

# Effects of Multiple Clients on the Reliability of Audit Reports

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## **Abstract**

This paper demonstrates the existence of two different kinds of externalities induced by an auditor servicing multiple clients at the same time. First, we show that the capital market price for a client can increase in the number of qualified reports that his auditor issues to his other clients, thus producing a stock price externality. Second, when the audit firm has limited wealth, an additional client can actually decrease the audit quality and increase the average likelihood of audit failure relative to a single-client setting because of reporting externalities.

Our analysis also demonstrates how requiring a more effective audit oversight mechanism can actually produce unintended consequences such as increased likelihood of audit failures.

# 1 Introduction

Though there is considerable analytical literature on auditing, virtually the entire literature, to the best of our knowledge, focuses on an auditor servicing only one client at a time. However, casual empiricism suggests that most auditors service multiple clients. Auditing multiple clients at the same time may affect the reliability of corporate financial reports for a variety of reasons. The main purpose of this paper is, therefore, to study how the presence of multiple clients affects auditors forming professional assessments of their clients' prospects, auditors' reporting behavior, and the resulting market valuation of client firms.

We view the process of an auditor generating a report as consisting of two significant steps: first, the adoption of an audit technology of a given quality or exerting auditing effort that permits the auditor to gather necessary evidence to form a professional assessment of his client's future economic prospects, and second, reporting publicly his professional assessment. So, the failure of an audit report in predicting correctly the impending economic difficulties of a client firm can occur on account of two different reasons: the inability of the auditing technology to gather all the required evidence, leading to a faulty professional assessment by the auditor or a deliberate misreporting by the auditor of his correct professional assessment.

Factors affecting audit failure examined by this paper include the number of clients, the proclivity and incentives of the auditor to misreport his professional assessment, the audit firm's wealth, and governance and control mechanisms. Of these, the last factor has received a lot of attention in recent days from regulators, legislature, accounting profession, and other interest groups, and hence, merits a detailed examination. Even if the auditor is inclined to misreport his private professional assessment, there are

mechanisms in place now that are designed to discourage, if not prevent, such misrepresentation. Following the recent financial reporting crisis that engulfed Enron, Sunbeam, WorldCom, Tyco, Waste Management, and similar other companies, several measures have been undertaken that are designed to decrease the likelihood of audit failure and enhance the credibility of financial reports. The Sarbanes-Oxley Act of 2002 and the creation of the Public Company Accounting Oversight Board represent some of the more prominent measures in this regard. The second objective of the paper, therefore, is to understand the implications of an oversight mechanism on auditors' behavior.

We study firms whose owners must sell their holdings at values determined by the capital market based on firms' audit reports. Auditors are assumed to be of two types: rigid auditors do not compromise on their integrity and always report truthfully their professional assessments, whereas flexible auditors let their reporting decisions be determined by a cost-benefit analysis of misreporting versus reporting honestly their professional assessments. Here, we assume that an auditor can misreport his professional assessment only when an audit oversight mechanism fails.<sup>1,2</sup> Each client firm hires an auditor at a non-contingent fee determined by the market for audit services. The auditor privately chooses his audit technology for each one of his multiple clients. Increasing the quality of audit technology is personally costly to the auditor. After forming a private professional assessment for each one of his clients' prospects, the auditor issues a public report for each client and the market determines the prices for

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<sup>1</sup>Analytical literature on auditor independence includes Antle [1982] and Magee and Tseng [1990]. Our modeling of auditors as consisting of two different types, depending on their reporting proclivities, is consistent with Dye, Balachandran, and Magee [1990].

<sup>2</sup> There are several institutions such as the audit committees of the client firms, the peer review processes within an audit firm, and the Public Company Accounting Oversight Board, all of which are designed to prevent misreporting by auditors. We collectively refer to these institutions as "audit oversight mechanism."

client firms based on all publicly available information. If an audit report fails to predict a subsequent economic failure of a client, the investors (i.e., the second generation shareholders) are eligible to receive a damage payment from the audit firm and the engagement partner.

In this setting, the value of a given client firm depends not only on the publicly observable audit report for that client but also on audit reports of *all* other client firms of the same auditor because the market's perception of the auditor's level of integrity is influenced by all the audit reports issued by a given auditor. In particular, we identify conditions under which the credibility of an auditor's report, and hence, the client firm's price increases in the number of qualified audit reports (i.e., those predicting poor prospects) its auditor issues to his other clients. In this way, an auditor of unknown integrity type auditing multiple clients at the same time induces a stock price externality.

We next examine the auditor's reporting behavior when he has multiple clients and when the audit firm's wealth is limited.<sup>3</sup> This limited wealth assumption gives rise to a second kind of externality: that the reporting considerations for one client can affect the reporting decision for another client of the same auditor. The intuition here is that when the audit firm's wealth is limited, an auditor decides on his reports for all clients together in a way to minimize paying expected litigation damages from his personal wealth. This bundling of reporting decisions for multiple clients creates reporting externalities.

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<sup>3</sup>The analytical auditing literature includes work that examines the auditor reporting behavior as determined by costs and benefits of misreporting the underlying economic value of the firm (e.g., Melumad and Thoman, 1990, Newman, Patterson, and Smith, 2001, Dye, 1993, and Pae and Yoo, 2001) and the value to the client firm from hiring an auditor (e.g., Christensen and Demski, 2004). While this literature examines primarily how one client's reporting behavior affects the auditor's responses, we examine how the behavior of an auditor with respect to one client affects his reporting decisions with respect to another client.

Our analysis further establishes that when client firms are sufficiently profitable, the addition of a second client can actually decrease the audit quality chosen by a flexible auditor, and as a consequence, increase the probability of audit failure relative to a single-client setting. In contrast, adding a second client always increases the rigid auditor’s quality choice if the audit firm’s wealth is limited. We further establish that the auditor’s quality choice decreases in his integrity level. Finally, we find that increasing the effectiveness of the audit oversight mechanism can have several unintended, and possibly undesirable, effects. For instance, an increase in the effectiveness of the audit oversight mechanism can decrease the quality of audit chosen by flexible auditors and result in an increase in the probability of audit failure.

The paper proceeds as follows. Section 2 describes the basic model. Section 3 presents the analysis of the basic model. Section 4 examines the impact of limited wealth of the audit firm on the auditors’ reporting behavior. Section 5 concludes the paper. All proofs are in Appendix B.

## 2 Model

An auditor has  $n$  identical client firms. We describe below the production and auditing processes for a typical client firm.<sup>4</sup> The outcome of a typical firm’s project is represented by a random variable  $\tilde{x} \in \{x_l, x_h\}$ , where  $x_l < x_h < \infty$ . Assume that the likelihood of success of the project of a firm is determined by the firm’s profitability parameter,  $\theta$ :  $\Pr(\tilde{x} = x_h|\theta) = \theta$  for some publicly known  $\theta \in (0, 1)$ . Without loss of generality, we normalize  $x_l$  to be zero. Each firm is required to hire an auditor to issue a financial report. The auditor privately chooses an audit quality for each firm,  $q \in [0, 1]$ , that

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<sup>4</sup>Given our assumption that all firms are identical, to simplify the notation we do not index any of the following variables to a given firm  $j$  in our analysis, unless the context specifically requires indexing.

can be interpreted as either reflecting the auditor’s level of effort or the quality of his auditing technology. We model the notion of an auditor forming a professional assessment about his client’s future economic prospects by assuming that the auditor obtains a private signal,  $\tilde{s} \in \{s_l, s_h\}$ , where  $\Pr(s_l|x_l, q) = q$  and  $\Pr(s_h|x_h, q) = 1$  for every  $q \in [0, 1]$ . The auditor’s personal disutility associated with the choice of quality level  $q$  is given by  $\frac{k}{2}q^2$ , for some finite cost parameter  $k > 0$ . After privately observing his audit signal,  $\tilde{s}$ , the auditor issues a public report  $r \in \{r_l, r_h\}$ .

