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**Audit-Firm Profitability:**  
**Determinants and Implications for Audit Outcomes**

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# **Audit-Firm Profitability:**

## **Determinants and Implications for Audit Outcomes**

### **Abstract**

We use a novel dataset that links *audit-firm* and client-firm financial statement information from the U.K.'s largest audit firms to examine drivers of audit-firm profitability and its implications for audit outcomes. We first explore the determinants of audit-firm profitability and conclude that Big-4 and non-Big-4 audit firms have fundamentally different profitability structures. Big-4 firms have higher profit margins than non-Big-4 firms. Furthermore, Big-4 profitability increases with client size and complexity, while non-Big-4 profitability is higher for smaller, private-firm clients. Next, we examine the relation between audit-firm profitability and audit outcomes. Using a battery of alternative outcome measures (proxies for financial reporting quality, the propensity to issue a qualified auditor opinion, accounting restatements, and the level of unexpected KAM disclosures), we find that more profitable audit firms deliver higher audit quality. In supplemental analyses we show that the positive relation between audit-firm profitability and audit outcomes is generally stronger for more influential and illiquid clients (i.e., when auditors are exposed to more litigation risk). Our inferences are robust to several endogeneity controls, such as using an instrumental variables approach, controlling for *client-firm* and *audit-firm* fixed effects, employing lead-lag and changes specifications, and assessing bias from correlated omitted variables. Our study contributes to the literature by being the *first* to provide insights into audit-firm profitability and examine in detail its implications for audit quality and audit effort.

Keywords: Auditing, Audit Firms, Audit-Firm Profitability, Private Firms, Audit Quality, Audit Effort

## **Audit-Firm Profitability:**

### **Determinants and Implications for Audit Outcomes**

#### **1. Introduction**

Theoretical models in economics suggest that firm profitability is a key performance indicator that significantly affects product quality (Beard, 1990; Chevalier and Scharfstein, 1996; Fazzari *et al.*, 1988; Maksimovic and Titman, 1991). These models have been backed by empirical evidence from a number of industries (Dionne *et al.*, 1997; Kini *et al.*, 2017; Matsa, 2011; Noronha and Singal, 2004; Phillips and Sertsios, 2013; Rose, 1990). Furthermore, strategic management research finds evidence that a firm's financial performance affects perceptions of management and firm quality (McGuire *et al.*, 1990). Yet there is virtually no empirical evidence on the drivers of audit firms' profitability as well as on its implications for audit outcome. The lack of empirical evidence on the implications of firm profitability for service quality in the audit context is surprising, particularly in the light of regulatory concerns that profitability-related considerations could negatively affect audit quality.<sup>1</sup>

Audit firms are private firms. Therefore, the lack of empirical evidence of the association between audit-firm factors and audit outcomes is likely because U.S. audit firms' financial statements are not publicly available. In Europe, however, *all* private firms that meet certain size criteria are mandated to disclose and obtain audit of their financial statements (Elemes *et al.*, 2021). We take advantage of this institutional setting to extend research on audit-firm determinants of audit outcomes (DeFond and Zhang, 2014) by using a unique dataset of U.K. audit firms that links *audit-firm* and

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<sup>1</sup> Specifically, Paul George, head of the Financial Reporting Council's Professional Oversight Board, expressed concerns that a general downturn in audit work during the financial crisis might see firms concentrate on their bottom line at the expense of audit quality and that cost cuts could promote a culture where audit firms' own business growth is more important than audit quality. "Any prolonged reduction in investment in audit, be it recruitment, training or investment in systems or any behavioral changes to a realignment of personal objectives will have a long-term impact on audit quality", he said (<https://www.accountancyage.com/2009/11/12/audit-quality-under-pressure-as-firms-cut-costs/>).

client-firm financial statement information, and examine the drivers of audit-firm profitability and its implications for audit outcomes.

We begin by offering descriptive and exploratory analyses of the determinants of audit-firm profitability. We find that Big-4 firms earn higher profit margins than non-Big-4 firms. Controlling for Big-4 membership, audit firms with more employees exhibit lower profitability, while those with higher cash holdings exhibit higher profitability. Prior research suggests that Big-4 and non-Big-4 auditors have fundamentally different revenue and cost structures. Specifically, Francis and Stokes (1986) suggest that Big-4 auditors apply product differentiation strategies that allow them to charge higher audit fees to larger, and more complex clients. In addition, because Big-4 auditors invest more in technology, training, and facilities, they are better able to realize economies of scale when client complexity increases (Chaney *et al.*, 2004). In contrast, non-Big-4 auditors experience diseconomies of scale for larger, and more complex clients (Francis and Stokes, 1986). Our findings are consistent with client-firm complexity being an important driver of audit-firm profitability; however, we find complexity affects the profitability of Big-4 and non-Big-4 accounting firms differently. Specifically, we find that Big-4 profitability increases with client complexity (measured by listing status and size) but find that the opposite for non-Big-4 auditors.

Our hypothesis examines the extent to which audit-firm profitability is associated with audit outcomes. We use several commonly used output-based audit-quality proxies to infer audit outcome. We argue that more profitable audit firms are less likely to face constraints in the investment of human capital and information technology, better able to attract and retain high-quality human capital, and more successful in supporting the audit process with state-of-the-art IT systems. Furthermore, compensation policies incentivize partners to exert effort and minimize threats to auditor independence. For that reason, partner compensation is, at least in part, a function of audit-firm profitability at the

national or even international (i.e., non-local) level (Burrows and Black, 1998; Carcello *et al.*, 2000; Elmes *et al.*, 2021; Trompeter, 1994). Partners in more profitable firms are, therefore, more likely to uphold independence and less likely to succumb to client pressure because they will receive a larger portion of their compensation from profit sharing at the firm level. We argue that more profitable audit firms are less likely to make concessions to quality when client firms exercise fee pressure, for example, by refusing to pay additional fees for transactions that are not known to the auditor upfront but are only revealed during the fiscal year. Finally, more profitable audit firms have “deeper pockets” and, therefore, they are more exposed to litigation risk. Prior research suggests that audit firms reduce exposure to litigation risk by exerting effort (DeFond and Zhang, 2014).

A strong positive relation between audit firms’ financial performance and audit quality, however, is not certain. First, if audit firms achieve financial success through client portfolio management or by accepting more high-risk clients, audit quality may be impaired. Second, to the extent that non-audit services are the dominant contributor to audit-firm profitability, it is possible that audit quality will be compromised by non-audit services. Last but not least, if financial performance of the audit firm is an important criterion in perceptions of management quality, partners may be encouraged to manipulate financial variables to enhance perceptions of management quality.

We find strong evidence that client firms of more profitable audit firms exhibit a lower level of earnings management, higher accruals quality, and a lower probability of restatement. Furthermore, more profitable audit firms are more likely to issue qualified audit opinions for loss-making client firms and report more abnormal KAMs.

We perform two cross-sectional tests. The first test examines the extent to which client importance influences the relation between audit-firm profitability and audit outcome. We find a stronger relation between audit-firm profitability and audit outcome for larger and more influential

client firms, consistent with these clients posing higher audit risk (Francis and Yu, 2009; Reynolds and Francis, 2000). The second cross-sectional test focuses on the client firm's default risk. More profitable audit firms have "deeper pockets" and more wealth at risk. Therefore, auditors from more profitable firms may have greater incentives to exert effort and maintain independence for client firms subject to higher default risk to mitigate their liability exposure. We find some evidence that the effect of audit-firm profitability on audit outcome is stronger in client firms with higher default risk.

We note that a key challenge for our empirical analyses is the possibility of unknown correlated omitted variables. To address this, we use an instrumental variable approach, control for both *client-firm and audit-firm fixed effects*, employ changes and lead-lag specifications, and assess bias from correlated omitted variables. Our inferences remain unchanged. Finally, we document positive associations between audit-firm profitability and future intangible assets and employee growth, providing corroborating evidence that more profitable audit firms have more resources to ensure quality audit work.

Our paper makes several contributions. First, despite its exploratory nature, our study is the first to provide insights into the determinants of overall audit-firm profitability. Our study relates to Hoang, Jamal, and Tan (2019) who examine determinants of audit-engagement profitability. A number of studies suggest that audit-firm overall profitability plays an important role - potentially greater than audit-engagement profitability - in partner-compensation policies and in incentivizing auditors to exert effort (e.g., Trompeter (1994); Hay *et al.* (2007); Ernstberger *et al.* (2020)). We respond to Hoang *et al.* (2019)'s call for future research on exploring better measures of *firm* profitability, which is used by audit firms to make resource allocation and performance bonus decisions (Hoang *et al.* (2019), p.276).

Second, our study contributes to the literature that examines drivers of operating efficiency for Big-4 and non-Big-4 auditors. Francis and Stokes (1986) and Chaney *et al.* (2004) suggest that Big-4

accounting firms are better able to audit larger, more complex clients when compared with their non-Big-4 counterparts. Consistent with this argument, we find that Big-4 (non-Big-4) profitability increases (decreases) with client complexity measured by client-firm size and listing status.

Third, our study is relevant to research that examines the association between audit-firm characteristics and audit quality. Prior research suggests that Big-N auditors or auditors specialized in a specific industry deliver higher audit quality (Becker *et al.*, 1998; DeAngelo, 1981; Francis and Wang, 2008). Francis (2011) argues that research on the relation between audit firms and audit quality is severely limited by the availability of data on audit-firm characteristics and recommends that researchers should attempt to analyze audit firms' organizational structure and operations. Our study extends this research by using *audit-firms' financial data* to more fully analyze the economic drivers that shape audit outcomes. We examine whether audit-firm profitability, a key performance indicator, is associated with various dimensions of audit outcome. Hoang *et al.* (2019) do not find a significant relation between audit quality (measured by discretionary accruals and audit adjustments) and engagement profitability. We find an *incremental* effect of audit-firm profitability on audit quality, after controlling for Big-N membership and auditor industry specialization that have been extensively used in the literature to infer audit quality.

Fourth, we show that the positive relation between audit-firm profitability and audit outcome strengthens in economically more important client firms and client firms with higher default risk. In that regard, we offer insights into the interplay among audit-firm financial performance, auditor's liability exposure, and audit quality. Our study also adds to the stream of research that highlights the importance of exposure to litigation risk in incentivizing auditors to exert effort (DeFond and Zhang, 2014; Dye, 1993).



Finally, when we separately examine the association between components of audit-firm profitability and audit quality, we find that audit-firm staff costs have an economically stronger implication for audit quality than audit-firm revenues, thereby highlighting the importance of focusing on audit-firm overall profitability in understanding the supply of audit quality. We, therefore, note that the contribution of our study is distinct from that of the literature examining determinants of engagement-specific audit fee revenue and the link between audit fees and audit outcomes (Hay *et al.*, 2006).

## **2. Literature Review and Hypothesis Development**

Theoretical models in economics suggest that the financial condition of a firm can affect its ability and incentives to invest in initiatives that enhance product quality (Beard, 1990; Chevalier and Scharfstein, 1996; Fazzari *et al.*, 1988; Maksimovic and Titman, 1991). These models have been backed by empirical evidence from many industries. For example, Rose (1990), Dionne *et al.* (1997), and Noronha and Singal (2004) provide evidence of a positive link between airline profitability and airline safety. Matsa (2011) finds evidence consistent with highly levered supermarkets degrading their products' quality in order to preserve current cash flow for debt service. Finally, Kini *et al.* (2017) utilize data on food, drug, and medical device recalls as well as on automobile recalls to examine product recall events from 37 (93) different two-digit (three-digit) SIC code industries. Their findings suggest a positive association between leverage/distress likelihood and the probability of a subsequent product recall.

Evidence from the marketing literature further suggests that firms' financial performance is important in explaining their engagement in cost-reduction activities that impair product quality and customer satisfaction (Anderson *et al.*, 1997; Malshe and Agarwal, 2015). Malshe and Agarwal (2015) argue that the negative relation between financial distress and customer satisfaction is stronger in

service firms because service firms are more likely to emphasize product customization and the cost of customization increases at an increasing rate.

Firm financial performance can affect labor supply as well. Using a proprietary dataset that tracks all jobs posted by forty high-profile financial services firms during the financial crisis, Brown and Matsa (2016) examine job-applicant behavior as a function of their perception about the posting firm's profitability. The authors find that applicants are less likely to apply to distressed firms and that this relation is more pronounced for positions with high educational requirements. They further find that applicants' average quality declines with firms' financial distress. This finding suggests a link between firm financial performance and the ability to attract high-quality human capital, an important production input and determinant of service quality.

The literature on audit-firm characteristics and their associations with audit quality begins with the Big-N dichotomy. Subsequent research identifies industry specialization as a source of variation in audit quality among audit firms (Balsam *et al.*, 2003; Beasley and Petroni, 2001; Craswell *et al.*, 1995). However, due to data constraints, much remains unknown about audit firms' organizational structure and operations and whether these firm-level factors influence the supply of audit quality.<sup>2</sup> Our study attempts to open up this black box as we use U.K. audit firms' financial data to understand the role of audit-firm profitability, a key performance indicator, in shaping the supply of audit quality.

In our study we posit that financial performance at the audit-firm level will have a positive impact on audit outcome, which we infer from commonly used audit-quality proxies and from auditors' KAM disclosures, for a number of reasons. First, more profitable firms face fewer resource constraints. They can attract and retain high-quality employees and provide them with up-to-date technical support and training. Firm-level financial performance influences investments in firm-wide audit support

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<sup>2</sup> Che *et al.* (2020) make use of detailed register data in Norway to examine *how* Big-4 firms provide higher audit quality than non-Big-4 firms. Such data are not available in most jurisdictions.

systems and the use of information technology to control the audit process. Anecdotal evidence is consistent with the idea that profitability concerns play an important role in investment in human capital and information technology.<sup>3</sup> The audit support system is essential for achieving high-quality audits because it is the primary technology application used by audit firms to control, facilitate, and support audit work (Banker *et al.*, 2002; Dowling and Leech, 2007). If more profitable audit firms have more abundant resources to respond to changes in various types of audit risk (e.g., litigation, earnings manipulation, and fraud, among others) and can afford to deploy a better audit-support system (e.g., through better staffing and sharing workloads) to achieve firm-wide compliance with the audit methodology, we expect their audit teams to deliver higher audit quality at the engagement level. In contrast, auditors who are vulnerable to the adverse implications of budget constraints and workload compression at the audit firm (office) level are more likely to sacrifice audit quality. Our discussions with a former Deloitte director confirmed that cost-cutting activities in response to profitability considerations can have negative implications for audit quality:<sup>4</sup>

*“Our profitability is a function of not only of our fees, but also of our costs. This is an observation, a personal observation from my side. Audit firms... have too long considered their profitability to stand above audit quality as opposed to serving audit quality, meaning that they depleted our resource bases, in terms of human resources, the auditors were not sufficiently paid, and accordingly, they couldn’t recruit as they wanted because they were not sufficiently paid, in a context where we are highly regulated, increasingly so, resulting in a real problem in terms of resources and a direct impact on audit quality.”*

Second, audit firms design compensation policies to incentivize auditors to exert effort. They share the profits among their partners at a local (e.g., office) level or at a national/international level

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<sup>3</sup> For example, in 2019, KPMG U.K., under profitability concerns, stepped up its cost-cutting drive by asking hundreds of its employees working in IT and legal teams to hand in their work mobile phones.

<sup>4</sup> We note that the interview-based assessment (date of interview: April 15, 2022) reflects the anonymous Deloitte director’s own viewpoints about the relation between audit-firm profitability and audit quality. We suggest that caution be exercised in interpreting this anecdotal evidence as the personal viewpoints may not generalize to other audit partners and/or audit firms.

(Hay *et al.*, 2007; Trompeter, 1994). This is because (1) audit firms are organized as partnerships where partners are both principals and agents of the firm and thus have incentives to monitor each other (Huddart and Liang, 2005), and (2) partners are required to remain independent of their clients. Research finds that profit sharing in a large profit pool at the national level is associated with higher audit quality because independence concerns arise in a small profit pool at the local level (Ernstberger *et al.*, 2020). Knechel *et al.* (2013) argue that partner profit sharing is likely to depend on the partner's client base as well as attributes of the audit firm, such as overall profits.<sup>5</sup> Our interview evidence confirmed the direct link between audit-partner compensation and audit-firm overall profitability, particularly for full-equity partners as the following quote attests to:

*“Partner remuneration is exclusively based on profit sharing and so on the profitability of the program (i.e., the firm) as a whole. Any negative margins that they would have made on their ordered jobs does not impact the remuneration that they receive. Obviously, they get rapped on the knuckles. They are incited to do better... In a certain category of partner, there will be a certain measure of impact coming from any losses they might make on their individual jobs because they don't get profit share. But those are non-equity partners, otherwise known as the signing directors or associate directors, depending on the audit firm.”*

In a more profitable audit firm, partners are less likely to compromise independence and succumb to client pressure because they will receive a larger portion of their compensation from profit sharing at the firm level. We expect that auditors facing lower profit pressure are more likely to uphold auditor independence and integrity. In contrast, poor-performing audit firms will increase their partners' vulnerability to client demands, unintentionally creating an independence threat.

