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Audit partner identification and audit quality

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Abstract
This paper studies the effects of disclosing the audit engagement partner's identity on individual and partnership incentives and overall audit quality. We model a collective decision problem, incorporating individual engagement partners' preferences with the partnership's choice of internal quality control. In our model, disclosure of the individual engagement partner (on Form AP) influences the probability that clients observe individual partners' past performance. While Form AP disclosure increases individual partners' incentives to provide high-quality audits for a given level of internal quality control within the partnership, it may simultaneously decrease the partnership's incentives to maintain good internal quality control systems, leading to a net degradation in audit quality. Our paper also demonstrates that the level of external audit oversight is critical in determining whether Form AP disclosure enhances audit quality.

Keywords Audit · Engagement partner · Audit transparency · Partner naming · Audit quality

JEL classification M41 · M42 · M48

1 Introduction

Following six years of discussion and four rounds of public comment, the Public Company Accounting Oversight Board (PCAOB) adopted rules to identify engagement partners on audits. Both the name of the engagement partner and details about the extent to which other accounting firms participate in the audit must be disclosed on

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Form AP, Auditor Reporting of Certain Audit Participants for each Securities and Exchange Commission (SEC) registrant. The PCAOB believes that the increased transparency will lead to higher quality audits by providing (i) individual effort incentives to partners and (ii) audit firm incentives to organize audit teams more conscientiously (Public Company Accounting Oversight Board 2015). While research has found that audit quality varies at the audit partner level (Gul et al. 2013) and that investors value audit partner information (Knechel et al. 2015; Aobdia et al. 2015; Dee et al. 2015), whether disclosing the engagement partner's name leads to improved audit quality is yet to be determined.[1]

Our paper focuses on how partner naming, which we refer to as Form AP disclosure, affects audit firms' and engagement partners' incentives and ultimately audit quality by modeling partner naming as an increase in the probability that an individual partner's performance becomes known. We find countervailing effects of naming engagement partners. Public disclosure increases partners' reputation risk and provides incremental partner incentives to conduct a high-quality audit. However, in turn, audit firms may invest less in firm-wide internal quality control systems in response to the increased individual efforts. The net effect is ambiguous, and we demonstrate that conditions exist under which partner naming results in lower overall audit quality.

In this paper, we construct a multiperiod audit model that allows us to study the effects of disclosing engagement partner's names on audit quality. We define a high (low) quality audit as one for which the audit procedures are sufficient (insufficient) to justify the audit opinion, according to professional standards and rules of the SEC and PCAOB.[2]

The International Auditing and Assurance Standards Board views audit quality in terms of three fundamental aspects: inputs, outputs, and context factors. These include factors such as the auditor's personal attributes, the audit process, the auditor's report, the auditee's corporate governance, and law and regulation (International Auditing and Assurance Standards Board 2011). To capture the underlying fundamentals of audit quality, we include the following factors in our model: engagement partner ability, the effort the engagement partner exerts, the internal quality control system of the audit firm, and the level of external oversight. Engagement partner ability (type) is either good or bad and ex ante affects the probability of a high-quality audit, holding fixed all other parameters.[3] Engagement partners choose an effort level in each period, depending on their type, the audit firm's internal quality control system, and the level of external oversight.

[1] Two empirical studies using data from countries with partner disclosures have different conclusions. Carcello and Li (2013) find evidence suggesting that engagement partner signature requirements lead to improved audit quality, whereas Knechel et al. (2015) find that an auditor who fails to issue a timely going-concern opinion is much more likely to fail again, compared to an auditor without that history, despite being individually identified.

[2] This definition follows the practitioners' view of audit quality that focuses on whether an audit is conducted according to relevant audit standards. Aobdia (2019a) shows that there is significant concordance between this definition of audit quality and several academic measures of audit quality, especially the issuance of a restatement and the propensity to meet or beat the zero earnings threshold. This definition is also consistent with the definition of audit quality used by DeFond and Zhang (2014) in that it refers to not only the correctness of the audit opinion but the quality of the opinion itself.

[3] Prior research suggests that auditor characteristics such as engagement partner's tenure, risk tolerance, and industry specialization affect the audit process (Chen et al. 2008; Zerni 2012).

The audit firm's internal quality control system in our model improves low-quality audits before they are publicly issued and decreases the likelihood that the final audit will be deemed deficient. The greater the audit firm's investment in internal quality controls, the more likely the audit process will lead to high-quality final reports. Moreover, if the internal quality control system detects a problem, it is known only within the audit firm and can be remedied prior to issuance without any reputation loss.

Each finalized audit is then subject to external oversight, which identifies (some) low-quality audits that persist. The external oversight can come from regulatory bodies, such as the SEC or the PCAOB, or from investors and clients, who monitor an audit firm or partner based on past performance and other audit quality indicators, such as audit firm characteristics or the financial reporting quality of their clients. (See DeFond and Zhang (2014) for more detailed examples of audit quality indicators.) The signals resulting from the external oversight can be direct (e.g., restatements, Accounting and Auditing Enforcement Releases (AAERs), and PCAOB inspection reports) or indirect (e.g., the audit quality indicators mentioned above). In our model, investors always observe a summary signal for the audit firm — namely the total number of the audit firm's clients with audits identified as low quality by the external oversight. Form AP disclosure discretely increases the amount of information that is observed at the individual partner level.

In our multiperiod model, the external oversight outcomes of the first period are revealed and used for pricing the engagements in the second period. That is, based on the external oversight signals from the first period along with the (known) internal quality control efforts of the audit firm, clients form their expectations of engagement partner ability and determine the second period audit fee, where "good" engagement partners are awarded higher fees.[4] We assume that an engagement partner's benefits are tied directly to the revenues that person generates and thus, when choosing effort, an individual partner considers how effort choice will affect his or her individual reputation and consequently second period audit fees as well as the expected disutility incurred from exerting effort and the expected disutility from performing additional procedures that the audit firm's internal quality control systems may require.

We find that, although Form AP increases individual engagement partner effort, the increased individual effort motivated by a higher level of partner identification can decrease the audit firm's optimal investment in costly internal quality control systems. After all, why would the audit firm incur significant costs to monitor agents who are already working hard? The offsetting nature of increased engagement partner effort and decreased investment in internal quality control can ultimately lead to overall lower audit quality. Specifically, audit quality *decreases* when external oversight is not strong enough to motivate the audit firm to maintain a sufficient level of internal quality control. We discuss how the imposition of a minimum (and sufficient) level of internal quality control can mitigate the lower audit quality resulting from Form AP disclosure, and how the effects of this disclosure may vary across firms due to variations in the strength of external oversight. Alternatively, we discuss how audit firms can effectively

[4] Although most people assume fees are consistently increasing, year-to-year reductions in audit fees are not uncommon. Over 1100 of approximately 6500 filers experienced fee decreases in 2015 (Allocca 2016).

avoid the effects of Form AP disclosure by establishing long-term contracts (i.e., those that span several periods) with their clients.

Two papers study the implications of engagement partner naming analytically.[5] Carcello and Santore (2015) predict that partner naming will result in weakly higher conservatism among individual partners and that partners will devote more resources into the audit. This is consistent with our finding that partner naming increases individual partners' incentives to exert more effort for a given level of internal quality control within the audit firm. Our model differs from that of Carcello and Santore (2015) by endogenizing the audit firm's internal quality control decision and introducing external oversight. Basu and Shekhar (2019) also examine the reputation incentives of engagement partners under partner naming where the issuer can pressure the engagement partner to overlook a negative signal ('acquiesce') and the monitoring partner may choose not to report on the engagement partner's incorrect audit report after perfectly identifying one.

A main objective of Form AP disclosure is to increase audit transparency. Chen et al. (2019) show that, while greater transparency in terms of disclosing information about the precision of audit opinion may assist investors' decision-making, it may also distort partners' incentives, potentially resulting in lower audit quality. Our study shows that greater transparency in terms of disclosing the identity of engagement partners can also decrease audit quality.

More generally, our study relates to the literature on the roles of individual and group reputations in partnerships. Tirole (1996) studies how the interaction between group and individual reputations affects the group's incentives to maintain their reputation when imperfect information regarding individual performance is available. Huddart and Liang (2003) examine optimal partnership structure, including size, distribution of responsibilities, and incentive contracts to reduce shirking behavior when partners perform both production and monitoring functions.[6] Chen et al. (2013) study an investment banking setting, where the bank strikes a balance between investing in short-term individual reputation and long-term institutional reputation. They find conditions where the bank preserves its long-term institutional reputation using monitoring. Motivated by these papers, our paper seeks an understanding of the effects of the Form AP requirement on the interaction between individual engagement partners' and partnerships' accountability.

We also contribute to the literature on regulation and audit quality. "Because regulation may not always appropriately consider the economic theory underlying the market for assurance services, it is likely that the positive benefits obtained from regulation will also be tempered by negative consequences" (Knechel 2016). Kornish and Levine (2004) show the costs associated with restricting the provision of non-audit services do not come with an offsetting increase in the quality of audits. Bronson et al. (2011) show that regulatory requirements intended to improve financial statement reliability have decreased the reliability of numbers

[5] Two empirical studies supporting the usefulness of individual auditor information in assessing audit quality are Gul et al. (2013), which uses Chinese data to show that audit quality varies across individual auditors, and Aobdia et al. (2015), which finds evidence from Taiwanese data that the engagement partner's identity provides informational value to investors beyond the identity of the audit firm.

[6] Narayanan (1995) shows how the threat of noncooperation or expulsion can mitigate the moral hazard problem in partnerships in repeated games.

in preliminary releases. Like these researchers, we note that partner naming has opposing effects on audit quality and illustrate cases in which the net effects of disclosing the identity of individual engagement partners are detrimental to audit quality.

Finally, we contribute to the broader literature on certification and how to ensure certification quality. Leland (1979) shows that, in markets with asymmetric information about a product's quality, minimum quality constraints may improve overall welfare. Raymond (1999) shows how the optimal inspection rates and fine for noncompliance depend on the distribution of firms' compliance costs. Both Mathis et al. (2009) and Stolper (2009) study the conflict of interests credit rating agencies face. The former examines whether credit rating agencies' reputational concerns are sufficient to mitigate the conflict, while the latter finds a regulatory approval scheme that can deter credit rating agencies from inflating their ratings.

Causholli and Knechel (2015) show that there are aspects of an audit which may fit the description of a credence good, that is, a good whose quality cannot be observed even after purchase; they discuss professional and institutional arrangements that may help to reduce inappropriate levels of auditing or fees. The economics literature also examines several mechanisms for reducing the problems that arise with credence goods, including multiperiod contracts and warranties (Taylor 1995), multiple opinions (Wolinsky 1995), and activism (Feddersen and Gilligan 2001). In this paper, after demonstrating the potential consequences of partner naming, we discuss further enhancements that might allow us to regain high audit quality.

The paper is organized as follows. Section 2 presents the model. Section 3 analyzes the audit partnership's choice of internal quality control and the individual partner's choice of effort. Section 4 presents the main results, showing how partner naming influences individual engagement partners' incentives, the partnership's choice of internal quality control, the expected audit quality, and the partnership's payoffs. Section 5 discusses the policy and empirical implications of our findings, and Section 6 concludes. Proofs are in the appendix.

2 Model

We develop a two-period model, where an audit partnership provides auditing services to clients in both periods. We evaluate decisions at the individual engagement partner level and at the collective audit partnership level. A multiperiod model is essential to capture the reputational concerns that audit partners face.

2.1 Audit quality

Audits can be either high (H) or low (L) quality, where a low-quality audit is one in which the engagement partner has not collected sufficient evidence to support his audit opinion. Though a deficient (sufficient) audit does not necessarily indicate the financial statements are inaccurate (accurate), it seems reasonable to assume that inaccuracies are less likely to be detected when audits are deficient. Therefore we give investors a preference for high-quality audits and denote the value of an audit of quality q as v_q,

where $v_H > v_L$, and $\Delta v \equiv (v_H - v_L)$ represents the value-added of a high-quality audit, compared to a low-quality audit.[7] Since audit fees are driven by audit quality in this model, this also represents the differential compensation for a high-quality audit, compared to a low-quality audit. Audit quality in each period depends on the engagement partner's type, his effort choice, and the effectiveness of the audit partnership's internal quality control system. For a complete list of notation, see Table 1.

2.2 Engagement partners

Each engagement partner belongs to one of two types, good (G) or bad (B). For simplicity, we assume it is public knowledge that each partner type is equally likely; that is, $Pr(G) = Pr(B) = 1/2$. Individual engagement partners learn their type in time to make effort decisions.

The individual engagement partner's effort choice is denoted as $e_t \in \{0, 1\}$ for $t = 1, 2$, where $e_t = 1$ represents high effort and $e_t = 0$ represents low effort in period t. Without taking into consideration the partnership's internal quality controls, a partner of type B choosing high effort will generate a high-quality report ($q = H$) with probability θ and a low-quality report with probability $(1 - \theta)$. The parameter $\theta \in (0, 1)$ captures the effectiveness of exerting high effort and in practice, it would be determined by factors such as the training level of engagement partners, the match between the engagement partner and client characteristics, engagement partner expertise, or the complexity of the audit. A B-type partner choosing low effort will always generate a low-quality audit ($q = L$). In contrast, a G-type partner will always produce a high-quality audit, regardless of his effort choice.[8] Exerting effort results in a disutility with an equivalent monetary value of $e\delta$.[9] Effort choice is unobservable and cannot be used directly in contracting. To focus our attention on the supply side of audit quality, we assume that clients are identical in terms of the amount of work required to provide a high-quality audit.

2.3 Audit partnership and internal quality control

Individual auditors are exogenously organized into partnerships comprised of N audit partners.[10] The audit of a particular client is conducted by a single audit team, led by an individual engagement partner who bears responsibility for the planning, execution, and outcome. Each period, the audit partnership randomly creates each "engagement," matching a partner with a client. In practice, audit partners are usually not reassigned annually, but public companies *are* required to rotate the lead engagement partner every

[7] Aobdia et al.'s (2015) findings are consistent with audits by a higher quality engagement partner having a greater value to the client. While the value of an audit would be determined by investors' perception of the audit quality, to focus the analysis on the interaction between individual partners and the partnership, we abstract away from the interaction between investors and the client.

[8] Relaxing the assumption that G-type partners always produce a high-quality audit lessens but does not eliminate partner identification's effect on individual effort, leaving our results qualitatively unchanged.

[9] Equivalently, we could assume that G-type partners produce high-quality audits with probability one if they exert high effort and their disutility of exerting high effort is zero.

[10] Although unmodeled, forming a partnership provides several obvious advantages, including effective recruiting to screen bad types and economies of scale for internal quality control investments (Gu et al. 2017).

Table 1 Notation

Variable	Description
N	Number of audit partners in partnership
$q \in \{H, L\}$	Audit quality
$v \in \{v_H, v_L\}$	Audit value
$i \in \{G, B\}$	Audit partner type
$e_t \in \{0, 1\}$	Audit partner effort choice in period t
$\theta \in (0, 1)$	Probability of a B-type partner producing a high-quality audit when exerting effort $e = 1$
δ	Disutility of exerting effort
$\eta \in [0, 1)$	Partnership's internal quality control
c	Internal quality control cost parameter
k	Disutility incurred by partner when audit is detected as low quality by the partnership's internal quality control system
$\varepsilon \in (0, 1)$	Probability of external oversight detecting deficiency
$\sigma_n \in (0, 1)$	Signal resulting from the external oversight process for audit n
$s_n \in (0, 1)$	Observed signal resulting from the external oversight process for audit n
$\beta \in (0, 1)$	Degree of partner identification
ω	Audit fee
$\overline{\square}$	Threshold value
$\widehat{\square}$	Conjectured value

five years, according to SOX §203. Each period in this model can be thought of as the term of assignment for a single engagement partner to a client.

A managing director, who does not lead any engagements herself, determines the investment in the internal quality control system; she thus chooses the level of investment that maximizes the expected net benefits to a representative partner or the partnership's expected net payoff over both periods. The effectiveness of the internal quality control system is characterized by parameter $\eta \in [0, 1)$, which is held fixed throughout the two periods.[11] Prior to issuing the audit report, the partnership's internal quality control system detects low-quality audits with probability η; high-quality audits are never incorrectly detected as low. That is, η is the probability that an audit is detected to be low quality by the internal quality control system, conditional on it being low quality. It also requires the audit partner to remedy the detected low-quality audit prior to issuing the final report. Therefore the probabilities that the final quality of a type B partner's audit is high when shirking and exerting high effort are $\Pr(H|B, e = 0) = \eta$ and $\Pr(H|B, e = 1) = \theta + (1 - \theta)\eta$, respectively. Internally identified audit deficiencies are known only within the partnership, to prevent reputation loss.

To establish the internal quality control system, the audit partnership makes a one-time investment of $C(\eta) = cN\eta^2$ at the beginning of period 1, where $c > 0$. Partners share

[11] Since we assume internal quality control is observable, we constrain the internal quality control system to be held fixed throughout the two periods for consistent model logic. That is, we can view η as the average level of internal quality control within the audit firm as small marginal adjustments to internal quality control between periods might be difficult to detect.

equally in the cost of implementing the internal quality control system. The internal quality control system also imposes a personal cost on an individual engagement partner if it requires the partner to do additional work to deliver a high-quality audit that he otherwise would not have done. The disutility of having to do additional work has a monetary value of $k > 0$.[12] We assume that the cost parameter is sufficiently high, or $c > \frac{1}{2}(1-\theta)(\Delta v - k)$, such that establishing a perfect internal quality control system of $\eta = 1$ is not an attractive option. We further assume that $k < \Delta v$, such that the personal disutility of additional procedures resulting from the internal quality controls is not so high that the partnership will never establish an internal quality control system.

Once an audit is complete, the partnership issues the final audit report and clients pay their audit fees, ω. Consistent with the findings of Knechel et al. (2013), partners' benefits are directly proportional to their individually earned audit fees. As in prior literature (e.g., Dye 1993), we assume that the potential number of clients is greater than the number of audits the partnership can provide, and therefore the resulting audit fee is set equal to the expected value of the audit provided.

2.4 External oversight

Though clients cannot discern the resulting audit quality directly, they can imperfectly learn about the quality over time through external oversight. External oversight identifies low-quality audits with probability $\varepsilon \in (0, 1)$, which is exogenous and known by all market participants. Thinking of the effectiveness of the internal quality control systems and external oversight in a probabilistic nature captures the idea that not all deficient audits will be identified. For example, the PCAOB does not inspect all audit engagements, and not all inspections will uncover a deficiency even if there is one. Therefore, the ex-ante probability of detection of a low-quality audit is equivalent to *Pr(inspection)* × *Pr(detection).*

The resulting signal for audit n is denoted as $\sigma_n \in \{0, 1\}$, where $\sigma_n = 0$ indicates no deficiency was detected and $\sigma_n = 1$ indicates that the audit was identified to be deficient by external oversight at the end of period 1. If we denote the audit quality of the nth engagement as q_n, the probabilities of each signal realization, given the actual audit quality, are $\Pr(\sigma_n = 0 | q_n = H) = 1$, $\Pr(\sigma_n = 1 | q_n = L) = \varepsilon$, and $\Pr(\sigma_n = 0 | q_n = L) = (1 - \varepsilon)$.The results of external oversight are always publicly observable at the partnership level. That is, clients always observe $s = \sum_{n=1}^{N} \sigma_n$, the total number of audits performed by the *partnership* that were identified to be deficient by external oversight in the first period.

[12] Although we have provided an interpretation based on effort (i.e., an engagement partner that is flagged must do some further work to comply with the standards of a high-quality audit), the costs may be more implicit. That is, if performance reviews depend on the outcome of the internal quality control system, then an engagement partner would bear some real economic costs of having been identified as producing a low-quality audit in the first round. For example, according to a KPMG report, "audit partners and leaders are evaluated based on an assessment of audit quality indicators" of which the results will "directly affect compensation and advancement of KPMG personnel, including partners." The report also notes that audit partners may receive "audit quality bonuses" (KPMG, 2016).

2.5 Engagement partner identification and partner naming regulation

To incorporate partner identification into the model, we include a parameter, β, which captures how much of that external oversight information becomes observable at the individual partner level. At the extreme $\beta = 0$, only signals about the partnership's performance would be observable, whereas, at $\beta = 1$, clients would observe the full vector of individual engagement partner outcomes ($\sigma_1, \ldots, \sigma_N$) and engagement partners can be perfectly linked to identified deficient audits. Capturing the effects of partner identification using the parameter β implicitly assumes that partner identification produces no additional aggregate information but allows the existing information to be disclosed in a more detailed manner. Since the signals regarding audit quality are produced by the external oversight, $\beta\varepsilon$ represents *Pr(inspection)* × *Pr(detection)* × *Pr(observation)* regarding the individual partner's performance. We denote the observed individual partner's signal as $s_n \in \{0, 1\}$, where $s_n = 1$ indicates that audit n was observed to be deficient (that is, the signal $\sigma_n = 1$ becomes observable) and $Pr\,(s_n = 1 |\, \sigma_n = 1) = \beta$. It follows that $s_n = 0$ indicates that either the signal $\sigma_n = 0$ is observed or the individual partner's signal is not observable, where $Pr\,(s_n = 0) = Pr\,(\sigma_n = 0) + (1 - \beta)\,Pr\,(\sigma_n = 1)$.

We consider the effect of Form AP disclosure to be a (nonnegligible) increase in the degree of partner identification β. The focus of this paper is how Form AP disclosure, or an increase in β, affects the audit partnership's and engagement partners' incentives and ultimately audit quality.

Figure 1 presents the timeline of the model, and Fig. 2 presents the probability structure. The endogenous variables are the partnership's level of internal quality control effectiveness η, engagement partner effort e_{it} for $i \in \{G, B\}$ and $t \in \{1, 2\}$, and the first and second period audit fees ω_1 and ω_2, respectively. Parameters δ, k, N, θ, v_H, v_L, β, ε, and η are public information, and all agents are assumed to be risk neutral. Conjectures are denoted with a hat, thresholds are denoted with an overbar, and optima are denoted with an asterisk.

2.6 Discussion of key variables

Before proceeding, we discuss the interpretation of several key variables and how they capture the impact of the new disclosures required in Form AP. The variable η captures the audit partnership's pre-issuance internal quality control efforts. These include engagement quality control reviews required by Auditing Standard No. 7 (AS 7), enhancement in audit processes and the development of audit technology, consultation with technical specialists and development of internal accounting specialists, or other

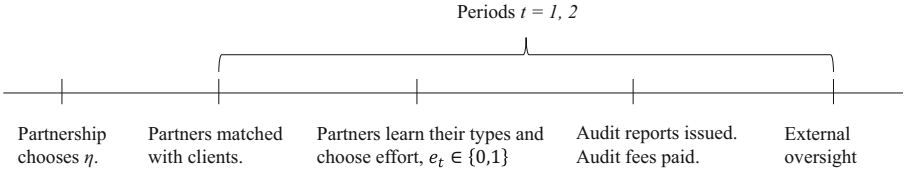

Fig. 1 Timeline of events

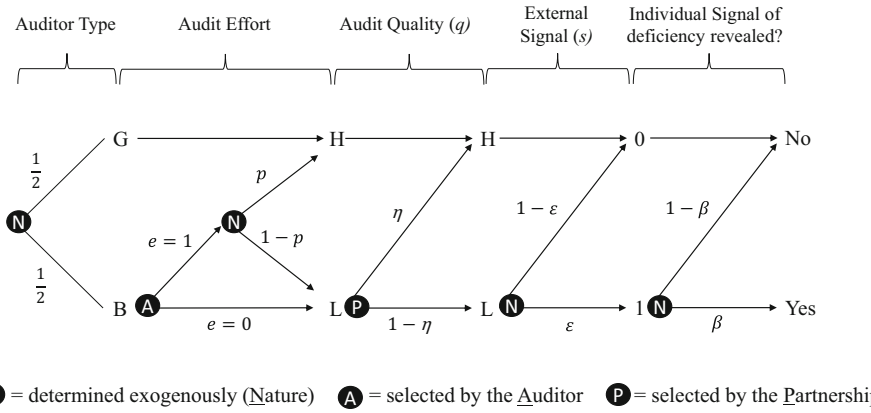

Fig. 2 Probability structure: Effort, type and monitoring levels

audit firm specific internal monitoring programs. In particular, AS 7 states: "In an audit, the firm may grant permission to the client to use the engagement report only after the engagement quality reviewer provides concurring approval of issuance."

To illustrate, Ernst and Young (2018) writes: "We do not wait for the audit to be complete before assessing … performance. We conduct rigorous reviews of specific areas of selected public company audits before we issue an auditor's report." Similarly, Deloitte (2016) writes: "Our Quality Performance Review program encompasses ongoing, rigorous internal inspections to promote continuous improvement in audit quality. .. the EQCR (engagement quality control reviewer) is required to complete their report before the auditor's report is issued." Undoubtedly there are also various post-issuance quality control mechanisms, such as post-issuance reviews, but these are unmodeled here.

The level of external oversight and the resulting signals are denoted by ε and σ_n. Audits are subject to external oversight from the PCAOB, the SEC, and litigation from investors and other related parties. This external oversight may result in signals about audit failure, such as PCAOB inspection reports, AAERs by the SEC, or restatements of financial statements. The probability that a low-quality audit will be identified as deficient by these external oversight mechanisms is modeled as ε, where a higher ε implies more extensive or thorough external oversight. The signal σ_n is the result of the external oversight and is a binary indicator indicating whether the audit was found deficient. This is a simplification as signals from different oversight mechanisms imply varying degrees of audit failure from audit deficiencies to incorrect audit opinions. However, all these signals provide evidence on the audit quality provided by the audit firm.

We refer to the degree to which these signals are indicative of the individual partner's performance as partner identification, β, and capture the effect of Form AP disclosure as an increase in β. In our model, β is the probability that the signal $\sigma_n = 1$ becomes observable, $Pr(s_n = 1 |\ \sigma_n = 1) = \beta$. In practice, β is likely to be somewhere between zero and one. Even without the increased requirements in Form AP, clients would occasionally learn of an engagement partner's past audit failures through AAERs (where the individual partner could be named), and, even with Form AP

filings, investors cannot identify which engagement partners' audits were deemed deficient by the PCAOB's inspections, since the PCAOB is restricted from publicly identifying the engagements selected for inspections by the Sarbanes-Oxley Act (§104) of 2002. For the following analyses, we assume $\beta \in (0, 1)$.

3 Equilibrium

An equilibrium is defined as follows.

Definition 1 *An equilibrium consists of the partnership's choice of internal quality control effectiveness η, effort choices {e_{i1}, e_{i2}} of each partner type i ∈ {G, B}, and audit fees for each period ω_1 and ω_2 such that:*

(i) *The level of internal quality control maximizes the expected profit for the partnership, given expected effort choices and expected audit fees.*
(ii) *Audit fees are set to the expected value of the audit.*
(iii) *Each engagement partner selects a level of effort in each period to maximize utility.*
(iv) *Beliefs are confirmed in equilibrium.*

Choosing η to maximize the aggregate partnership's expected profit is equivalent to choosing the level that maximizes the expected profits of a representative partner, or

$$\eta = \underset{\eta \in [0,1)}{\operatorname{argmax}} \sum_{t=1}^{2} E(\omega_t(\eta)) - \frac{1}{2}\left(\hat{e}_{Bt}[\delta + (1-\theta)\eta k] + (1-\hat{e}_{Bt})\eta k\right) - c\eta^2, \tag{1}$$

where $\hat{e}$ represents conjectures about individual effort.

Once η is chosen, clients and the partnership agree upon an audit fee, ω_t, equal to the expected value of the audit to be provided in period t based on the observable η and partners' conjectured effort choices. Specifically, the audit fee is set to:

$$\omega_t = E[v|\eta, \hat{e}_{Gt}, \hat{e}_{Bt}] = \Pr(H|\eta, \hat{e}_{Gt}, \hat{e}_{Bt})v_H + \Pr(L|\eta, \hat{e}_{Gt}, \hat{e}_{Bt})v_L. \tag{2}$$

Since clients do not have information regarding the individual partner's type at the beginning of the game ($t = 1$), the first period audit fee will be the same for all partners. However, with partner identification ($\beta > 0$), the second period audit fee can vary among partners. The second period revenues of a partner who has been identified with a low-quality audit (i.e., a type B partner) will be lower than auditors who are not identified with low-quality audits. This contrasts with the case when $\beta = 0$ and clients cannot determine auditor type, in which case each engagement partner's fees would be identical in the second period as well.

As individual partners choose their second period effort after second period audit fees are set, the effort choice in period 2 is determined by a cost minimization problem. Type B partners select an optimal level of effort for period 2, according to (3) below.

$$e_{B2} = \underset{e\in\{0,1\}}{\operatorname{argmin}}\ e[\delta + (1-\theta)\eta k] + (1-e)\eta k. \tag{3}$$

Type *B* partners' first-period effort choice problem incorporates how their effort choice affects the second-period audit fees through their external oversight outcome:

$$e_{B1} = \underset{e\in\{0,1\}}{\operatorname{argmax}}\ E(\omega_2|e) - e[\delta + (1-\theta)\eta k] - (1-e)\eta k. \tag{4}$$

Type *G* partners generate high-quality audits, regardless of their effort choices, and therefore they will always choose to exert low effort (i.e., $(e_{G1}, e_{G2}) = (0, 0)$) to minimize their expected costs. While this paper focuses on symmetric equilibria, where partners of the same type choose the same strategy, we do not assume that partners of the same type coordinate their strategies.[13]

In the remainder of this section, we analyze the model and present the equilibrium. We first look for individual partners' optimal effort choices and the audit fees in each period given η. Then we solve for the partnership's optimal choice of η, anticipating individual partners' optimal responses and the expected audit fees. As we have already established that *G*-type partners' effort choices are $(e_{G1}, e_{G2}) = (0, 0)$, in the following analyses, we focus on solving for the *B*-type partners and drop the partner type subscript from our effort notation.

Examining the strategy of type *B* partners, the solution to Expression (3) yields high second-period effort for high values of η and low second-period effort for low values of η. We assume that $\delta < \theta k$ holds, so that the effect of internal quality control on motivating partners' effort is not trivial. For type *B* partners' first-period effort choice, (4) also incorporates the effect on the (anticipated) second-period audit fee, where $E(\omega_2|\, e_1) = Pr\,(s_n = 0|\, e_1)\ \omega_2(0) + Pr\,(s_n = 1|\, e_1)\omega_2(1)$.

$$Pr(s_n = 1|e_1) = (1-e_1\theta)\beta\varepsilon(1-\eta) \tag{5}$$

is the probability that clients observe a deficient audit conducted by a *B* partner, given a first-period effort choice of e_1. This combines the probability that the audit is deficient, that it is detected by external oversight, and that the signal regarding the individual partner's performance becomes available. The probability that clients do not observe such a signal is $Pr(s_n = 0|\, e_1) = 1 - Pr\,(s_n = 1|\, e_1)$.

The second-period audit fee, $\omega_2(s_n)$, $s_n \in \{0, 1\}$ depends on the individual partner's first-period signal from external oversight and is:

$$\omega_2(s_n) \equiv E(v_2|s_n) = v_L + \left\{\eta + (1-\eta)\left[\phi_{s_n} + \left(1-\phi_{s_n}\right)\widehat{e}_2\theta\right]\right\}\Delta v,$$

[13] Green and Porter (1984) show a setting where collusion may occur in the presence of imperfect information. In their setting, firms can only observe the market price, which imperfectly reflects other firms' past quantity choices. Anticipating the effect of their quantity choice on market price, individual firms collude which involves penalizing the industry whenever the market price drops below a trigger price. In the current paper, external oversight imperfectly reflects individual partners' actions and affects future prices, while internal controls provide additional disincentives for partners to deviate.

where ϕ_{s_n} represents clients' beliefs that a partner is type G, with the observed external oversight signals taking on the values $s_n = \{0, 1\}$. Specifically, $\phi_1 = Pr(G|\, s_n = 1) = 0$ and

$$\phi_0 = Pr(G|s_n = 0) = \frac{1}{Pr\left(s_n = 0|\widehat{e}_1\right) + 1}. \tag{6}$$

Since good engagement partners always deliver high-quality audits, the conditional probability that audit partner n is good when the audit is found to be deficient is zero. To calculate the beliefs regarding partner type in expression (6), there are four possibilities to consider. First, the partner is type G; second, the partner is type B, and the audit quality was high; third, the partner is type B, and the audit quality was low but external oversight failed to detect it; or fourth, external oversight detects the deficiency, but the signal is not disclosed for the individual partner.[14]

The individual partner's problem in the first period also depends on the conjectured second-period effort choice $\widehat{e}_2$ through its effect on the expected second-period audit fee $E(\omega_2|\, e_1)$. When the partnership selects an η greater than or equal to the threshold $\overline{\eta} \equiv \delta/(\theta k)$, then $\widehat{e}_2 = e_2 = 1$, and Lemma 1 shows that type B partners' optimal first-period strategy is to exert high effort as well. When the partnership selects an η less than $\overline{\eta}$, clients conjecture that type B partners will exert low effort in the second period. Substituting $\widehat{e}_2 = 0$ into (4) and finding conditions where beliefs are confirmed (i.e., $e_1 = \widehat{e}_1$) gives the conditions in Lemma 1, for each level of η.

Lemma 1 *If* $\eta \in [\overline{\eta}, 1) \Rightarrow (e_1, e_2) = (1, 1)$. *If* $\eta \in (0, \overline{\eta})$, *and if*

$$\text{(i)}\ \ \beta\varepsilon(1-\eta)^2\theta\Delta v - (\delta - \theta\eta k)[2 - \beta\varepsilon(1-\eta)(1-\theta)] \geq 0 \Rightarrow (e_1, e_2) = (1, 0), \tag{7}$$

$$\text{(ii)}\ \ \beta\varepsilon(1-\eta)^2\theta\Delta v - (\delta - \theta\eta k)[2 - \beta\varepsilon(1-\eta)] < 0 \Rightarrow (e_1, e_2) = (0, 0). \tag{8}$$

From Lemma 1, we can see that, as long as there is some level of partner identification ($\beta > 0$), the level of external oversight (ε) affects individual partners' effort choices through two channels. First, the intensity of external oversight determines the probability of receiving a deficient report. Second, it affects audit fees, when $s_n = 0$, by influencing how clients update their beliefs regarding a partner's type. When clients observe $s_n = 0$, clients revise their expectations upward that the partner is type G, and this increase is greater when the level of external oversight is stronger.

[14] Although it may seem that an audit firm could simply fire a partner who was revealed to be type B, there are two reasons we do not consider this. First, our assumption that good engagement partners always produce high-quality audits is made for tractability; it is likely that even good partners sometimes produce deficient audits, albeit with a lower probability than bad partners. Second, partnership agreements are written so that it is difficult to terminate a partner. Whether such partnership arrangements are optimal is outside the scope of our model.

The following corollary demonstrates how partner identification impacts individual partners' effort choices and how this impact is affected by the level of external oversight.

Corollary 1 With $\eta \in (0, \overline{\eta})$ and $\beta > 0$,

(i) Type *B* partners' incentives to exert high effort in the first period are increasing in the degree of partner identification (β) for a given level of internal quality control,
(ii) The range of parameters for which type *B* partners exert effort in the first period for a given $\eta \in (0, \overline{\eta})$ is increasing in ε.

Part 1 of Corollary 1 shows that type *B* partners exert more effort, the more individually accountable for first period performance they are. Part 2 of Corollary 1 provides insights into the effect of external oversight on individual partners' incentives by analyzing the left-hand sides of the inequalities in (7) and (8). External oversight strengthens the effects of partner identification by lowering the threshold for motivating individual partners to exert (weakly) more effort. This is because the amount of information regarding an individual partner's performance that is provided with partner identification is determined by the product of external oversight and the degree of partner identification, that is, $\beta\varepsilon$. Note that, when η is high, engagement partners are already selecting a high effort level, regardless of the level of external oversight. Only when η is lower will the level of external oversight and partner identification influence partners' effort, with greater external oversight leading to more effort.

Getting a sufficiently high level of ε may be impossible or prohibitively costly, given the regulatory constraints and the resources and support available to the PCAOB, SEC, and other bodies. In the analysis that follows, we focus our attention on the case in which $\varepsilon \leq \overline{\varepsilon} \equiv 2\delta/(\delta + \theta\Delta v)$. This is a sufficient condition, such that the firm can choose an η to motivate every combination of effort. Figure 3 illustrates how the level of external oversight affects the feasible ranges or the set of internal quality control levels that will motivate each two-period effort combination. In Panel (a) of Fig. 3, there is a low level of external oversight, and, in Panel (b), there is a high level of external oversight. The higher the external oversight, the smaller the range of levels of internal quality control that will motivate effort levels (0,0), and the larger the range of internal quality control values that will motivate (0,1). The range of values of internal quality control that motivates (1,1) is unaffected by the amount of external oversight. The shaded regions in both (a) and (b) indicate levels of internal quality control that are infeasible in equilibrium. If the partnership chooses an η from the shaded range, anticipating type *B* partners to exert high (low) effort, and investors also conjecture high (low) effort $\widehat{e}_1 = 1$ ($\widehat{e}_1 = 0$), then type *B* partners' optimal response is to exert low (high) effort. This infeasible range occurs because ϕ_0 is decreasing in $\widehat{e}_1$. That is, investors' updated beliefs after observing a clean external oversight signal is higher when they expect type *B* partners to exert low effort in the first period (i.e., $\widehat{e}_1 = 0$) than when they expect type *B* partners to exert high effort. It follows that the second-period audit fee for engagement partners with $s_n = 0$ will be higher when

$\widehat{e}_1 = 0$ than when $\widehat{e}_1 = 1$. Therefore type B partners have greater incentives to exert high effort in the first period when $\widehat{e}_1 = 0$.[15]

The first-period audit fee is dependent on the partnership's observable level of internal quality control η, and clients' conjecture of partners' first-period effort choices ($\widehat{e}_1$). Rewriting the probabilities in (2) gives $Pr(H|\eta,\widehat{e}_1) = \frac{1}{2}(1+\eta+\widehat{e}_1\theta(1-\eta))$ and $Pr(L|\eta,\widehat{e}_1) = \frac{1}{2}(1-\eta)(1-\widehat{e}_1\theta)$, where $\widehat{e}_1$ is consistent with Lemma 1 given η.

Given anticipated individual engagement partners' optimal effort choices and the expected audit fees for a given internal quality control system η, the managing director then selects the internal quality control system that maximizes a representative engagement partner's ex ante expected payoff. The managing director takes into consideration the effect of the internal quality control effectiveness on audit fees, the expected disutility that individual partners incur, and the cost of providing such internal quality control. The audit partnership's internal quality controls affect audit fees directly by decreasing the probability a low-quality audit report is issued and indirectly by motivating individual partners to exert more effort. Since the audit partnership's expected payoff depends on type B partners' effort, we first solve for the optimal levels of internal quality controls that motivate a given set of audit efforts (i.e., high in both periods, high in the first and low in the second, or low in both periods). Then we compare expected payoffs across the three levels. Proposition 1 presents the partnership's optimal choice of internal quality control effectiveness η.

Proposition 1 *Let $\overline{c}_H$ be the internal quality control cost above which the preferred η to motivate effort (0,0) is less than $\overline{\eta}$, and let $\overline{\varepsilon}_H$ be the value of $\beta\varepsilon$ at which the preferred η to motivate effort (1,0) satisfies Expression (7) with equality.*

(i) *For any $\varepsilon \in (0,1)$ and $\beta \in (0,1)$, there exists a threshold on c below which the audit partnership chooses a level of internal quality control that motivates type B partners to exert high effort in both periods.*

(ii) *When $c \geq \overline{c}_H$ and $\beta\varepsilon \leq \overline{\varepsilon}_H$, there exists a threshold on c above which the audit partnership chooses a level of internal quality control that motivates type B partners to exert low effort in both periods.*

(iii) *Otherwise, the audit partnership chooses a level of internal quality control such that type B partners exert high effort in the first period and low effort in the second period.*

The functional forms for all thresholds are in the appendix.

The optimal level of η is driven by the cost of internal quality control c, the level of external oversight ε, and the level of partner identification β. Figure 4 shows how the cost of internal quality control (increasing from panels (a) to (b) to (c)) affects the partnership's payoff functions, when type B engagement partners exert high effort in both periods (the solid line), exert high effort in the first period and low effort in the second period (the dotted line), and exert low effort in both periods (the dashed line), respectively. Notice that the payoff maximizing η's for

[15] For example, for case (b) in Figure 3, suppose the partnership chooses $\eta = 0.3$, which is in the shaded range. When we substitute the relevant values into (7) and (8), we find that neither condition is satisfied as the left-hand side of (7) is approximately −0.018, and the left-hand side of (8) is approximately 0.092.

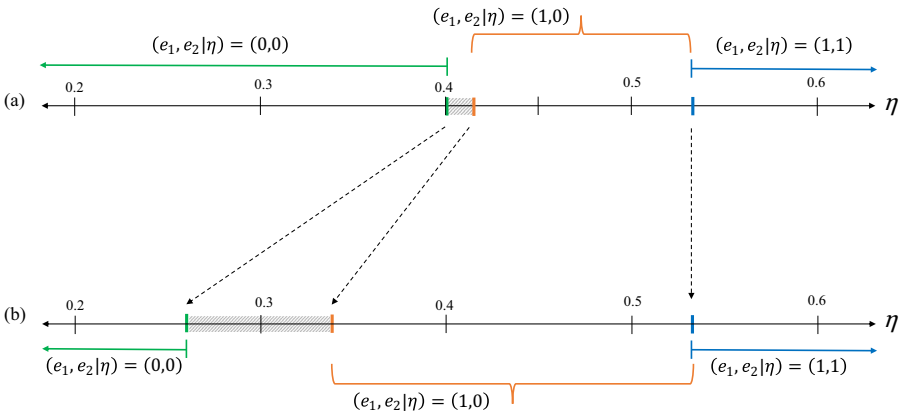

Fig. 3 The range of levels of internal quality control that will motivate effort levels (0,0), (1,0), and (1,1), varying ε. In (**a**), $\varepsilon = 1/3$; in (**b**), $\varepsilon = 8/19$. Fixed parameters: $\delta = 1/3$, $k = 1$, $\theta = 5/8$, $\beta = 1$, and $\Delta v = 2$. The shaded region indicates the infeasible region for η

all three functions shift left as c increases. While, for any given η, the partnership's payoff is greatest when partners exert high effort in both periods and lowest when partners exert low effort in both periods, every η motivates only one optimal effort response from B-type partners. That is, imagine superimposing Fig. 4 on Fig. 3; if the η that maximizes firm profits is in a region in which low effort will be provided, the best the partnership can do is to achieve the profits depicted by the dashed line. The partnership has to determine whether the cost of increasing η is offset by the benefits of moving into the region in which the firm can get high effort in one or both periods. The more costly internal quality controls are, the less likely this trade-off will be desirable. Although it may seem perverse that certain parameters in our model lead to all engagement partners exerting low effort, it is worth noting that low effort does not imply audits have no value. The partnership's significant investments in internal quality controls along with the fraction of good engagement partners lead to greater assurances about the financial statements than absent an audit.

While the level of external oversight and partner identification do not directly affect the partnership's payoff given a choice of η, they do affect the ranges of induced effort, which affects the partnership's choice of internal quality control. From Corollary 1, we know that, when $\beta\varepsilon$ is higher, the range of values of η that induce the B-type partner to exert high effort in the first period and low effort in the second is greater, allowing the managing director to choose a level of internal quality control that results in a higher payoff.[16]

[16] If firms' optimal levels of internal quality control can differ in periods 1 and 2, it is easier to motivate partners to exert effort in the first period when the anticipated second-period level of internal quality control is lower, and type B partners are expected to exert low effort in the second period. However, given the complex interactions between the internal quality controls in each period, the model becomes analytically intractable.

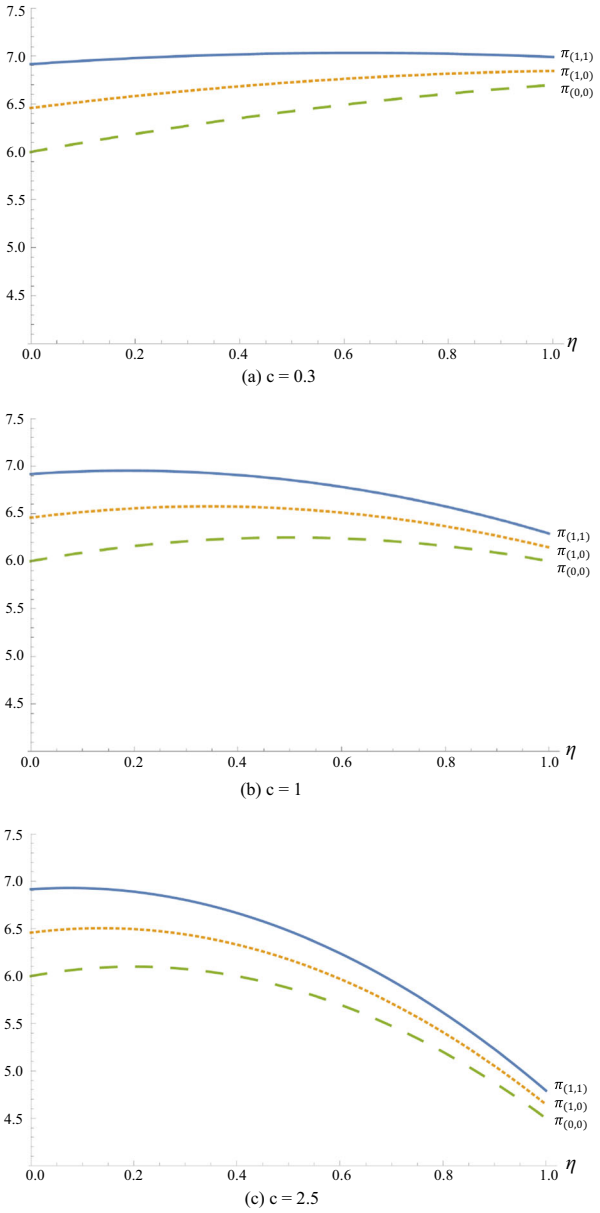

Fig. 4 Panels (**a**), (**b**), and (**c**) show partnership payoff functions for internal control costs $c = 0.3$, $c = 1$, and $c = 2.5$, respectively. Fixed parameters: $\delta = 1\ /3$, k = 1, $\theta = 5/8$, $\beta = 1$, $v_H = 4$, and $v_L = 2$

4 The effects of new regulation: Form AP

So far, we have identified individual partners' and partnership's strategies for a given level of partner identification. In this section, we analyze the effects of disclosing partners' names through Form AP on the partnership's choice of internal quality control

and the resulting expected audit quality. On December 15, 2015, the PCAOB adopted Rule 3211, Auditor Reporting of Certain Audit Participants, which requires registered public accounting firms to file Form AP with the Board for each audit report it issues for an issuer on or after January 31, 2017. The focus of our analyses is on the effects of disclosing the name of the engagement partner and Partner ID on Form AP. We expect this to result in an increase in the degree of partner identification, which would be captured by an increase in β in our model. First, we will look at how Form AP disclosure would affect individual partners' incentives for a given level of internal quality control and see how the change in individual partners' incentives affects the partnership's choice of internal quality control. Then we derive the conditions under which Form AP disclosure results in higher expected audit quality. Finally, we analyze partners' preferences for disclosing partner names.

4.1 Individual partners' incentives

The Advisory Committee on The Auditing Profession (2008) argues that having senior engagement partners sign audit reports (and thus increasing the level of partner identification) increases individual partners' accountability, which will lead to higher audit quality. In the current model, the increased accountability indeed translates into greater incentives for individual partners to exert high effort. As shown in Corollary 1, as β increases, the condition for type B partners to exert high effort in the first period becomes more easily satisfied. Moreover, the range of internal quality control levels that increase effort is greater when the level of external oversight is higher because high levels of external oversight under partner identification indeed result in higher accountability for the individual partner. In contrast, when the external oversight is completely ineffective (i.e., $\varepsilon \to 0$), Form AP disclosure also becomes ineffective in our setting. This is because external oversight determines the amount of information that becomes available with additional disclosure of individual engagement partners.

4.2 Partnership's internal quality control system

How would the increase in individual partners' incentives to exert effort affect the partnership's choice of internal quality control? Recall that the partnership seeks to maximize the expected (net) payoff of each partner and saving money on internal quality control systems is one way to reduce costs. Corollary 2 provides conditions under which the partnership's choice of internal quality control is higher (or lower) with Form AP disclosure, using the results of Proposition 1. We focus our attention to the case where the degree of partner identification was low (i.e., below $\overline{\varepsilon}_L/\varepsilon$) prior to Form AP disclosure but increases significantly (i.e., to above $\overline{\varepsilon}_L/\varepsilon$) after the new regulation was implemented.

Corollary 2 *Let β_{AP} be the level of partner identification following Form AP regulation. The partnership's choice of internal quality control is greater with Form AP disclosure only when the optimal internal control without partner naming motivates low effort in both periods, and one of the following conditions hold:*

(i) $c \le \overline{c}_1$,

(ii) $c \in (\overline{c}_1, \min\{\overline{c}_2, \overline{c}_3\})$ *and* $\beta_{AP} \in \left(\frac{\overline{\varepsilon}_L}{\varepsilon}, \frac{\overline{\varepsilon}_H}{\varepsilon}\right)$,
(iii) $c \in (\min\{\overline{c}_2, \overline{c}_3\}, \max\{\overline{c}_2, \overline{c}_4\})$ *and* $\beta_{AP} \in \left(\frac{\overline{\varepsilon}_L}{\varepsilon}, \frac{\overline{\varepsilon}_M}{\varepsilon}\right)$,

where all thresholds can be found in the appendix. Otherwise Form AP disclosure results in the partnership choosing a weakly lower level of internal quality controls.

Corollary 2 shows that Form AP disclosure does not necessarily lead to an increase in the partnership's choice of internal quality control levels; in fact, except for the cases listed in Corollary 2, the partnership's choice of internal quality control is weakly lower with Form AP disclosure. The increase in individual partners' incentives to exert effort when they are individually identified as the engagement partner on an audit has two countervailing effects on the partnership's choice of internal quality control. First, by increasing the level of partner identification, Form AP disclosure allows the partnership to motivate partners with a lower level of internal quality control. This could lead to a decrease in the choice of η if the partnership already invested in a high level of internal quality control to motivate partners. Second, by decreasing the cost of motivating partners to exert high effort, a higher level of partner identification could incentivize a partnership that had previously chosen a low level of internal quality control that did not motivate partners to increase their choice of η. Disclosures linking partners to their engagements would lead to an increase in internal quality controls when this latter effect dominates, which are the cases specified in Corollary 2.

When the cost parameter c (which scales the cost of establishing a given level of internal quality control) is sufficiently high (greater than max $\{\overline{c}_5, \overline{c}_6\}$) and the level of partner identification is low, the partnership chooses a level of internal quality control that does not motivate effort. In this case, as long as the cost is not exorbitantly high, Form AP disclosure could lead to an increase in the partnership's choice of internal quality control due to the second effect. However, notice that, even in these cases, the choice of internal quality control could decrease if Form AP disclosure results in a level of partner identification that is high (Corollary 2 (ii) and (iii)). This follows because the first effect starts dominating for higher levels of partner identification, and the partnership's choice of η that increases individual partners' effort will be lower than before Form AP disclosure. Further note that the thresholds on β in Corollary 2 (ii) and (iii) depend on ε, implying that whether Form AP disclosure increases the partnership's choice of internal quality control depends on the level of external oversight: when external oversight is strong (high ε) a change in β will have a greater effect.

The result that Form AP disclosure can lower the partnership's choice of internal quality control comports with the results of Chen et al. (2008), who show that an increase in the importance of individual reputation could result in a decrease in a group's effort to maintain its reputation. It also provides support for some concerns that emphasizing individual accountability may lead to a decrease in firm accountability. This is especially true when the cost of establishing effective internal quality control within the partnership is low, such that a sufficient level of internal quality control is already achieved and hence cannot be improved upon with increased partner identification.

4.3 Audit quality

While the PCAOB promoted disclosing the names of engagement partners on the premise that the additional information would be useful to investors (or the boards of directors that represent them), an implication was that the greater accountability would lead engagement partners to exert more effort, which would in turn lead to higher quality audits (PCAOB Release No. 2015–008, 2015). Although Corollary 1 shows that individual partners' incentives to exert effort for a given level of internal quality control is higher with Form AP disclosure, Corollary 2 shows that the resulting partnership's choice of internal quality control can be lower. Since internal quality control within the partnership not only motivates partners to exert effort but also directly improves audit quality by deterring low-quality audits from being issued, the decrease in internal quality control effectiveness could lead to lower audit quality. What is the net effect, or how would Form AP disclosure affect the resulting expected audit quality when we consider both the effect on partner effort and on the choice of internal quality control? Proposition 2 presents results on overall audit quality. It focuses on the first period, as this is where the increase in individual accountability occurs in this model from disclosing the individual partner. As in Corollary 2, we focus on the cases where Form AP disclosure increases the degree of partner identification from below $\overline{\varepsilon}_L/\varepsilon$ to above it.

Proposition 2 *The expected audit quality in the first period is higher with Form AP disclosure only when both of the following conditions hold: (i)* $c > \max\{\overline{c}_H, \overline{c}_5, \overline{c}_6\}$ *and (ii)* $\eta^* > \frac{\eta_{(0,0)}-\theta}{(1-\theta)}$*, where* $\eta_{(0,0)}$ *is the optimal level of internal control to motivate low effort in both periods.*

Notice that Proposition 2 includes the cases in Corollary 2 where η^* increases after Form AP disclosure, as well as some cases where the resulting η^* is smaller with Form AP disclosure yet induces higher effort in the first period. Proposition 2 shows that Form AP disclosure increases audit quality only if the cost of internal quality control was sufficiently high, such that the partnership would not have induced high effort, absent Form AP disclosure. Further, even if Form AP disclosure allows a partnership to choose an internal quality control level that induces higher effort than before, if the optimal level of internal quality control (η^*) is not sufficiently high, the resulting audit quality could be lower than without Form AP disclosure.

In all other cases, audit quality is weakly lower with Form AP disclosure. This includes cases where the cost of internal quality control is low, such that internal quality control was already high without Form AP disclosure and cases where the cost is so high that audit firms cannot increase the level of internal control, even with Form AP disclosure. When the cost of internal quality control is low, and the partnership's investment in internal quality controls induces partners to exert high effort, the partnership may choose a lower level of costly internal quality control with Form AP disclosure as partner identification and external oversight replace internal quality controls for motivating effort.

4.4 Partnership's expected payoff

Finally, we examine how increasing the accountability for the individual partner affects the partnership's payoffs. At first, it would seem that the partnership would be able to

(weakly) decrease its investment in internal quality controls, due to the increased individual accountability, as was shown in Corollary 1. However, Corollary 2 indicates that, depending on the level of external oversight and the cost of internal quality control, the partnership's choice of internal quality control could be higher with Form AP disclosure. Furthermore, as the resulting expected audit quality changes, the audit fees the partnership will receive change as well. Proposition 3 provides results on how Form AP disclosure affects the partnership's expected payoff.

Proposition 3 *Expected profits to the partnership are weakly greater with Form AP disclosure when (i)* $c \leq \overline{c}_H$*, regardless of the level of external oversight, or when (ii)* $\beta_{AP} \geq \overline{\varepsilon}_H / \varepsilon$*, regardless of the cost of internal quality control.*

Proposition 3 may be somewhat counterintuitive, since one would expect Form AP disclosure to allow the partnership to save on the cost of internal quality control by better aligning the interests of the individual partner and partnership, and that the cost savings from the reduction in internal quality control would be greater when the cost of establishing effective internal quality control is higher. However, it is when c is low that the partnership is making the largest investments in internal quality controls before Form AP disclosure, and therefore it has greater scope to reduce its control efforts when the engagement partners' names are disclosed. When c is above $\overline{c}_H$, the partnership's choice of internal quality control may already be low, leaving little room to further decrease the level of and save on the costs of internal quality control with Form AP disclosure. Moreover, in some cases, by making the choice of low internal quality control suboptimal, Form AP disclosure incentivizes the audit firm to increase its internal quality control to a level that would motivate individual partners to exert high effort. While this would result in higher expected audit quality, the audit firm's expected payoff could be lower. Proposition 3 (ii) also notes that Form AP disclosure would increase audit firms' expected payoff, regardless of the cost of internal quality control, if the disclosure results in a sufficient amount of information regarding the individual partner. This implies that, if external oversight is not as effective, audit firms may not benefit from Form AP disclosure, since the lack of information would make partner identification less effective in motivating individual partners. Most audit firms were initially opposed to the PCAOB proposal to disclose engagement partners' names; this might suggest that the costs of internal quality control are high or the effectiveness of external oversight is not sufficiently high that the benefits to the partnership do not outweigh the costs.

5 Empirical and policy implications

5.1 Audit firms' internal quality control

Our study shows that Form AP disclosure may diminish audit quality if audit firms decrease investment in their internal quality control systems (Proposition 2). Regulators should be aware of this potential consequence of their newly enacted rules. In this regard, the PCAOB's increased attention to audit partnerships' internal control efforts as well as the specific audits themselves could help enhance audit quality by enforcing

a minimum investment by audit firms in quality control.[17] Following the Sarbanes-Oxley Act of 2002, the PCAOB not only inspects individual audits but also evaluates the sufficiency of the audit firm's quality control system.[18] The review of audit firms' quality control systems is documented in Part II of the PCAOB Inspection Report, which is initially nonpublic (i.e., it is only provided to the audit firm). However, failure to satisfactorily remediate the issues raised in this report within 12 months can lead to a public disclosure of Part II. Several empirical studies suggest that firms go to considerable efforts to remediate the PCAOB concerns (e.g., Drake et al. 2016; Aobdia 2019b); if remediation is unsuccessful, audit firms lose significant market share following the disclosure of Part II (Nagy 2014). Therefore these PCAOB measures may prevent audit firms from providing too low a level of internal quality control.

5.2 The effectiveness of Form AP

Our model also highlights the dependence of the effectiveness of Form AP disclosure on the level of external oversight. This dependence is captured in our model, where the effectiveness of Form AP disclosure is determined by the product of partner identification and external oversight, $\beta\varepsilon$, and Form AP disclosure increases β. PCAOB Release No. 2015–008 states the benefit of disclosing engagement partners' identity as allowing "investors to research whether engagement partners have been associated with adverse audit outcomes that could be attributed to deficiencies in their audit work or have been sanctioned by the PCAOB or SEC" and to analyze the disclosed information "in conjunction with other publicly available information." Form AP disclosure in itself does not create new information but allows investors and issuers to analyze the data provided in a more granular way. The usefulness of Form AP disclosure in motivating individual partners therefore depends on the effectiveness of the law and government institutions as well as the financial marketplace in identifying deficient audits, audit failures and predictors of good audit practices, and how the market reacts to this information (Gunther and Moore 2002).

Empirically, this may result in some variation in how disclosing the names of engagement partners affects audit quality depending on within-country variations in the level of external oversight across firms. For example, it is plausible to assume that the degree of partner identification from filing Form AP would be the same for all public accounting firms that are registered in the United States. However, there is variation in the level of external oversight across these firms, since Section 104 of the SOX requires the PCAOB to conduct annual inspections for firms that provide audit reports for more than 100 SEC registered companies, while firms that provide audit reports for 100 or fewer registered companies are inspected triennially. Moreover, the probability of an audit being inspected depends on the proportion of engagements with SEC registered clients that is inspected within an audit firm. It follows that, for audit firms that are inspected with the same frequency and for a given number of inspections within an audit firm, engagements at audit firms with fewer SEC registered clients

[17] According to a speech in 2016 by a PCAOB member, the Board has recently begun to consider focusing more on assessing the audit firms' internal control efforts (Rapoport 2016).

[18] Examples of quality control reviews include review of the firm's processes for monitoring audit performance, review of management structure and process, and review of partner management (Center for Audit Quality 2012).

would be inspected with a higher probability. This is captured by a higher ε in our model.

Research has found that there are variations in the level of external oversight across countries as well. For example, Aobdia and Shroff (2017) show that there is variation in the presence of local auditor regulation and local inspection programs, and Lamoreaux (2016) shows that there is variation in the PCAOB's ability to inspect auditors across countries. These cross-country variations in external oversight, especially regulatory oversight, may also lead to varying effects of disclosing engagement partner identities.

The potential effects of Form AP disclosure may vary between Big N firms and non-Big N firms as well. Not only are Big N audit firms subject to annual inspections, but they are generally subject to greater reputation risk and higher litigation risk, because of their larger client base and deep pockets (DeFond and Zhang 2014). Our study suggests that, due to the greater level of external oversight, disclosures on Form AP will be more effective for these Big N firms, and, from Corollary 2 and Proposition 2, we show that when $\beta\varepsilon$ is greater, Form AP disclosure is more likely to result in an improvement in audit quality. On the other hand, if we assume there is a fixed cost to implementing internal quality control within an audit firm (Gu et al. 2017), the per partner cost of implementing internal quality control may be lower for a Big N firm. This decreases the potential improvement that requiring Form AP disclosure can bring about. Considering these various factors, it is difficult to say whether it would be the audits performed by Big N or the non-Big N firms that are likely to improve most from the regulatory changes.

Even if Form AP disclosure does not reduce audit quality, there may be no benefits (i.e., increases to audit quality), making the rule seem to fail a basic cost-benefit constraint. King et al. (2012) suggest that partner naming will increase audit quality in appearance, but if it leads to over auditing (ineffective procedures), it may also give false confidence in quality in fact. In a similar spirit, if the imposition of minimum standards leads to extra but unhelpful work, the costs of audit and the false confidence in audits might increase, but final report quality would not.

5.3 Can audit partnerships subvert the effects of Form AP disclosure

Not all partnerships benefit from providing partner level information on Form AP, but those that would see a decrease in payoff are precisely the partnerships for which Form AP disclosure weakly increases expected audit quality. Is there a way for these partnerships to avoid the potential decrease in payoffs? Suppose the partnership is legally permitted to negotiate a long-term contract with its clients.[19] In the current model, this would be a two-period contract that is negotiated at the beginning of the model after the partnership makes its investment in internal quality control systems η. With a two-period contract, the partnership can protect the individual partner from the effects of first period external oversight results that affect second period audit fees. Since audit fees are determined to equal the expected value of the audits provided, risk neutral clients are ex-ante indifferent between the short-term and long-term contract. With long-term contracts in place, the

[19] Clients may willingly agree to a recurring contract if they have a preference for stable and predictable fees. Without them, their fees would change depending on engagement partner type in the second period.

individual engagement partner's problem reverts to the cost minimization problem in period 2 (Expression (3)), and the type *B* engagement partners' effort choice will be to exert high effort if $\eta \geq \overline{\eta}$ and exert low effort otherwise. Given type *B* partners' strategy, the audit partnership's optimal choice of internal quality control will be the same as without partner identification, and therefore the partnership can avoid the lower payoffs associated with Form AP disclosure. If this type of long-term contracting is permitted, audit firms can mitigate the negative (positive) effects to them (to investors) of the new regulation.

6 Conclusion

Until recent changes in the disclosure environment, audit reports in the U.S. were issued in the name of the accounting firm. Consequently, clients and investors could rely only on the accounting firm's reputation when assessing the reliability of the audit. However, evidence suggests that audit quality may vary significantly across engagement partners within the same firm. As an effort to increase transparency in the auditing process, the PCAOB adopted new rules that require registered audit firms to submit Form AP, Auditor Reporting of Certain Audit Participants. In Form AP, audit firms disclose the names of specific engagement partners. The empirical evidence on the relation between partner name disclosure and audit quality is mixed. This paper aims to enhance our understanding of the potential effects of disclosing the engagement partner's name on audit quality using an analytical model. We study this effect with a focus on the changes in individual partners' incentives to exert effort and the audit firm's incentives to establish effective internal quality control systems.

In this model, the audit firm's internal quality control system has two functions. First, it aligns the incentives of individual partners and the audit firm, and, second, it directly improves the expected audit quality. By analyzing the effect of Form AP disclosure on the equilibrium outcomes, this paper finds that, while the increased individual accountability increases individual partners' incentives to exert effort, it may also decrease the audit firm's ex ante commitment to internal quality control. As a result, the audit firm's choice of internal quality control could be lower with Form AP disclosure. Whether the net effect of Form AP disclosure on expected audit quality is negative depends on the cost of establishing effective internal quality control. Form AP disclosure results in higher expected audit quality when the cost of internal control is sufficiently high, such that there is room for improvement in motivating individual partners' effort, but not too high, such that it results in a significant decrease in the choice of internal control. Moreover, we show how the effectiveness of Form AP disclosure depends on the level of external oversight.

This paper provides insight into the potential effects of disclosing the identity of the engagement partner. Thus far, the discussion on the benefits and costs of Form AP disclosure has focused on the informational benefits to investors and the increased accountability for the individual engagement partner. The findings of this paper suggest that we should also consider the effects on the audit firm's incentive to invest in its own internal quality control and how this will affect expected audit quality. For audit firms that previously had poor internal quality controls, the increase in individual accountability makes motivating individual partners to exert high effort through an increase in internal quality control more attainable, resulting in improved audit quality. However, for audit firms that have already established a sufficient level of internal quality control that motivates high effort from individual partners, the increase in individual accountability

may allow the audit firm to decrease its internal quality control efforts and yet still motivate individual audit partners to exert high effort. This can lead to a decrease in audit quality, because audit firms' internal quality controls also directly improve expected audit quality. In this respect, enforcing audit firms to maintain a sufficient level of internal quality control would help achieve higher audit quality through Form AP disclosure.

The paper also calls attention to the role of external oversight on the effectiveness of Form AP disclosure. Since external oversight provides signals regarding audit quality, the amount and usefulness of the information provided by partner name disclosure depend on the level of external oversight. We expect the effects of Form AP disclosure to be stronger when external oversight of audits is stronger. The findings of this paper may help explain the mixed evidence regarding the effects of disclosing individual partner names on audit quality, since these empirical studies have been based on various countries where the potential level of external oversight most likely differs.

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Appendix

Proof of Lemma 1

When $\eta \in [\overline{\eta}, 1), e_2 = 1$, where $\overline{\eta} = \delta/(\theta k)$. The derivative of (4), with respect to e after substituting $\widehat{e}_2 = 1$ is positive, implying $e_1 = 1$ when $\eta \in [\overline{\eta}, 1)$. When $\eta \in (0, \overline{\eta})$, the derivative of (4), with respect to e after substituting $\widehat{e}_1 = 1$, and $\widehat{e}_2 = 0$ must be positive for the partner to choose $e_1 = 1$, consistent with the conjectured effort choice $\widehat{e}_1$. After some simplification, we get the condition (7). Following the same logic, the derivative of (4) with respect to e, after substituting $\widehat{e}_2 = 0$ and $\widehat{e}_1 = 0$, must be negative for the partner to choose $e_1 = 0$, consistent with the conjectured effort choice $\widehat{e}_1$. After some simplification, this gives the condition (8). Note that the left-hand side (LHS) of (8) is greater than the LHS of (7) for any $\eta \in (0, \overline{\eta})$ and $\beta > 0$. This implies that, if any $\eta \in (0, \overline{\eta})$ satisfies (7), it cannot satisfy (8).

In the following analyses, we impose the condition $\varepsilon \leq \overline{\varepsilon} \equiv 2\delta/(\delta + \theta\Delta v)$, which is the sufficient condition under which the LHSs of both (7) and (8) evaluated at $\eta = 0$ are negative. This condition rules out settings in which type B partners' effort choices would not be monotonic in the level of internal control.

Proof of Corollary 1

(i) Analyzing (4) gives a condition for $e_1 = 1$:

$$\beta\varepsilon\left(1-\theta\widehat{e}_2\right)(1-\eta)^2\theta\phi_0\Delta v - \delta + \theta\eta k \geq 0. \tag{9}$$

The LHS of (9) is increasing in the level of partner identification (β). Moreover, the cross partial derivative of the LHS with respect to β and then ε is positive, which indicates that the additional incentive with partner identification is greater the higher the external oversight.

(ii) Taking the derivative of the LHSs of (7) and (8) with respect to ε, both are positive. Thus, for any $\eta \in (0, \overline{\eta})$, a higher ε allows the η to satisfy (7), which results in *B*-type partners exerting effort in the first period, for a wider range of parameters.

Proof of Proposition 1

The optimal η is found by first solving for the partnership's optimal choices of η to induce each possible choice of effort and then selecting the one that maximizes the partnership's expected payoff. Substituting the expected audit fees into (1) gives us the following expected payoff function for the partnership, which is concave in η:

$$\pi = -c\eta^2 + (v_H + v_L) + \eta(\Delta v - k) + \frac{1}{2}\sum_{t=1}^{2} \widehat{e}_t[\eta\theta k - \delta + (1-\eta)\theta\Delta v]. \qquad (10)$$

For the chosen level of internal control, η, to be feasible, it must satisfy the respective conditions in Lemma 1. Conditions (7) and (8) are such that i) both LHSs are convex in η; ii) when $\eta = \overline{\eta}$, both LHSs are equal to each other at a positive value; and iii) the LHS of (8) is always greater than the LHS of (7), whenever $\eta \in (0, \overline{\eta})$. From Lemma 1, it follows that the feasible ranges of η that induce effort levels (1,1), (1,0) and (0,0) under the constraint $\varepsilon \leq \overline{\varepsilon}$ are $[\overline{\eta}, 1), [\overline{\eta}_1, \overline{\eta}),$ and $[0, \overline{\eta}_0)$, respectively, where $\overline{\eta}_1$ and $\overline{\eta}_0$ are the points at which the LHSs of (7) and (8) cross zero from below, respectively. Given the characteristics of (7) and (8), $0 < \overline{\eta}_0 < \overline{\eta}_1 < \overline{\eta}$ under the condition $\varepsilon \leq \overline{\varepsilon}$.

Partnership's choice of η to induce effort pair (1,1)

Substituting $\widehat{e}_1 = 1$ and $\widehat{e}_2 = 1$ into (10) and then solving for the profit maximizing η, we get an unconditional optimum $\eta_{(1,1)} = (1-\theta)(\Delta v - k)/(2c)$. Since η must also satisfy the condition $\eta_{(1,1)} \in [\overline{\eta}, 1)$ to motivate high effort in both periods, the optimal η that motivates (1,1) is $\eta^*_{(1,1)} = max\left\{\eta_{(1,1)}, \overline{\eta}\right\}$. Let $\overline{c}_L \equiv (1-\theta)(\Delta v - k)/(2\overline{\eta})$. We can then write the optimal η that motivates (1,1) as

$$\eta^*_{(1,1)} = \begin{cases} \eta_{(1,1)}: & c \leq \overline{c}_L \\ \overline{\eta}: & c > \overline{c}_L \end{cases}.$$

Partnership's choice of η to induce effort pair (1,0)

Substituting $\widehat{e}_1 = 1$ and $\widehat{e}_2 = 0$ into (10) and then solving for the maximizing η, we get an unconditional optimum $\eta_{(1,0)} = (2-\theta)(\Delta v - k)/(4c)$. From Lemma 1, we know that for $\eta_{(1,0)}$ to be feasible, it must satisfy $\eta_{(1,0)} \in [\overline{\eta}_1, \overline{\eta})$. This yields:

$$\eta^*_{(1,0)} = \begin{cases} \overline{\eta}: & 0 \le c \le \overline{c}_M \\ \eta_{(1,0)}: & c > \overline{c}_M \text{ and } \beta\varepsilon \ge \overline{\varepsilon}_H \\ \overline{\eta}_1: & c > \overline{c}_M \text{ and } \beta\varepsilon < \overline{\varepsilon}_H \end{cases},$$

where

$$\overline{\varepsilon}_H = \frac{8c[4c\delta - \theta(2-\theta)k(\Delta v - k)]}{[4c - (2-\theta)(\Delta v - k)]\left(4c[(1-\theta)\delta + \theta\Delta v] - \theta(2-\theta)(\Delta v - k)[\Delta v + (1-\theta)k]\right)}$$

is the threshold on $\beta\varepsilon$, such that, when $\beta\varepsilon \ge \overline{\varepsilon}_H$, $\eta_{(1,0)}$ is greater than or equal to $\overline{\eta}_1$, and $\overline{c}_M = (2-\theta)(\Delta v - k)/(4\overline{\eta})$ is the threshold on c, such that when $c > \overline{c}_M$, $\eta_{(1,0)}$ is less than $\overline{\eta}$.

Partnership's choice of η to induce effort pair (0,0)

Substituting $\widehat{e}_1 = 0$ and $\widehat{e}_2 = 0$ into (10) and then solving for the maximizing η, we get the unconditional optimum $\eta_{(0,0)} = (\Delta v - k)/(2c)$. $\eta_{(0,0)}$ will be feasible (i.e., induce (0,0)) if it satisfies $\eta_{(0,0)} \in [0, \overline{\eta}_0)$. This yields:

$$\eta^*_{(0,0)} = \begin{cases} \overline{\eta}_0: & c \le \overline{c}_H \\ \eta_{(0,0)}: & c > \overline{c}_H \text{and} \beta\varepsilon < \overline{\varepsilon}_L \\ \overline{\eta}_0: & c > \overline{c}_H \text{and} \beta\varepsilon \ge \overline{\varepsilon}_L \end{cases},$$

where $\overline{c}_H = (\Delta v - k)/2\overline{\eta}$ is the threshold on c, such that when $c > \overline{c}_H$, $\eta_{(0,0)}$ is less than $\overline{\eta}$, and

$$\overline{\varepsilon}_L = \frac{4c[2c\delta - \theta k(\Delta v - k)]}{(2c + k - \Delta v)(2c(\delta + \theta\Delta v) - \theta(\Delta v + k)(\Delta v - k))}$$

is the threshold on $\beta\varepsilon$, such that, when $\beta\varepsilon < \overline{\varepsilon}_L$, $\eta_{(0,0)}$ satisfies condition (8).

Partnership's overall optimal η given c and βε

First notice that, for a given set of parameters, $\overline{c}_L < \overline{c}_M < \overline{c}_H$ and $\eta_{(1,1)} < \eta_{(1,0)} < \eta_{(0,0)}$. Also, the LHSs of (7) and (8) are both increasing in ε, which implies that, as ε increases, the feasible range for $\eta_{(1,0)}$ increases, while the feasible range for $\eta_{(0,0)}$ decreases. It follows that $\overline{\varepsilon}_L < \overline{\varepsilon}_H$ when we limit our analysis to $\varepsilon < \overline{\varepsilon}$.

When we take the derivative of the partnership's payoff with respect to e_1 and e_2, we can see that both are positive, implying that, for a given η, the partnership always prefers that type B partners exert high effort rather than exerting low effort. Defining $\pi(e_1, e_2, \eta)$ as the partnership's expected payoff when type B partners exert effort (e_1, e_2) and the internal quality control is η, two observations follow.

1. Whenever $\eta_{(1,1)}$ is in the feasible range, $\eta_{(1,1)}$ is the optimal level of internal quality control.
2. Whenever $\eta_{(1,0)}$ is in the feasible range, it is preferred to any level of internal quality control that induces low effort in both periods.

Furthermore, when the firm must use a level of internal control equal to $\overline{\eta}$ to motivate (1,0), it can also induce (1,1) for the same level of internal control. Therefore, whenever $\overline{\eta}$ is selected, the manager will be asked to exert high effort in both periods. Considering these findings, we can summarize the partnership's optimal internal quality control level choices given c and $\beta\varepsilon$. Whenever an unambiguous optimum exists, it is noted in bold:

Case	c	$\beta\varepsilon$	$\left\{\eta^*_{(1,1)}, \eta^*_{(1,0)}, \eta^*_{(0,0)}\right\}$
1	$c \le \overline{c}_L$		$\{\boldsymbol{\eta_{(1,1)}}, \eta_{(1,0)}, \eta_{(0,0)}\}$
2	$c \in \left(\overline{c}_L, \overline{c}_M\right]$		$\{\boldsymbol{\overline{\eta}}, \overline{\eta}, \overline{\eta}_0\}$
3	$c > \overline{c}_M$	$\beta\varepsilon \ge \overline{\varepsilon}_H$	$\left\{\overline{\eta}, \eta_{(1,0)}, \eta_{(0,0)}\right\}$
4	$c \in (\overline{c}_M, \overline{c}_H]$	$\beta\varepsilon < \overline{\varepsilon}_H$	$\{\overline{\eta}, \overline{\eta}_1, \overline{\eta}_0\}$
5	$c > \overline{c}_H$	$\beta\varepsilon \in [\overline{\varepsilon}_L, \overline{\varepsilon}_H)$	$\{\overline{\eta}, \overline{\eta}_1, \overline{\eta}_0\}$
6	$c > \overline{c}_H$	$\beta\varepsilon < \overline{\varepsilon}_L$	$\left\{\overline{\eta}, \overline{\eta}_1, \eta_{(0,0)}\right\}$

Comparing the partnership's payoffs for case 3: $\overline{\eta}$ vs.$\eta_{(1,0)}$

We already know from 2 above that $\eta_{(1,0)}$ dominates $\eta_{(0,0)}$. Therefore we need only compare $\pi(1, 1, \overline{\eta})$ to $\pi(1, 0, \eta_{(1,0)})$. The partnership prefers the former to the latter whenever $c \le \overline{c}_1$, where $\overline{c}_1 = \frac{2\delta\ (1-\theta)(\Delta v-k)+\theta k\ (\theta\Delta v-\delta)+\sqrt{[2\delta(2-\theta)(\Delta v-k)+(\theta k-\delta)\theta\Delta v](\theta k-\delta)\theta\Delta v}}{4\delta\overline{\eta}}$, which is increasing in Δv and θ, and decreasing in δ.

Comparing the partnership's payoffs for cases 4 and 5: $\overline{\eta}$ vs.$\overline{\eta}_1$vs.$\overline{\eta}_0$

When we compare partnership payoffs $\pi(1, 1, \overline{\eta}), \pi(1, 0, \overline{\eta}_1)$ and $\pi(0, 0, \overline{\eta}_0)$ we get:

- $\pi(1, 0, \overline{\eta}_1) > \pi(1, 1, \overline{\eta})$ if $c > \overline{c}_2$ and $\pi(1, 0, \overline{\eta}_1) \le \pi(1, 1, \overline{\eta})$ if $c \le \overline{c}_2$, where $\overline{c}_2 = \frac{\theta k[(\theta k-\delta)\theta\Delta v+(2-\theta)(\Delta v-k)(\delta-\theta k\overline{\eta}_1)]}{2(\delta-\theta k\overline{\eta}_1)(\delta+\theta k\overline{\eta}_1)}$.

- $\pi(0, 0, \overline{\eta}_0) > \pi(1, 1, \overline{\eta})$ if $c > \overline{c}_3$ and $\pi(0, 0, \overline{\eta}_0) \le \pi(1, 1, \overline{\eta})$ if $c \le \overline{c}_3$, where $\overline{c}_3 = \frac{\theta k[(\theta k-\delta)\theta\Delta v+(\Delta v-k)(\delta-\theta k\overline{\eta}_0)]}{(\delta-\theta k\overline{\eta}_0)(\delta+\theta k\overline{\eta}_0)}$.

- $\pi(0,0,\overline{\eta}_0) > \pi(1,0,\overline{\eta}_1)$ if $c > \overline{c}_4$ and $\pi(0,0,\overline{\eta}_0) \leq \pi(1,0,\overline{\eta}_1)$ if $c \leq \overline{c}_4$, where $\overline{c}_4 = \frac{\theta\Delta v - \delta + [(2-\theta)\overline{\eta}_1 - 2\overline{\eta}_0](\Delta v - k)}{2(\overline{\eta}_1 - \overline{\eta}_0)(\overline{\eta}_1 + \overline{\eta}_0)}$.

Comparing the partnership's payoff for case 6: $\overline{\eta}, \overline{\eta}_1$ and $\eta_{(0,0)}$

- $\pi\left(0,0,\eta_{(0,0)}\right) > \pi(1,1,\overline{\eta})$ if $c > \overline{c}_5$ and $\pi\left(0,0,\eta_{(0,0)}\right) \leq \pi(1,1,\overline{\eta})$ if $c \leq \overline{c}_5$, where $\overline{c}_5 = \frac{(\theta k - \delta)\theta\Delta v + \delta(\Delta v - k) + \sqrt{(\theta k - \delta)\theta\Delta v[(\theta k - \delta)\theta\Delta v + 2\delta(\Delta v - k)]}}{2\delta\overline{\eta}}$.

- $\pi\left(0,0,\eta_{(0,0)}\right) > \pi(1,0,\overline{\eta}_1)$ if $c > \overline{c}_6$ and $\pi\left(0,0,\eta_{(0,0)}\right) \leq \pi(1,0,\overline{\eta}_1)$ if $c \leq \overline{c}_6$, where $\overline{c}_6 = \frac{\theta\Delta v - \delta + (2-\theta)(\Delta v - k)\overline{\eta}_1 + \sqrt{[\delta - \theta\Delta v + \theta(\Delta v - k)\overline{\eta}_1][\delta - \theta\Delta v - (4-\theta)(\Delta v - k)\overline{\eta}_1]}}{4\overline{\eta}_1^2}$.

Note: $\overline{c}_1 < \overline{c}_2, \overline{c}_5 < \overline{c}_3, \overline{c}_6 < \overline{c}_4$ and $\overline{c}_H < \overline{c}_3$.

Collecting the pieces: Partnership's optimal choice of η

Using the results above, the optimal internal quality control level, η^* and resulting effort choice is written as:

$$\eta^* = \begin{cases} \eta_{(0,0)} & : c > \overline{c}_H, \beta\varepsilon < \overline{\varepsilon}_L, c > \max\left\{\overline{c}_5, \overline{c}_6\right\} \quad \Rightarrow (e_1^*, e_2^*) = (0,0) \\ \overline{\eta}_0 & : c > \overline{c}_H, \beta\varepsilon \in \left[\overline{\varepsilon}_L, \overline{\varepsilon}_H\right), c > \max\left\{\overline{c}_3, \overline{c}_4\right\} \quad \Rightarrow (e_1^*, e_2^*) = (0,0) \\ \overline{\eta}_1 & : \mathcal{C} \quad \Rightarrow (e_1^*, e_2^*) = (1,0) \\ \eta_{(1,0)} & : c \geq \overline{c}_M, \beta\varepsilon \geq \overline{\varepsilon}_H, c > \overline{c}_1 \quad \Rightarrow (e_1^*, e_2^*) = (1,0) \\ \eta_{(1,1)} & : c \leq \overline{c}_L \quad \Rightarrow (e_1^*, e_2^*) = (1,1) \\ \overline{\eta} & : otherwise \quad \Rightarrow (e_1^*, e_2^*) = (1,1) \end{cases}$$

where $\mathcal{C} = \{ (c \in (\overline{c}_M, \overline{c}_H], \beta\varepsilon < \overline{\varepsilon}_H, c > \overline{c}_2)$ or $(c > \overline{c}_H, \beta\varepsilon \in (\overline{\varepsilon}_L, \overline{\varepsilon}_H), c \in (\overline{c}_2, \max\{\overline{c}_2, \overline{c}_4\}])$ or$(c > \overline{c}_H, \beta\varepsilon < \overline{\varepsilon}_L, c \in (\overline{c}_2, \max\{\overline{c}_2, \overline{c}_6\}])\}$.

Proof of Corollary 2

We find the conditions for Corollary 2 by finding the cases in which the optimal internal quality control choice increases with an increase in β. The expression in the Proof of Proposition 1 presents the partnership's optimal choice of η under different parametric conditions. When $c > \overline{c}_H$, $\beta \in (\overline{\varepsilon}_L/\varepsilon, \overline{\varepsilon}_H/\varepsilon)$ (case 5) and η^* takes on the value $\overline{\eta}_0$, η^*decreases as β increases until $\beta > \overline{\varepsilon}_H/\varepsilon$ at which point η^* increases to $\eta_{(1,0)}$. When $c > \overline{c}_H$, and $c \in (\max\{\overline{c}_5, \overline{c}_6\}, \max\{\overline{c}_3, \overline{c}_4\})$, as β increases from $\beta < \overline{\varepsilon}_L/\varepsilon$ to $\beta \in (\overline{\varepsilon}_L/\varepsilon, \overline{\varepsilon}_H/\varepsilon)$, that is, when β crosses the threshold $\overline{\varepsilon}_L/\varepsilon$, η^* jumps from $\eta_{(0,0)}$ to either $\overline{\eta}$ or $\overline{\eta}_1$ and will start to weakly decrease in β. While $\overline{\eta}$ is always greater than $\eta_{(0,0)}$, $\overline{\eta}_1$ may not be. The condition for $\overline{\eta}_1$ to be greater than $\eta_{(0,0)}$ is $\beta < \overline{\varepsilon}_M/\varepsilon$, where

$$\overline{\varepsilon}_M = \frac{4c[\theta k(\Delta v - k) - 2c\delta]}{(2c + k - \Delta v)(\theta(\Delta v - k)[(1-\theta)k + \Delta v] - 2c[(1-\theta)\delta + \theta\Delta v])} > \overline{\varepsilon}_L.$$

It is tedious but possible to show that η^* is weakly decreasing in β in all other cases, noting that $\overline{\eta}_1$ and $\overline{\eta}_0$ are decreasing in β, and $\overline{\eta}$, $\eta_{(0,0)}$, $\eta_{(1,0)}$, and $\eta_{(1,1)}$ are independent of β. Focusing on when Form AP disclosure increases β from $\beta < \overline{\varepsilon}_L/\varepsilon$ to above it and summarizing these cases gives Corollary 2.

Proof of Proposition 2

The expected audit quality in each period is $E(q_t|\,\eta,\, e_t) = v_H Pr\,(v_H|\eta,\, e_t) + v_L Pr\,(v_L|\,\eta,\, e_t)$ where $\Pr\,(v_H|\eta, e_t) = \frac{1}{2}[1 + \eta + e_t\theta(1-\eta)]$ and $\Pr(v_L|\eta, e_t) = \frac{1}{2}(1-e_t\theta)(1-\eta)$.

Form AP disclosure affects expected audit quality through the partnership's choice of η and partners' effort choices e_t. Since the expected audit quality is increasing in η and e_t, Form AP disclosure would lead to an increase in expected audit quality if it increases either or both η and e_t. Additionally, we have to consider the case where an increase in β results in an increase in e_t but a decrease in η.

The cases where Form AP disclosure either increased the partnership's η^* or the resulting effort choices were described in the proof of Corollary 2. Also, Form AP disclosure would result in higher audit quality if the partnership's optimal internal quality control without Form AP disclosure was $\eta_{(0,0)}$ but becomes $\overline{\eta}_1$ or $\eta_{(1,0)}$ after the disclosure as long as the resulting η^* is greater than $\frac{(\eta_{(0,0)}-\theta)}{(1-\theta)}$. Focusing on the cases where Form AP disclosure increases β from below $\overline{\varepsilon}_L/\varepsilon$ to above it and summarizing these cases gives the conditions in Proposition 2.

Proof of Proposition 3

The proof follows an identical structure to the Proof of Corollary 2, seeking a case where an increase in β would result in an increase in the partnership's expected profit, π. Specifically, π would increase if the partnership's optimal investment in internal control can decrease without reducing individual partners' effort choices or if the partnership can induce higher effort choices with a small increase in the investment in internal control.

When $c < \overline{c}_M$, the optimal investment and thus the expected profits are not affected by β. When $c \in (\overline{c}_M, \overline{c}_H)$, $\beta < \overline{\varepsilon}_H/\varepsilon$, and $c \le \overline{c}_2$, $\eta^*=\overline{\eta}$, which does not increase in β. If β increases to $\beta \ge \overline{\varepsilon}_H/\varepsilon$, the partnerships's payoff is always weakly improved with Form AP disclosure, since $\eta^*=\overline{\eta}$ continues to be a feasible option. When $c \in (\overline{c}_M, \overline{c}_H)$, $\beta < \overline{\varepsilon}_H/\varepsilon$ and $c > \overline{c}_2$, $\eta^* = \overline{\eta}_1$, which is decreasing in β. In this case, the expected profit increases until $\beta \ge \overline{\varepsilon}_H/\varepsilon$ at which point $\eta^*=\eta_{(1,0)}$, which is independent of β. Therefore, when $c \le \overline{c}_H$, profits are weakly increasing in β.

When $c > \overline{c}_H$, η^* depends on whether $\beta \le \overline{\varepsilon}_L/\varepsilon$ (case 6), $\beta \in (\overline{\varepsilon}_L/\varepsilon, \overline{\varepsilon}_H/\varepsilon)$ (case 5) or $\beta \ge \overline{\varepsilon}_H/\varepsilon$ (case 3). When $c > \overline{c}_H$ and $\beta \ge \overline{\varepsilon}_H/\varepsilon$, η^* is independent of β. When $c > \overline{c}_H$ and $\beta < \overline{\varepsilon}_H/\varepsilon$, for the ranges of c where $\eta^* = \overline{\eta}$, profits are weakly increasing in β because $\overline{\eta}$ continues to be a feasible option for the partnership in all cases. When $c > \overline{c}_H$, $\beta < \overline{\varepsilon}_H/\varepsilon$ and $\eta^* = \overline{\eta}_1$, η^* continues to decrease in β, and the expected profit increases until $\beta \ge \overline{\varepsilon}_H/\varepsilon$ at which point $\eta^* = \eta_{(1,0)}$. When $c > \overline{c}_H$, $\beta < \overline{\varepsilon}_H/\varepsilon$

and $\eta^* = \overline{\eta}_0$, η^* decreases as β increases, moving farther away from $\eta_{(0,0)}$, resulting in a decrease in expected profits until $\beta \geq \overline{\varepsilon}_H/\varepsilon$, η^* flips to $\eta_{(1,0)}$, and expected profits increase. When $c > \overline{c}_H$, $\beta \leq \overline{\varepsilon}_L/\varepsilon$ and $\eta^* = \eta_{(0,0)}$, expected profits will increase with an increase in β if it results in $\eta^* = \eta_{(1,0)}$, which occurs when the resulting β is greater than $\overline{\varepsilon}_H/\varepsilon$. In the other cases where β increases from $\beta < \overline{\varepsilon}_L/\varepsilon$ to $\beta \in (\overline{\varepsilon}_L/\varepsilon, \overline{\varepsilon}_H/\varepsilon)$, and η^* jumps from $\eta_{(0,0)}$ to $\overline{\eta}_0$ or $\overline{\eta}$, the partnership's payoff will be lower. If η^* jumps from $\eta_{(0,0)}$ to $\overline{\eta}_1$, the relative values depend on the parameters, and Form AP disclosure may increase or decrease the partnership's payoffs.

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