We assume that auditors differ along the dimension of their integrity: that is, an auditor can be either rigid ( $R$ ) or flexible ( $F$ ) in his reporting decision. A rigid auditor obtains a prohibitively large personal cost from misrepresenting his private assessment of his client’s future prospects and, hence, always reports his professional assessment truthfully. In contrast, a flexible auditor derives a personal, private benefit,  $B > 0$ , from overreporting a low private signal,  $s_l$ .<sup>5</sup> Our modeling of auditor’s integrity is based on the premise that an individual’s integrity represents an intrinsic and inalienable personal attribute, which cannot be influenced by an oversight or a control mechanism or by formal or informal incentives. As such, the behavior of a rigid auditor in our setting corresponds to that of an auditor with utmost integrity.<sup>6</sup> We also assume that the auditor’s integrity type is private, which information cannot be credibly communicated to any one. The prior probability of an auditor being rigid is  $\rho \in (0, 1)$ .

There are several institutions that, when functioning effectively, prevent auditors who lack integrity from knowingly misrepresenting their professional assessments.

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<sup>5</sup>The private benefit that a flexible auditor obtains from presenting a favorable report for the client may accrue for a variety of reasons including developing a personally beneficial relation with the client’s senior management, a greater likelihood of retaining the client, enhancing the chances of gaining other rewarding assignments with the client, and increasing the likelihood of obtaining a top management position in the client firm.

<sup>6</sup>Our operationalizing the notion of the auditor’s integrity is consistent with the AICPA Code of Professional Conduct, which defines lack of integrity as “*knowingly* misrepresenting facts or subordinating one’s own judgment to others.”

Those institutions, which we collectively refer to as an audit oversight mechanism (*AOM*), include the client’s audit committee, the recently constituted Public Company Accounting Oversight Board (PCAOB), review of the auditor’s work by his peers, the code of professional ethics, and self-regulatory mechanisms enforced by the AICPA.<sup>7</sup> So, we assume that the flexible auditor can misreport his private audit signal only when the *AOM* of the client firm fails. As ensuring perfect effectiveness of such a monitoring mechanism is prohibitively costly, we assume that the *AOM* functions effectively with probability  $g$ , where  $g \in (0, 1)$ . Whether the *AOM* of a given firm is functioning effectively at a given point in time is not publicly observable. The functioning of firms’ *AOMs* as well as all other random variables are independently distributed across firms. Figure (1) presents the reporting options available to a flexible auditor.

[Insert Figure 1 here]

The sequence of events is as follows. The market for audit services determines non-contingent audit fees for each client,  $\phi$ . We assume in the following that the audit fee,  $\phi$ , is sufficiently high to induce auditors to accept their audit assignments. The auditor privately learns his integrity type and then privately chooses his audit quality,  $q$ , for each of his  $n$  clients. If the auditor is flexible, then he can overreport if he receives a low audit signal,  $s_l$ , for a client and that client’s *AOM* fails. In all other instances, the audit report represents an honest disclosure of the auditor’s private assessment of the client’s prospects. The auditor makes his audit quality choices and reporting decisions simultaneously for all clients. The market determines a price,  $P^j(r^j, R^{-j})$ , for each client firm  $j$  based on all publicly available information, where  $r^j$  represents the audit

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<sup>7</sup>To emphasize the monitoring role of PCAOB, we quote from the mission statement of PCAOB: “The PCAOB is a private-sector, non-profit corporation, created by the Sarbanes-Oxley Act of 2002, to *oversee* (italics added) the auditors of public companies in order to protect the interests of investors and further the public interest in the preparation of informative, fair, and independent audit reports.”

report for firm  $j$  and  $R^{-j} \equiv \{r^1, r^2, \dots, r^{j-1}, r^{j+1}, \dots, r^n\}$  denotes the vector of reports for all other clients than client  $j$ .

An audit failure ( $AF$ ) for a client is said to occur if the auditor reports high ( $r_h$ ) for that client and the actual outcome turns out to be low ( $x_l$ ).<sup>8</sup> In the event of an audit failure, the engagement partner is required to pay the portion  $\alpha D$  of the total damages,  $D$ , to the second generation shareholders out of his personal wealth, with the remaining portion  $(1 - \alpha) D$  being paid by the audit firm, for some fraction  $\alpha \in (0, 1)$ . Here we assume that the total damages  $D < x_h$ . To capture occasional equilibrium misreporting by auditors and to ensure that the distinction between rigid and flexible auditors is meaningful, we assume that  $B > \alpha D$  for the rest of our analysis. Figure (2) presents a timeline depicting the sequence of events.

[Insert Figure 2 here]

### 3 Analysis

#### 3.1 Equilibrium

In this section, we assume that the audit firm's end-of-the-period wealth,  $W_f$ , and the engagement partner's end-of-the-period personal wealth,  $W$ , are large enough to pay for their respective portions of damage payments even when audit failures occur for all  $n$  clients at the same time, i.e.,<sup>9</sup>

$$W_f > n(1 - \alpha)D \text{ and } W > n\alpha D. \tag{C1}$$

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<sup>8</sup>An implicit assumption we make is that the auditor cannot underreport a high private signal,  $s_h$ , for a variety of exogenous reasons such as not being able to generate the necessary evidence to issue a qualified report when  $\tilde{s} = s_h$ . Therefore, the only form of audit failure that can occur in our model is that of the auditor overreporting his low professional assessment of a client's prospects,  $s_l$ .

<sup>9</sup>The following section examines the case when condition (C1) does not hold.

An equilibrium consists of an auditor's quality choices and reporting strategies for each of his  $n$  clients as a function of his integrity type and capital market prices determined rationally given all the information available to the capital market. Given his integrity type, the auditor chooses his audit quality for each one of his  $n$  clients and then decides on his reporting strategies that maximize his expected payoffs conditioned on his private audit signal and the state of the *AOM* for each one of his  $n$  clients. While rigid auditors always report truthfully, flexible auditors will misreport their signals in equilibrium only if the *AOM* is not effective and benefits from misreporting exceed costs. Working backwards, the equilibrium reporting strategy of the flexible auditor then reduces to  $r_F(s_l) = r_h$  if the *AOM* is not effective and truthful reporting of his private signal in all other instances.<sup>10</sup>

Since the audit firm's and engagement partner's wealth are assumed to be sufficient to cover all potential damage payments and all random variables are distributed independently across clients, maximizing the sum of net expected payoffs for all clients is identical to maximizing the net expected payoff for each client individually. So, the rigid auditor decides on his audit quality ( $q_R$ ) for each client by solving:

$$\max_{q_R} W - \Pr(s_h \cap x_l | q_R) \alpha D - \frac{k}{2} q_R^2, \quad (1)$$

The maximization problem (1) anticipates that when the rigid auditor reports his imperfect high signal,  $s_h$ , truthfully, he will pay damages  $\alpha D$  with probability  $\Pr(s_h \cap x_l | q_R) = (1 - \theta)(1 - q_R)$ .

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<sup>10</sup>If one were to assume that the auditor's private benefit  $B$  from overreporting represented the side payment that the client  $j$ 's manager paid him, then  $B$  would be bound from above by  $P^j(r_h^j, R^{-j}) - P^j(r_l^j, R^{-j})$ . For a sufficiently large value of  $x_h$ , the client's manager would be willing to make a side payment greater than  $\alpha D$  to the flexible engagement partner to obtain a favorable report whenever the *AOM* fails. Our analysis subsumes this subgame between the auditor and a given client's manager.

The flexible auditor's quality ( $q_F$ ) choice problem requires maximizing his net expected payoffs for each client, where he anticipates an audit failure occurring due to his imperfect auditing technology not detecting the realized low outcome with probability  $\Pr(s_h \cap x_l | q_F) = (1 - \theta)(1 - q_F)$ , and an audit failure occurring due to his overreporting his low private signal,  $s_l$ , with probability  $\Pr(r_h \cap s_l | q_F) = (1 - \theta)q_F(1 - g)$ . So, for each client the flexible auditor solves the following optimization problem:

$$\max_{q_F} W - \Pr(s_h \cap x_l | q_F) \alpha D + \Pr(r_h \cap s_l | q_F) (B - \alpha D) - \frac{k}{2} q_F^2 \quad (2)$$

Whenever an auditor issues a low report for a client the market price for that client will be zero because auditors of either type cannot, by assumption, underreport actual earnings, i.e.,  $P^j(r_l^j, R^{-j}) = 0$  for all  $R^{-j}$ . However, if an auditor issues a favorable report for a client then the value the capital market attaches to the firm depends on the market's beliefs about the auditor's type based on all the information available to it. Appendix A provides a formal definition of an equilibrium in this game.