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<sup>5</sup> For instance, on p. 1 of the 2016 financial statements of PwC U.K. it is explicitly stated that partners at PwC U.K. receive a distribution of the profits of the LLP (i.e., the profits of the consolidated entity). Specifically, at PwC U.K. each partner's profit share comprises three interrelated profit-dependent components: (1) responsibility income – reflecting the partner's sustained contribution and responsibilities, (2) performance income – reflecting how a partner and their team(s) have performed, and (3) equity unit income – reflecting the *overall profitability* of the LLP. The argument that audit-partner compensation is a function of audit-firm profitability is consistent with Vandenhoute *et al.* (2020) and Alberti *et al.* (2020) who suggest that audit-partner compensation structure and audit-firm culture are dominated by commercial logic.

Third, and related to the second point, client firms may negotiate with their auditors on audit fees and this could have implications for audit quality if less profitable audit firms make concessions to audit quality when client firms refuse to pay for additional effort:

*“In June (assuming fiscal year end on 31<sup>st</sup> of December), we will present our audit strategy to the audit committee. Preceding that meeting with the audit committee, we will have made an estimation of our budget that we will have discussed with group finance to get their feeling about whether they would be okay with the fees per se. If we run into trouble in that space, when we present to the audit committee, we will explain to them that the group finance has put a limit on how much they’re willing to pay meaning that this could have a direct impact on our scoping and hence a direct impact on our quality and the quality of our opinion.”*

Our interview evidence suggested that clients often engage in negotiations with their auditor and/or are reluctant to pay for additional effort, particularly for transactions that are not visible to the auditor upfront:

*“In order to construct an audit approach that makes sense, we need to have good visibility on what the entity is going to be getting up to. Are there acquisitions coming up? Are there big refinancing, operations coming up? Yes or no? We don’t necessarily have that information upfront... should there be any transactions later in the year, we would expect to be able to issue an addendum to our engagement letter and in so doing, charge additional fees for that... Vinci when they bought Gatwick Airport, the audit partner trying to negotiate additional fees to order the acquisition, and the group just sent them packing saying, don’t steal. How this is any different from what I do every single year. Acquisitions are part of the normal life of a company, so too bad for you.”*

Finally, one could argue that more profitable audit firms have “deeper pockets” and more wealth at risk, making them a target for litigation. Prior research suggests that auditors reduce exposure to litigation risk by exerting more effort. We, therefore, hypothesize that more profitable audit firms have stronger incentives to deliver high audit quality to avoid costly litigation (DeFond and Zhang, 2014).

Based on the above discussion, we state our main hypothesis in the alternative form as follows:

**H1: *Audit-firm profitability is positively associated with audit quality.***

The null hypothesis is that engagement-specific audit outcome is not associated with audit-firm profitability. While we do not expect this to be the case, the research question is not without tension for several reasons. First, many audit firms, especially the Big-4, are highly profitable. Partners may be insensitive to minor fluctuations of firm-level profitability or they only participate in profit sharing at the local level (Ernstberger *et al.*, 2020; Hay *et al.*, 2007; Trompeter, 1994). Second, if an audit firm is solely focused on the bottom line and achieves financial success through client portfolio management (e.g., accepting more high-risk clients), then audit quality may not be related to, or may even be negatively related to, audit-firm profitability.<sup>6</sup> Third, to the extent that an audit firm's profitability is significantly influenced by its non-audit services, potential conflicts of interest that arise between the auditing work and consulting work for client firms may jeopardize audit quality.<sup>7</sup> Fourth, if financial performance of the audit firm is an important criterion in perceptions of management quality with strong implications for client selection (McGuire *et al.*, 1990), partners may have incentives to manipulate financial performance.<sup>8</sup> Finally, other firm-level and engagement-level characteristics, such as firm size and fee dependence (that we control for), may subsume audit-firm profitability in driving the audit process. These tensions leave our research question as an empirical one.

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<sup>6</sup> Hay *et al.* (2007) document that audit firms with profit-sharing arrangements at the national level are associated with riskier client portfolios. However, shifting toward riskier clients may not necessarily impact the supply of audit quality.

<sup>7</sup> In 2020, the Financial Reporting Council in the U.K., aiming to reduce potential conflicts of interest and boost the quality of audits, requested that large audit firms separate audit and non-audit services by June 2024. See [https://www.wsj.com/articles/u-k-regulator-orders-big-four-to-separate-audit-practices-by-2024-11594070565?mod=article\\_inline](https://www.wsj.com/articles/u-k-regulator-orders-big-four-to-separate-audit-practices-by-2024-11594070565?mod=article_inline) for details. However, empirical evidence is mixed on the relation between non-audit services and audit quality (e.g., Frankel *et al.* (2002); Ashbaugh *et al.* (2003); Svanström (2013)).

<sup>8</sup> Bowen *et al.* (1995) find that income-increasing earnings management is more prevalent for firms that depend more on implicit claims with their stakeholder groups, such as customers, suppliers, and employees. Similarly, Raman and Shahrur (2008) find that earnings management is used opportunistically to influence the perception of suppliers and customers about the firm's prospects.

### 3. Research Design

#### 3.1 Determinants Analyses

We first seek to understand *what drives* audit-firm profitability. This test is exploratory in nature because we lack clear economic (audit) theory to guide our choice of the determinants of profitability at the audit-firm level. We classify our explanatory variables into two groups: *audit-firm* characteristics and *clientele* characteristics. Audit-firm characteristics include size, intangible asset intensity, cash holdings, and industry specialization. Larger firms benefit from economies of scale and market power, so we expect them to be more profitable (Hall and Weiss, 1967; Schmalensee, 1989). We measure audit-firm size by the natural logarithm of the number of employees (*LnEmpl AF*) and Big-4 membership (*Big4*). Firms compete in product markets by investing in innovation using their cash holdings (Lyandres and Palazzo, 2016). Given audit firms' strong commitment to emerging technologies, we expect their cash policies to be strategically motivated by investments in innovation, which in turn can influence firm growth and operating performance. Accordingly, we include the natural logarithm of cash holdings (*LnCash AF*) as a potential contributing factor to profitability. Prior research provides evidence consistent with intangible asset intensity being a determinant of tax-motivated profit shifting in audit-firm networks (and hence, audit-firm profitability) (Elemes *et al.*, 2021). Accordingly, we include a control for the ratio of audit-firm intangible to total assets. Finally, industry specialists charge a fee premium (Hay *et al.*, 2006) and could be associated with higher profitability. We, therefore, control for auditor industry specialization, averaged at the audit-firm-year level (*AvgIndSpec AF*). We define auditor industry specialization (*IndSpec AF*) as the ratio of all audit

fees collected by a given audit firm in a given industry-year to the sum of all audit fees collected by all audit firms in that industry-year. We identify industries using their two-digit SIC code.

We also expect certain client-firm characteristics to be associated with audit-firm profitability. The literature provides compelling evidence that auditors charge higher fees for riskier clients and larger clients whose operations are more complex (Hay *et al.*, 2006). However, whether these clients improve or hurt audit-firm profitability is an open question, as it is not clear whether audit firms can fulfill their service in a cost-effective way. Our unit of observation is *audit firm-year*. Our client-firm determinants are, therefore, estimated at the audit firm-year level and represent mean values of the respective determinant. We include the proportion of public client firms to the total number of client firms (*AvgPublic CF*), the proportion of client firms reporting a loss (negative net income) to the total number of client firms (*AvgLoss CF*), the average client size (*AvgLnAssets CF*), the average client leverage (*AvgLeverage CF*), the average client operating performance (*AvgROA CF*), the average proportion of client receivables and inventory to total assets (*AvgRecInv CF*), the average client sales volatility (*AvgStdSales CF*), the average client non-audit to audit fees ratio (*AvgNonAuditFeesRatio CF*), the average client importance (*AvgInfluential CF*), and the average client number of subsidiaries (*AvgLnNumSubs CF*). For these variables, we do not make directional predictions.

We estimate the following equation using OLS:

$$\begin{aligned}
 \mathbf{EBIT\ Margin\ } AF_{j,t} = & \alpha_0 + \alpha_1 \mathbf{LnEmpl\ } AF_{j,t} + \alpha_2 \mathbf{LnCash\ } AF_{j,t} + \alpha_3 \mathbf{Intangibles\ } AF_{j,t} + \alpha_4 \mathbf{AvgIndSpec\ } AF_{j,t} \\
 & + \alpha_5 \mathbf{Big4}_{j,t} + \alpha_6 \mathbf{AvgPublic\ } CF_{i,t} + \alpha_7 \mathbf{AvgLnAssets\ } CF_{i,t} + \alpha_8 \mathbf{AvgLeverage\ } CF_{i,t} + \alpha_9 \mathbf{AvgROA\ } CF_{i,t} + \\
 & \alpha_{10} \mathbf{AvgLoss\ } CF_{i,t} + \alpha_{11} \mathbf{AvgRecInv\ } CF_{i,t} + \alpha_{12} \mathbf{AvgStdSales\ } CF_{i,t} + \alpha_{13} \mathbf{AvgNonAuditFeesRatio\ } CF_{i,t} + \\
 & \alpha_{14} \mathbf{AvgInfluential\ } CF_{i,t} + \alpha_{15} \mathbf{AvgLnNumSubs\ } CF_{i,t} + \mathbf{Year\ Fixed\ Effects} + \varepsilon_{i,t} \quad (1)
 \end{aligned}$$

where *EBIT Margin*  $AF_{j,t}$  is earnings before interest and taxes scaled by sales for audit firm  $j$  in year  $t$ .



### 3.2 Consequences Analyses

To evaluate our hypothesis, we estimate the following baseline equation using OLS or logit estimation techniques (depending on the outcome measure):

$$\begin{aligned} \text{Audit Quality}_{i,j,t} = & \alpha_0 + \alpha_1 \text{EBIT Margin AF}_{j,t} + \alpha_2 \text{LnEmpl AF}_{j,t} + \alpha_3 \text{LnCash AF}_{j,t} + \alpha_4 \text{Intangibles AF}_{j,t} \\ & + \alpha_5 \text{IndSpec AF}_{j,t} + \alpha_6 \text{Big4}_{j,t} + \alpha_7 \text{Public CF}_{i,t} + \alpha_8 \text{LnAssets CF}_{i,t} + \alpha_9 \text{Leverage CF}_{i,t} + \alpha_{10} \text{ROA CF}_{i,t} \\ & + \alpha_{11} \text{Loss CF}_{i,t} + \alpha_{12} \text{RecInv CF}_{i,t} + \alpha_{13} \text{StdSales CF}_{i,t} + \alpha_{14} \text{NonAuditFeesRatio CF}_{i,t} + \alpha_{15} \text{Influential CF}_{i,t} \\ & + \alpha_{16} \text{LnNumSubs CF}_{i,t} + \alpha_{17} \text{AuditorSwitich CF}_{i,t} + \text{Year Fixed Effects} + \text{Industry Fixed Effects} + \varepsilon_{i,t} \quad (2) \end{aligned}$$

We use the following outcome measures: the level of absolute discretionary accruals ( $|DACC|$   $CF$ ) as in Kothari *et al.* (2005), the McNichols (2002) modification of the Dechow and Dichev (2002) accrual quality measure ( $AQ$   $CF$ ), the propensity to issue a qualified opinion ( $Qualified$   $CF$ ), the likelihood of accounting restatements ( $Restatement$   $CF$ ), and the level of unexpected KAMs ( $Unexp.$   $KAMs$   $CF$ ) following Lennox *et al.* (2022). We provide a detailed description of how we construct the five outcome measures in Online Appendix I.

#### Control Variables

The control variables can be broadly classified into two groups. The first group contains the audit-firm characteristics identified in our preceding determinants analyses. In particular, we include  $LnEmpl$   $AF$ ,  $LnCash$   $AF$ ,  $Intangibles$   $AF$ ,  $IndSpec$   $AF$ , and  $Big4$ .

Our second group of control variables contains client-firm determinants of audit quality. Following prior research (Burgstahler *et al.*, 2006; Francis and Yu, 2009; Hope *et al.*, 2013; Lennox *et al.*, 2022), we include client-firm size/complexity measured by the natural logarithm of total assets ( $LnAssets$   $CF$ ), listing status ( $Public$   $CF$ ), and the natural logarithm of the number of subsidiaries ( $LnNumSubs$   $CF$ ). We include controls for performance using return on assets ( $ROA$   $CF$ ) and loss making ( $Loss$   $CF$ ). We include the ratio of receivables and inventory to total assets ( $RecInv$   $CF$ ) to

capture components that require certain audit procedures and are often viewed as sources of increased audit risk. Further, we include the level of operating volatility (*StdSales CF*) and leverage (*Leverage CF*) to represent riskiness.

To assess the potential economic bonding between the client firm and its auditor we control for the ratio of non-audit to audit fees (*NonAuditFeesRatio CF*), whether the client changes its auditor in year  $t$  (*AuditorSwitch CF*), as well as a proxy for client importance (*Influential CF*). We define this variable as the ratio of total fees collected by a given client to the sum of total fees collected by all clients in a given year. Following prior research (Ashbaugh *et al.*, 2003; Choi *et al.*, 2010), we augment equation (2) by including the level of lagged total accruals (*LagTACC CF*) in the specifications in which we measure audit quality using proxies for financial reporting quality ( $|DACC| CF$  and *AQ CF*) to control for the reversal of accruals over time. Finally, we include industry and year fixed effects. We define industries using their two-digit SIC code. In all models we use heteroskedasticity-robust standard errors, clustered at the audit-firm level.

## 4. Sample Selection and Descriptive Statistics

### 4.1 Sample Selection

Our main source of U.K. data is the FAME database by Bureau van Dijk. Our initial sample consists of all U.K. private and publicly listed firms in the FAME database with available auditor financial statement information during the period 2008-2020 (689,329 client-firm-year observations).<sup>9</sup> We drop firms belonging in the financial sector (SIC codes: 60-69) as well as private firms that are not

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<sup>9</sup> Audit firms are private firms. Therefore, they are required to comply with the Fourth EU Directive and its amendments that mandate the financial statement disclosure and audit of all private firms that meet certain size criteria. To identify audit firms in FAME we limit our sample to those private firms that engage in accounting, bookkeeping, auditing, and tax consultancy activities (Peer group code: 6920). We subsequently manually match the company name field (i.e., the audit-firm name field) in the audit-firm sample with the auditor name field in the client-firm sample.

subject to mandatory audit<sup>10</sup> (159,881 and 237,467 client-firm-year observations, respectively). We further delete observations without enough data to calculate our accrual-based outcome measures ( $|DACC| CF$  and  $AQ CF$ ) and observations with missing values for the control variables in equation (2) (187,127 client-firm-year observations). Our main sample consists of 104,854 client-firm-year and 502 audit-firm-year observations (58 unique audit firms). We present the sample selection procedures for the main sample in Table 1, panel A.

For our analyses that examine the relation between audit-firm profitability and the auditor's propensity to issue a qualified auditor opinion we drop client firms with positive net income (82,322 client-firm-year observations). We additionally lose 3,154 client-firm-year observations upon including industry fixed effects in the logit specifications. Our qualified opinion sample consists of 19,378 client-firm-year observations. Table 1, panel B presents the sample selection procedures for the qualified opinion sample.

We use Audit Analytics Europe as our source for restatement data. Restatement data is only available for private firms. We, therefore, drop 99,021 private client-firm-year observations from our main sample. Restatement announcement coverage in Audit Analytics Europe starts in 2017. Prior research documents a considerable time lag between the original financial statement release and a subsequent restatement (Cheffers *et al.*, 2011). Accordingly, we use 2014 as our cutoff year to allow sufficient time for the subsequent restatements to occur. Finally, we lose 1,144 client-firm-year observations when including industry fixed effects in the logit specifications. Our restatement sample consists of 2,265 client-firm-year observations. Table 1, panel C presents the sample selection procedures for the restatement sample.

