misstatement conditional on its existence
Payoff components	
$W^{H,L}$	Wage management receives (amount depends on client company outcome)
$C^{M,A}$	Cost of effort exerted by manager as a function of μ or by auditor as a function of λ
F	Fee auditor receives for audit
$P^{M,A}$	Penalty assessed manager and auditor respectively when a misstatement is discovered by market
B	Bribe
Scalar	
k	Proportion of B deducted from manager's payoff

Table 1: Definitions of variables

Parameter estimate for β_{fees}:	Number
Positive, statistically significant	3
Positive, not significant	25
Negative, not significant	18
Negative, statistically significant	4
Total	50

Table 2: Monte Carlo result summary. A positive parameter estimate implies that increased fees are associated with an increased risk of audit failure. A result is statistically significant if $p < 0.1$.