### 3.2 Audit quality

The following Lemma demonstrates how an auditor's integrity type affects his audit quality choice, in anticipation of his subsequent reporting strategies.

**Lemma 1** *Assume that condition (C1) holds. Then, for a sufficiently large value of  $k$ , the optimal levels of audit quality chosen by flexible and rigid auditors for each of*

their  $n$  clients are in the interior and equal to:<sup>11</sup>

$$(a) \ q_F^* = \frac{1}{k}(1 - \theta) [\alpha Dg + (1 - g)B] \text{ and } q_R^* = \frac{1}{k}(1 - \theta)\alpha D, \text{ respectively; and}$$

$$(b) \ q_F^* > q_R^*.$$

Lemma 1 (b) establishes that an auditor with a lower level of integrity chooses a higher audit quality in equilibrium for each of his  $n$  clients than an auditor with a higher level of integrity. This result follows from the fact that, given our assumption that  $B > \alpha D$ , the flexible auditor wishes to derive his private benefit  $B$  more often, which is possible only by improving his quality and obtaining the low audit signal,  $s_l$ , more frequently.

Lemma 1 results enable us to understand better the likelihood of audit failure for a given client, where

$$\Pr(AF) = (1 - \theta) [\rho(1 - q_R^*) + (1 - \rho)((1 - q_F^*) + q_F^*(1 - g))]. \quad (3)$$

Expression (3) reflects the fact that an audit failure can occur for two different reasons in this setting. First, the inability of the imperfect auditing technology to detect the realized low outcome all the time (i.e.,  $q_i^* < 1$  in equilibrium for  $i = F, R$ ) implies that whenever the auditor reports his high signal truthfully, there is always a strictly positive posterior probability that the auditor's report is wrong. This kind of an audit failure can occur for both rigid and flexible auditors. Second, the flexible auditor's incentives to overreport his private signal  $\tilde{s} = s_l$  whenever the *AOM* fails also leads to an audit failure in equilibrium. Letting  $\Pr(AF|i)$  denote the probability of audit failure

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<sup>11</sup>For the rest of the analysis, we assume  $k$  to be sufficiently large so that both  $q_R^*$  and  $q_F^*$  are strictly in the interior.

given that the auditor is of type  $i$ , for  $i = R, F$ , Proposition 1 predicts the likelihood of audit failure and audit quality choices as a function of several aspects of this reporting environment.

**Proposition 1** *Assume that condition (C1) holds. Then, the equilibrium impact of the audit oversight mechanism on auditor behavior follows:*

- (a)  $\frac{\partial q_F^*}{\partial g} < 0$ ; and  $\frac{\partial q_R^*}{\partial g} = 0$ ;
- (b)  $\Pr(AF|F) < \Pr(AF|R)$  if and only if  $g > \frac{\alpha D}{B - \alpha D}$ ; and
- (c)  $\frac{\partial \Pr(AF)}{\partial g} > 0$  if and only if  $g > \frac{B}{2[B - \alpha D]}$ .

Proposition 1 (a) establishes that a flexible auditor's quality choice actually decreases as the AOM becomes more effective. As the effectiveness of the AOM,  $g$ , increases the incidence of overreporting by the flexible auditor will decrease, with the result that the chances of his deriving private benefit  $B$  given that  $\tilde{x} = x_l$  will also diminish, leading to a decrease in his incentives to detect the realized low outcome. As a consequence, the flexible auditor will lower his quality choice. In contrast, a rigid auditor's reporting behavior is not affected by the effectiveness of the AOM,  $g$ .

Given the flexible auditor's proclivity to overstate his clients' prospects, one might expect a flexible auditor to cause audit failure with a greater probability than a rigid auditor. However, Part (b) of Proposition 1 identifies a necessary and sufficient condition for the reverse to be true, i.e., that the probability of audit failure can be lower for an auditor with a lower level of integrity than one with a higher level of integrity. The probability of audit failure given that the auditor is rigid does not depend on the effectiveness of the AOM. In contrast, the probability of audit failure given that the auditor is flexible is affected by a change in the effectiveness of the AOM in two different ways. On the one hand, for a given quality level,  $q_F$ , an increase in the effectiveness

of the *AOM* decreases the likelihood of overreporting given that the auditor detects the realized low outcome (direct effect). But, on the other hand, as established in part (a) of the Proposition, an increase in the effectiveness of the *AOM* also decreases the flexible auditor's quality choice (incentive effect). Part (b) of Proposition 1 establishes the result that when the *AOM* is sufficiently effective (i.e., for  $g > \frac{\alpha D}{B - \alpha D}$ ), the direct effect of the reduced incidence of misreporting dominates the incentive effect of diminished audit quality choice, resulting in an overall lower probability of audit failure with a flexible auditor than with a rigid auditor.

Though one might expect an increase in the effectiveness of the *AOM*,  $g$ , to reduce the probability of audit failure, Proposition 1 (c) identifies a necessary and sufficient condition under which the probability of audit failure actually increases in  $g$ . An increase in  $g$  beyond the threshold level,  $\frac{B}{2[B - \alpha D]}$ , causes the consequent detrimental effect of a reduction in  $q_F^*$  to dominate the salutary effect of a more effective *AOM* on the flexible auditor's misreporting tendencies and contributes to an increase in the incidence of audit failure.

In a single-period setting, the non-contingent audit fee – that is determined based on the audit market's prior beliefs about a given auditor's integrity type – partly contributes to the results in Proposition 1 about how an auditor's integrity type affects his audit quality choice and the likelihood of audit failure. Endogenously determined audit fees in a multi-period setting could give rise to auditor reputation concerns and potentially change both the flexible auditors' incentives to misreport and their audit quality choices. Our results could further be affected by the clients also making reporting decisions. A more comprehensive model that considers several other factors – such as the precisions of clients' and auditors' information, the relative timing of clients' versus auditors' reports, whether clients' reports are public or private only to

their auditors, and the costs and benefits for clients from misreporting – could provide additional insights into the reporting behavior of auditors.<sup>12</sup> Given this paper’s focus on a richer auditing environment, we abstract away from a formal examination of the interaction of the clients’ and auditors’ reporting decisions.<sup>13</sup>

### 3.3 Stock price externality

Given our assumption that an auditor’s integrity type is private information, the capital market will use all audit reports issued by that auditor to update its beliefs about the auditor’s type. A firm’s capital market price,  $P^j(r^j, R^{-j})$ , will, therefore, depend not only on its own audit report but also on the audit reports received by all other clients that share the same auditor. Proposition 2 establishes this stock price externality induced by client firms’ reports. Since we assume all clients to be identical and all random variables are distributed independently across clients, the number of clients an auditor serves and the number of low reports he issues to those clients form a sufficient statistic for all the publicly available information with respect to the auditor’s integrity type. Let  $P(r_h, \lambda, n)$  denote the capital market price of a client that has received a high audit report, given that its auditor has  $n$  total number of clients and has issued  $\lambda$  low reports to his other clients in a given period. We assume that the auditor issues reports for all his clients before the price determination that Proposition 2 examines.

**Proposition 2** *Assume that condition (C1) holds. Then, the equilibrium price  $P(r_h, \lambda, n)$*

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<sup>12</sup>Christensen and Demski [2004] demonstrate that requiring an auditor to report on the outcome of the client firm’s manager’s actions can be either beneficial or detrimental depending on the nature and quality of the manager’s and auditor’s information. In contrast, in our setting in which the client’s manager has no private information, if the manager made an endogenous private investment decision and was interested in maximizing expected market price of the firm, then auditing would always be beneficial provided the cost of auditing was sufficiently small.