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<sup>10</sup> <https://www.gov.uk/audit-exemptions-for-private-limited-companies>

We use Audit Analytics Europe as our source for the KAM data as well (only available for publicly listed firms). In June 2013, the U.K. issued ISA 700 (Revised) that requires auditors to report KAMs. This requirement became mandatory for firms with a premium listing of stocks on the London Stock Exchange Main Market for fiscal year-ends in or after September 2013 and for all listed firms for fiscal year-ends in or after December 2016. Accordingly, our sample includes U.K. premium-listed firms with fiscal year ends between September 2013 and November 2016 and all U.K. listed firms with fiscal year-ends between December 2016 and December 2020. Our KAM sample consists of 2,722 client-firm-year observations (we drop 99,021 private client-firm-year observations from the main sample, 2,128 client-firm-year observations representing client-firm-years before September 2013 and 983 client-firm-year observations representing non-premium listed firms with fiscal year-ends between September 2013 and November 2016). Table 1, panel D presents the sample selection procedures for the KAM sample.

## 4.2 Descriptive Statistics

Panel A (panel B) of Table 2 presents descriptive statistics for the variables used in the determinants (consequences) analyses. On average, audit firms report an *EBIT Margin AF* of 24%. The mean of *Big4* in panel A suggests that 10% of our audit-firm data relate to Big-4 accounting firms. Big-4 accounting firms audit roughly 66% of the main sample client firms as indicated by the mean of *Big4* in panel B. Roughly 1% of the firms in the qualified opinion sample have received a qualified opinion as suggested by the mean of *Qualified CF*. Furthermore, 14% of the client-firm observations in the restatement sample relate to client-firm-years that are subsequently restated. Finally, 6% of our sample firms change auditors over the sample period, as indicated by the mean of *AuditorSwitch CF*.<sup>11</sup>

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<sup>11</sup> We present the correlations between client-firm outcome measures and audit-firm variables in Online Appendix II. We find that *EBIT Margin AF* is significantly negatively (positively) correlated with *|DACC| CF*, *AQ CF*, and *Restatement CF* (*Unexp. KAMs CF*). Furthermore, we find a positive and insignificant correlation coefficient between *EBIT Margin AF* and *Qualified CF*. The bivariate results, therefore, provide initial support for our hypothesis.

## 5. Results

### 5.1 Determinants of Audit-Firm Profitability

We present the audit-firm profitability determinants analyses in Table 3 (models 1-3). In the first model we report the results for all 502 audit-firm-year observations between 2008 and 2020. We find that audit-firm cash holdings are positively and significantly associated with profitability. Big-4 firms are significantly more profitable than non-Big-4 firms. Turning to clientele characteristics, we document evidence that auditing more complex client firms is less profitable for audit firms. We also find that client-firm loss-making and client-firm leverage are negatively associated with audit-firm profitability. Furthermore, audit firms with more influential clients and audit firms with higher non-audit-to-audit fees ratios are associated with lower audit-firm profitability. These are new findings in the literature.

Big-4 and non-Big-4 audit firms operate in different segments of the U.K. audit market and their business models (profit functions) are likely to differ. For instance, Chaney *et al.* (2004) suggest that, relative to non-Big-4 firms, Big-4 firms are able to carry out audits more efficiently for large and complex client firms. Thus, we separately estimate the audit-firm profitability equation for the Big-4 and non-Big-4 subsamples in the next two models. We find that Big-4 profitability increases with the number of public client firms (*AvgPublic CF*) and the size of client firms (*AvgLnAssets CF*) but drops with client-firm operating volatility (*AvgStdSales CF*).

In contrast, non-Big-4 profitability is positively associated with audit-firm cash holdings (*LnCash AF*), suggesting that the profitability of small audit firms is sensitive to cash policies. Client-firm size (*AvgLnAssets CF*) and listing status (*AvgPublic CF*) are negatively associated with audit-firm profitability, consistent with non-Big-4 profitability being optimized for smaller, private client firms. Furthermore, client-firm loss-making is negatively associated with audit-firm profitability for non-Big-

4 auditors. Finally, non-Big-4 audit firms with more influential clients as well as non-Big-4 audit firms with higher non-audit-to-audit fees ratios are associated with lower profit margins.

To shed light on the determinants of *components* of audit-firm profitability for Big-4 and non-Big-4 accounting firms, we repeat our estimations of models 2 and 3 after decomposing *EBIT Margin AF* into a revenue component (*Revenues AF*) and three alternative cost components, i.e., total operating audit-firm costs (*Costs AF*), audit-firm cost of employees (*StaffCosts AF*), and audit-firm all other costs (*OtherCosts AF*). We present these analyses in Online Appendix II. We find that the positive (negative) association between proxies for client-firm complexity and audit-firm profitability in Big-4 (non-Big-4) audit-firms is generally driven, in part, by a positive (negative) association between client-firm complexity and audit-firm revenues and, in part, by a negative (positive) association between client-firm complexity and audit-firm staff and/or non-staff costs (i.e., overhead and other costs). These findings suggest that, while both audit-firm characteristics and clientele characteristics are associated with profitability at the audit-firm level, Big-4 and non-Big-4 auditors target different audit-market segments and have different sources of profitability. Our analyses provide new empirical evidence that has previously not been possible due to a lack of data on audit firms.

## **5.2 Audit-Firm Profitability and Audit Outcomes**

### **5.2.1. Main Findings**

Our hypothesis predicts a positive relation between audit-firm profitability and audit quality. We report the results of testing H1 in Table 4 (models 1-5). Regardless of how we measure audit quality we find evidence in line with more profitable audit firms exerting more effort and delivering higher audit quality. In particular, in model 1 we examine the relation between audit-firm profitability and client-firm absolute discretionary accruals ( $|DACC| CF$ ). We find that the coefficient on *EBIT Margin AF* is significantly negative ( $\alpha_1 = -0.005$ ;  $t$ -stat = -3.22). This finding is consistent with client firms of

more profitable audit firms engaging in lower levels of earnings management. In model 2 we use *AQ CF* as our proxy for audit quality. We find a significantly negative coefficient on *EBIT Margin AF* ( $\alpha_1 = -0.003$ ;  $t\text{-stat} = -2.00$ ) suggesting that client firms of more profitable audit firms have lower accrual estimation errors. Model 3 examines the association between audit-firm profitability and the propensity to issue a qualified auditor opinion (*Qualified CF*) for loss client firms. Once again, results are consistent with expectations as indicated by the significantly positive coefficient on *EBIT Margin AF* ( $\alpha_1 = 4.566$ ;  $z\text{-stat} = 1.73$ ). In model 4 we measure audit quality using accounting restatements (*Restatement CF*). We find a significantly negative coefficient on *EBIT Margin AF* suggesting that client firms of more profitable audit firms are less likely to restate their earnings ( $\alpha_1 = -4.099$ ,  $z\text{-stat} = -2.57$ ).<sup>12</sup> Finally, our estimations of model 5 reveal that more profitable audit firms are associated with higher levels of unexpected KAMs (*Unexp. KAMs CF*) as indicated by the significantly positive coefficient on *EBIT Margin AF* ( $\alpha_1 = 0.826$ ;  $t\text{-stat} = 2.52$ ). Taken together, the results of Table 4 provide consistent evidence in line with more profitable audit firms exerting more effort and delivering higher audit quality.

Turning to the control variables, we find that Big-4 clients (*Big4*) are associated with lower financial reporting quality (regardless of how we measure it i.e., *|DACC| CF* or *AQ CF*). This finding is consistent with Chen *et al.* (2021) who suggest that Big-4 accounting firms emphasize tax planning rather than financial reporting quality in the audit services they deliver to private-firm clients (94% of the firms in the main sample are private firms). In addition, Big-4 clients are less likely to receive a qualified auditor opinion and are less likely to restate their earnings. In line with prior research (Burgstahler *et al.*, 2006; Hope *et al.*, 2013), we find that large client firms (*LnAssets CF*) and publicly listed client firms (*Public CF*) are generally associated with better financial reporting quality.

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<sup>12</sup> Inferences are unchanged if we repeat our estimations of models 3 and 4 using OLS (instead of logit) techniques.

Furthermore, loss-making client firms (*Loss CF*) have lower financial reporting quality and higher levels of unexpected KAMs. After controlling for loss-making we find that client-firm profitability (*ROA CF*) is negatively associated with financial reporting quality, consistent with very profitable client firms engaging in earnings management. Furthermore, more profitable client firms are less likely to receive a qualified auditor opinion and are associated with higher levels of unexpected KAMs.<sup>13, 14</sup>

### 5.2.2. Endogeneity in the Form of Potential Reverse Causality

Our findings are consistent with economic theory suggesting that firm profitability positively affects product/service quality (Beard, 1990; Chevalier and Scharfstein, 1996; Fazzari *et al.*, 1988; Maksimovic and Titman, 1991). However, we recognize that endogeneity in the form of reverse causality is an important consideration in our setting to the extent that audit firms that deliver high audit quality have greater reputation capital and, therefore, are able to generate higher profit margins.

To control for possible endogeneity related to “unobservables” and/or the direction of causality we employ an instrumental variable approach using the ratio of audit-firm tax expense to audit-firm total assets as our instrument for audit-firm profitability. We expect audit firms’ tax planning strategies to be strongly positively associated with audit-firm profitability. However, there is no reason to expect that the ratio of audit-firm tax expense to audit-firm total assets should have an effect on audit outcomes for the focal client.

In the first-stage model (Online Appendix II) we regress *EBIT Margin AF* on the ratio of audit-firm tax expense to audit-firm total assets as well as the control variables in equation (2). We use the predicted value from the first-stage regression model to calculate the instrumented (predicted) audit-

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<sup>13</sup> In untabulated analyses we repeat our estimations of equation (2) separately for Big-4 and non-Big-4 auditors. We find that, despite different profitability structures of Big-4 and non-Big-4 audit firms, the implications of their firm-level profitability for audit outcomes are similar.

<sup>14</sup> Inferences remain unchanged when we repeat our estimations of Table 4 for a reduced sample that excludes the Covid period and spans from 2008 to 2019.



firm profitability. We next rerun equation (2) after replacing *EBIT Margin AF* with the predicted value from the first-stage regression. We present the second-stage regression results in Online Appendix II. Our references remain unchanged. In particular, we continue to find a significantly negative coefficient on *EBIT Margin AF* in models 1 (*|DACC| CF*), 2 (*AQ CF*), and 4 (*Restatement CF*) and a significantly positive coefficient on *EBIT Margin AF* in models 3 (*Qualified CF*) and 5 (*Unexp. KAMs CF*). These findings reinforce the notion that the direction of causality is more likely to run from audit-firm-level profitability to client-firm-level audit effort and audit outcome.<sup>15</sup>

### 5.3 Further Controls for Endogeneity

The results of our instrumental variables approach suggest that more profitable audit firms exert more effort and/or are less likely to compromise their independence. To address potential residual endogeneity, we perform a battery of additional robustness tests. We present these analyses in Online Appendix II.

#### 5.3.1. Controlling for *Client-Firm* and *Audit-Firm* Fixed Effects

*Unobservable, time-invariant* client- or audit-firm characteristics that are determinants of audit-firm profitability may also influence audit quality. For instance, reliance on incentive-based compensation may differ across audit firms (Bouwens *et al.*, 2019). Each audit firm has its own audit (reporting) style (Francis *et al.*, 2014). Client-firm management quality and corporate culture are likely to influence audit risk and are also potential drivers of audit-firm performance.

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<sup>15</sup> We perform several tests to examine the validity of our instrument following the approach described by Larcker and Rusticus (2010). In the first-stage regression of audit-firm profitability on our instrument and all controls in equation (2), the partial F-statistic of the instrument ranges between 724.15 and 3,689.35 (depending on the specification). These values are well above the thresholds recommended by Stock *et al.* (2002). We further report a *p*-value of less than 0.05 for both the Anderson-Rubin Wald test and the Stock-Wright LM S statistic (OLS regressions) in all but one specification. The null hypothesis assessed in both cases is that the coefficients of the endogenous regressors in the structural equation are jointly equal to zero, and, in addition, that the over-identifying restrictions are valid. Finally, using the Hansen J test for over-identifying restrictions (OLS regressions), we fail to reject the null hypothesis that the instrument is exogenous (the *p*-value is 1.00 in all specifications). These tests enhance our confidence about the validity of our instrument.

Consequently, we re-estimate equation (2) after controlling for *audit-firm* and *client-firm* fixed effects. We continue to find a significantly positive association between audit-firm profitability and audit quality (regardless of how we measure it). Importantly, our results are stronger in four out of the five models (models 2, 3, 4, and 5) when we control for audit-firm and client-firm fixed effects than when we do not (Table 4), suggesting that within-audit-firm variation has an economically meaningful impact on audit outcome.

### 5.3.2 Changes Specifications

Next, we employ strict changes specifications. These specifications difference out unmeasured and unchanging causes of audit outcomes that may be associated with audit-firm profitability. Specifically, we regress changes in each outcome measure on changes in audit-firm profitability ( $\Delta EBIT\ Margin\ AF$ ) after controlling for changes in all control variables of equation (2). Consistent with H1, we continue to find a significantly negative (positive) coefficient on  $\Delta EBIT\ Margin\ AF$  when we measure audit quality using  $|DACC|\ CF$  and  $AQ\ CF$  (*Qualified CF* and *Unexp. KAMs CF*). The coefficient on  $\Delta EBIT\ Margin\ AF$  is negative and insignificant when we measure audit quality using *Restatement CF*.

### 5.3.3 Lead-Lag Audit-Firm Profitability and Audit Outcomes

To further address the direction of the relation between audit-firm profitability and audit outcomes, we repeat our estimations of equation (2) using the lead and lagged value of *EBIT Margin AF* as test variable. When we examine the relation between lead audit-firm profitability and audit quality we fail to find a significant coefficient on *LeadEBIT Margin AF* in all models. When we examine the relation between lagged audit-firm profitability and audit quality we find that the coefficient on *LagEBIT Margin AF* is negative but indistinguishable from zero in models 1 ( $|DACC|\ CF$ ) and 2 ( $AQ\ CF$ ). The coefficient on *LagEBIT Margin AF* is significantly positive (at the 10% level)

in models 3 (*Qualified CF*) and 5 (*Unexp. KAMs CF*) and significantly negative (at the 10% level) in model 4 (*Restatement CF*). Taken together, the results of lead-lag specifications are consistent with the notion that the direction of causality is more likely to run from audit-firm-level profitability to client-firm-level audit effort and audit outcome than the other way around.

#### **5.3.4 Unobservable Selection and Coefficient Stability (Oster, 2019)**

Finally, we apply the method developed by Oster (2019) to assess bias from correlated omitted variables following prior research (Call *et al.*, 2018; Drake *et al.*, 2022). To assess unobservable selection, Oster (2019) proposes a coefficient of proportionality,  $\delta$ . Values of  $\delta$  greater than 1.00 suggest that, for unobservable factors to result in a treatment effect of zero, they would need to be as important as the observable control variables. We estimate  $\delta$  after estimating the specifications of Table 4. We find that  $\delta$  is greater than 1.00 in all but one outcome specifications (*Qualified CF*). Specifically,  $\delta$  equals 2.04 when we measure audit quality using *|DACC| CF*, 5.40 when we measure audit quality using *AQ CF*, -5.64 when we measure audit quality using *Qualified CF*, 1.91 when we measure audit quality using *Restatement CF*, and 2.03 when we measure audit quality using *Unexp. KAMs CF*. These results suggest that unobservable factors would need to be 2.04, 5.40, -5.64, 1.91, and 2.03 times, respectively, as important as the observable control variables to render the test variable indistinguishable from zero. Taken together, these findings increase our confidence that endogeneity stemming from unobservable control variables explains away our results.

#### **5.4 Cross-Sectional Analyses**

Our findings are consistent with more profitable auditors having stronger litigation considerations and being less likely to succumb to client-firm pressure (i.e., being more likely to uphold independence). In supplemental analyses we perform two cross-sectional analyses to examine how

exposure to client-firm risk and/or client-firm pressure moderates the relation between audit-firm profitability and audit outcomes.

#### 5.4.1 The Association Between Audit-Firm Profitability and Audit Outcomes Conditional on Client-Firm Importance

Our first cross-sectional analyses examine whether audit-firm financial condition matters when auditing larger, influential clients. On one hand, auditor-client economic dependence is greater for influential clients. Therefore, influential clients are likely to have increased bargaining power and the ability to exercise pressure over their auditors to report favorably. On the other hand, due to their size and greater relative importance these clients pose higher audit risk (Francis and Yu, 2009; Reynolds and Francis, 2000). To the extent that more (less) profitable audit firms have stronger (weaker) litigation considerations due to their “deeper pockets” and are less (more) likely to succumb to client-firm pressure, we expect the positive relation between audit-firm profitability and audit quality to be stronger for influential clients.