<sup>13</sup>We thank an anonymous referee for pointing out the critical role of reporting by the client in the auditor’s quality choice.

of a given client:

- (a) *increases in the number of low reports,  $\lambda$ , issued by the auditor for a given number of his clients,  $n$ ; and*
- (b) *decreases in the total number of the auditor's clients,  $n$ , for a given number of low reports,  $\lambda$ , issued by its auditor.*

As  $\lambda$ , the number of low reports issued by the auditor, increases, the market attaches greater credibility to a firm's high report.<sup>14</sup> If the probability of audit failure is lower for rigid auditors than for flexible auditors, then the capital market's posterior beliefs of the auditor being rigid increases in the number of low reports an auditor issues. This is the case when the *AOM* is not very effective, i.e., when  $g < \frac{\alpha D}{B - \alpha D}$  (see Proposition 1). If, however, the parameters are such that the probability of audit failure is lower for flexible auditors than rigid auditors, then the capital market's posterior beliefs of the auditor being rigid decreases in the number of low reports. In both cases, a higher number of low audit reports indicates that an audit failure upon receiving a high report is less likely, and hence, the investors are more likely to receive the high outcome,  $x_h$ , following a high audit report. The intuition for part (b) of Proposition 2 follows similar lines of argument.

A similar kind of stock price externality effect with respect to auditor reputation has been documented in the empirical literature around the fall of Andersen. Callen and Morel (2002) and Krishnamurthy et al. (2002) find that Andersen's other clients experienced negative abnormal returns in the period around Enron debacle. Baber et al. (1995) document a similar externality effect around the time of the bankruptcy of Laventhol and Horwath.

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<sup>14</sup>Further, if  $g \neq \frac{\alpha D}{B - \alpha D}$ ,  $P(r_h, \lambda, n)$  increases strictly in  $\lambda$  for a given  $n$  and decreases strictly in  $n$  for a given  $\lambda$ .

## 4 Limited wealth for the audit firm

So far, an auditor's optimal audit quality choice is independent of the number of clients and the reporting behavior of the flexible auditor for one client does not depend on the signals he receives for his other clients. These results critically depend on the assumption that both the audit firm and the auditor have sufficient wealth to cover their share of damage payments regardless of the number of audit failures occurring at the same time (see condition C1). However, empirically what we know is that most audit firms have low levels of capital relative to their revenues. Hence, in this section we impose limits on the audit firm's wealth and examine two consequences: (1) reporting externalities in the sense that the auditor's reporting strategy for one client depends on how many other clients he has and the reporting environment for his other clients; and (2) how the number of clients affects the audit quality choice and the likelihood of an audit failure. For tractability reasons, we restrict ourselves to the case when the auditor has only two clients.

Assume that if the audit firm's wealth is insufficient to meet its portion of damage payments, then the engagement partner's personal wealth must be used to pay the remaining amount of damages.<sup>15</sup> The audit firm's limited wealth, therefore, increases the auditor's personal wealth at risk, and consequently, has the potential to affect the auditor's behavior. In particular, assume that the end-of-the-period wealth for the

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<sup>15</sup>Our modeling of the engagement partner's liability vis-a-vis the audit firm's liability captures the legal provisions related to such matters in most states when the audit firm is organized as a limited liability partnership. For instance, Section 905 of the Michigan Limited Liability Company Act (Act 23 of 1993) stipulates that the owners of a limited liability partnership "are personally liable for all the debts of the business, except those debts resulting from acts committed by another partner (..)"

audit firm,  $W_f$ , is limited in the following way:<sup>16</sup>

$$(1 - \alpha)D < W_f < 2(1 - \alpha)D \tag{C2}$$

Condition (C2) stipulates that if one audit failure occurs then the audit firm's wealth,  $W_f$ , is sufficient to meet the firm's portion of the damage payments. However, if audit failures occur for both clients at the same time, the wealth of the audit firm is insufficient to meet its share of the damages. Therefore, when both audits of the engagement partner result in failures, the remaining portion of the total damage payments must be paid out of the engagement partner's personal wealth to the extent possible. In order for the limited wealth of the audit firm to have an effect on the engagement partner's wealth at risk, we assume that the engagement partner's wealth exceeds his (initial) portion of damage payments when two audit failures occur at the same time:

$$W > 2\alpha D. \tag{C3}$$

Let  $M \equiv \min \{W, 2D - W_f\}$  denote the portion of the total damages that will be paid to the plaintiffs from the engagement partner's personal end-of-the-period wealth,  $W$ , when two audit failures occur at the same time.

#### 4.1 Reporting externalities

If each auditor had only one client, then the above conditions (C2) and (C3) imply that the audit firm's wealth would be sufficient to pay for the audit firm's share of damage payments. Consequently, the auditor's optimal quality choices and the result-

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<sup>16</sup>To further simplify our analysis, we assume that the fees earned by other partners of the same audit firm and any possible damage claims from the clients of those other partners occur after the game for this particular engagement partner is over.

ing probabilities of audit failure would be the same as characterized in Lemma 1 and Proposition 1; in particular, the flexible auditor would overreport when he got a low audit signal and his client's *AOM* failed.

However, when an auditor has two clients, a reporting externality is said to occur if his reporting behavior for one client is affected by the presence of his other client. The rigid auditor always reports his signals truthfully regardless of whether he has one or two clients, and hence, no reporting externalities ever occur in the presence of the rigid auditor. However, the overreporting tendency of the flexible auditor can potentially lead to reporting externalities. There are two possible ways in which reporting externalities can occur in this setting: first, if a flexible auditor obtains two low signals he may choose not to overreport both of them even if the *AOMs* fail for both his clients; and second, if a flexible auditor observes a low signal for one client and a high signal for the other, he may choose not to overreport the low signal even if the *AOM* for that client fails. Lemma 2 identifies conditions under which the first type of reporting externality occurs, i.e., when the flexible auditor does not overreport for both clients at the same time even when he can. Recall that the auditor makes his audit quality choices and reporting decisions simultaneously for all his clients.

**Lemma 2** *Assume that conditions (C2) and (C3) hold and that*

$$M - \alpha D > B. \tag{C4}$$

*If*

- (a) *the flexible auditor obtains low audit signals for both his clients, and*
- (b) *the audit oversight mechanism fails for at least one client,*

*then the flexible auditor will misreport for only one of his two clients.*

To understand condition (C4) in Lemma 2, consider the case where the flexible auditor obtains two low signals and the *AOMs* for both his clients fail so that he has the option to overreport for both his clients. First, note that the flexible auditor always prefers to issue one high report to issuing no high report because  $B - \alpha D > 0$ . Second, the auditor's payoff from overreporting both low signals is  $2B - M$  because there will be two audit failures and the audit firm's wealth is limited. A reporting externality occurs in this case if the flexible auditor prefers issuing only one high report to two high reports, i.e. if  $B - \alpha D > 2B - M$ . Rearranging terms yields condition (C4).

The next Lemma identifies conditions under which the second type of reporting externality occurs, i.e., when the flexible auditor does not overreport one client's low signal if he observes a high signal for his other client.

**Lemma 3** *Assume that conditions (C2) and (C3) hold and that*

$$\Pr(x_l | s_h, q_F^*) [M - 2\alpha D] > B - \alpha D. \quad (C5)$$

*If the AOM fails for a client and the flexible auditor privately observes a low audit signal for that client and a high audit signal for his other client, then he will not misreport the low signal.*

When the conditions in Lemma 3 are met, misreporting in equilibrium will never produce two audit failures at the same time. In particular, condition (C5) ensures that if the flexible auditor receives one low and one high signal for his two clients, he chooses not to overreport the low signal because if he did, then with probability  $\Pr(x_l | s_h, q_F^*) > 0$  there would be two audit failures. In this event, his personal wealth would be used to pay for the shortfall in the audit firm's portion of litigation damages

caused by the limited wealth of the audit firm. In contrast, with only one audit failure, the limited wealth of the audit firm will not impose any additional drain on the personal wealth of the engagement partner beyond his portion,  $\alpha D$ . Since condition (C5) also implies that condition (C4) holds, when condition (C5) is met the flexible auditor overreports for at most one of his clients even if he observes two low signals.

In this way, Lemmas 2 and 3 provide another possible explanation (than liability considerations) for the well known empirical phenomenon that most audit firms retain a small capital base (relative to their revenues): that the limited wealth of the audit firm has a mitigating effect on the flexible auditors' misreporting tendency.

The following Proposition identifies conditions under which a unique reporting equilibrium obtains in this setting, and in that equilibrium, the flexible auditor's reporting decision for one client is affected by the reporting environment for the other client.

**Proposition 3** *Assume that conditions (C2), (C3), and (C4) hold. Further, assume that the cost of audit quality,  $k$ , is sufficiently large and the flexible auditor's private benefit,  $B$ , is sufficiently small. If*

- (a) *the flexible auditor obtains low audit signals for both his clients, and*
- (b) *the audit oversight mechanism fails for at least one client,*

*then he will misreport in equilibrium for only one of his two clients. Further, misreporting will not occur in equilibrium under any other circumstance.*

Proposition 3 conditions that  $k$  be sufficiently large and  $B$  be sufficiently small ensure that the flexible auditor's quality choice is such that condition (C5) is met, leading to the results in Proposition 3. Under conditions of Proposition 3, both types of reporting externalities occur in equilibrium: i.e., the flexible auditor will never overreport for both his clients at the same time and will not overreport when he gets

only one low signal.

## 4.2 Audit quality and audit failure

This subsection examines the impact of the auditor servicing multiple clients on his choice of audit quality and consequent probabilities of audit failure. Let  $\Pr(AF|i, n)$  denote the probability of audit failure *on a per client basis* when an auditor of type  $i$  has  $n$  clients and let  $q_i(n)$  denote the quality choice by an auditor of type  $i$  with  $n$  clients, for  $i = F, R$  and  $n = 1, 2$ .<sup>17</sup> Proposition 4 establishes that in the presence of limited wealth for the audit firm, the addition of the second client can decrease the flexible auditor's choice of audit quality and increase the probability of audit failure.

**Proposition 4** *Assume that the conditions of Proposition 3 hold. Further, if the client firms' profitability parameter,  $\theta$ , is sufficiently large:*

- (a)  $q_F(2) < q_F(1)$ ;
- (b)  $\Pr(AF|F, n = 1) < \Pr(AF|F, n = 2)$ ; and
- (c)  $\Pr(\text{overreporting}|F, n = 1) > \Pr(\text{overreporting}|F, n = 2)$ .

The intuition for part (a) of Proposition 4 follows. Recollect that under conditions of Proposition 3, the flexible auditor will overreport for only one client and that too only

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<sup>17</sup>Letting  $\Pr(AF_j|F, n = 2)$  denote the probability of audit failure for client  $j$  for  $j = 1, 2$ , the sum of probabilities of audit failure for both clients (1 and 2) of the flexible auditor, given that (C5) holds, equals:

$$\Pr(AF_1|F, n = 2) + \Pr(AF_2|F, n = 2) = 2(1 - \theta)(1 - q_F^*(2)) + [q_F^*(2)(1 - \theta)]^2 [2(1 - g)g + (1 - g)^2] \quad (4)$$

To derive the probability of audit failure on a *per client* basis, we divide the expression (4) by two to obtain:

$$\Pr(AF|F, n = 2) = (1 - \theta) \left[ (1 - q_F^*(2)) + [q_F^*(2)]^2 (1 - \theta) \left[ (1 - g)g + \frac{1}{2}(1 - g)^2 \right] \right] \quad (5)$$

The implicit assumption here is that if the auditor receives two low audit signals and the audit oversight mechanisms fail for both clients, he overreports for each client with equal probability.

when he gets low audit signals for both his clients. As a consequence, the likelihood of his deriving private benefit  $B$  from overreporting  $s_l$  diminishes relative to a single-client setting. Such dampened incentives to detect the true low outcome manifest in a lower audit quality choice with two clients than with one, *i.e.*,  $q_F(2) < q_F(1)$ . Part (b) of Proposition 4 follows directly from part (a): a lower audit quality leads to a higher probability of audit failure with two clients than with one. The incidence of overreporting decreasing with the addition of a second client (Proposition 4 (c) result) follows from Lemmas 2 and 3, wherein a necessary condition for the flexible auditor to overreport in the presence of two clients is that he obtains low signals for both his clients, which event is less likely than obtaining a low signal for only one client. It is important to note that all the results in Proposition 4 are obtained only for highly profitable clients, *i.e.*, for sufficiently large values of  $\theta$ . If  $\theta$  is sufficiently small, then the flexible auditor will be more concerned about detecting the true low outcome to minimize expected damages and the above results reverse.<sup>18</sup>

Next, Corollary 1 examines how the addition of the second client affects the sensitivity of the likelihood of audit failure and the audit quality choice to damages,  $D$ , and the auditor's private benefits from overreporting,  $B$ .

**Corollary 1** *Assume that the conditions of Proposition 3 hold. If the client firms' profitability parameter,  $\theta$ , is sufficiently large:*

- (a)  $\frac{\partial \Pr(AF|F,n=2)}{\partial D} < \frac{\partial \Pr(AF|F,n=1)}{\partial D}$ ;
- (b)  $\frac{\partial q_F(1)}{\partial D} < \frac{\partial q_F(2)}{\partial D}$ ; and
- (c)  $\frac{\partial \Pr(AF|F,n=2)}{\partial B} < \frac{\partial \Pr(AF|F,n=1)}{\partial B}$ .

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<sup>18</sup>That is, for sufficiently low values of  $\theta$ ,  $q_F^*(1) < q_F^*(2)$ ; and  $\Pr(AF|F, n = 1) > \Pr(AF|F, n = 2)$ .

Parts (a) and (c) of Corollary 1 establish that the likelihood of audit failure with the flexible auditor is less sensitive to changes in  $D$  and  $B$ , respectively, when the auditor has two clients than one. However, part (b) demonstrates that the flexible auditor's quality choice is more sensitive to damages when the auditor has two clients than one. While extending our analysis to any arbitrary  $n$  number of clients is difficult for us given the complex nature of the problem, our current analysis nevertheless yields a testable prediction that increasing damages are less likely to affect the likelihood of an audit failure when a firm has more clients than less.

Given the simultaneous determination of audit fees for all clients of a given auditor, the flexible auditor's report in our setting is determined based solely on the trade-off between expected damages and private benefits. As the market's perception of a given auditor's integrity type is influenced by all the reports of a given auditor, the auditor's reporting strategy would also be influenced by his reputation concern if the audit fees for the second client were determined after the first client's auditing was over or if this model was extended to multiple periods.<sup>19</sup>

By assumption, a rigid auditor never misreports a private signal. So, it might seem that the addition of a second client would have no impact on his quality choice. However, Proposition (5) establishes that the limited wealth of the audit firm will also affect the rigid auditor's choices.

**Proposition 5** *Assume that conditions (C2) and (C3) hold. Then:*

(a)  $q_R(2) > q_R(1)$  and  $\Pr(AF|R, n = 2) < \Pr(AF|R, n = 1)$ ; and

(b) further, if other conditions of Proposition 3 hold, then  $q_F(2) > q_R(2)$  and

$$\frac{\partial q_F(2)}{\partial g} < 0 \text{ and } \frac{\partial q_R(2)}{\partial g} = 0.$$

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<sup>19</sup>See Datar [1985] and Datar and Alles [1999] for models that focus on auditors' reputation concerns.

The limited wealth of the audit firm increases the rigid auditor's personal wealth at risk even when he reports the high signals truthfully, and hence, induces him to exert higher effort when he has two clients than one (part (a) of Proposition 5). A consequence of this higher audit quality with two clients than one is a lower probability of audit failure for the rigid auditor with more clients. Just as in the case of a single client, Proposition 5 (b) establishes that the auditor's level of integrity and quality choice are inversely related even when he has two clients because of the flexible auditor's incentives to detect a low signal to derive his private benefit  $B$ . Likewise, the direction of the sensitivity of the auditor's quality choice to the effectiveness of the *AOM* remains unchanged relative to the case of a single-client setting. Finally, Propositions 4 and 5 together highlight how an auditor's integrity level affects the desirability of an auditor taking on a second client.

## 5 Conclusion

Our analysis demonstrates that an auditor servicing multiple clients at the same time can introduce both stock price and reporting externalities. Further, in the presence of limited wealth for the audit firm, the addition of a second client can decrease audit quality and increase the likelihood of audit failure relative to a single-client setting. Moreover, we show that the auditor's quality choice can decrease and the likelihood of audit failure increase in his level of integrity. This paper also finds that some regulatory mechanisms such as increasing the effectiveness of the audit oversight mechanism can produce unintended consequences in the form of increased likelihood of audit failure.