To investigate this, we estimate an expanded version of equation (2) by allowing the relation between audit-firm profitability and audit outcome to vary with the level of client-firm importance (*Influential CF*). Specifically, we estimate the following equation:

$$\mathbf{Audit\ Quality}_{i,j,t} = \alpha_0 + \alpha_1 \mathbf{EBIT\ Margin\ AF}_{j,t} + \alpha_2 \mathbf{EBIT\ Margin\ AF}_{j,t} \times \mathbf{Influential\ CF}_{i,t} + \alpha_3 \mathbf{Influential\ CF}_{i,t} + \mathbf{Controls} + \mathbf{Year\ Fixed\ Effects} + \mathbf{Industry\ Fixed\ Effects} + \varepsilon_{i,t} \quad (3)$$

Consistent with expectations, in Table 5, panel A we find a significantly negative (positive) coefficient on *EBIT Margin AF* × *Influential CF* when we measure audit quality using *|DACC| CF* and *AQ CF (Unexp. KAMs CF)*. The coefficient on *EBIT Margin AF* × *Influential CF* is negative (positive) and insignificant when we measure audit quality using *Restatement CF (Qualified CF)*. Taken together,

the results of Table 5, panel A are consistent with more profitable audit firms delivering higher audit quality to influential clients than less profitable audit firms.<sup>16</sup>

#### 5.4.2 The Association Between Audit-Firm Profitability and Audit Outcomes Conditional on Client-Firm Illiquidity

A key factor that drives auditors to supply audit effort (quality) is their litigation concern (Dye, 1993).<sup>17</sup> Prior research suggests that auditor litigation risk increases with client financial distress (DeFond and Zhang, 2014; Hay *et al.*, 2006). Therefore, in our second cross-sectional analysis we examine the moderating role of client-firm illiquidity on the relation between audit-firm profitability and audit outcome. Specifically, we estimate an expanded version of equation (2) by allowing the relation between audit-firm profitability and audit outcome to vary with the level of client-firm illiquidity (*Illiquid CF*). We measure *Illiquid CF* as the average of the decile-ranked client-firm negative cash holdings and decile-ranked client-firm leverage following Biddle *et al.* (2009):

$$\begin{aligned} \text{Audit Quality}_{i,j,t} = & \alpha_0 + \alpha_1 \text{EBIT Margin AF}_{j,t} + \alpha_2 \text{EBIT Margin AF}_{j,t} \times \text{Illiquid CF}_{i,t} + \alpha_3 \text{Illiquid CF}_{i,t} \\ & + \text{Controls} + \text{Year Fixed Effects} + \text{Industry Fixed Effects} + \varepsilon_{i,t} \quad (4) \end{aligned}$$

We present the results of estimating equation (4) in Table 5, panel B. We find some evidence consistent with more profitable audit firms exerting more effort and taking action to protect themselves from exposure to potential litigation risk from illiquid client firms. Specifically, we find that the coefficient on *EBIT Margin AF*  $\times$  *Illiquid CF* is significantly positive when we measure audit quality

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<sup>16</sup> In untabulated analyses, we repeat our estimations of equation (3) for the instrumented audit-firm profitability estimated in section 5.2. We find a significantly negative (positive) coefficient on *Instrumented EBIT Margin AF*  $\times$  *Influential CF* when we measure audit quality using *AQ CF* (*Qualified CF*). The coefficient on *Instrumented EBIT Margin AF*  $\times$  *Influential CF* is indistinguishable from zero in all other specifications.

<sup>17</sup> Audit litigation can be serious enough to threaten the viability of even the largest and most profitable audit firms. Research finds compelling evidence that audit firms consider litigation risk in the planning stages of the audit and in the pricing of audit services (e.g., Simunic (1980); Ewert *et al.* (2000); Simunic and Stein (1996); Gietzmann and Pettinicchio (2014); Bigus (2015); Elemes and Chen (2020)).

using *Qualified CF* (model 3) and *Unexp. KAMs CF* (model 5). The coefficient on *EBIT Margin AF*  $\times$  *Illiquid CF* is indistinguishable from zero when we measure audit quality using *|DACC| CF*, *AQ CF* or *Restatement CF*. Overall, the results of Table 5, panel B support the notion that more profitable audit firms have stronger incentives to deliver high audit quality for more illiquid clients.<sup>18</sup>

## 5.5 Additional Tests

### 5.5.1 Components of Audit-Firm Profitability and Audit Outcomes

Audit effort is an important input to the audit process that is intuitively related to audit quality (DeFond and Zhang, 2014). Our measure of audit-firm profitability captures audit effort through its revenue (*Revenues AF*) and employee cost component (*StaffCosts AF*).<sup>19</sup> To provide insights into how these two components of audit-firm profitability are associated with audit quality, we regress in separate specifications our proxies for audit quality on the revenue and employee cost component of our proxy for audit-firm profitability (*EBIT Margin AF*). We present these analyses in Online Appendix II.

We find a positive association between audit-firm staff costs and audit quality, regardless of how we measure it. Specifically, the coefficient on *StaffCosts AF* is significantly negative when we measure audit quality using *|DACC| CF*, *AQ CF*, and *Restatement CF* (models 1, 2, and 4). Furthermore, the coefficient on *StaffCosts AF* is significantly positive when we measure audit quality

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<sup>18</sup> In untabulated analyses, we repeat our estimations of equation (4) for the instrumented audit-firm profitability estimated in section 5.2. We find that the coefficient on *Instrumented EBIT Margin AF*  $\times$  *Illiquid CF* is significantly positive when we measure audit quality using *Qualified CF* and *Unexp. KAMs CF*. The coefficient on *Instrumented EBIT Margin AF*  $\times$  *Illiquid CF* is indistinguishable from zero in all other specifications.

<sup>19</sup> Higher employee cost may also indicate higher quality human capital or more generous compensation schemes. In both scenarios we predict a positive association between cost of employees and audit quality through higher auditor skill or higher auditor independence.

using *Qualified CF* and *Unexp. KAMs CF* (models 3 and 5). These findings are consistent with audit quality increasing with audit-firm cost of employees.<sup>20</sup>

We next turn to the association between audit-firm operating revenue and client-firm audit outcomes. Consistent with the revenue component of audit-firm profitability capturing audit effort (through audit fee revenue), we find that the coefficient on *Revenues AF* is significantly negative when we measure audit quality using *|DACC| CF* and *AQ CF* (models 1, 2) and significantly positive when we measure audit quality using *Qualified CF* and *Unexp. KAMs CF* (models 3 and 5). The coefficient on *Revenues AF* is indistinguishable from zero when we measure audit quality using *Restatement CF* (model 4). Taken together the findings are consistent with variation in audit-firm staff costs and audit-firm operating revenue capturing variation in audit effort and, by extension, audit quality. More importantly, the coefficient magnitudes for *StaffCosts AF* are always larger than the corresponding values for *Revenues AF*, indicating that audit-firm staff costs may have an economically stronger implication for audit quality than audit-firm revenues and highlighting the importance of focusing on audit-firm profitability in understanding the supply of audit quality.

### **5.5.2 Audit-Firm Profitability and Future Investments in Assets and Personnel**

One important premise of our main line of argumentation is that more profitable audit firms are less likely to face constraints in the investment of human capital and information technology and are better able to attract and retain high-quality human capital. To examine the implications of audit-firm profitability for future investments in assets and personnel we estimate the relation between audit-firm profitability and one year ahead audit-firm total assets (*LeadLnAssets AF*), tangible assets (*LeadLnTangibles AF*), intangible assets (*LeadLnIntangibles AF*), average cost of employees

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<sup>20</sup> When we examine the association between all other costs and audit outcome, we find no systematic association between that cost component and audit quality.

(*LeadAvgEmplCost AF*), and number of employees (*LeadLnEmpl AF*). We present these analyses in Online Appendix II.

In model 1 we examine the association between one year ahead audit-firm total assets and audit-firm profitability. We find that the coefficient on *EBIT Margin AF* is significantly positive consistent with more profitable audit firms acquiring more assets. When we decompose audit-firm total assets into tangible and intangible assets (models 2 and 3, respectively), we find that that the coefficient on *EBIT Margin AF* is significantly positive only when we consider tangible assets (model 2). In models 4 (model 5) we examine the association between one year ahead audit-firm average cost of employees (one year ahead number of employees) and audit-firm profitability. We find that one year ahead average cost of employees and one year ahead number of employees are significantly higher in more profitable audit firms. These findings are in line with more profitable audit firms facing fewer constraints in human capital, attracting higher quality human capital, and/or offering higher remuneration to partners and other staff.

## **6. Conclusion**

Theoretical and empirical evidence in economics and management suggests that there is a positive association between firm operating performance and product/service quality. Yet research in auditing lacks evidence on what drives audit-firm profitability and how audit-firm profitability is associated with audit outcome. In this paper, we attempt to close this gap in the literature. We compile a novel dataset that links audit-firm and client-firm financial statement information from the U.K. Our objectives are to examine determinants of audit-firm profitability and to explore its consequences for audit outcomes.

Our determinants analyses reveal that Big-4 and non-Big-4 audit firms have fundamentally different profitability structures. These analyses suggest that larger audit firms are more cost-effective



and generate more profits in auditing larger and more complex clients when compared with smaller firms. Consistent with economic theory, our analyses of the relation between audit-firm financial performance and audit quality provide strong evidence that more profitable audit firms exert more effort and deliver higher audit quality.

In cross-sectional analyses we find that the positive relation between audit-firm profitability and audit quality is generally stronger for more influential and more illiquid client firms. These findings are consistent with more profitable audit firms being less likely to succumb to client-firm pressure. They are also consistent with litigation considerations incentivizing more profitable audit firms to exert more effort and deliver higher audit quality.

Our study represents a first attempt at understanding the determinants of audit-firm profitability and its implications for audit effort and audit outcomes. As a caveat to our findings, although we implement a variety of research-design approaches to address potential sources of endogeneity, we cannot rule out the possibility that unknown sources of heterogeneity affect our conclusions. We note, however, that linking audit-firm and client-firm financial statement information introduces an opportunity for audit research to more closely focus on the interplay between audit-firm and client-firm characteristics and the ways through which they determine client outcomes. We encourage future research to explore how audit- and client-firm characteristics interact with each other to affect the whole spectrum of services offered by both large and smaller audit firms.

## Appendix: Variable Definitions

### Client-Firm Variables

$ DACC  CF$	The value of absolute discretionary accruals as in Kothari <i>et al.</i> (2005). In particular, we estimate the following model for each two-digit SIC code industry with at least 20 observations: $TACC CF_{i,t} = a_0 + a_1(1/Assets CF_{i,t-1}) + a_2\Delta Sales CF_{i,t} + a_3Tangibles CF_{i,t} + a_4ROA CF_{i,t} + \varepsilon_{i,t}$ . We measure total accruals ( $TACC CF$ ) as change in non-cash current assets less change in current non-interest bearing liabilities, less depreciation for firm $i$ in year $t$ , scaled by total assets. Higher values of $ DACC  CF$ indicate higher absolute discretionary accruals and lower audit quality.
$AQ CF$	The Dechow and Dichev (2002) accrual quality measure modified by McNichols (2002). In particular, we estimate the following model for each two-digit SIC code industry with at least 20 observations: $WCACC CF_{i,t} = \beta_0 + \beta_1CFO CF_{i,t-1} + \beta_2CFO CF_{i,t} + \beta_3CFO CF_{i,t+1} + \beta_4\Delta Sales CF_{i,t} + \beta_5Tangibles CF_{i,t} + \varepsilon_{i,t}$ . We measure working capital accruals ( $WCACC$ ) as change in current assets less change in current liabilities, less change in cash, plus change in short-term debt. We measure cash flow from operations ( $CFO$ ) as net income before extraordinary items less total accruals. $AQ CF$ is the 5-year standard deviation of the estimated residuals. Higher values of $AQ CF$ indicate more accrual estimation errors and lower audit quality.
$AuditorSwitch CF$	An indicator variable that takes the value 1 if a client firm switches auditor in a given year, and 0 otherwise.
$AvgVariable CF$	The audit-firm year mean of the corresponding client firm-year or audit firm-two digit SIC code-year characteristic. This variable is calculated at the audit firm-year level.
$Deferred Taxes CF$	The ratio of client-firm deferred taxes to client-firm total assets.
$Extr. Items CF$	The ratio of client-firm extra-ordinary items to client-firm total assets.
$Illiquid CF$	The average of the decile-ranked client-firm negative cash holdings and decile-ranked client-firm leverage (Biddle <i>et al.</i> , 2009).
$Influential CF$	The ratio of total fees collected from a given client firm by a given audit firm in a given year to the sum of total fees collected from all client firms in that year.
$LagAcquisition CF$	The ratio of client-firm acquisitions amount to client-firm total assets, lagged by one year.

<i>LagQualified CF</i>	Variable <i>Qualified CF</i> , lagged by one year.
<i>LagTACC CF</i>	Variable <i>TACC CF</i> , lagged by one year. We measure total accruals ( <i>TACC CF</i> ) as change in non-cash current assets less change in current non-interest bearing liability, less depreciation for client firm <i>i</i> in year <i>t</i> , scaled by total assets.
<i>Leverage CF</i>	The ratio of client-firm short-term and long-term debt to client-firm total assets.
<i>LnAssets CF</i>	The natural logarithm of client-firm total assets.
<i>LnNumKAMs CF</i>	The natural logarithm of the number of client-firm Key Audit Matters reported by the auditor.
<i>LnNumSubs CF</i>	The natural logarithm of the number of subsidiaries of a given client firm.
<i>Loss CF</i>	An indicator variable that takes the value 1 if a client firm reports negative net income in a given year, and 0 otherwise.
<i>NonAuditFeesRatio CF</i>	The ratio of client-firm non-audit to audit fees.
<i>Problem CF</i>	An indicator variable that takes the value 1 if a client firm restated its earnings over the previous two years, and 0 otherwise.
<i>Public CF</i>	An indicator variable that takes the value 1 if a client firm is publicly listed, and 0 otherwise.
<i>Qualified CF</i>	An indicator variable that takes the value 1 if a client firm receives a qualified auditor opinion, and 0 otherwise.
<i>RecInv CF</i>	The ratio of client-firm receivables and inventory to client-firm total assets.
<i>Restatement CF</i>	An indicator variable that takes the value 1 if a client firm- year is subsequently restated, and 0 otherwise.
<i>ROA CF</i>	The ratio of client-firm net income to client-firm total assets.
<i>Sales Growth CF</i>	The percentage change in client-firm sales.
<i>StdSales CF</i>	The standard deviation of the ratio of client-firm sales to client-firm total assets.
<i>Tangibles CF</i>	The ratio of client-firm tangible to total assets.
<i>Unexp. KAMs CF</i>	The residuals from the KAM prediction model (Online Appendix I).

## Audit-Firm Variables

<i>AvgEmplCost AF</i>	Audit-firm cost of employees scaled by the number of audit-firm employees.
<i>Big4</i>	An indicator variable that takes the value 1 if a client firm is audited by a Big-4 auditor, and 0 otherwise.
<i>Costs AF</i>	The ratio of audit-firm operating costs to audit-firm average total assets.
<i>EBIT Margin AF</i>	The ratio of audit-firm operating profit to audit-firm sales.
<i>IndSpec AF</i>	The ratio of the sum of all audit fees received by a given audit firm in a given industry to the sum of all audit fees received by all audit firms in the sample in that industry. We define industries by their two-digit SIC codes. This variable is calculated at the audit firm-two digit SIC code-year level.
<i>Instrument</i>	The ratio of audit-firm tax expense to audit-firm total assets.
<i>Intangibles AF</i>	The ratio of audit-firm intangible to total assets.
<i>LagEBIT Margin AF</i>	Variable <i>EBIT Margin AF</i> in year $t-1$ .
<i>LnAssets AF</i>	The natural logarithm of audit-firm total assets.
<i>LeadEBIT Margin AF</i>	Variable <i>EBIT Margin AF</i> in year $t+1$ .
<i>LnCash AF</i>	The natural logarithm of audit-firm cash.
<i>LnEmpl AF</i>	The natural logarithm of audit-firm number of employees.
<i>LnIntangibles AF</i>	The natural logarithm of audit-firm intangible assets.
<i>LnTangibles AF</i>	The natural logarithm of audit-firm tangible assets.
<i>OtherCosts AF</i>	The ratio of audit-firm other costs to average audit-firm total assets. We define other costs as audit-firm operating expenses less audit-firm cost of employees.
<i>Revenues AF</i>	The ratio of audit-firm operating revenue to average audit-firm total assets.
<i>StaffCosts AF</i>	The ratio of audit-firm cost of employees to average audit-firm total assets.