One extension of our model would allow for multiple periods. Such an extension would examine the auditor's reputation effects on his reports for multiple clients. Also,

the role of the audit oversight mechanism could be extended to have a direct influence also on the quality of the professional assessment that the auditor obtains about the client's prospects.

## Appendix A: Equilibrium definition for the case of unlimited wealth

Indexing the auditor's client firms by  $j = 1..n$ , let  $q_i^j$  denote the audit quality chosen by auditor type  $i$ ,  $i = R, F$ , for client  $j$  and  $Q_i = \{q_i^j\}_{j=1}^n$  be the vector of audit qualities that type- $i$  auditor chooses for his  $n$  clients. Similarly, let  $s^j$  denote the signal an auditor obtains for his client  $j$  and let  $S^{-j} \equiv \{s^1, s^2, \dots, s^{j-1}, s^{j+1}, \dots, s^n\}$  denote the vector of signals for all other clients than client  $j$ . Then,  $S = s^j \cup S^{-j}$  denotes the vector of signals for all his  $n$  clients. Let the indicator variable  $\sigma^j = 0$  and  $\sigma^j = 1$  imply that the audit oversight mechanism for client  $j$  fails and does not fail, respectively. It follows that  $\Pr(\sigma^j = 1) = g$ . Then,  $r^j = r_i(s^j, S^{-j}, \sigma^j)$  denotes type- $i$  auditor's report as a function of his signal for client  $j$ , the signals he obtains for his other clients, and the effectiveness of the AOM. Finally, let  $R = \{r^j\}_{j=1}^n$  denote the vector of public reports issued by the auditor to his  $n$  clients.

Let  $b(s^j, r^j, \sigma^j)$  denote the benefit a flexible auditor derives from reporting  $r^j$  if he observed the audit signal  $s^j$  for client  $j$  and the state of client  $j$ 's AOM is given by  $\sigma^j$ . Then,  $b(s_l, r_h, 0) = B$  and  $b(s^j, r^j, \sigma^j) = 0$  for all  $(s^j, r^j, \sigma^j) \neq (s_l, r_h, 0)$ . Similarly, let  $d(x^j, r^j)$  denote the damage payments an auditor must make if he reports  $r^j$  and the outcome of firm  $j$ 's project is  $x^j$ . Then,  $d(x_l, r_h) = \alpha D$  and  $d(x^j, r^j) = 0$  otherwise.

**Definition 1** *An equilibrium consists of an auditor's quality choices,  $\{Q_R, Q_F\}$ , auditor's reporting strategies,  $\{r_R(S, \sigma^j), r_F(S, \sigma^j)\}$ , and capital market prices,  $\{P^j(R)\}_{j=1}^n$ , such that:*

(a) the auditor's optimal reporting strategies solve

$$\begin{aligned} r_R(s_h^j, S^{-j}, \sigma^j) &= r_h^j \text{ and } r_R(s_l^j, S^{-j}, \sigma^j) = r_l^j; \\ r_F(s_h^j, S^{-j}, \sigma^j) &= r_h^j \text{ and } r_F(s_l^j, S^{-j}, 1) = r_l^j; \text{ and} \\ r_F(s_l^j, S^{-j}, 0) &\in \arg \max_{r^j} E \left[ b(s_l^j, r^j, 0) - d(\tilde{x}^j, r^j) \mid s^j = s_l, S^{-j}, \sigma^j = 0, Q_F \right] \end{aligned}$$

(b) given the rigid auditor's reporting strategy, his quality choice,  $Q_R \equiv \{q_R^j\}_{j=1}^n$ , solves

$$\begin{aligned} \max_{\{q_R^j\}_{j=1}^n} W - \sum_{j=1}^n \left( \Pr(\tilde{s}^j = s_h \cap \tilde{x}^j = x_l | q_R^j) \alpha D + \frac{k}{2} (q_R^j)^2 \right) \\ \text{s.t. } Q_R \in [0, 1]^n \end{aligned}$$

(c) given the flexible auditor's reporting strategy, his quality choice,  $Q_F \equiv \{q_F^j\}_{j=1}^n$ , solves

$$\begin{aligned} \max_{\{q_F^j\}_{j=1}^n} W - \sum_{j=1}^n \left( \Pr(\tilde{s}^j = s_h \cap \tilde{x}^j = x_l | q_F^j) \alpha D - \Pr(\tilde{r}^j = r_h \cap \tilde{s}^j = s_l | q_F^j) (B - \alpha D) + \frac{k}{2} (q_F^j)^2 \right) \\ \text{s.t. } Q_F \in [0, 1]^n; \text{ and} \end{aligned}$$

(d) given the auditor's reporting strategies and quality choices,  $\{Q_R, Q_F\}$ , the capital market prices the firm in a rational manner:

$$\begin{aligned} P^j(r_l^j, R^{-j}) &= 0; \text{ and} \\ P^j(r_h^j, R^{-j}) &= \Pr(x_h^j | r_h^j, R^{-j}) x_h + \Pr(x_l^j | r_h^j, R^{-j}) D, \end{aligned} \quad (6)$$

where the market's posterior beliefs  $\Pr(x^j | r^j, R^{-j})$  are derived in a Bayesian manner consistent with the auditor's reporting and quality choice strategies and the functioning of the client firms' AOMs.

Part (a) of the definition reflects that, by assumption, the rigid auditor always

reports his private signal truthfully. We also assumed that the flexible auditor cannot misrepresent a high signal,  $s_h$ , nor can he misrepresent a low signal when client  $j$ 's *AOM* is effective. Note that the information structure implies that

$$E [b(s^j = s_l, r^j, \sigma^j) - d(\tilde{x}^j, r^j) | s^j = s_l, S^{-j}, \sigma^j, Q_F] = b(s^j = s_l, r^j, \sigma^j) - d(\tilde{x}^j = x_l, r^j).$$

We can therefore rewrite the flexible auditor's reporting decision when he observes a low signal and the *AOM* of client  $j$  fails as

$$r_F(s_l^j, S^{-j}, 0) \in \arg \max_{r^j} \begin{cases} B - \alpha D & \text{if } r^j = r_h; \\ 0 & \text{otherwise.} \end{cases}$$

It immediately follows that  $r_F(s_l^j, S^{-j}, 0) = r_h$  for all  $S^{-j}$  because  $B > \alpha D$  by assumption. To reduce the notational clutter, we simply denote the auditor's reporting strategy as  $r_i(s^j)$ , dropping references to other arguments such as the state of functioning of the *AOM* and signal obtained for clients other than client  $j$ , for  $i = F, R$ .

## Appendix B: Proofs

**Proof of Lemma 1** Part (a) Solving the first order conditions for (1) and (2) yields the desired results. The second order conditions for both maximization problems are also negative, thus establishing the unique optimal audit quality choices.

Part (b) Follows from comparing  $q_F^*$  and  $q_R^*$  and using the assumption  $B > \alpha D$ . ■

**Proof of Proposition 1** Follows from taking the corresponding derivatives in case of parts (a) and (c) and by comparing the expressions for  $\Pr(AF|F)$  and  $\Pr(AF|R)$  in case of part (b). ■

**Proof of Proposition 2** (sketch) Let  $\hat{\rho}(n, \lambda) = \Pr(R|n, \lambda)$  denote the market's posterior belief that the auditor is rigid given that the auditor has issued  $\lambda$  low reports out of a total  $n$  clients, where these posterior beliefs are computed after the audit

reports are issued (to all clients) but before terminal dividends are realized for any of the clients. Then, the capital market's posterior beliefs are:

$$\widehat{\rho}(n, \lambda) = \Pr(R|\lambda, n) = \frac{\Pr(R, \lambda|n)}{\Pr(\lambda|n)} = \frac{\Pr(\lambda|R, n)\rho}{\Pr(\lambda|R, n)\rho + \Pr(\lambda|F, n)(1 - \rho)}$$

Because

$$\begin{aligned} \Pr(\lambda|R, n) &= \binom{n}{\lambda} \Pr(r_l|R)^\lambda [1 - \Pr(r_l|R)]^{n-\lambda} = \binom{n}{\lambda} [(1 - \theta)q_R^*]^\lambda [1 - (1 - \theta)q_R^*]^{n-\lambda}; \text{ and} \\ \Pr(\lambda|F, n) &= \binom{n}{\lambda} \Pr(r_l|F)^\lambda [1 - \Pr(r_l|F)]^{n-\lambda} = \binom{n}{\lambda} [(1 - \theta)q_F^*g]^\lambda [1 - (1 - \theta)q_F^*g]^{n-\lambda}, \end{aligned}$$

some algebraic reduction yields:

$$\begin{aligned} &\widehat{\rho}(n, \lambda) - \widehat{\rho}(n, \lambda - 1) \\ &= \frac{(1 - \rho) \left[ \frac{(1-\theta)q_F^*g}{(1-\theta)q_R^*} \right]^{\lambda-1} \left[ \frac{1-(1-\theta)q_F^*g}{1-(1-\theta)q_R^*} \right]^{n-\lambda} \left( \frac{\Pr(r_h|F)}{\Pr(r_h|R)} - \frac{\Pr(r_l|F)}{\Pr(r_l|R)} \right)}{\left( \rho + \left[ \frac{(1-\theta)q_F^*g}{(1-\theta)q_R^*} \right]^\lambda \left[ \frac{1-(1-\theta)q_F^*g}{1-(1-\theta)q_R^*} \right]^{n-\lambda} (1 - \rho) \right) \left( \rho + \left[ \frac{(1-\theta)q_F^*g}{(1-\theta)q_R^*} \right]^{\lambda-1} \left[ \frac{1-(1-\theta)q_F^*g}{1-(1-\theta)q_R^*} \right]^{n-\lambda+1} (1 - \rho) \right)} \end{aligned} \quad (7)$$

The *sgn* (7) is determined by the term  $\left( \frac{\Pr(r_h|F)}{\Pr(r_h|R)} - \frac{\Pr(r_l|F)}{\Pr(r_l|R)} \right)$ , which is positive iff  $\Pr(r_l|F) < \Pr(r_l|R) \Leftrightarrow g < \frac{\alpha D}{B - \alpha D}$ , where the last claim follows from Proposition 1. Price  $P_j(r^j = r_h, n, \lambda)$  for client  $j$  can be equivalently written as  $P^j(r_h, \widehat{\rho}(n, \lambda))$ . Adapting the pricing equation (6) yields

$$P^j(r_h, \widehat{\rho}(n, \lambda)) = D + \frac{\theta}{\widehat{\rho} [1 - q_R^*(1 - \theta)] + (1 - \widehat{\rho}) [1 - q_F^*g(1 - \theta)]} [x_h - D]$$

So,  $\frac{\partial P(r_h, \widehat{\rho})}{\partial \widehat{\rho}} = \frac{-\theta[1 - q_R^*(1 - \theta) - [1 - q_F^*g(1 - \theta)]]}{[\widehat{\rho}[1 - q_R^*(1 - \theta)] + (1 - \widehat{\rho})[1 - q_F^*g(1 - \theta)]]^2} [x_h - D]$ , which is greater than zero iff  $g < \frac{\alpha D}{B - \alpha D}$ . Hence, it follows that  $g < \frac{\alpha D}{B - \alpha D}$  implies  $P^j(r_h, n, \lambda) > P^j(r_h, n, \lambda - 1)$ . Next, assume that  $g > \frac{\alpha D}{B - \alpha D}$ . It follows then  $g > \frac{\alpha D}{B - \alpha D} \Leftrightarrow \widehat{\rho}(n, \lambda) < \widehat{\rho}(n, \lambda - 1)$ ; and  $g > \frac{\alpha D}{B - \alpha D} \Leftrightarrow \frac{\partial P(r_h, \widehat{\rho})}{\partial \widehat{\rho}} < 0$ . Hence,  $g > \frac{\alpha D}{B - \alpha D}$  also implies  $P^j(r_h, n, \lambda) > P^j(r_h, n, \lambda - 1)$ . Finally, on similar lines, it can be established that  $P^j(r_h, n, \lambda) <$

$P^j(r_h, n - 1, \lambda)$  for any given  $\lambda$ . ■

**Proof of Lemma 2.** Recall that the indicator variable  $\sigma^j = 0$  and  $\sigma^j = 1$  imply that the audit oversight mechanism for client  $j$  fails and does not fail, respectively. Assume that the auditor's private signal for each one of his two clients is  $s_l$ . In this case, the flexible auditor's expected net utility is given by

$$W \text{ if he does not misreport for either of his two clients;} \quad (8)$$

$$B + W - \alpha D \text{ if he misreports for only one of them; and} \quad (9)$$

$$2B + W - M \text{ if he misreports for both clients.} \quad (10)$$

A comparison of (8) and (9), yields  $W < B + W - \alpha D$  and, hence, the auditor will misreport at least for one of his clients if  $\sum_j \sigma^j \leq 1$ . Further, comparing (9) and (10), if  $M - \alpha D > B$  then the auditor will misreport only for one client even if  $\sum_j \sigma^j = 0$ , which condition is met when condition (C5) is satisfied. ■

**Proof of Lemma 3.** Let the flexible auditor's posterior belief that the true outcome is low given a high private signal be  $\omega \equiv \Pr(x_l | s_h, q_F) = \frac{\Pr(x_l \cap s_h | q_F)}{\Pr(s_h | q_F)} = \frac{(1-\theta)(1-q_F)}{1-q_F(1-\theta)}$ . Assume that the auditor's private signal for one client is  $s_h$  while the signal for the other client is  $s_l$ . Auditor's expected net utility is  $W - \omega \alpha D$  if he does not misreport and  $B + W - (1 - \omega)\alpha D - \omega M$  if he overreports his single low signal  $s_l$ . So, the auditor will choose not to misreport his single low signal when that client's audit oversight mechanism fails provided  $W - \omega \alpha D \geq B + W - (1 - \omega)\alpha D - \omega M$ , which condition simplifies to (C5). ■

**Proof of Proposition 3.** The proof proceeds in 3 steps. First, when the flexible auditor observes one low and one high signal, let  $q_F^{1st}$  and  $q_F^{2nd}$  denote his optimal quality choices given that he subsequently overreports and reports the low signal truthfully, respectively. Then we show that for  $k$  sufficiently large and  $B$  sufficiently low (i.e. close to  $\alpha D$ ) the first reporting strategy cannot occur in equilibrium. Solving for the auditor's optimal quality choices by taking first order conditions of the respective

objective functions yields

$$\begin{aligned} q_F^{1st} &= \frac{(1-\theta)[B-g(B-\alpha D)] + (1-\theta)^2 g(M-2\alpha D)}{(1-\theta)^2 [(M-2\alpha D)(2g-1) + (1-g)^2(B-\alpha D)] + k}; \text{ and} \\ q_F^{2nd} &= \frac{(1-\theta)\theta\alpha D + (1-\theta)^2 [M-\alpha D]}{(1-\theta)^2 [M-2\alpha D - (1-g^2)(B-\alpha D)] + k}, \end{aligned} \quad (11)$$

under the two reporting strategies, respectively. For the second reporting strategy to occur in equilibrium the above quality must satisfy condition (C5) which can be written as

$$q_F^{2nd} < \frac{(1-\theta)(M-2\alpha D) - B + \alpha D}{(1-\theta)[M-\alpha D - B]}$$

It can be shown that this is the case for  $k$  sufficiently large and  $B$  close enough to  $\alpha D$ . Similarly, for the first reporting strategy to be part of an equilibrium it must be the case that

$$q_F^{1st} > \frac{(1-\theta)(M-2\alpha D) - B + \alpha D}{(1-\theta)[M-\alpha D - B]}$$

For  $k$  sufficiently large and  $B$  close enough to  $\alpha D$ , it can be shown that  $\frac{(1-\theta)(M-2\alpha D) - B + \alpha D}{(1-\theta)[M-\alpha D - B]} > q_F^{2nd} > q_F^{1st}$ , and hence, the above inequality is violated. Hence, the flexible auditor chooses  $q_F^{2nd}$  and, in equilibrium, truthfully reports a low signal if he obtains a high signal for his other client. The uniqueness of the reporting equilibrium follows from the above arguments when the conditions in Proposition 3 are met. ■

**Proof of Proposition 4.** Letting  $\Delta_q \equiv q_F(2) - q_F(1)$ , where the values of  $q_F(1)$  and  $q_F(2)$  are provided by Lemma 1 and (11), respectively, we get

$$\Delta_q = (1-\theta) \left[ \frac{\theta\alpha D + (1-\theta)[M-\alpha D]}{(1-\theta)^2 [M-2\alpha D - (1-g^2)(B-\alpha D)] + k} - \frac{\alpha Dg + (1-g)B}{k} \right]$$

Part (a): We will establish that

$$\theta > \frac{1-\alpha g}{1-\alpha} - \frac{(1-g)B}{(1-\alpha)D} \quad (12)$$

is a sufficient condition for  $\Delta_q < 0$ , i.e.,  $q_F(2) < q_F(1)$ . Because  $\frac{\partial \Delta_q}{\partial M} > 0$ ,  $\Delta_q < 0$  for all feasible values of  $M$  if  $\Delta_q|_{M=D(1+\alpha)} < 0$  where  $D(1+\alpha)$  is an upper bound on  $M$ . Evaluating  $\Delta_q$  at  $M = D(1+\alpha)$  yields

$$\begin{aligned} \Delta_q|_{M=D(1+\alpha)} &= \frac{\frac{\theta}{1-\theta}\alpha D + M - \alpha D}{M - 2\alpha D - (1-g^2)[B - \alpha D] + \frac{k}{(1-\theta)^2}} \Bigg|_{M=D(1+\alpha)} - (1-\theta)\frac{\alpha Dg + (1-g)B}{k} \\ &< \frac{\frac{\theta}{1-\theta}\alpha D + M - \alpha D}{\frac{k}{(1-\theta)^2}} \Bigg|_{M=D(1+\alpha)} - (1-\theta)\frac{\alpha Dg + (1-g)B}{k} \\ &= \frac{1-\theta}{k} [D - \alpha Dg - (1-g)B - \theta D(1-\alpha)] < 0 \end{aligned}$$

rearranging which yields (12). In the above, the first inequality follows from  $M - \alpha D > B$ , a condition implied by (C5). Hence, a sufficient condition for  $\Delta_q|_{M=D(1+\alpha)} < 0$  is  $\theta > \frac{1-\alpha g}{1-\alpha} - \frac{(1-g)B}{(1-\alpha)D}$ . Further, it can be shown that  $0 < \frac{1-\alpha g}{1-\alpha} - \frac{(1-g)B}{(1-\alpha)D} < 1$ , so that there always exists sufficiently large  $\theta$  such that the condition (12) is met.

Part (b): follows from simple algebraic manipulation that establishes when (12) is met,  $\Pr(AF|F, un) < \Pr(AF|F, ltd)$ .

Part (c): We need to establish that  $\Pr(\text{overreporting}|n=1, F) = (1-\theta)q_F(1)(1-g) > \Pr(\text{overreporting}|n=2, F) = ((1-\theta)q_F(2))^2(1-g^2) \iff q_F(1) > (1-\theta)(q_F(2))^2(1+g)$ . From part (a), we know that for sufficiently large value of  $\theta$ ,  $q_F(1) > q_F(2)$ . Moreover,  $(1-\theta)(1+g) \leq 1$  for  $\theta \geq \frac{1}{2}$ . Hence,  $q_F(1) > (1-\theta)(1+g)q_F(1) > (1-\theta)(1+g)q_F(2) > (1-\theta)(q_F(2))^2(1+g)$ , which establishes the desired result. ■

**Proof of Corollary 1** Follows from a comparison of simple derivatives. ■

**Proof of Proposition 5.** Part a. Letting  $q_R(2)$  be the solution to the rigid auditor's FOC, we have

$$q_R(2) = \frac{(1-\theta)\theta\alpha D + (1-\theta)^2(M - \alpha D)}{(1-\theta)^2(M - 2\alpha D) + k} \quad (13)$$

First note that for  $M \rightarrow 2\alpha D$ , we have  $q_R(2) \rightarrow \frac{(1-\theta)\theta\alpha D + (1-\theta)^2\alpha D}{k} = \frac{(1-\theta)\alpha D[\theta + 1 - \theta]}{k} = \frac{(1-\theta)\alpha D}{k} = q_R(1)$  which is the rigid auditor's quality choice when he has only one client

(which is the same as when the audit firm's wealth is unlimited, Lemma 1).

$$\begin{aligned} \frac{\partial q_R(2)}{\partial M} &= (1-\theta)^2 \frac{k - (1-\theta)\theta\alpha D}{[(1-\theta)^2(M - 2\alpha D) + k]^2} > (1-\theta)^2 \frac{(1-\theta)\alpha D - (1-\theta)\theta\alpha D}{[(1-\theta)^2(M - 2\alpha D) + k]^2} \\ &= (1-\theta)^2 \frac{(1-\theta)\alpha D [1-\theta]}{[(1-\theta)^2(M - 2\alpha D) + k]^2} > 0 \end{aligned}$$

where the first inequality follows from the assumption that  $k$  is sufficiently large so that  $q_R(1) = \frac{(1-\theta)\alpha D}{k} \in (0, 1)$ . Condition (C5) implies that  $M > 2\alpha D$ . Since  $q_R(2) = q_R(1)$  for the minimum of  $M$  and  $\frac{\partial q_R(2)}{\partial M} > 0$  it follows that  $q_R(2) > q_R(1)$  and hence  $\Pr(AF|R, n=2) < \Pr(AF|R, n=1)$ .

Part b. Comparing (13) and (11) yields  $q_R(2) < q_F(2)$ . Taking derivatives yields the comparative statics results. ■

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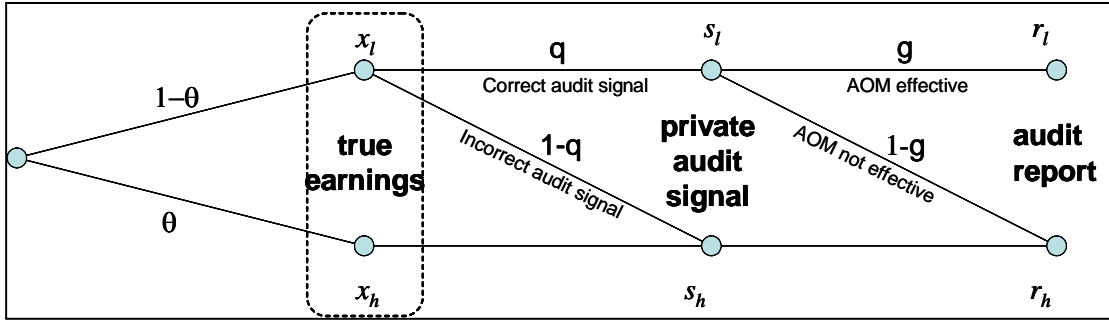


Figure 1: Reporting options for the flexible auditor

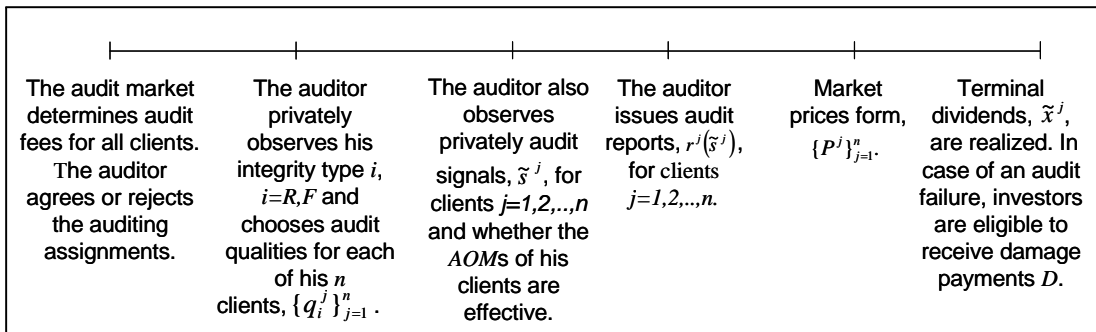


Figure 2: Timeline