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**Table 1: Sample Selection****Panel A: Main sample**

All UK private and publicly listed firms in the FAME database with available auditor financial statement information during the period 2008-2020	689,329
<i>Less:</i>	
Firms belonging in the financial sector (SIC codes 60–69)	(159,881)
Private firms that are not subject to mandatory audit	(237,467)
Firm-years with missing data to calculate key variables in the  DACC  CF and AQ CF regression analyses	(187,127)
<b>Main sample</b>	<b>104,854</b>
# of audit firm-years	502
# of audit firms	58

**Panel B: Sample used in the qualified opinion specifications**

Main sample	104,854
<i>Less:</i>	
Firm-years with positive operating profit	(82,322)
Firm-years dropping due to the inclusion of industry fixed effects in logit specifications	(3,154)
<b>Qualified opinion sample</b>	<b>19,378</b>

**Panel C: Restatement sample**

Main sample	104,854
<i>Less:</i>	
Private firms	(99,021)
Firm-years before 2014	(2,424)
Firms dropping due to the inclusion of industry fixed effects in logit specifications	(1,144)
<b>Restatement sample</b>	<b>2,265</b>

**Panel D: Sample used in the KAM specifications**

Main sample	104,854
<i>Less:</i>	
Private firms	(99,021)
Firm-years before September 2013	(2,128)
Non-premium listed firms with fiscal years ending between September 2013 and November 2016	( 983)
<b>KAM sample</b>	<b>2,722</b>

This table presents the sample selection procedures. Panel A presents the sample selection procedures for the main sample (sample period: 2008-2020); panel B for the sample used in the qualified opinion specifications (sample period: 2008-2020); panel C for the restatement sample (sample period 2014-2020); panel D for the sample used in the KAM specifications (sample period: September 2013-December 2020).

**Table 2: Descriptive Statistics**

Panel A: Descriptive statistics of variables used in the determinants analyses

Variables	Num. Obs.	Mean	Std. Dev.	Q1	Median	Q3
<i>EBIT Margin AF</i>	502	0.24	0.09	0.19	0.25	0.30
<i>LnEmpl AF</i>	502	5.78	1.60	4.77	5.29	6.36
<i>LnCash AF</i>	502	6.04	3.04	4.38	6.23	7.64
<i>Intangibles AF</i>	502	0.09	0.15	0.00	0.03	0.09
<i>AvgIndSpec AF</i>	502	0.03	0.06	0.00	0.00	0.01
<i>Big4</i>	502	0.10	0.31	0.00	0.00	0.00
<i>AvgPublic CF</i>	502	0.01	0.01	0.00	0.00	0.02
<i>AvgLnAssets CF</i>	502	8.16	0.67	7.63	8.10	8.66
<i>AvgLeverage CF</i>	502	0.31	0.13	0.21	0.28	0.42
<i>AvgROA CF</i>	502	0.04	0.05	0.01	0.04	0.06
<i>AvgLoss CF</i>	502	0.32	0.09	0.27	0.31	0.36
<i>AvgRecInv CF</i>	502	0.19	0.06	0.15	0.18	0.22
<i>AvgStdSales CF</i>	502	0.43	0.16	0.34	0.41	0.49
<i>AvgNonAuditFeesRatio</i>	502	0.29	0.16	0.19	0.28	0.36
<i>AvgInfluential</i>	502	0.01	0.01	0.00	0.01	0.01
<i>AvgLnNumSubs CF</i>	502	0.44	0.15	0.35	0.43	0.53

Panel B: Descriptive statistics of variables used in the outcome analyses

Variables	Num. Obs.	Mean	Std. Dev.	Q1	Median	Q3
<b>Audit-firm characteristics</b>						
<i>EBIT Margin AF</i>	104,854	0.24	0.05	0.20	0.24	0.28
<i>LnEmpl AF</i>	104,854	8.58	1.54	7.94	9.39	9.63
<i>LnCash AF</i>	104,854	10.11	2.57	9.55	10.78	11.98
<i>Intangibles AF</i>	104,854	0.04	0.04	0.02	0.04	0.06
<i>IndSpecialist AF</i>	104,854	0.16	0.13	0.05	0.13	0.23
<i>Big4</i>	104,854	0.66	0.47	0.00	1.00	1.00
<b>Client-firm characteristics</b>						
<i> DACC  CF</i>	104,854	0.11	0.14	0.03	0.06	0.13
<i>AQ CF</i>	104,854	0.08	0.07	0.03	0.05	0.09
<i>Qualified CF</i>	19,378	0.01	0.10	0.00	0.00	0.00
<i>Restatement CF</i>	2,265	0.14	0.35	0.00	0.00	0.00
<i>Unexp. KAMs CF</i>	2,722	0.01	0.52	-0.65	0.21	0.50
<i>Public CF</i>	104,854	0.06	0.23	0.00	0.00	0.00
<i>LnAssets CF</i>	104,854	10.57	1.55	9.44	10.27	11.38
<i>Leverage CF</i>	104,854	0.30	0.43	0.04	0.19	0.43
<i>ROA CF</i>	104,854	0.05	0.17	0.01	0.04	0.10
<i>Loss CF</i>	104,854	0.22	0.41	0.00	0.00	0.00
<i>RecInv CF</i>	104,854	0.23	0.20	0.05	0.19	0.36
<i>StdSales CF</i>	104,854	0.24	0.38	0.06	0.14	0.29
<i>NonAuditFeesRatio CF</i>	104,854	0.93	1.10	0.00	0.69	1.39
<i>Influential CF</i>	104,854	0.43	2.45	0.00	0.05	0.39
<i>LnNumSubs CF</i>	104,854	0.00	0.01	0.00	0.00	0.00
<i>AuditorSwitch CF</i>	104,854	0.06	0.24	0.00	0.00	0.00
<i>LagTACC CF</i>	104,854	-0.02	0.19	-0.08	-0.01	0.06

Panel A of presents the descriptive statistics for the variables included in the main determinants analyses. Panel B presents the descriptive statistics for the variables included in the analyses examining the relation between audit-firm profitability and audit outcomes. See the Appendix for variable definitions. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed).

**Table 3: Audit-Firm and Client-Firm Determinants of Audit-Firm Profitability**

Variables	<i>Dep. Var. = EBIT Margin AF</i>					
	Full Sample		Big-4 Subsample		non-Big4 Subsample	
	Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat
<i>LnEmpl AF</i>	-0.019***	-6.12	-0.018	-1.71	-0.019***	-4.68
<i>LnCash AF</i>	0.003**	2.25	0.001	0.38	0.002*	1.74
<i>Intangibles AF</i>	-0.034	-1.57	0.370	0.72	-0.031	-1.44
<i>AvgIndSpec AF</i>	0.110	0.66	0.101	0.43	-0.181	-0.70
<i>Big4</i>	0.046**	2.06				
<i>AvgPublic CF</i>	-0.521***	-2.86	5.538*	1.95	-0.407**	-2.15
<i>AvgLnAssets CF</i>	-0.012*	-1.82	0.842**	2.56	-0.015**	-2.02
<i>AvgLeverage CF</i>	-0.061*	-1.95	0.716	1.48	-0.041	-1.31
<i>AvgROA CF</i>	0.005	0.10	1.627*	1.95	0.024	0.43
<i>AvgLoss CF</i>	-0.098***	-3.19	-0.111	-0.19	-0.089***	-2.95
<i>AvgRecInv CF</i>	-0.065	-1.15	0.036	0.05	-0.048	-0.82
<i>AvgStdSales CF</i>	0.005	0.26	-0.583***	-3.14	0.007	0.35
<i>AvgNonAuditFeesRatio</i>	-0.032**	-2.06	0.031	0.28	-0.040**	-2.54
<i>AvgInfluential</i>	-2.803***	-6.02	-104.139	-0.24	-2.965***	-6.15
<i>AvgLnNumSubs CF</i>	0.033	1.63	-0.430	-0.65	0.042**	2.02
Year FE	Yes		Yes		Yes	
# of audit firm-years	502		52		450	
Adj. R <sup>2</sup>	0.208		0.668		0.233	

This table presents audit-firm and client-firm determinants of audit-firm profitability. These analyses cover the period 2008-2020 and include all observable client firms in FAME. Model 1 presents audit-firm and client-firm determinants of audit-firm profitability for the pooled sample of Big-4 and non-Big-4 accounting firms (58 Big-4 and non-Big-4 audit firms), whereas model 2 (model 3) presents audit-firm and client-firm determinants of audit-firm profitability for the subsample of Big-4 (non-Big-4) accounting firms. See the Appendix for variable definitions. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed).

**Table 4: Audit-Firm Profitability and Client-Firm Audit Outcomes**

Variables	Dep. Var. =  DACC  CF		Dep. Var. = AQ CF		Dep. Var. = Qualified CF		Dep. Var. = Restatement CF		Dep. Var. = Unexp. KAMs CF	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	z-stat	Coeff.	z-stat	Coeff.	t-stat
<i>EBIT Margin AF</i>	-0.005***	-3.22	-0.003*	-2.00	4.566*	1.73	-4.099**	-2.57	0.826**	2.52
<i>LnEmpl AF</i>	-0.000	-0.61	0.001	1.57	0.005	0.05	-0.077	-1.45	0.031*	1.90
<i>LnCash AF</i>	0.001***	4.88	0.001***	4.14	0.133**	2.19	0.186*	1.75	-0.008	-0.77
<i>Intangibles AF</i>	0.010	0.94	0.005	0.66	-5.775**	-2.46	-6.932	-1.16	0.598**	1.99
<i>IndSpec AF</i>	-0.004	-0.81	0.001	0.18	1.152	1.15	0.130	0.17	0.126	1.62
<i>Big4</i>	0.013***	11.48	0.009***	9.81	-1.955***	-4.62	-0.678***	-3.03	-0.061	-1.28
<i>Public CF</i>	-0.015***	-11.39	-0.000	-0.10	-0.633**	-2.31				
<i>LnAssets CF</i>	-0.002***	-3.52	-0.005***	-11.73	0.078	0.93	0.163	1.49	-0.003	-0.33
<i>Leverage CF</i>	0.040***	16.61	0.031***	13.11	0.168	1.22	-0.048	-0.32	-0.013	-0.31
<i>ROA CF</i>	0.198***	15.36	0.146***	17.41	-0.979***	-2.95	0.290	0.39	0.843***	5.05
<i>Loss CF</i>	0.027***	11.96	0.030***	25.14			0.102	0.44	0.128***	3.40
<i>RecInv CF</i>	-0.048***	-11.68	-0.039***	-14.30	-0.454	-0.74	-1.119	-1.18	0.072	0.91
<i>StdSales CF</i>	0.243***	22.00	0.137***	39.29	-0.819*	-1.76	1.059**	2.49	0.093	1.03
<i>NonAuditFeesRatio CF</i>	-0.000**	-2.16	-0.000	-0.13	-0.061	-0.24	0.392	0.94	-0.006	-0.15
<i>Influential CF</i>	-0.967	-1.25	0.453	0.68	313.939*	1.81	148.159	1.57	54.039***	2.84
<i>LnNumSubs CF</i>	-0.007***	-10.99	-0.002***	-9.04	-0.394***	-4.20	0.000	0.01	0.004	0.28
<i>AuditorSwitch CF</i>	0.020***	9.15	0.006***	3.86	0.895***	4.30	0.075	0.41	-0.050	-1.50
<i>LagTACC CF</i>	0.078***	13.75	0.016***	5.86						
Industry FE	Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	104,854		104,854		19,378		2,265		2,722	
Adj. R <sup>2</sup> /Pseudo R <sup>2</sup>	0.122		0.220		0.138		0.141		0.111	

This table presents the regression results of estimating the relation between audit-firm profitability and client-firm audit outcomes. We use the following audit outcomes: the level of absolute discretionary accruals as in Kothari *et al.* (2005) (model 1), the McNichols (2002) modification of the Dechow and Dichev (2002) accrual quality measure (model 2), the propensity to issue a qualified audit opinion for loss-making client firms (model 3), accounting restatements (model 4), and the level of unexpected KAMs (model 5). See the Appendix for variable definitions. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed).

**Table 5: Audit-Firm Profitability and Client-Firm Audit Outcomes – Cross-Sectional Analyses**

Panel A: Audit-firm profitability and client-firm audit outcomes conditional on client-firm importance

Variables	Dep. Var. =  DACC  CF		Dep. Var. = AQ CF		Dep. Var. = Qualified CF		Dep. Var. = Restatement CF		Dep. Var. = Unexp. KAMs CF	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	z-stat	Coeff.	z-stat	Coeff.	t-stat
<i>EBIT Margin AF</i>	-0.001	-1.14	-0.000	-0.16	4.234	1.61	-2.120	-1.07	0.557	1.59
<i>EBIT Marg. AF × Infl. CF</i>	-4.837*	-1.84	-4.699***	-3.49	376.021	0.19	-1,877.207	-0.99	336.692***	3.24
<i>LnEmpl AF</i>	-0.000	-0.70	0.001	1.51	0.005	0.05	-0.088	-1.60	0.044**	2.08
<i>LnCash AF</i>	0.001***	4.81	0.001***	4.14	0.134**	2.26	0.167	1.54	-0.018	-1.34
<i>Intangibles AF</i>	0.007	0.69	0.003	0.40	-5.701**	-2.51	-7.197	-1.26	0.586	1.47
<i>IndSpec AF</i>	-0.004	-0.94	0.000	0.13	1.158	1.15	0.160	0.20	0.144	1.39
<i>Big4</i>	0.013***	11.57	0.009***	9.61	-1.945***	-4.65	-0.669***	-2.92	-0.029	-0.47
<i>Public CF</i>	-0.015***	-11.26	-0.000	-0.10	-0.633**	-2.31				
<i>LnAssets CF</i>	-0.002***	-3.49	-0.005***	-11.83	0.079	0.94	0.169	1.47	-0.020	-1.55
<i>Leverage CF</i>	0.040***	17.55	0.031***	13.09	0.169	1.21	-0.080	-0.49	-0.005	-0.10
<i>ROA CF</i>	0.188***	15.52	0.146***	17.38	-0.979***	-2.95	0.258	0.36	0.883***	4.11
<i>Loss CF</i>	0.026***	11.91	0.030***	25.09			0.099	0.44	0.138***	2.85
<i>RecInv CF</i>	-0.045***	-11.87	-0.039***	-14.29	-0.454	-0.74	-1.136	-1.19	0.000	0.00
<i>StdSales CF</i>	0.233***	22.89	0.137***	39.33	-0.820*	-1.76	1.078**	2.52	0.146	1.25
<i>NonAuditFeesRatio CF</i>	-0.000**	-2.28	-0.000	-0.13	-0.058	-0.22	0.381	0.89	-0.012	-0.24
<i>Influential CF</i>	0.122	0.11	1.590*	1.93	223.773	0.39	539.344	1.25	2.318	1.19
<i>LnNumSubs CF</i>	-0.007***	-11.30	-0.002***	-8.99	-0.394***	-4.16	-0.006	-0.09	-0.020	-1.24
<i>AuditorSwitch CF</i>	0.019***	8.35	0.006***	3.85	0.895***	4.29	0.067	0.35	-0.058	-1.38
<i>LagTACC CF</i>	0.072***	13.24	0.017***	5.86						
Industry FE	Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	104,854		104,854		19,378		2,265		2,722	
Adj. R <sup>2</sup> /Pseudo R <sup>2</sup>	0.127		0.220		0.138		0.142		0.116	

Panel B: Audit-firm profitability and client-firm audit outcomes conditional on client-firm illiquidity (Biddle *et al.*, 2009)

Variables	Dep. Var. =  DACC  CF		Dep. Var. = AQ CF		Dep. Var. = Qualified CF		Dep. Var. = Restatement CF		Dep. Var. = Unexp. KAMs CF	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	z-stat	Coeff.	z-stat	Coeff.	t-stat
<i>EBIT Margin AF</i>	-0.006	-1.52	-0.002	-0.51	-4.944	-1.20	-6.891**	-2.03	-0.564	-1.49
<i>EBIT Marg. AF × Illiq. CF</i>	0.000	0.35	-0.000	-0.50	1.415**	2.20	0.553	0.80	0.224**	2.44
<i>Illiquid CF</i>	0.001	1.26	-0.001	-1.65	-0.254	-1.60	-0.001	0.00	-0.056***	-2.63
<i>LnEmpl AF</i>	-0.000	-0.61	0.001	1.55	-0.003	-0.03	-0.075	-1.42	0.039**	2.06
<i>LnCash AF</i>	0.001***	4.81	0.001***	4.17	0.132**	2.16	0.191*	1.80	-0.009	-0.84
<i>Intangibles AF</i>	0.009	0.85	0.005	0.69	-5.854**	-2.48	-7.194	-1.18	0.743**	2.10
<i>IndSpec AF</i>	-0.004	-0.86	0.000	0.13	1.184	1.17	0.138	0.17	0.143	1.55
<i>Big4</i>	0.013***	11.56	0.009***	9.95	-1.936***	-4.66	-0.645***	-2.68	-0.045	-0.81
<i>Public CF</i>	-0.015***	-10.87	-0.001	-0.19	-0.597**	-2.14				
<i>LnAssets CF</i>	-0.002***	-3.60	-0.004***	-11.91	0.048	0.56	0.123	1.08	-0.008	-0.70
<i>Leverage CF</i>	0.036***	7.94	0.036***	8.11	0.068	0.48	-0.804	-1.36	0.027	0.40
<i>ROA CF</i>	0.191***	14.91	0.142***	15.86	-1.064***	-3.38	0.346	0.46	0.876***	4.40
<i>Loss CF</i>	0.026***	12.07	0.030***	24.73			0.105	0.47	0.138***	3.12
<i>RecInv CF</i>	-0.046***	-11.25	-0.039***	-12.54	-0.504	-0.84	-1.181	-1.14	0.041	0.45
<i>StdSales CF</i>	0.233***	22.54	0.137***	37.39	-0.807*	-1.69	1.051**	2.24	0.098	0.93
<i>NonAuditFeesRatio CF</i>	-0.000**	-2.23	-0.000	-0.14	-0.019	-0.07	0.405	1.01	-0.012	-0.26
<i>Influential CF</i>	-0.973	-1.25	0.353	0.52	330.383*	1.94	156.492*	1.69	73.488***	3.33
<i>LnNumSubs CF</i>	-0.007***	-11.53	-0.002***	-9.22	-0.385***	-3.96	0.010	0.15	-0.009	-0.63
<i>AuditorSwitch CF</i>	0.019***	8.29	0.006***	3.86	0.907***	4.28	0.079	0.44	-0.060	-1.57
<i>LagTACC CF</i>	0.071***	13.89	0.018***	5.47						
Industry FE	Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	104,854		104,854		19,378		2,265		2,722	
Adj. R <sup>2</sup> /Pseudo R <sup>2</sup>	0.127		0.220		0.142		0.144		0.113	

Panel A (panel B) presents the regression results of estimating the relation between audit-firm profitability and client-firm audit outcomes conditional on the level of client-firm importance (client-firm illiquidity). We measure client-firm importance (*Influential CF*) using the level of total fees collected from the focal client to the total fees received from all clients in a given audit firm-year. We measure client-firm illiquidity (*Illiquid CF*) using the measure of firm illiquidity developed by Biddle *et al.* (2009). See the Appendix for variable definitions. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed).

## Online Appendix I

### Definitions of Outcome Measures

#### I. Absolute Value of Performance-Adjusted Discretionary Accruals ( $|DACC| CF$ )

We estimate performance-adjusted discretionary accruals following Kothari *et al.* (2005). Specifically, we perform annual cross-sectional regressions of the following equation for each two-digit SIC industry and fiscal year, with at least 20 observations per regression (Hope *et al.*, 2013):

$$TACC CF_{i,t} = \alpha_0 + \alpha_1 (1/Assets CF_{i,t-1}) + \alpha_2 \Delta Sales CF_{i,t} + \alpha_3 Tangibles CF_{i,t} + \alpha_4 ROA CF_{i,t} + \varepsilon_{i,t} \text{ (i)}^{21}$$

$|DACC| CF$  is the absolute value of the client-firm-specific residuals estimated from equation (i). Higher values of  $|DACC| CF$  indicate more earnings management and lower audit quality. To the extent that more profitable audit firms deliver higher audit quality, we expect a negative coefficient on *EBIT Margin AF* when we measure audit quality using  $|DACC| CF$ .

#### II. Mapping Between Working Capital Accruals and Cash Flows from Operations ( $AQ CF$ )

We measure the extent to which working-capital accruals map into past, present, and future cash flows from operations using the McNichols (2002) modification of the Dechow and Dichev (2002) model. Specifically, we estimate the following equation for each two-digit SIC industry and fiscal year with at least 20 observations per regression:

$$WCACC CF_{i,t} = \alpha_0 + \alpha_1 CFO CF_{i,t-1} + \alpha_2 CFO CF_{i,t} + \alpha_3 CFO CF_{i,t+1} + \alpha_4 \Delta Sales CF_{i,t} + \alpha_5 Tangibles CF_{i,t} + \varepsilon_{i,t} \text{ (ii)}^{22}$$

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<sup>21</sup>  $TACC_{i,t}$ : client-firm total accruals scaled by total assets. We calculate total accruals as change in current assets less change in current liabilities less change in cash plus change in short-term debt less depreciation;  $\Delta Sales CF_{i,t}$ : the change in client-firm sales scaled by total assets;  $Tangibles CF_{i,t}$ : the ratio of client-firm tangible to total assets;  $ROA_{i,t}$ : the ratio of client-firm net income to client-firm total assets.

<sup>22</sup>  $WCACC CF_{i,t}$ : client-firm working capital accruals scaled by total assets. We calculate working capital accruals as change in current assets less change in current liabilities less change in cash plus change in short-term debt;  $CFO_{i,t}$ :



Following Francis *et al.* (2005), we calculate *AQ CF* as the five-year standard deviation (from year  $t-4$  to year  $t$ ) of the estimated firm-year residuals from equation (ii). Higher values of *AQ CF* indicate more accrual estimation errors and lower audit quality. To the extent that more profitable audit firms deliver higher audit quality, we expect a negative coefficient on *EBIT Margin AF* when we measure audit quality using *AQ CF*.

### **III. The Propensity to Issue a Qualified Auditor Opinion (*Qualified CF*)**

Our third audit-quality proxy is the propensity to issue a qualified auditor opinion (*Qualified CF*) (e.g., DeFond, Raghunandan, and Subramanyam 2002; Hope and Langli 2010). We define this variable as an indicator taking the value 1 if a client-firm receives a qualified audit opinion, and 0 otherwise. In line with prior research (e.g., Francis and Yu (2009)) we limit our analyses of the relation between audit-firm profitability and the propensity to issue a qualified auditor opinion to distressed client-firms (i.e., client-firms with negative net profit) because the auditor's decision to issue a qualified audit opinion is likely more salient for financially distressed clients. We expect a positive coefficient on *EBIT Margin AF* to the extent that more profitable firms are more likely to issue a qualified audit opinion to financially distressed client firms.

### **IV. Accounting Restatements (*Restatement CF*)**

Our fourth audit-quality proxy is accounting restatements (*Restatement CF*). We define this variable as an indicator taking the value 1 if a client-firm subsequently restates its financial statements in a given year (in either direction), and 0 otherwise. A negative coefficient on *EBIT Margin AF* is in line with more profitable audit firms delivering higher audit quality.

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client-firm cash flow from operations of firm  $i$  in year  $t$ , calculated as net income before extra-ordinary items less total accruals.

## V. The Level of Unexpected KAMs (*Unexp. KAMs CF*)

For our fifth audit-quality proxy we rely on the KAM prediction model of Lennox *et al.* (2022). Specifically, we estimate the following equation:

$$\begin{aligned} \text{LnNumKAMs } CF_{i,t} = & \alpha_0 + \alpha_1 \text{LnAssets } CF_{i,t} + \alpha_2 \text{Loss } CF_{i,t} + \alpha_3 \text{Reclnv } CF_{i,t} + \alpha_4 \text{LnNumSubs} \\ & CF_{i,t} + \alpha_5 \text{Problem } CF_{i,t} + \alpha_6 \text{LagQualified } CF_{i,t} + \alpha_7 \text{Intangibles } CF_{i,t} + \alpha_8 \text{Tangibles } CF_{i,t} + \\ & \alpha_9 \text{LagAcquisition } CF_{i,t} + \alpha_{10} \text{Extr. Items } CF_{i,t} + \alpha_{11} \text{Sales Growth } CF_{i,t} + \alpha_{12} \text{Deferred Taxes} \\ & CF_{i,t} + \text{Year Fixed Effects} + \text{Industry Fixed Effects} + \varepsilon_{i,t} \text{ (iii)}^{23} \end{aligned}$$

Our final proxy for audit effort and audit quality is the level of unexpected KAMs (*Unexp. KAMs CF*) estimated from the residuals of equation (iii). A positive coefficient on *EBIT Margin AF* is consistent with the idea that auditors from more profitable audit firms exert more effort to identify and communicate KAMs.

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<sup>23</sup> *LnAssets*  $CF_{i,t}$ : the natural logarithm of client-firm total assets; *Loss*  $CF_{i,t}$ : an indicator variable taking the value 1 if a client-firm reports negative net income, and 0 otherwise; *Reclnv*  $CF_{i,t}$ : the ration of client-firm receivables and inventory to client-firm total assets; *LnNumSubs*  $CF_{i,t}$ : the natural logarithm of client firm number of subsidiaries; *Problem*  $CF_{i,t}$ : an indicator variable that takes the value 1 if a client firm restated its earnings in the previous two years, and 0 otherwise; *LagQualified*  $CF_{i,t}$ : variable *Qualified*  $CF_{i,t}$ , lagged by one year; *Intangibles*  $CF_{i,t}$ : the ratio of client-firm intangible to total assets; *Tangibles*  $CF_{i,t}$ : the ratio of client-firm tangible to total assets; *LagAcquisition*  $CF_{i,t}$ : the ratio of client-firm acquisitions amount to client-firm total assets, lagged by one year; *Extr. Items*  $CF_{i,t}$ : the ratio of client-firm extra-ordinary items to client-firm total assets; *Sales Growth*  $CF_{i,t}$ : the percentage change in client-firm sales; *Deferred Taxes*  $CF_{i,t}$ : the ratio of client-firm deferred taxes to client-firm total assets.

## Online Appendix II

**Table I: Correlation Matrices**

Panel A: Correlation between outcome measures and key audit-firm characteristics

Variables	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	
<i> DACC  CF</i>	(a)										
<i>AQ CF</i>	(b)	<b>0.42</b>									
<i>Qualified CF</i>	(c)	0.01	<b>0.03</b>								
<i>Restatement CF</i>	(d)	-0.01	-0.03	<b>0.05</b>							
<i>Unexp. KAMs CF</i>	(e)	0.01	-0.01	-0.02	<b>-0.03</b>						
<i>EBIT Margin AF</i>	(f)	<b>-0.01</b>	<b>-0.01</b>	0.01	<b>-0.07</b>	<b>0.07</b>					
<i>LnEmpl AF</i>	(g)	<b>0.06</b>	<b>0.09</b>	<b>-0.04</b>	0.00	<b>0.28</b>	<b>-0.06</b>				
<i>LnCash AF</i>	(h)	<b>0.07</b>	<b>0.10</b>	<b>-0.02</b>	0.01	<b>-0.12</b>	<b>-0.05</b>	<b>0.76</b>			
<i>Intangibles AF</i>	(i)	<b>-0.03</b>	<b>-0.04</b>	-0.01	-0.03	<b>0.19</b>	<b>-0.04</b>	<b>-0.20</b>	<b>-0.22</b>		
<i>IndSpec AF</i>	(j)	<b>0.04</b>	<b>0.05</b>	<b>-0.02</b>	0.02	<b>0.18</b>	<b>0.11</b>	<b>0.50</b>	<b>0.46</b>	<b>-0.17</b>	
<i>Big4</i>	(k)	<b>0.07</b>	<b>0.10</b>	<b>-0.05</b>	-0.01	<b>0.07</b>	<b>0.07</b>	<b>0.71</b>	<b>0.58</b>	<b>-0.35</b>	<b>0.64</b>

Panel B: Correlation between outcome measures and key client-firm characteristics

Variables	(a)	(b)	(c)	(d)	(e)	(m)	(n)	(o)	(p)	(q)	(r)	(s)	(t)	(u)	(v)	(w)
DACC  CF	(a)															
AQ CF	(b)	<b>0.42</b>														
Qualified CF	(c)	0.01	<b>0.03</b>													
Restatement CF	(d)	-0.01	-0.03	<b>0.05</b>												
Unexp. KAMs CF	(e)	0.01	-0.01	-0.02	<b>-0.03</b>											
Public CF	(m)	<b>-0.09</b>	<b>-0.06</b>	<b>-0.01</b>	.	.										
LnAssets CF	(n)	<b>-0.08</b>	<b>-0.12</b>	<b>-0.01</b>	<b>0.08</b>	<b>0.08</b>	<b>0.26</b>									
Leverage CF	(o)	<b>0.11</b>	<b>0.21</b>	<b>0.02</b>	0.02	0.02	<b>-0.06</b>	<b>0.03</b>								
ROA CF	(p)	<b>-0.04</b>	<b>-0.11</b>	<b>-0.03</b>	0.01	<b>0.05</b>	<b>-0.07</b>	<b>0.01</b>	<b>-0.35</b>							
Loss CF	(q)	<b>0.06</b>	<b>0.16</b>	.	-0.01	-0.02	<b>0.02</b>	<b>-0.03</b>	<b>0.27</b>	<b>-0.53</b>						
RecInv CF	(r)	0.00	<b>-0.06</b>	0.00	<b>-0.05</b>	0.01	<b>-0.07</b>	<b>-0.25</b>	<b>-0.07</b>	<b>0.04</b>	<b>-0.08</b>					
StdSales CF	(s)	<b>0.24</b>	<b>0.27</b>	-0.01	<b>0.07</b>	0.02	<b>-0.07</b>	<b>-0.15</b>	<b>0.05</b>	<b>-0.02</b>	<b>0.02</b>	<b>0.15</b>				
NonAuditFeesRatio CF	(t)	<b>-0.11</b>	<b>-0.11</b>	<b>-0.02</b>	<b>0.06</b>	<b>0.08</b>	<b>0.50</b>	<b>0.53</b>	<b>-0.05</b>	0.00	<b>-0.03</b>	<b>-0.08</b>	<b>-0.11</b>			
Influential CF	(u)	<b>-0.01</b>	<b>-0.01</b>	0.00	0.00	0.02	<b>0.02</b>	<b>0.05</b>	0.00	0.00	0.01	-0.01	<b>-0.01</b>	<b>0.05</b>		
LnNumSubs CF	(v)	<b>-0.04</b>	<b>-0.05</b>	<b>0.04</b>	0.02	<b>0.04</b>	<b>0.04</b>	<b>0.02</b>	<b>-0.04</b>	0.00	<b>-0.02</b>	<b>0.02</b>	<b>-0.01</b>	<b>0.10</b>	<b>0.04</b>	
AuditorSwitch CF	(w)	<b>0.05</b>	<b>0.04</b>	<b>0.03</b>	0.03	-0.02	0.01	0.00	<b>0.01</b>	<b>-0.01</b>	<b>0.03</b>	<b>-0.01</b>	<b>0.02</b>	<b>-0.01</b>	<b>-0.02</b>	<b>-0.02</b>
LagTACC CF	(x)	<b>0.03</b>	<b>-0.09</b>	0.00	0.01	0.00	<b>-0.02</b>	<b>0.02</b>	<b>-0.03</b>	<b>0.04</b>	<b>-0.06</b>	<b>0.04</b>	<b>-0.04</b>	0.00	0.00	0.00

Panel A (panel B) presents Pearson correlations between audit outcome measures and key audit-firm (client-firm) characteristics. Bold values indicate significance at the two-tailed 5% level or better. See the Appendix in the manuscript for variable definitions. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed).

**Table II: Audit-Firm and Client-Firm Characteristics Associated with Audit-Firm Profitability (Determinants Analyses)**

Panel A: Decomposing Big-4 profitability into revenue and cost component

Variables	<i>Dep. Var. = Costs AF</i>		<i>Dep. Var. = StaffCosts AF</i>		<i>Dep. Var. = OtherCosts AF</i>		<i>Dep. Var. = Revenues AF</i>	
	Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat
<i>Costs AF</i>							0.859***	6.99
<i>Revenues AF</i>	1.008***	10.22	0.493***	3.02	0.564***	3.72		
<i>LnEmpl AF</i>	0.107**	3.12	0.765*	1.99	0.198**	2.61	-0.023	-0.61
<i>LnCash AF</i>	-0.002	-0.26	0.001	0.18	-0.020	-1.68	-0.009	-1.52
<i>Intangibles AF</i>	-0.788	-0.55	0.405	0.16	-1.846	-0.82	2.352*	1.73
<i>AvgIndSpec AF</i>	-1.892**	-2.47	-1.598*	-2.01	-0.501	-0.65	0.492	0.64
<i>Big4</i>								
<i>AvgPublic CF</i>	-37.663**	-2.50	-40.310***	-3.50	-53.927**	-2.08	44.430***	3.16
<i>AvgLnAssets CF</i>	-2.815*	-2.03	-0.497	-0.45	-5.073*	-1.99	0.676**	2.41
<i>AvgLeverage CF</i>	-0.448	-0.35	1.135	0.79	-0.719	-0.35	-1.905	-1.59
<i>AvgROA CF</i>	-6.579**	-2.49	2.560	0.88	-5.652	-1.50	1.709	0.79
<i>AvgLoss CF</i>	-2.993	-1.15	-2.985	-0.98	2.996	1.04	4.654**	2.24
<i>AvgRecInv CF</i>	-0.554	-0.14	-0.476	-0.09	1.963	0.34	-1.204	-0.30
<i>AvgStdSales CF</i>	0.958*	1.97	-0.680	-0.75	0.541	0.47	0.086	0.13
<i>AvgNonAuditFeesRatio</i>	-0.381	-1.05	0.461	1.01	-0.002	0.00	0.710*	1.90
<i>AvgInfluential</i>	-2,022.652	-1.44	-1,718.847	-1.47	2,951.094	0.58	1,052.904	1.17
<i>AvgLnNumSubs CF</i>	2.860	0.94	-1.994	-0.61	5.433**	2.16	-2.087	-0.83
<i>Year FE</i>	Yes		Yes		Yes		Yes	
<i># of audit firm-years</i>	52		52		52		52	
<i>Adj. R<sup>2</sup></i>	0.910		0.560		0.591		0.949	

Panel B: Decomposing non-Big-4 profitability into revenue and cost component

Variables	<i>Dep. Var. = Costs AF</i>		<i>Dep. Var. = StaffCosts AF</i>		<i>Dep. Var. = OtherCosts AF</i>		<i>Dep. Var. = Revenues AF</i>	
	Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat	Coeff.	<i>t</i> -stat
<i>Costs AF</i>							1.162***	38.27
<i>Revenues AF</i>	0.646***	38.16	0.402***	19.15	0.264***	15.45		
<i>LnEmpl AF</i>	0.035***	3.19	0.039*	3.13	0.018*	1.70	-0.021	-1.46
<i>LnCash AF</i>	0.001	0.51	0.001	0.55	-0.000	-0.11	-0.003	-0.72
<i>Intangibles AF</i>	0.122**	2.58	-0.038	-1.01	-0.015	-0.33	-0.392***	-5.66
<i>AvgIndSpec AF</i>	-0.657	-1.01	-1.242*	-1.87	-0.292	-0.46	-0.232	-0.29
<i>Big4</i>								
<i>AvgPublic CF</i>	1.160**	2.30	0.039***	0.09	1.255*	1.94	-2.241***	-3.62
<i>AvgLnAssets CF</i>	0.044**	2.57	-0.002	-0.11	0.044**	2.39	-0.073***	-3.14
<i>AvgLeverage CF</i>	0.047	0.63	-0.077	-1.25	0.192***	3.22	-0.061	-0.58
<i>AvgROA CF</i>	-0.132	-1.08	-0.024	-0.21	0.001	0.01	0.297	1.49
<i>AvgLoss CF</i>	0.047	0.65	-0.106	-1.29	0.248 ***	3.39	-0.028	-0.28
<i>AvgRecInv CF</i>	-0.207	-1.64	-0.132	-1.05	0.035	0.25	0.440**	2.42
<i>AvgStdSales CF</i>	-0.016	-0.34	0.035	0.76	-0.008	-0.11	-0.033	-0.50
<i>AvgNonAuditFeesRatio</i>	0.036	0.97	0.106	3.21	-0.037	-0.68	-0.018	-0.34
<i>AvgInfluential</i>	3.266***	2.66	0.536	0.42	2.557**	2.11	-8.131**	-4.75
<i>AvgLnNumSubs CF</i>	-0.179***	-3.77	0.048	1.05	-0.168***	-3.86	0.242***	3.49
<i>Year FE</i>	Yes		Yes		Yes		Yes	
<i># of audit firm-years</i>	450		450		450		450	
<i>Adj. R<sup>2</sup></i>	0.822		0.653		0.465		0.849	

In panel A we examine audit-firm and client-firm determinants of Big-4 operating costs (model 1), staff costs (model 2), all other costs (model 3), and operating revenues (model 4). In panel B we examine audit-firm and client-firm determinants of non-Big-4 operating costs (model 1), staff costs (model 2), all other costs (model 3), and operating revenues (model 4). See the Appendix in the manuscript for variable definitions. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed).

**Table III: Instrumented (Predicted) Audit-Firm Profitability and Client-Firm Audit Outcomes**

Panel A: First stage regression results

Variables	<i>Dep. Var. = EBIT Margin AF (Main sample)</i>		<i>Dep. Var. = EBIT Margin AF (Qualified opinion sample)</i>		<i>Dep. Var. = EBIT Margin AF (Restatement sample)</i>		<i>Dep. Var. = EBIT Margin AF (Unexpected KAM sample)</i>	
	Coeff.	<i>t</i> -stat	Coeff.	<i>z</i> -stat	Coeff.	<i>z</i> -stat	Coeff.	<i>t</i> -stat
<i>Instrument</i>	1.407***	26.91	2.695***	60.74	4.881***	35.68	3.039***	34.72
<i>LnEmpl AF</i>	-0.015***	-55.49	-0.015***	-46.88	-0.034***	-28.34	-0.018***	-21.28
<i>LnCash AF</i>	0.004***	16.68	0.002***	6.23	0.011***	13.31	0.004***	8.18
<i>Intangibles AF</i>	0.015	1.24	-0.150***	-20.31	-0.135***	-6.05	-0.148***	-9.43
<i>IndSpec AF</i>	0.107***	32.97	0.041***	15.51	0.021***	3.47	0.032***	8.45
<i>Big4</i>	0.043***	55.19	0.047***	49.19	0.068***	21.42	0.039***	17.28
<i>Public CF</i>	0.002	1.33	0.002	1.53				
<i>LnAssets CF</i>	-0.002***	-8.55	-0.001***	-5.07	-0.004***	-3.83	-0.002***	-3.21
<i>Leverage CF</i>	0.002	1.18	-0.000	-1.27	0.002	0.64	0.003	1.17
<i>ROA CF</i>	0.002	0.27	0.008	1.54	-0.001	-0.08	-0.011	-1.27
<i>Loss CF</i>	-0.001	-0.52			-0.003	-1.25	-0.002	-1.19
<i>RecInv CF</i>	-0.004**	-2.43	-0.005***	-3.14	-0.020***	-3.76	-0.014***	-3.78
<i>StdSales CF</i>	-0.003***	-2.99	-0.002*	-1.81	0.007	1.42	0.003	0.72
<i>NonAuditFeesRatio CF</i>	-0.002***	-4.20	0.000*	1.90	-0.000	-0.95	-0.001	-0.58
<i>Influential CF</i>	-0.000	-0.97	0.099***	3.76	0.328**	2.26	0.700	0.74
<i>LnNumSubs CF</i>	14.890***	24.21	-0.001*	-1.89	-0.001	-1.41	0.000	0.25
<i>AuditorSwitch CF</i>	-0.004***	-2.60	-0.001	-0.75	-0.003	-1.10	0.000	0.27
<i>LagTACC CF</i>	0.003	1.07						
Industry FE	Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes	
# of client firm-years	104,854		19,378		2,265		2,722	
Adj. R <sup>2</sup>	0.192		0.448		0.632		0.561	

Panel B: Instrumented (predicted) audit-firm profitability and client-firm audit outcomes

Variables	Dep. Var. =  DACC  CF		Dep. Var. = AQ CF		Dep. Var. = Qualified CF		Dep. Var. = Restatement CF		Dep. Var. = Unexp. KAMs CF	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	z-stat	Coeff.	z-stat	Coeff.	t-stat
<i>Instr. EBIT Margin AF</i>	-0.045***	-2.64	-0.035***	-4.19	3.768**	1.99	-4.248***	-2.83	1.191**	2.07
<i>LnEmpl AF</i>	-0.000	-0.85	0.000	0.71	0.024	0.52	-0.093	-1.37	0.035**	2.00
<i>LnCash AF</i>	0.002***	5.19	0.002***	10.59	0.027	0.85	0.093*	1.66	-0.012	-1.02
<i>Intangibles AF</i>	0.010	1.10	0.008*	1.83	-2.470**	-2.49	-3.079*	-1.95	0.601**	1.98
<i>IndSpec AF</i>	0.002	0.53	0.005**	2.05	0.263	0.83	0.406	1.27	0.111	1.42
<i>Big4</i>	0.014***	8.83	0.009***	11.39	-0.904***	-6.25	-0.361**	-2.01	-0.073	-1.49
<i>Public CF</i>	-0.018***	-11.48	-0.002**	-2.42	-0.229	-1.38				
<i>LnAssets CF</i>	-0.004***	-11.01	-0.006***	-30.50	0.099***	2.76	0.286***	4.77	-0.002	-0.17
<i>Leverage CF</i>	0.040***	20.67	0.032***	30.35	0.080**	2.04	-0.020	-0.10	-0.013	-0.30
<i>ROA CF</i>	0.222***	21.30	0.166***	31.58	-3.654**	-5.97	-1.755**	-2.49	0.842***	4.86
<i>Loss CF</i>	0.030***	21.81	0.032***	45.94			-0.167	-1.21	0.128***	3.57
<i>RecInv CF</i>	-0.028***	-11.27	-0.029***	-24.63	-0.128	-0.67	-0.765***	-2.61	0.082	1.08
<i>StdSales CF</i>	0.076***	28.72	0.046***	33.16	-0.290*	-1.93	0.787***	3.29	0.092	1.03
<i>NonAuditFeesRatio</i>	-0.007***	-15.63	-0.002***	-10.29	-0.148***	-3.46	0.012	0.29	-0.004	-0.11
<i>Influential CF</i>	-0.000**	-2.13	-0.000	-0.56	-0.002	-0.14	-0.004	-0.38	50.915***	2.68
<i>LnNumSubs CF</i>	0.522	0.65	1.650***	3.89	3.182	1.79	9.598	1.26	0.004	0.35
<i>AuditorSwitch CF</i>	0.020***	10.31	0.007***	7.54	0.348***	3.75	-0.022	-0.17	-0.050	-1.56
<i>LagTACC CF</i>	0.076***	16.50	0.005**	2.29						
Industry FE	Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	104,854		104,854		19,378		2,265		2,722	
Adj. R <sup>2</sup>	0.106		0.197						0.110	
Instr. First-Stage F-stat	724.15		724.15		3,689.35		1,273.06		1,205.47	
Wald Test (p-value)	<0.01		<0.01		0.37		0.029		0.042	
S-W LM S (p-value)	<0.01		<0.01						0.039	
Hansen J stat. (p-value)	1.00		1.00						1.00	

In panel A (panel B) we present the first stage (second stage) results of the relation between instrumented (predicted) audit-firm profitability and client-firm audit outcomes. We use the following audit outcomes: the level of absolute discretionary accruals as in Kothari *et al.* (2005) (model 1), the McNichols (2002) modification of the Dechow and Dichev (2002) accrual quality measure (model 2), the propensity to issue a qualified audit opinion for loss-making client firms (model 3), accounting restatements (model 4), and the level of unexpected KAMs (model 5). We use the ratio of audit-firm tax expense to audit-firm total assets as instrument



for audit-firm profitability. See the Appendix in the manuscript for variable definitions. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed).

**Table IV: Other Robustness Tests**

Panel A: Controlling for audit-firm and client-firm fixed effects

Variables	Dep. Var. =  DACC  CF		Dep. Var. = AQ CF		Dep. Var. = Qualified CF		Dep. Var. = Restatement CF		Dep. Var. = Unexp. KAMs CF	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	z-stat	Coeff.	z-stat	Coeff.	t-stat
<i>EBIT Margin AF</i>	-0.004**	-2.07	-0.018**	-2.66	13.339**	2.21	-17.929***	-3.57	1.438***	3.19
<i>LnEmpl AF</i>	-0.000	-0.33	0.000	0.39	-0.392	-1.22	0.934**	2.10	0.085***	4.35
<i>LnCash AF</i>	0.001***	3.45	0.000***	3.34	0.466*	1.70	0.132	0.59	0.040**	2.38
<i>Intangibles AF</i>	-0.066**	-2.66	-0.016	-1.34	1.268	0.17	14.820**	2.05	4.517***	6.12
<i>IndSpec AF</i>	-0.001	-0.06	0.003*	1.89	0.456	0.24	1.055	1.00	-0.057	-0.85
<i>Big4</i>										
<i>Public CF</i>	-0.008	-0.52	-0.008***	-3.65						
<i>LnAssets CF</i>	-0.050***	-19.59	-0.029***	-29.85	0.674	1.37	0.317	1.07	0.103***	3.74
<i>Leverage CF</i>	0.009	1.49	0.016***	8.29	0.783*	1.74	1.143	1.02	0.122	1.30
<i>ROA CF</i>	0.146***	6.14	0.061***	9.62	-2.216***	-2.74	-2.866*	-1.65	0.240	1.31
<i>Loss CF</i>	0.018***	5.88	0.006***	9.12			-0.285	-0.79	0.011	0.40
<i>RecInv CF</i>	0.003	0.59	0.001	1.14	-1.176	-0.86	-3.424*	-1.67	0.127	0.98
<i>StdSales CF</i>	0.064***	19.60	0.067***	15.90	0.555	0.51	-0.272	-0.25	-0.242**	-2.21
<i>NonAuditFeesRatio</i>	-0.000	-0.07	-0.000	-0.26	-1.309*	-1.65	-0.058	-0.13	0.051	1.27
<i>Influential CF</i>	7.591**	2.52	1.429	1.66	214.385	0.32	0.047	0.00	70.487***	3.19
<i>LnNumSubs CF</i>										
<i>AuditorSwitch CF</i>	0.017***	5.57	0.002**	2.46	1.185**	2.05	0.390	1.02	-0.020	-0.90
<i>LagTACC CF</i>	0.063***	12.22	-0.007***	-4.22						
Audit-Firm FE	Yes		Yes		Yes		Yes		Yes	
Client-Firm FE	Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	104,854		104,854		355		711		2,722	
Adj. R <sup>2</sup> /Pseudo R <sup>2</sup>	0.263		0.661		0.187		0.091		0.675	

Panel B: Change in audit-firm profitability and change in client-firm outcomes

Variables	Dep. Var. = $\Delta DACC  CF$		Dep. Var. = $\Delta AQ CF$		Dep. Var. = $\Delta Qualified CF$		Dep. Var. = $\Delta Restatement CF$		Dep. Var. = $\Delta Unexp. KAMs CF$	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	z-stat	Coeff.	z-stat	Coeff.	t-stat
$\Delta EBIT Margin AF$	-0.005**	-2.50	-0.001**	-2.39	0.308***	2.68	-0.634	-0.33	0.289**	2.15
$\Delta LnEmpl AF$	0.000	0.37	0.000	0.45	-0.033	-0.65	-0.979	-1.23	0.017***	4.31
$\Delta LnCash AF$	0.000**	2.35	0.000	1.42	0.009	0.53	0.041	1.38	-0.002	-0.49
$\Delta Intangibles AF$	0.027	1.21	-0.015*	-1.72	1.670	0.45	-2.314**	-2.06	0.226***	2.75
$\Delta IndSpec AF$	0.002	0.50	0.001	0.24	0.656**	2.07	-0.061	-0.21	-0.050**	-2.18
$\Delta Big4$	0.005	0.85	-0.000	-0.15	0.163	0.54	-0.423	-1.09	-0.018	-1.08
$\Delta Public CF$	0.000	0.02	-0.002	-0.86	0.043	0.24				
$\Delta LnAssets CF$	-0.110***	-17.31	-0.028***	-27.51	0.028	0.28	0.112	0.95	0.032***	3.05
$\Delta Leverage CF$	0.003	1.01	-0.003**	-2.48	0.710	1.08	0.205*	1.88	0.023	0.89
$\Delta ROA CF$	0.009	1.30	-0.009**	-2.59	-0.366**	-2.42	-0.706***	-4.01	-0.034**	-2.04
$\Delta Loss CF$	0.003*	1.89	-0.000	-0.03	-0.110 *	-1.72	-0.146	-1.19	-0.025***	-3.58
$\Delta RecInv CF$	0.031***	5.61	0.005***	3.52	0.192	0.33	-0.798	-0.89	-0.137***	-3.40
$\Delta StdSales CF$	0.065***	18.57	0.014***	11.25	-0.025	-0.36	-0.335**	-1.97	0.033	1.64
$\Delta NonAuditFeesRatio CF$	-0.000	-0.40	0.000	1.52	-0.005***	-3.01	0.004	1.58	-0.000	-0.23
$\Delta Influential CF$	0.464**	2.59	-0.047	-1.02	522.686	1.18	-1.593	-0.23	1.490**	2.20
$\Delta LnNumSubs CF$										
$\Delta AuditorSwitch CF$	0.014***	6.72	0.002***	2.77	0.311***	4.12	0.029	0.32	0.003	0.50
$\Delta LagTACC CF$	0.107***	18.46	-0.000	-0.69						
Industry FE	Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	86,148		86,148		19,096		2,257		2,633	
Adj. R <sup>2</sup> /Pseudo R <sup>2</sup>	0.077		0.063		0.257		0.043		0.112	

Panel C: The relation between lead audit-firm profitability and audit outcomes

Variables	Dep. Var. =  DACC  CF		Dep. Var. = AQ CF		Dep. Var. = Qualified CF		Dep. Var. = Restatement CF		Dep. Var. = Unexp. KAMs CF	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	z-stat	Coeff.	z-stat	Coeff.	t-stat
<i>LeadEBIT Margin AF</i>	0.001	0.47	0.000	0.01	0.009	0.02	-2.614	-1.49	0.285	0.94
<i>LnEmpl AF</i>	-0.000	-0.35	0.001	1.67	-0.055	-0.54	-0.012	-0.11	0.014	0.85
<i>LnCash AF</i>	0.001***	4.58	0.001***	4.01	0.168***	2.58	0.075	0.57	0.006	0.33
<i>Intangibles AF</i>	0.008	0.71	0.004	0.48	-5.667**	-2.36	-7.165	-1.54	2.023***	3.58
<i>IndSpec AF</i>	-0.005	-1.05	-0.000	-0.06	0.831	1.09	0.698	1.12	0.098	1.10
<i>Big4</i>	0.013***	11.59	0.009***	9.21	-1.564***	-4.88	-0.959***	-2.88	-0.008	-0.16
<i>Public CF</i>	-0.015***	-11.30	-0.000	-0.02	-0.793**	-2.35				
<i>LnAssets CF</i>	-0.002***	-3.55	-0.005***	-11.71	0.056	0.72	0.522***	4.60	-0.005	-0.48
<i>Leverage CF</i>	0.040***	15.89	0.031***	13.13	0.175	1.21	-0.155	-0.45	-0.019	-0.46
<i>ROA CF</i>	0.198***	15.98	0.146***	18.16	-0.954***	-2.84	-0.122	-0.12	0.854***	4.97
<i>Loss CF</i>	0.027***	12.34	0.030***	26.20			0.120	0.45	0.130***	3.34
<i>RecInv CF</i>	-0.049***	-12.08	-0.040***	-14.51	-0.503	-0.82	-1.375**	-2.50	0.051	0.63
<i>StdSales CF</i>	0.244***	22.16	0.137***	39.16	-0.948*	-1.85	1.995***	3.13	0.091	1.58
<i>NonAuditFeesRatio CF</i>	-0.000**	-2.16	-0.000	-0.13	-0.057	-0.22	0.080	0.27	0.002**	2.31
<i>Influential CF</i>	-1.097	-1.35	0.393	0.58	433.568***	2.85	180.773	1.51	62.254***	3.22
<i>LnNumSubs CF</i>	-0.007***	-10.69	-0.002***	-9.07	-0.408***	-4.25	-0.001	-0.02	0.008	0.61
<i>AuditorSwitch CF</i>	0.020***	9.46	0.006***	3.96	0.890***	4.11	0.133	0.55	-0.052	-1.52
<i>LagTACC CF</i>	0.080***	13.89	0.017***	5.74						
Industry FE	Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	103,913		103,913		19,196		2,162		2,586	
Adj. R <sup>2</sup> /Pseudo R <sup>2</sup>	0.122		0.220		0.137		0.151		0.113	

Panel D: The relation between lagged audit-firm profitability and audit outcomes

Variables	Dep. Var. =  DACC  CF		Dep. Var. = AQ CF		Dep. Var. = Qualified CF		Dep. Var. = Restatement CF		Dep. Var. = Unexp. KAMs CF	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	z-stat	Coeff.	z-stat	Coeff.	t-stat
<i>LagEBIT Margin AF</i>	-0.000	-0.16	-0.002	-1.12	1.817*	1.73	-1.816*	-1.70	0.459*	1.88
<i>LnEmpl AF</i>	-0.000	-0.46	0.001*	1.68	-0.012	-0.37	-0.018	-0.31	0.026	1.61
<i>LnCash AF</i>	0.001***	4.69	0.001***	4.14	0.059**	2.48	0.037	0.56	-0.005	-0.54
<i>Intangibles AF</i>	0.011	0.89	0.006	0.69	-1.997**	-2.16	-3.739**	-1.96	0.606**	2.01
<i>IndSpec AF</i>	-0.004	-1.00	0.000	0.08	0.372	1.17	0.104	0.35	0.148*	1.91
<i>Big4</i>	0.013***	12.22	0.009***	9.96	-0.736***	-4.71	-0.323*	-1.87	-0.061	-1.25
<i>Public CF</i>	-0.015***	-10.99	-0.000	-0.07	-0.243**	-2.50				
<i>LnAssets CF</i>	-0.002***	-3.46	-0.005***	-11.70	0.028	0.89	0.087**	2.30	-0.002	-0.25
<i>Leverage CF</i>	0.040***	16.40	0.031***	13.06	0.291**	2.00	-0.041	-0.30	-0.011	-0.26
<i>ROA CF</i>	0.197***	15.15	0.146***	17.30	-0.436***	-3.16	0.117	0.22	0.840***	5.03
<i>Loss CF</i>	0.027***	11.86	0.030***	25.11			0.054	0.39	0.127***	3.39
<i>RecInv CF</i>	-0.048***	-11.29	-0.039***	-14.36	-0.153	-0.64	-0.600**	-2.17	0.063	0.80
<i>StdSales CF</i>	0.243***	22.13	0.137***	39.80	-0.295*	-1.70	0.970***	3.02	0.076	1.36
<i>NonAuditFeesRatio CF</i>	-0.000**	-2.15	-0.000	-0.12	0.023	0.24	0.196	1.29	0.003***	2.97
<i>Influential CF</i>	-1.072	-1.38	0.368	0.55	125.553*	1.83	67.745	1.00	49.784***	2.59
<i>LnNumSubs CF</i>	-0.007***	-10.87	-0.002***	-8.96	-0.149***	-3.93	0.011	0.24	0.004	0.32
<i>AuditorSwitch CF</i>	0.019***	8.80	0.006***	3.85	0.362***	4.71	0.035	0.28	-0.048	-1.46
<i>LagTACC CF</i>	0.080***	14.15	0.017***	5.79						
Industry FE	Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	104,406		104,406		19,298		2,265		2,722	
Adj. R <sup>2</sup> /Pseudo R <sup>2</sup>	0.122		0.220		0.139		0.141		0.110	

In panel A we re-estimate the relation between audit-firm profitability and client-firm audit outcomes after controlling for audit-firm and client-firm fixed effects. In panel B we examine the relation between changes in audit-firm profitability and changes in client-firm audit outcomes. In panel C (panel D) we estimate the relation between lead (lagged) audit-firm profitability and client-firm audit outcomes. We use the following audit outcomes: the level of absolute discretionary accruals as in Kothari *et al.* (2005) (model 1), the McNichols (2002) modification of the Dechow and Dichev (2002) accrual quality measure (model 2), the propensity to issue a qualified audit opinion for loss-making client firms (model 3), accounting restatements (model 4), and the level of unexpected KAMs (model 5). See the Appendix in the manuscript for variable definitions. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed).

**Table V: Additional Tests**

Panel A: Audit-firm staff costs and client-firm audit outcomes

Variables	Dep. Var. =  DACC  CF		Dep. Var. = AQ CF		Dep. Var. = Qualified CF		Dep. Var. = Restatement CF		Dep. Var. = Unexp. KAMs CF	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	z-stat	Coeff.	z-stat	Coeff.	t-stat
<i>StaffCosts AF</i>	-0.004**	-2.65	-0.005***	-2.82	1.761**	1.97	-1.960**	-2.16	0.321**	2.40
<i>LnEmpl AF</i>	0.000	0.74	0.001***	4.40	-0.082	-0.89	-0.060	-0.47	0.019	0.92
<i>LnCash AF</i>	0.001***	3.34	0.001***	9.97	0.149*	1.85	0.006	0.08	-0.005	-0.45
<i>Intangibles AF</i>	-0.002	-0.24	0.007	1.53	-6.596***	-2.89	-13.819***	-3.25	0.572	1.44
<i>IndSpec AF</i>	-0.004	-1.21	-0.001	-0.48	1.363	1.55	0.170	0.22	0.205**	2.02
<i>Big4</i>	0.008***	14.20	0.010***	12.17	-1.849***	-6.74	-0.773**	-2.14	0.024	0.40
<i>Public CF</i>	-0.016***	-10.76	-0.002*	-1.92	-0.458	-1.11				
<i>LnAssets CF</i>	-0.003***	-7.78	-0.005***	-25.12	0.092	1.48	0.192*	1.79	-0.020	-1.58
<i>Leverage CF</i>	0.030***	22.79	0.029***	22.33	0.174*	1.91	-0.057	-0.38	-0.011	-0.20
<i>ROA CF</i>	0.176***	20.66	0.137***	26.55	-1.048***	-3.74	0.268	0.37	0.872***	4.05
<i>Loss CF</i>	0.022***	13.97	0.032***	45.99			0.119	0.50	0.135***	2.78
<i>RecInv CF</i>	-0.022***	-6.96	-0.064***	-35.82	-0.501	-0.89	-1.023	-1.12	-0.027	-0.28
<i>StdSales CF</i>	0.047***	17.79	0.137***	82.37	-0.586*	-1.85	1.058**	2.55	0.163	1.39
<i>NonAuditFeesRatio CF</i>	-0.006***	-14.32	-0.002***	-8.60	-0.002	-0.01	0.464	1.14	-0.016	-0.31
<i>Influential CF</i>	-0.009***	-4.98	-0.013***	-12.67	18.064***	3.66	65.880	0.74	83.691***	3.36
<i>LnNumSubs CF</i>	-0.301	-0.38	8.287***	5.34	-0.384***	-3.93	0.020	0.29	-0.021	-1.30
<i>AuditorSwitch CF</i>	0.014***	6.90	0.006***	6.70	0.874***	3.85	0.089	0.51	-0.059	-1.40
<i>LagTACC CF</i>	0.070***	11.89	0.017***	5.33						
Industry FE	Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	104,854		104,854		19,378		2,265		2,722	
Adj. R <sup>2</sup> /Pseudo R <sup>2</sup>	0.116		0.216		0.137		0.142		0.116	

Panel B: Audit-firm operating revenue and client-firm audit outcomes

Variables	Dep. Var. =  DACC  CF		Dep. Var. = AQ CF		Dep. Var. = Qualified CF		Dep. Var. = Restatement CF		Dep. Var. = Unexp. KAMs CF	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	z-stat	Coeff.	z-stat	Coeff.	t-stat
<i>Revenues AF</i>	-0.001*	-1.98	-0.002***	-2.84	0.704**	2.07	0.114	0.38	0.153***	3.77
<i>LnEmpl AF</i>	-0.000	-0.46	0.001***	3.07	-0.089	-0.95	-0.015	-0.15	0.013	0.62
<i>LnCash AF</i>	0.001***	3.19	0.001***	7.67	0.138*	1.80	-0.031	-0.31	-0.007	-0.60
<i>Intangibles AF</i>	-0.002	-0.21	-0.027*	-1.89	-6.069***	-2.70	-6.995*	-1.74	0.720*	1.77
<i>IndSpec AF</i>	-0.005	-1.64	-0.005*	-1.70	1.375	1.56	0.070	0.13	0.216**	2.13
<i>Big4</i>	0.008***	8.25	0.007***	9.18	-1.802***	-6.50	-0.729**	-2.22	0.053	0.86
<i>Public CF</i>	-0.014***	-12.05	-0.002**	-2.12	-0.487	-1.18				
<i>LnAssets CF</i>	-0.001***	-2.98	-0.006***	-23.32	0.091	1.50	0.189***	2.73	-0.019	-1.50
<i>Leverage CF</i>	0.031***	24.60	0.026***	32.09	0.170*	1.86	-0.059	-0.22	-0.010	-0.18
<i>ROA CF</i>	0.151***	19.43	0.151***	29.86	-1.053***	-3.74	0.300	0.30	0.881***	4.09
<i>Loss CF</i>	0.019***	11.98	0.029***	42.22			0.131	0.50	0.134***	2.76
<i>RecInv CF</i>	-0.024***	-12.56	-0.045***	-33.01	-0.496	-0.88	-0.989*	-1.88	-0.017	-0.17
<i>StdSales CF</i>	0.157***	35.36	0.096***	76.91	-0.584*	-1.86	1.068***	2.99	0.164	1.40
<i>NonAuditFeesRatio CF</i>	-0.006***	-16.37	-0.003***	-11.24	0.008	0.03	0.427	1.49	-0.016	-0.31
<i>Influential CF</i>	-0.000***	-2.68	-0.000	-0.09	17.554***	3.70	68.691	0.55	78.895***	3.20
<i>LnNumSubs CF</i>	-1.497**	-2.48	-0.906**	-2.44	-0.378***	-3.87	0.021	0.24	-0.020	-1.21
<i>AuditorSwitch CF</i>	0.013***	6.44	0.006***	7.00	0.875***	3.86	0.078	0.33	-0.062	-1.48
<i>LagTACC CF</i>	0.066***	10.98	0.020***	6.45						
Industry FE	Yes		Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	104,854		104,854		19,378		2,265		2,722	
Adj. R <sup>2</sup> /Pseudo R <sup>2</sup>	0.143		0.237		0.137		0.139		0.118	

Panel C: Audit-firm profitability and future investments in assets and personnel

Variables	Dep. Var. = <i>LeadLnAssets AF</i>		Dep. Var. = <i>LeadLnTangibles AF</i>		Dep. Var. = <i>LeadLnIntangibles AF</i>		Dep. Var. = <i>LeadAvgEmplCost AF</i>		Dep. Var. = <i>LeadLnEmpl AF</i>	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
<i>EBIT Margin AF</i>	0.104**	2.22	0.226**	2.12	0.122	0.30	0.751*	1.77	0.122**	2.55
<i>LnAssets AF</i>	1.010***	141.61								
<i>LnTangibles AF</i>			0.948***	68.19						
<i>LnIntangibles AF</i>					0.981***	18.16				
<i>LnCostPerEmpl AF</i>							1.122***	10.76		
<i>LnEmpl AF</i>									1.109***	63.22
<i>B4</i>	0.002	0.09	0.292 ***	4.12	-0.101	-0.27	-0.074	-0.84	0.002	0.32
<i>LnCash AF</i>	-0.003	-1.10	0.018 **	2.32	0.047	1.51	-0.024**	-2.22	0.000	0.07
<i>Public CF</i>	-0.295	-0.43	-0.931	-0.51	-3.564	-0.65	-0.120	-0.06	1.108***	3.68
Year FE	Yes		Yes		Yes		Yes		Yes	
# of client firm-years	331		331		331		331		331	
Adj. R <sup>2</sup> /Pseudo R <sup>2</sup>	0.996		0.967		0.740		0.304		0.969	

Panel A presents the results of estimating the relation between audit-firm staff costs (*StaffCosts AF*) and client-firm audit outcomes. Panel B presents the regression results of estimating the relation between audit-firm operating revenue (*Revenues AF*) and client-firm audit outcomes. We use the following audit outcomes: the level of absolute discretionary accruals as in Kothari *et al.* (2005) (model 1), the McNichols (2002) modification of the Dechow and Dichev (2002) accrual quality measure (model 2), the propensity to issue a qualified audit opinion for loss-making client firms (model 3), accounting restatements (model 4), and the level of unexpected KAMs (model 5). Panel C presents the regression results of estimating the relation between audit-firm profitability and one year ahead audit-firm total assets (model 1), tangible assets (model 2), intangible assets (model 3), average employee cost (model 4), as well as number of employees (model 5). See the Appendix in the manuscript for variable definitions. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed).