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Audit in the Digital Age: The Strategic Role of Auditor IT Expertise in Achieving Internal Control Success in Chinese Firms

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Abstract

Purpose: This study investigates the role of auditor IT expertise in achieving internal control objectives within Chinese firms. By leveraging resource dependence theory, it examines how auditor IT expertise enhances the functionality and reliability of internal controls and explores the moderating effects of financial constraints.

Design/methodology/approach: The research utilizes a dataset of 22,441 firm-year observations from 2013 to 2021, covering Chinese non-financial firms listed on the Shanghai and Shenzhen Stock Exchanges. A multivariate regression framework is employed to test the hypothesized relationships, with robustness checks using alternative measures and addressing endogeneity concerns.

Findings: Auditor IT expertise significantly improves the achievement of internal control objectives, particularly in areas such as operational efficiency, reliable reporting, and compliance. The effect is more pronounced in financially constrained firms and non-State-Owned Enterprises (non-SOEs). Additional analyses reveal that auditor IT expertise plays a critical role in addressing severe internal control weaknesses and enhancing the quality of internal control systems.

Practical implications: The findings emphasize the strategic importance of engaging IT-proficient auditors to enhance corporate governance, especially for firms facing financial constraints. Audit firms are encouraged to invest in IT training to improve service quality, while policymakers should consider incentives for integrating IT expertise into audit practices.

Originality/value: This study contributes to the literature by integrating resource dependence theory into the underexplored domain of auditor IT expertise, providing new insights into its critical role in achieving internal control objectives. Unlike prior research that primarily focuses on traditional auditor competencies, this study highlights how IT expertise not only enhances internal control effectiveness but also serves as a strategic resource for firms navigating complex technological and financial environments. By focusing on Chinese firms—a rapidly evolving regulatory and technological context—it offers a globally relevant perspective on the interplay between IT, auditing, and corporate governance, paving the way for future research and practical advancements in audit quality and sustainability.

Keywords: Auditor IT expertise; Internal control objectives; Resource dependence theory; Financial constraints; Corporate governance.

1. Introduction

The increasing integration of Information Technology (IT) within corporate governance frameworks has significantly transformed internal control systems, making IT expertise a crucial asset for auditors. IT serves as the backbone of efficient control frameworks, enabling the timely and accurate capture, processing, and reporting of data, thereby enhancing the overall integrity and reliability of internal control mechanisms (Chen, 2023; Hu et al., 2024). Recognizing this, organizations are increasingly aware of the imperative to engage auditors with comprehensive IT expertise to ensure the robustness and resilience of their internal control systems (Chen et al., 2016; Haislip et al., 2016).

Prior research has extensively examined internal control systems through the lens of their structural components, such as the control environment, risk assessment, control activities, information and communication, and monitoring (e.g., Gong et al., 2013; Ji et al., 2019; Klamm & Watson, 2009; Li et al., 2012). While this work has provided important insights into the design and quality of internal controls, considerably less attention has been paid to the extent to which firms successfully achieve the underlying objectives of internal control systems, including operational efficiency, reliable reporting, legal compliance, strategic goal attainment, and asset protection. Moreover, although the auditing literature documents that auditor expertise in areas such as industry specialization (Knechel et al., 2007; Reichelt & Wang, 2010), multinational operations (Gunn & Michas, 2018), and task-specific knowledge (Ahn et al., 2020), the role of auditor IT expertise has been relatively understudied. Notable exceptions include Haislip et al. (2016) and Maghakyan et al. (2025), who examined the relationship between auditor IT expertise and outcomes such as audit fee premiums and internal control deficiencies. This study contributes to this emerging body of literature by investigating the association between auditor IT expertise and the achievement of internal control objectives within Chinese firms, providing practical insights that can guide auditors, organizations, and policymakers in developing robust internal control systems tailored to the complexities of modern IT environments.

At the same time, auditor IT expertise is unlikely to enhance internal control outcomes uniformly across firms. Organizations with strong internal IT capabilities and sophisticated governance structures may rely less on external expertise, limiting its incremental value (Ayyagari et al., 2011; He & Ren, 2023). In contrast, firms facing resource constraints, weaker governance

capacity, or severe internal control deficiencies may depend more heavily on auditors' IT expertise (Chen, 2023; Oradi & E-Vahdati, 2021). Accordingly, the relevance of auditor IT expertise is context dependent rather than universally beneficial.

Accordingly, this study examines the association between auditor IT expertise and the achievement of internal control objectives using on a dataset comprising 22,441 firm-year observations from Chinese non-financial firms listed on the Shanghai and Shenzhen Stock Exchanges between 2013 and 2021. The Chinese setting provides a particularly informative context for this analysis for several reasons that distinguish it from other institutional environments. First, China's rapid technological advancement has led to pervasive IT integration across corporate operations, intensifying firms' reliance on digital systems for operational efficiency, financial reporting, compliance, and strategic decision making (Chen et al., 2020; Lin et al., 2024). This widespread digitalization creates both heightened internal control challenges and greater demand for specialized IT-related oversight, increasing the potential relevance of auditor IT expertise (Chen et al., 2020; Lin et al., 2024). Second, China's internal control regulatory framework, shaped by the introduction of the Basic Standards for Enterprise Internal Control (China SOX) in 2008 and its mandatory implementation in 2012, extends well beyond financial reporting to encompass multiple operational, strategic, and compliance objectives. Unlike the U.S. SOX regime, which primarily focuses on financial reporting controls, China SOX requires firms to conduct comprehensive internal control self-assessments and to engage auditors to evaluate both financial and non-financial controls, thereby amplifying the importance of auditors' ability to assess technologically complex control environments (Ji et al., 2019; Chen et al., 2020). Third, China's corporate sector is characterized by heterogeneous ownership structures, including the continued prominence of state-owned enterprises, which operate under distinct governance arrangements, political influences, and resource constraints. These institutional features introduce substantial variation in firms' internal control capacity and their reliance on external expertise, suggesting that the role of auditor IT expertise may differ systematically across firms (Chua et al., 2024; Tong et al., 2022; Xia et al., 2024).

Drawing on resource dependence theory (RDT), we find that auditor IT expertise plays a significant role in achieving internal control objectives. However, this association is not universal. Instead, it is concentrated in firms facing financial constraints, in non-state-owned enterprises, and in firms exhibiting more severe internal control weaknesses. In settings where internal resources

and governance capacity are stronger, the association is substantially weaker or absent. These findings highlight the importance of organizational context in shaping the role of auditor IT expertise and caution against interpreting such expertise as a generic quality attribute.

This study makes four main contributions. First, it extends the emerging literature on auditor IT expertise by shifting the focus from internal control deficiencies to the broader concept of internal control objectives. Prior research, such as Haislip et al. (2016), primarily examines whether IT-experienced auditors are associated with fewer internal control weaknesses. In contrast, this study focuses on the extent to which firms achieve multiple internal control objectives, including operational efficiency, reliable reporting, compliance, and asset protection, offering a more comprehensive assessment of internal control effectiveness. Second, the study clarifies what makes auditor IT expertise distinct from traditional forms of auditor specialization, such as industry or task-specific expertise (Knechel et al., 2007; Reichelt & Wang, 2010; Ahn et al., 2020). While traditional expertise primarily supports transaction-level evaluation, IT expertise enables auditors to engage with system-embedded controls in increasingly digitalized environments, allowing them to assess the integrity of underlying information systems. Third, the study provides a clearer explanation of the mechanisms through which auditor IT expertise influences internal control outcomes. In particular, IT expertise enhances internal control evaluation through automation monitoring, system-level assurance, and data governance, enabling auditors to assess continuous controls, system reliability, and data integrity. Fourth, drawing on RDT, the study shows that the benefits of auditor IT expertise are conditional rather than universal. Specifically, IT expertise functions as a compensatory external resource, with stronger effects observed in firms facing financial constraints, weaker internal capabilities, or more severe internal control weaknesses. The study also offers practical implications for firms, audit firms, and regulators operating in increasingly digitalized environments. Additionally, the study offers practical implications for firms, audit firms, and regulators operating in increasingly digitalized environments, emphasizing that investments in auditor IT expertise are most consequential when internal resources and control capacity are limited.

The organization of this paper is as follows: Section 2 presents the theoretical foundation; Section 3 reviews the literature and develops the hypotheses; Section 4 outlines the research

design, including data collection and models; Section 5 reports the empirical results; Section 6 includes additional tests and robustness checks; and Section 7 offers concluding remarks.

2. Theoretical Foundation

This study examines the relationship between auditor IT experience and the achievement of internal control objectives by drawing on RDT as its guiding conceptual framework (Hillman & Dalziel, 2003; Mizruchi, 1996; Pfeffer & Salancik, 2015). RDT suggests that firms are not fully self-sufficient and therefore rely on external actors to access critical resources that are not readily available internally. These external dependencies shape organizational behavior and influence how firms respond to resource constraints and environmental complexity (Hillman & Dalziel, 2003; Pfeffer & Salancik, 2015).

In the context of auditing, external auditors can be viewed as providers of specialized knowledge and expertise that complement firms' internal capabilities. Prior research suggests that auditors play an important role in influencing internal control practices and governance structures through their expertise and external perspective (Francis et al., 2014; Chen, 2023; Yang, 2021). In particular, auditors possess extensive knowledge of internal control systems across different firms and are therefore well positioned to identify weaknesses, recommend improvements, and enhance the overall effectiveness of control environments (Dao et al., 2024; Hooghiemstra et al., 2015; Knechel et al., 2007; Lin et al., 2014; Liu & Lai, 2012; Oradi et al., 2020; Hansen et al., 2021).

Building on this perspective, this study focuses specifically on auditor IT expertise as a distinct form of external resource. In increasingly digitalized environments, internal controls are often embedded within complex information systems, automated processes, and data infrastructures. As a result, evaluating internal control effectiveness requires not only transaction-level verification but also the ability to assess system-level controls, continuous monitoring mechanisms, and data governance structures. Firms may lack sufficient internal IT capabilities to effectively design, monitor, and evaluate these system-embedded controls, particularly when they face resource constraints or limited technological expertise. In such settings, auditors with IT expertise can serve as a valuable external resource by supporting the evaluation of automated control processes, enterprise systems, and data integrity. Their expertise enables a more comprehensive assessment of internal control systems, extending beyond traditional audit procedures to include system-level assurance and the evaluation of digital control environments.

This role is particularly important in contexts where firms rely heavily on digital systems for operational efficiency, financial reporting, compliance, and strategic decision making.

Drawing on RDT, this study argues that the value of auditor IT expertise is not uniform across firms but depends on their internal resource conditions and governance capacity. Specifically, auditor IT expertise is expected to be more relevant in firms that face financial constraints, exhibit weaker internal capabilities, or experience more severe internal control weaknesses. In such cases, IT-experienced auditors provide complementary knowledge that enhances the effectiveness of internal control systems. Conversely, in firms with stronger internal resources and more developed control environments, the incremental value of external IT expertise may be more limited. Thus, this study applies RDT to explain how auditor IT expertise functions as a conditional external resource in shaping internal control outcomes.

3. Literature Review and Hypotheses Development

3.1 The Regulatory Framework for Internal Control in China

The rapid expansion of the Chinese stock market over recent decades has heightened the focus on the robustness of internal controls, particularly as many listed firms have transitioned from state-owned enterprises (SOEs) (Chen, 2023; Noureldeen et al., 2026). This evolution has surfaced inherent challenges in corporate governance and risk management, necessitating regulatory intervention. The China Securities Regulatory Commission (CSRC) has played a crucial role in this process, collaborating with the Shanghai and Shenzhen Stock Exchanges to enhance internal control practices. In 2006, these exchanges issued the "Guidance for Internal Control for Listed Companies," recommending that firms submit Internal Control Reports (ICRs) and auditors' opinions within four months of the financial year-end. However, due to the voluntary nature of this guidance, compliance was limited, highlighting the need for more stringent regulatory frameworks (Ji et al., 2019).

The introduction of the Basic Standard of Enterprise Internal Control, commonly known as China SOX, in 2008 marked a significant shift towards mandatory internal control measures (Hu et al., 2024; Huang et al., 2023). Fully implemented by 2012, China SOX drew inspiration from the COSO framework but was uniquely tailored to address the challenges faced by Chinese firms. Unlike its U.S. counterpart, which focuses primarily on financial reporting, China SOX

adopts a broader scope, mandating internal control evaluations across five key objectives: strategic development, operational efficiency, financial reporting reliability, legal compliance, and asset safety. First, the strategic objective focuses on promoting business development by evaluating factors such as business plans, competitive advantages, and systemic risks. Second, the operational efficiency objective seeks to enhance efficiency and effectiveness by monitoring indicators like total asset turnover, per capita operating income, and return on net assets. Third, the reliability of reporting objective emphasizes the need for comprehensive, transparent, and accurate financial reporting, evaluating audit opinions, financial restatements, and earnings quality indicators. Fourth, the legal compliance objective assesses adherence to laws and regulations, with a focus on violations, investigations, and litigation. Finally, the asset safety objective ensures the protection of assets through considerations such as asset impairment, investment loss, and adjustments in non-operating expenses (Chan et al., 2021; Ji et al., 2019).

China SOX requires firms to conduct annual self-assessments and report on internal control effectiveness, with audits covering both financial and non-financial controls. Notably, China SOX introduces a tiered classification of internal control weaknesses¹—material, major, and minor—allowing for a nuanced approach to identifying and rectifying deficiencies (Chen, 2023). This comprehensive framework reflects China's government-led approach to corporate governance, which not only prioritizes the protection of financial assets but also aims to achieve broader strategic objectives (Ji et al., 2019). Coupled with the inclusion of non-financial controls, this framework underscores the unique characteristics of China's internal control regulations, designed to improve the quality and effectiveness of corporate governance across a diverse range of organizational activities (Christ et al., 2021; Ji et al., 2019).

3.2 Auditor IT experience and internal control objectives

In today's digitalized business landscape, the evaluation of internal controls has taken on increased importance, ensuring the integrity and efficiency of organizational processes (Maghakyan et al., 2025). Historically, auditors may have been reluctant to thoroughly assess corporate internal

¹ At the material level, significant deficiencies result in firms failing to meet internal control objectives. The major level represents deficiencies with a lower economic impact compared to the material level. Whereas the minor level identifies weaknesses that do not meet the criteria for being classified as material or major deficiencies. This classification system introduces a nuanced approach to assessing and addressing internal control deficiencies (Chen, 2023).

control systems due to a lack of IT expertise (Messier et al., 2004). However, as digital processes have become integral to operations, auditing standards now mandate a comprehensive examination of internal control environments (Chen, 2023). This evolution reflects the need for auditors to develop IT expertise to effectively assess and evaluate controls that safeguard both financial and operational integrity. The adoption of digital technologies has thus become imperative for auditors, necessitating continuous skill enhancement to meet the demands of modern auditing practices (Brazel & Agoglia, 2007; Maghakyan et al., 2025).

The literature consistently underscores the benefits of engaging auditors with specialized expertise, providing valuable insights into various aspects of auditing and financial reporting (Chen, 2023; Jiang & Kim, 2024; Pham et al., 2024; Tong et al., 2022; Xia et al., 2024). For instance, Reichelt & Wang (2010) highlight improvements in financial reporting quality linked to auditors' industry expertise. Similarly, Knechel et al. (2007) document positive market reactions to the hiring of industry experts, and Gunn & Michas (2018) emphasize the critical role of auditor expertise in audit quality. McGuire et al. (2012) further contribute to this discourse by discussing the advantages of tax strategies facilitated by auditors with specialized knowledge. Despite these insights, the specific influence of auditor IT experience remains relatively underexplored. Notable exceptions include Haislip et al. (2016), who report a negative association between auditor IT experience and the occurrence of internal control material weaknesses, and Maghakyan et al. (2025), who identify an audit fee premium for audit partners specializing in digitalization.

Given the complexity of today's business environment, auditors must possess a robust foundation in IT to effectively assess their clients' digitalized operations, plan audits, and apply advanced technologies in their procedures (Bauer et al., 2019; Hux, 2017). Research suggests that auditors lacking IT skills face challenges in identifying audit risks (Brazel & Agoglia, 2007) and translating the work of IT specialists into audit evidence (Eilifsen et al., 2020). Consequently, a comprehensive understanding of IT enhances auditors' ability to evaluate internal control systems and strengthens the effectiveness of their audits (Brazel & Agoglia, 2007; Haislip et al., 2016).

Within the framework of internal control objectives, auditor IT skills and knowledge can be viewed as a specialized capability that enhances the evaluation of system-embedded controls. In digitalized environments, internal controls are increasingly automated and integrated within enterprise systems, requiring auditors to assess not only transaction-level accuracy but also how

systems process, validate, and store data. Specifically, auditor IT expertise influences internal control outcomes by shaping key stages of the audit process. First, auditors with IT expertise improve risk identification at the system level by better understanding system architecture, data flows, and automated processes. This enables them to detect control risks arising from system configurations and processing logic that may not be observable through traditional audit procedures (Brazel & Agoglia, 2007; Eilifsen et al., 2020).

Second, IT expertise enhances the evaluation of control design and operating effectiveness. Auditors with IT knowledge are better able to test automated controls, such as access restrictions, validation rules, and continuous monitoring mechanisms, and to assess whether these controls operate consistently over time. This strengthens assurance over system-level controls rather than relying solely on sampled transactions. Third, IT expertise improves the independent verification of data integrity and system outputs. By reconciling system-generated outputs with underlying data processes, IT-experienced auditors are more likely to detect inconsistencies, processing errors, or manipulation risks embedded within complex systems.

Through these mechanisms, auditor IT expertise enhances the quality of internal control evaluation, which represents the primary transmission channel to observable outcomes. More effective evaluation increases the likelihood that control deficiencies are identified and corrected, thereby reducing the incidence of financial misstatements, internal control weakness disclosures, and regulatory violations, which are commonly used in prior literature as observable proxies for internal control effectiveness (Chen, 2023; Haislip et al., 2016). These outcomes are directly aligned with auditors' responsibilities and therefore represent the most immediate effects of auditor IT expertise. Importantly, the impact of auditor IT expertise is expected to be strongest for reporting and compliance-related outcomes. The extension of these effects to broader internal control objectives, such as operational efficiency, strategic alignment, and asset safety, occurs indirectly through improved system reliability and reduced control failures. That is, stronger evaluation of system-embedded controls enhances the reliability of organizational processes, which may subsequently support broader objectives, but these outcomes are not directly controlled by auditors.

In essence, auditors with IT expertise enhance internal control effectiveness primarily by improving the evaluation and assurance of system-level controls, with broader benefits arising as

downstream effects of stronger control environments. Based on this discussion, we hypothesize the following:

H1. There is a positive relationship between auditor IT experience and the achievement of internal control objectives.

3.3 The Moderating role of Financial Constraints

In this section, we examine how financial constraints moderate the relationship between auditor IT experience and the achievement of internal control objectives. Limited financial resources often constrain firms' ability to invest adequately in control systems, staff training, and IT infrastructure, potentially leading to weaker internal controls, heightened vulnerability to operational and financial risks, and challenges in maintaining regulatory compliance (Chen et al., 2020; Chan et al., 2021). Firms under financial strain may also lack the resources to implement advanced technologies or hire specialized professionals, exacerbating difficulties in sustaining effective internal controls and increasing exposure to control deficiencies (Ding et al., 2022; Banerjee et al., 2021). Consequently, financially constrained firms are more likely to experience gaps in internal control systems and face greater challenges in achieving internal control objectives (Chen et al., 2020; Banerjee et al., 2021).

Drawing on RDT, firms that lack critical internal resources are more likely to rely on external actors to compensate for these deficiencies (Hillman & Dalziel, 2003; Pfeffer & Salancik, 2015). In the auditing context, external auditors represent an important source of specialized knowledge and expertise that can complement firms' internal capabilities (Francis et al., 2014; Chen, 2023; Yang, 2021). In particular, auditors with IT expertise possess knowledge of system-embedded controls, data governance structures, and automated processes that many firms may not fully develop internally, especially under financial constraints (Bauer et al., 2019; Hux, 2017). This external expertise enables auditors to identify control deficiencies, evaluate system reliability, and enhance the overall assessment of internal control effectiveness (Oradi et al., 2020; Hansen et al., 2021).

Compared with financially unconstrained firms, constrained firms rely more heavily on external professional expertise due to their limited ability to invest in internal IT capabilities, internal control systems, and specialized personnel (Chen et al., 2020; Ding et al., 2022). This

increased dependence suggests that auditor IT expertise becomes a more critical resource in financially constrained settings, where internal capabilities are insufficient to support effective control evaluation (Hillman & Dalziel, 2003; Pfeffer & Salancik, 2015). In such contexts, auditors' experience across diverse IT environments allows them to transfer knowledge and best practices, helping firms improve control evaluation and mitigate risks without requiring substantial internal investment (McCracken et al., 2008; Oradi & E-Vahdati, 2021; Bauer et al., 2019).

At the same time, an alternative theoretical perspective suggests that financial constraints may limit firms' ability to absorb and implement external expertise. Resource-constrained firms may lack the organizational capacity, technological infrastructure, or managerial flexibility required to effectively act on auditors' recommendations, which could weaken the impact of external expertise on internal control outcomes (Ding et al., 2022; Chan et al., 2021). This absorptive capacity argument implies that even if auditors provide valuable insights, financially constrained firms may face difficulties in translating these insights into tangible improvements in internal control systems (Banerjee et al., 2021).

Despite this competing argument, we expect the resource dependence effect to dominate. First, auditor IT expertise primarily operates through enhancing the evaluation and identification of control deficiencies, rather than requiring firms to undertake substantial investments in implementation. Improved detection of system-level risks, automated control failures, and data integrity issues can strengthen internal control effectiveness even when firms face resource limitations (Brazel & Agoglia, 2007; Eilifsen et al., 2020). Second, financially constrained firms face greater exposure to operational and reporting risks, which increases their reliance on external expertise to mitigate these risks and ensure compliance with regulatory requirements (Chen et al., 2020; Chan et al., 2021). Third, auditors' ability to draw on experience across multiple clients allows them to provide cost-effective insights and benchmarking information, which are particularly valuable in resource-constrained environments (McCracken et al., 2008; Bauer et al., 2019).

Taken together, while financial constraints may impose some limitations on firms' ability to absorb external expertise, they simultaneously increase dependence on external auditors, making the net effect of auditor IT expertise stronger in financially constrained firms. Thus,

financial constraints are expected to amplify the relationship between auditor IT expertise and internal control outcomes. Based on this reasoning, we propose the following hypothesis:

H2. Financial constraints moderate the relationship between auditor IT experience and the achievement of internal control objectives, such that the relationship is stronger for firms with higher financial constraints.

4. Research Design

4.1 Sample Selection and Data Collection

Our study focuses on all A-share non-financial firms listed on the Shanghai and Shenzhen Stock Exchanges during the period from 2013 to 2021. We sourced the data from the China Stock Market and Accounting Research (CSMAR) database, ensuring comprehensive coverage of relevant firms. The sample selection process, including exclusions and industry distribution, is detailed in Table 1. Panel A of Table 1 outlines the sample selection procedure. Starting with an initial dataset of 38,714 firm-year observations, we excluded 857 firm-year observations from the financial and insurance industries (China Securities Regulatory Commission (CSRC) industry codes J66–J69) due to their distinct financial and regulatory structures (Chen, 2023). Additionally, we removed 1,370 firm-year observations associated with special treatment (ST or *ST) tags, which indicate firms that have reported losses for more than two consecutive years and are at risk of delisting. Further, 14,046 firm-year observations were excluded due to missing essential data required for regression analysis. After these exclusions, our final sample comprises 22,441 firm-year observations.

Panel B of Table 1 provides a breakdown of the sample by industry, as classified under the CSRC guidelines issued in 2012. Manufacturing emerges as the most represented sector, accounting for 65.97% of the sample. Other sectors are represented with varying percentages, reflecting the diversified composition of the sample.

[Insert Table 1 here]

4.2 Research Model

To examine the association between auditor IT experience and internal control objectives, we estimate the following regression model (Martikainen et al., 2022; Tan, 2023).

$$ICINDEX_{it} = \beta_0 + \beta_1 AUITEXP_{it} + \beta_2 SIZE_{it} + \beta_3 AGE_{it} + \beta_4 REC_INV_{it} + \beta_5 LEV_{it} + \beta_6 CURR_{it} + \beta_7 ROA_{it} + \beta_8 LOSS_{it} + \beta_9 AFEES_{it} + \beta_{10} TOP10_{it} + \beta_{11} BRDSIZE_{it} + \beta_{12} BRDIIND_{it} + \beta_{13} SUPSIZE_{it} + \beta_{14} CONCTOWN_{it} + Ind + Year + \varepsilon_{it} \quad (1)$$

Subscripts *i* and *t* denote firm and year, respectively. In our model, *ICINDEX* is the primary dependent variable, with *AUITEXP* as the independent variable. *ICINDEX* is derived from the DIB internal control index, a comprehensive measure that evaluates the effectiveness of internal controls by assessing the degree to which firms achieve five key objectives: operational efficiency and effectiveness, legal compliance, reliable financial reporting, strategic goal attainment, and asset protection (Duan et al., 2021). While internal control quality reflects the overall robustness and design of the internal control systems—including components such as the control environment, risk assessment, control activities, information and communication, and monitoring—internal control effectiveness specifically gauges the actual performance of these controls in achieving their intended outcomes (Tan, 2023). This distinction is crucial, as high-quality controls do not automatically ensure effective outcomes. Internal control effectiveness, therefore, directly influences a firm’s ability to meet its strategic objectives, maintain financial integrity, and manage risks, making it a critical determinant of organizational success.

The DIB internal control index, developed by DIB Enterprise Risk Management Technology Co., is an authoritative and nuanced metric, providing a detailed assessment of how well firms manage key control areas critical to long-term sustainability (Tan, 2023). Scored on a scale of 0 to 1,000 and scaled to a range of 0 to 10 for our analysis, this index allows us to quantify the effectiveness of internal controls in a standardized manner. This approach not only enhances our understanding of the role of auditor IT expertise in effective corporate governance but also offers valuable insights into how IT proficiency can improve the practical outcomes of internal control systems.

Our independent variable *AUITEXP* represents the auditor’s IT experience captured by the ratio of the IT related assets divided by total assets audited by an auditor over the prior three years.

The IT-related assets measure is obtained from firms' financial report notes and published by CSMAR. IT-related assets include investments in, but are not limited to, artificial intelligence, blockchain, cloud computing, computers, storage equipment, networks, and other related information technologies. Our proxies for auditor IT expertise aim to identify audit firms that possess a stronger grasp of IT for various reasons (Haislip et al., 2016). Primarily, these firms engage with clients whose financial reporting involves a higher level of IT integration. Furthermore, these audit firms often actively seek out IT-intensive clients and recognize the importance of significant investments in updating audit methodologies and staff training to keep pace with technological advancements (IFIAR, 2015). By enhancing their internal IT knowledge, these firms can also create additional opportunities to improve client service (Lingor, 2015). Consequently, based on observed evidence, such audit firms are more inclined to incorporate IT elements into their training programs (Haislip et al., 2016). Overall, these firms are more likely to be sensitive to the critical role of IT in clients' financial reporting systems and the related audit challenges. The continuous nature of our measures allows us to evaluate the relative IT experience of audit firms on an annual basis.

Consistent with previous research (Chang et al., 2023; Chen, 2023; Mahran and Elamer, 2025a), our regression model incorporates several control variables capturing firm characteristics, audit, and governance factors that could significantly influence internal control objectives. Specifically, these include firm size (*SIZE*), firm listing age (*AGE*), asset efficiency ratio (*REC_INV*), financial leverage (*LEV*), current ratio (*CURR*), return on assets (*ROA*), reporting a loss (*LOSS*), audit fees (*AFEES*), top 10 domestic auditors (*TOP10*), board of directors' size (*BRDSIZE*), board of directors' independence (*BRDIIND*), supervisory board size (*SUPSIZE*), and concentrated ownership (*CONCTOWN*). Finally, we include industry fixed effects (*Ind*) and year fixed effects (*Year*) to capture differences in the internal control objectives across industries and over time. To mitigate the influence of outliers on the values of continuous variables, all such variables undergo a winsorization process, wherein extreme values are capped at the 1st and 99th percentiles. Comprehensive definitions for each variable are provided in Appendix A.

5. Empirical Results

5.1 Descriptive Statistics

Table 2 presents the descriptive statistics of each variable used in our main analysis. The statistics show considerable results showcasing a widespread distribution across all variables. The auditor IT experience (*AUITEXP*) ranges up to about 1.6%, with a mean of 0.002 and a standard deviation of 0.002, reflecting IT experience over the last three years. The internal control index (*ICINDEX*) ranges from 0 to 6.693 and has a mean of 6.269 and a standard deviation of 1.124, which is relatively consistent with prior studies (e.g., Chen et al., 2020; Tan, 2023). This represents a high level of objectives achievement according to the DIB data. Looking at the strategic level, the mean of *STRGHIR* is 5.949, with standard deviation of 1.125 and a maximum of 6.778. *STRGHIR* reflects the achievement of the firm's strategic goals, including aspects of the business plan, competitive advantage, and system risk. The operational level index (*BUISSLV*), representing the operational efficiency objective, has a mean of 5.961 and a standard deviation of 1.048, ranging from 0 to 6.844. The fourth subindex, focusing on the reliable reporting objective (*RELIBTY*) has a mean of 6.541 and a maximum of 6.909. The average of the compliance objective index (*LGCOMP*) is 6.6, with the highest standard deviation among all indices, at 1.174. The asset safety objective has a mean of 6.048 with a standard deviation of 1.058. Notably, there is relatively little variation among the achievement levels of the five objectives. This can be explained by the specificity nature of the IC objectives in China, compared to USA, and the intersection among the five objectives (Wang et al. 2022).

[Insert Table 2 here]

The correlation coefficients between our variables are presented in Table 3 showing Pearson coefficients. Table 3 shows that the correlations between the IT experienced auditor (*AUITEXP*) and the internal control index (*ICINDEX*) are positive and significant. The coefficients are also positive and significant between *AUITEXP* and each of the operational efficiency objective (*BUISSLV*) and the reliable reporting objective (*RELIBTY*). However, the correlations between IT experienced auditors and the other objectives of strategy (*STRGHIR*), compliance (*LGCOMP*) and asset safety (*ASAFETY*) are positive but insignificant. Unsurprisingly, the five sub-indices have high correlations among themselves. The correlation results support our first hypothesis of the

positive relationship between auditor IT experience and the achievement of internal control objectives in general but with some variation in sub-indices. As shown in Table 3, the coefficients absolute values among other variables mostly fall below 0.7, indicating that there is no serious issue of multicollinearity among our variables.

[Insert Table 3 here]

5.2 Baseline Results (Multivariate Analysis)

5.2.1 The effect of auditors' IT experience on achieving internal control objectives:

To examine the association between auditor IT expertise and the achievement of internal control objectives (*HI*), we employed the regression analysis for Model 1. According to our hypothesis, we anticipate positive coefficients for the variable *AUITEXP*. The regression results, presented in Table 4, support this hypothesis. Specifically, Column (1) of Table 4 reveals that the coefficient for *AUITEXP* is positive and statistically significant for the total internal control index (*ICINDEX*), with a coefficient of 11.798 ($p < 0.01$). This result aligns with our first hypothesis, indicating that auditor IT expertise positively influences the overall achievement of internal control objectives².

Further analysis reveals that the positive association between auditor IT expertise and each of the five sub-indices of internal control. Columns (2) through (6) of Table 4 illustrate that *AUITEXP* exhibits positive and significant coefficients with the strategic objectives index (*STRGHIR*) (13.050, $p < 0.01$), operational efficiency objective (*BUISSLV*) (10.45, $p < 0.01$), reliable reporting objective (*RELIBTY*) (12.393, $p < 0.01$), compliance (*LGCOMP*) (12.987, $p < 0.01$), and asset safety objective (*ASAFETY*) (9.063, $p < 0.01$). These findings collectively suggest that auditors with substantial IT experience contribute significantly to the achievement of various

² We acknowledge the potential concern of reverse causality. To address this issue, we employ forward values of the dependent variable; the results (untabulated) remain consistent with those obtained using contemporaneous specifications. In addition, the use of a rolling average for the independent variable further alleviates concerns regarding reverse causality. With respect to alternative proxies, data limitations prevent us from observing auditors' backgrounds; therefore, we rely on auditors' exposure to IT-related assets as a proxy. To strengthen this measure, we reconstruct auditor-level IT exposure by excluding the focal firm and re-estimate the main models. The findings (untabulated) remain robust. Furthermore, excluding firms operating in the IT industry yields similar results (untabulated), reinforcing the stability of our inferences.

internal control objectives, consistent with the notion that auditor IT expertise is crucial for the effective implementation of internal controls.

The significance of these results is reinforced by the theoretical underpinnings of RDT. This theory posits that organizations rely on external resources, such as specialized auditor expertise, to enhance their operational effectiveness (Hillman & Dalziel, 2003; Mahran & Elamer, 2025b; Mizruchi, 1996). In this context, the positive relationship between auditor IT experience and internal control outcomes underscores the importance of external IT resources in supporting organizational objectives. These results are consistent with the predictions of our first hypothesis (*H1*) and align with the broader literature that emphasizes the role of auditor specialization in achieving desired organizational outcomes (Chen et al., 2023; Knechel et al., 2007).

In addition to the primary variables of interest, the control variables in the model provide further insights into factors influencing the achievement of internal control objectives. Specifically, firm size (*SIZE*), asset efficiency ratio (*REC_INV*), return on assets (*ROA*), and the presence of a top 10 domestic auditor (*TOP10*) are positively and significantly associated with both the total internal control index and each of the five sub-indices. This indicates that larger firms, those with efficient asset utilization, higher profitability, and reputable auditors are more likely to achieve their internal control objectives. Conversely, variables such as firm age (*AGE*), financial leverage (*LEV*), current ratio (*CURR*), and reporting a loss (*LOSS*) exhibit a negative and significant association with the internal control indices, both overall and across the sub-indices. These findings suggest that older firms, those with higher leverage, lower liquidity, and those reporting losses may face greater challenges in achieving effective internal controls. Interestingly, the governance-related control variables, such as board size (*BRDSIZE*) and board independence (*BRDIIND*), did not show significant associations, which is consistent with findings in some previous studies (e.g., Chen et al., 2020; Tan, 2023).

Aligned with the RDT, these findings underscore the pivotal role that external resources, such as auditor IT expertise, play in shaping organizational behavior and achieving internal control objectives. Beyond their traditional monitoring role, auditors with IT expertise enhance their information-sharing capabilities, acting as vital resources for organizations. This dual role of auditors—through both their unique audit style and the extensive private information they acquire during routine audit tasks—highlights their substantial influence on client behavior, particularly in

the domain of internal controls (McCracken et al., 2008). The extent of IT expertise displayed by auditors not only underscores their technical proficiency but also amplifies their association to the effectiveness of internal control systems within the firms they audit.

[Insert Table 4 here]

5.2.2 The moderating effect of financial constraints on the auditors' IT experience and IC objectives achievement link:

Building on our previous findings, which suggest that auditors' IT expertise serves as an external resource that firms leverage to enhance the achievement of their internal control objectives, it is essential to consider how financial constraints might influence this relationship. Prior research has consistently highlighted the negative impact of financial distress on the quality of internal controls (e.g., Li et al., 2012; Wilamsari et al., 2022). Financially distressed firms often lack the necessary resources to recruit personnel with specialized IT expertise and to implement effective internal control mechanisms. Consequently, these firms are more likely to rely heavily on the expertise of IT-experienced auditors as a cost-effective alternative to internal investments in IT resources.

To further explore the moderating effect of financial distress on the relationship between auditors' IT experience and the achievement of internal control objectives, we employed the KZ index to categorize our sample into two groups: high financially distressed firms (*HighKZ*) and low financially distressed firms (*LowKZ*). The regression results presented in Table 5 provide strong empirical support for our hypothesis.

Columns 1 and 2 of Table 5 reveal that the coefficient for *AUITEXP* is positive and significant only in the HighKZ subsample (17.346, $p < 0.01$), while it remains insignificant in the LowKZ subsample. This finding underscores the heightened importance of IT-experienced auditors in financially distressed firms, where internal resources are limited and the reliance on external expertise becomes critical.

Further analysis using the five sub-indices as dependent variables (presented in Columns 3 to 12 of Table 5) reinforces these findings. The coefficients for *AUITEXP* are consistently positive and significant across all sub-indices within the HighKZ subsample: strategic objectives (*STRGHIR*) (18.231, $p < 0.01$), operational efficiency objective (*BUISSLV*) (17.811, $p < 0.01$),

reliable reporting objective (*RELIBTY*) (18.996, $p < 0.01$), compliance (*LGCOMP*) (20.923, $p < 0.01$), and asset safety (*ASAFETY*) (13.955, $p < 0.01$)³. These results clearly indicate that the contribution of auditors' IT expertise is particularly pronounced in high financially distressed firms, where it plays a pivotal role in overcoming resource constraints and enhancing the achievement of internal control objectives.

Overall, these findings provide robust support for our second hypothesis, demonstrating that financial constraints significantly moderate the relationship between auditors' IT experience and the achievement of internal control objectives. This moderation suggests that in contexts of financial distress, auditors with IT expertise become even more crucial, effectively compensating for the firm's internal resource limitations.

[Insert Table 5 here]

6. Additional Analysis and Robustness Checks

6.1 Additional analyses

Previous research has identified various factors that can impact the effectiveness of internal controls, including corporate governance, audit quality, and financial constraints (e.g., Li et al., 2012; Chen, 2023). To further explore the mechanisms underlying our primary findings on the positive relationship between auditors' IT expertise and the achievement of internal control objectives, we conducted a series of additional analyses. These analyses examine whether this positive association varies across firms based on ownership type and the severity of internal control (IC) weaknesses, internal control system quality and we also employed alternative measures for our key variable of interest, auditor IT expertise.

6.1.1 Auditor IT expertise and IC objectives achievement: the moderating role of state ownership

To investigate the moderating effect of ownership type on the relationship between auditor IT expertise and the achievement of internal control objectives, we divided our sample into two

³ We rerun our model in Equation 1 using an interaction variable between AUITEXP and HighKZ, and the untabulated results confirm the significant and positive association between auditor IT expertise and each objective across the alternative measures employed for auditor IT expertise.

subgroups: State-Owned Enterprises (SOEs) and Non-State-Owned Enterprises (Non-SOEs). We hypothesize that the positive association of auditor IT expertise and internal control objectives is more pronounced in Non-SOEs. Non-SOEs are characterized by greater operational flexibility, efficiency, and a focus on innovation, often driven by competitive market pressures that necessitate the strategic use of technological advancements to maintain a competitive edge (Higgins, 2005). In contrast, SOEs are typically marked by bureaucratic structures and multiple, often conflicting, objectives—including social and political goals—which can dilute their focus on operational efficiency and responsiveness (Ayyagari et al., 2011; Liu et al., 2017). This divergence in organizational priorities and structures suggests that auditor IT expertise, essential for navigating complex IT environments and enhancing internal controls, might be less impactful in the bureaucratic and politically driven context of SOEs compared to the market-oriented Non-SOEs.

Our empirical results, presented in Table 6, support this notion. The analysis reveals that the positive effect of auditor IT expertise (*AUITEXP*) on the achievement of internal control objectives is significant and substantial only within the Non-SOE subgroup. Specifically, for the total internal control index (*ICINDEX*), the coefficient for *AUITEXP* is positive and significant in the Non-SOE sample (16.093, $p < 0.01$), while it remains insignificant for SOEs. This pattern holds across all five sub-indices: strategic objectives (*STRGHIR*) (16.796, $p < 0.01$), operational efficiency (*BUISSLV*) (14.034, $p < 0.01$), reliable reporting (*RELIBTY*) (15.969, $p < 0.01$), compliance (*LGCOMP*) (16.375, $p < 0.01$), and asset safety (*ASAFETY*) (12.726, $p < 0.01$)⁴. The economic significance of these findings is underscored by the fact that a one standard deviation increase in *AUITEXP* (0.002) corresponds to a 0.032 (= 0.002×16.093) percent increase in the achievement of internal control objectives, particularly in Non-SOEs, where market competition drives a greater emphasis on efficiency and compliance.

These results suggest that in the competitive and innovation-driven environment of Non-SOEs, auditor IT expertise plays a critical role in enhancing the effectiveness of internal controls. The competitive pressures in these firms accentuate the strategic importance of IT-proficient auditors, who contribute to aligning IT systems with legal requirements, safeguarding assets, and fostering comprehensive and transparent financial disclosures (Chen, 2023). Conversely, the

⁴ We also used an interaction term between *AUITEXP* and state ownership (*AUITEXP*SOE*) to test the moderating role of the ownership type. The un-tabulated results show a significant and positive association for the interaction term in all models except for the compliance objective (*LGCOMP*).

bureaucratic nature and multifaceted objectives of SOEs may diminish the direct association of auditor IT expertise and internal controls, as these entities are less responsive to market pressures and more focused on meeting political and social mandates. This disparity highlights the importance of considering ownership structure when assessing the role of auditor IT expertise in achieving internal control objectives, as the effectiveness of such expertise is contingent upon the organizational context and its underlying governance dynamics.

[Insert Table 6 here]

6.1.2 Auditor IT expertise and IC objectives achievement: the moderating role of the severity of IC weaknesses

China's regulatory framework employs a nuanced approach to assessing internal control deficiencies, requiring firms to identify and classify internal control weaknesses in both financial and non-financial areas based on their severity into material, major, and minor (Chen, 2023). Moreover, auditors are mandated to assess the effectiveness of their clients' internal control systems by evaluating weaknesses related to both financial and non-financial reporting (Ji et al., 2019). To gain deeper insights into the relationship between auditor IT expertise and the achievement of internal control objectives, we classified our sample into two sub-samples according to the severity of IC weaknesses. Severity was measured by assigning 3 for material weaknesses, 2 for major weaknesses, and 1 for minor weaknesses, and then calculating the industry median.

The regression results presented in Table 7 provide a clear illustration of the role of auditor IT expertise in firms with high-severity IC weaknesses. Columns 1 and 2 show the results for the overall severity of IC weaknesses, combining both financial and non-financial reporting. The coefficient for *AUITEXP* is significant and positive in the HighS subsample (54.777, $p < 0.01$) but insignificant in the LowS subsample⁵. These findings emphasize the critical role of auditor IT expertise in addressing severe IC weaknesses, aligning with prior research (e.g., Haislip et al.,

⁵ We also run our model using each of the sub-indices as a dependent variable. The un-tabulated results show also significant and positive coefficients for *AUITEXP* in the subsample of *HighS* firms and insignificant coefficient for the LowS sample.

2016), which demonstrated that IT-proficient auditors play a pivotal role in remediating material IC weaknesses.

Additionally, we focused on the severity of IC weaknesses related specifically to financial reporting. Columns 3 and 4 in Table 7 present the results for high financial severity (HighFS) and low financial severity (LowFS). The results indicate significant and positive coefficients for *AUITEXP* in both subsamples: (40.411, $p < 0.05$) for the high financial severity sample and (124.71, $p < 0.01$) for the low financial severity sample. Similarly, we examined the severity of IC weaknesses related to non-financial reporting, with results presented in Columns 5 and 6. Here, the coefficients for *AUITEXP* are significant and positive only in the HighNFS subsample (50.288, $p < 0.01$).

Overall, these findings highlight the importance of auditor IT expertise in achieving internal control objectives, particularly in firms facing high-severity IC weaknesses. The results underscore the auditor's role in both financial and non-financial reporting contexts, further illustrating how IT proficiency can enhance the effectiveness of internal controls across a broad spectrum of organizational activities.

[Insert Table 7 here]

6.1.3 Alternative measures of Auditor IT expertise

To ensure that our main findings are robust and not dependent on the specific measurement of *AUITEXP* used in our primary analysis, we conducted additional tests using alternative measures of auditor IT expertise. First, we extended the period over which auditor IT expertise was assessed, creating a measure (*AUITEXP1*) based on the ratio of IT-related assets to total assets audited by each auditor over the prior five years. The results, presented in Column 1 of Table 8, confirm a positive and significant association with the achievement of internal control objectives (10.425, $p < 0.01$).

Next, we used the natural logarithm of IT-related assets audited by an auditor over the prior five years (*ITASSETS*) as an alternative measure. The results, shown in Column 2 of Table 8, also indicate a positive and significant coefficient (0.016, $p < 0.01$). Finally, we assessed IT expertise at the audit firm level, using *AFITEXP*, measured by the ratio of IT-related assets to total assets audited by an audit firm over the prior five years. The results, presented in Column 3 of Table 8,

support our main findings, with the coefficient for *AFITEXP* remaining significant and positive (61.227, $p < 0.01$)⁶. Instead of measuring auditor IT expertise using a continuous variable, we construct a binary measure. Specifically, we use *AFITEXP_Top* as an indicator variable, which equals 1 if *AFITEXP* is in the top quantile and 0 otherwise. The results, reported in Column (4) of Table 8, show that auditor IT expertise remains positively associated with the achievement of internal control objectives. We further exclude firms operating in the IT industry, as these firms are inherently more technologically oriented. The results reported in Column (5) of Table 8 show that excluding IT firms does not alter the pattern of our main findings.

Collectively, these robustness checks reinforce our primary argument that auditors with IT expertise play a crucial role in the achievement of internal control objectives, and this relationship holds across various measures of IT proficiency.

[Insert Table 8 here]

6.1.4 Auditor IT expertise and internal control system.

The internal control system, as defined by COSO (1992, 2013), comprises five key components: Control Environment, Risk Assessment, Control Activities, Information and Communication, and Monitoring. The Control Environment is foundational, shaping the organizational culture, governance, and risk appetite. Risk Assessment involves identifying and evaluating risks, while Control Activities implement checks and balances. Information and Communication ensure the flow of relevant information, and Monitoring assesses the ongoing effectiveness of internal controls.

In this section, we examine whether auditors with higher IT expertise enhance the quality and effectiveness of internal controls across these components. This study's design is grounded in the belief that IT expertise is not merely a supplementary skill but a critical driver of internal control robustness.

Our analysis begins by examining the relationship between auditor IT expertise and the overall quality of the internal control system, as well as its individual components (Table 9). The

⁶ We rerun our model in Equation 1 using each of the five sub-indices as a dependent variable. The untabulated results confirm the significant and positive association between auditor IT expertise and each objective across the alternative measures employed for auditor IT expertise.

results indicate that auditor IT expertise is positively associated with the overall quality of internal controls, particularly in the Control Environment (coefficient = 3.626, $t = 2.560$), Information and Communication (coefficient = 2.302, $t = 2.188$), and Monitoring (coefficient = 2.849, $t = 2.546$). These findings suggest that IT-proficient auditors are better equipped to assess and enhance the infrastructure and processes that underpin effective internal controls. The insignificant results for Risk Assessment and Control Activities highlight the nuanced role of IT expertise, which may be more critical in areas requiring continuous monitoring and communication.

[Insert Table 9 here]

Second, to rigorously assess the association between auditor IT expertise and internal control effectiveness, we incorporate internal control system quality as a control variable. This step allows us to differentiate the effect of IT expertise on the actual achievement of control objectives from the general strength or comprehensiveness of the internal control system. By controlling for the quality of these systems, we ensure that the observed relationship between auditor IT expertise and ICINDEX accurately reflects the influence of IT proficiency on the effectiveness of internal controls, rather than simply the quality of their design.

Table 10 show consistent positive relationships observed (e.g., ICINDEX, coefficient = 8.850, $t = 3.007$) underscore the role of IT expertise in enhancing control effectiveness. This approach ensures that our findings are not merely reflective of general internal control quality but specifically attributable to the influence of IT-proficient auditors.

[Insert Table 10 here]

Further, we control for individual internal control components to assess whether the positive associations hold when these are accounted for (Table 11). The results confirm that auditor IT expertise continues to significantly associated with internal control effectiveness across all internal control objectives. This finding is critical as it underscores the importance of IT expertise in maintaining ongoing oversight and detecting control deficiencies in real-time.

[Insert Table 11 here]

6.2 Robustness analyses

To ensure the robustness of our findings, we conducted several tests to address potential sources of endogeneity, including self-selection bias, reverse causality, and omitted variables (Dahya et al., 2008; Lin et al., 2016).

6.2.1 Controlling for audit committee.

Previous studies have shown that audit committee characteristics can significantly influence the efficiency of internal controls (e.g., Knechel et al., 2007). To address the potential omitted variable bias, we re-estimated our model after controlling for audit committee quality. We included three specific variables: audit committee size (*ACSIZE*), audit committee independence (*ACIND*), and the frequency of audit committee meetings (*ACMEETS*)⁷.

The results, presented in Table 12, indicate that the coefficient for *AUITEXP* remains significant and positive across all models, confirming the robustness of our main findings. Specifically, the coefficients for *AUITEXP* are as follows: *ICINDEX* in Column 1 (14.591, $p < 0.01$), *STRGHIR* in Column 2 (17.488, $p < 0.01$), *BUISSLV* in Column 3 (10.412, $p < 0.10$), *RELIBTY* in Column 4 (13.715, $p < 0.01$), *LGCOMP* in Column 5 (15.483, $p < 0.01$), and *ASAFETY* in Column 6 (10.908, $p < 0.05$). These results reaffirm that auditor IT expertise plays a crucial role in enhancing the achievement of internal control objectives, independent of audit committee characteristics.

[Insert Table 12 here]

6.2.2 Propensity Score Matching (PSM)

To address the issue of selection bias, we employed Propensity Score Matching (PSM) to account for potential differences in firm characteristics between those audited by IT-experienced auditors and those audited by non-IT-experienced auditors. This method helps to mitigate concerns that our results might be driven by pre-existing differences between these two groups of firms.

The PSM results, presented in Table 13, show that the coefficient for *AUITEXP* remains significant and positive (10.996, $p < 0.01$) when using the matched sample. We also re-estimated

⁷ We additionally include auditor tenure and client importance as control variables available in the dataset. The results (untabulated) remain consistent with the main findings.

the PSM model for each internal control objective, finding consistent positive and significant associations between auditor IT expertise and each objective at the 1% significance level. These findings are consistent with our main results presented in Table 4, further supporting our argument that IT-experienced auditors positively associated to the achievement of internal control objectives.

[Insert Table 13 here]

To assess the quality of the matching procedure, we report covariate balance diagnostics. Panel A of Table A1 in Appendix B presents balance tests for each covariate in the treated and control groups, both before and after matching. Panel B shows the overall improvement in balance following the matching process. Overall, the results indicate that standardized mean differences are reduced after matching. In addition, no significant differences remain between the treatment and control groups for the matched covariates, supporting the validity of the covariate balance and the parallel trends assumptions.

6.2.3 Heckman two-step estimations

Lastly, to further address sample selection bias and endogeneity, we applied the Heckman (1979) two-step estimation procedure. In the first step, we created a dummy variable based on the median value of auditor IT expertise (*AUITEXP*) and ran a probit regression model to estimate the likelihood of engaging a highly IT-experienced auditor, using the characteristics included as control variables in our main analysis. We also employed *DIGITAL*, capturing the total number of words related to digital transformation in Management Discussion and Analysis (MD&A) disclosures as an exclusion restriction, observing a positive and significant relationship with *HIGH_AUITEXP* ($z= 2.69$; $p=0.001$), indicating that digitization words significantly influence the extent of auditor IT expertise.

In the second step, we calculated the Inverse Mills' Ratio (*IMR*) using the estimated parameters from the first stage and included it as an additional explanatory variable in the second stage regression. The results, presented in Table 15, show a significant and positive association between *AUITEXP* and *ICINDEX* in Column 1 (11.41, $p<0.01$), consistent with our main analysis in Table 4. Similar positive and significant coefficients for *AUITEXP* were observed across all five sub-indices in Columns 2 to 6, confirming that our findings remain robust even when accounting for potential sample-induced endogeneity.

[Insert Table 14 here]

7. Conclusion

This study examines the association between auditor IT expertise and the achievement of internal control objectives in the Chinese context. Using a sample of 22,441 firm-year observations from Chinese non-financial firms between 2013 and 2021, the findings show that auditor IT expertise is not uniformly associated with stronger internal control outcomes. Instead, its influence is highly context dependent. The positive association is concentrated in firms facing financial constraints, in non-SOEs, and in firms exhibiting more severe internal control weaknesses, while it is weaker or absent in settings where internal resources and governance capacity are stronger. These patterns indicate that auditor IT expertise does not function as a generic quality attribute but becomes salient primarily when firms face limitations in managing technologically complex control environments.

This study contributes to the literature in several important ways. First, it extends prior research on auditor IT expertise by moving beyond a narrow focus on internal control deficiencies to examine the broader achievement of internal control objectives. While prior studies, such as Haislip et al. (2016), primarily consider whether IT-experienced auditors are associated with fewer reported weaknesses, the findings of this study show that auditor IT expertise is also related to the extent to which firms achieve multiple dimensions of internal control effectiveness, including operational efficiency, reporting reliability, compliance, and asset protection. This provides a more comprehensive and outcome-oriented understanding of internal control systems. Second, the study advances the literature by clarifying the distinct role of auditor IT expertise relative to traditional forms of auditor specialization. The results suggest that, unlike industry or task-specific expertise, which primarily supports transaction-level verification, IT expertise enables auditors to engage with system-embedded controls within increasingly digitalized environments. This distinction is particularly important given that modern internal control systems are increasingly automated and integrated within enterprise-wide information systems, requiring evaluation beyond conventional audit procedures.

Third, the study offers a more explicit explanation of the mechanisms through which auditor IT expertise affects internal control outcomes. The empirical findings are consistent with

the view that IT expertise enhances internal control evaluation through improved automation monitoring, stronger system-level assurance, and more effective assessment of data governance structures. These mechanisms highlight how IT-experienced auditors are better equipped to assess continuous control processes, the reliability of enterprise systems, and the integrity of data flows, thereby strengthening the overall effectiveness of internal controls. Fourth, drawing on RDT, the study provides evidence that the benefits of auditor IT expertise are conditional rather than universal. Specifically, the results indicate that IT expertise is more valuable in firms facing financial constraints, weaker internal capabilities, or more severe internal control weaknesses. This suggests that auditor IT expertise functions as a compensatory external resource, helping firms overcome internal limitations and improve control outcomes. In doing so, the study contributes to a more nuanced and context-dependent understanding of the role of external expertise in corporate governance.

The practical implications of the findings are correspondingly nuanced and context specific. For firms, the results suggest that engaging auditors with strong IT expertise is most consequential when internal control capacity and resources are limited. Rather than viewing auditor IT expertise as a general quality attribute, firms may benefit from aligning auditor selection with their internal control challenges, particularly in settings characterized by financial constraints, technological complexity, or significant control weaknesses. For audit firms, the findings highlight the strategic importance of developing and maintaining IT-related capabilities as part of their professional service offerings. As clients increasingly operate in digitalized environments, audit firms that invest in continuous IT training and expertise development are better positioned to support firms facing complex internal control challenges. At the same time, the results suggest that the value of such investments may vary across client types, underscoring the need for audit firms to strategically deploy IT expertise where it is most impactful. For regulators and standard setters, particularly in jurisdictions with broad internal control mandates, the findings point to the conditions under which auditor IT expertise can meaningfully support internal control effectiveness. Regulatory frameworks that emphasize comprehensive internal control evaluation, including non-financial controls, may increase firms' reliance on auditors with specialized IT capabilities. Understanding these dynamics can inform regulatory efforts aimed at strengthening internal control systems in increasingly digitalized organizational environments.

This study has several limitations that should be acknowledged. First, the analysis is confined to Chinese non-financial listed firms, and the findings should therefore be interpreted in light of China's distinctive institutional environment. Importantly, the relevance of auditor IT expertise in China is shaped by several key local factors that differ from many other countries. These include the breadth of China's internal control regime under China SOX, which extends beyond financial reporting to encompass operational, strategic, and compliance objectives; substantial cross-regional variation in marketization, digital infrastructure, and regulatory enforcement; and heterogeneity in firms' access to internal IT resources and governance capacity. Together, these factors create meaningful variation in firms' reliance on external auditor expertise that cannot be captured by firm characteristics alone. Second, although we distinguish between state-owned and non-state-owned enterprises to capture institutional heterogeneity, we recognize that the SOE versus non-SOE dichotomy represents a relatively coarse classification in the contemporary Chinese setting. State ownership varies in degree rather than kind, and important distinctions may arise from differences such as central versus local government control, mixed-ownership reform status, political embeddedness of top management, and the intensity of government oversight at the regional level. These more nuanced institutional dimensions may further shape how firms depend on auditor IT expertise and how effectively such expertise translates into internal control outcomes. Future research could incorporate these finer-grained categorizations to deepen understanding of the mechanisms identified in this study and to assess the extent to which similar institutional factors condition the role of auditor IT expertise in other countries undergoing rapid digitalization and regulatory expansion. Finally, while this study primarily relies on quantitative data, future research could employ qualitative methods to gain a deeper understanding of the mechanisms through which auditor IT expertise influences internal control effectiveness. Such research would provide a more nuanced exploration of the complex interplay between technology and audit practices in contemporary organizations.

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Tables

Table 1: Sample selection and industry distribution

Panel A: Sample Selection			
	Firm observations of A-share firms on CSMAR from 2013-2021		38,714
	Less:		
	Observations representing the financial and insurance industries		(857)
	Observations representing ST and *ST		(1,370)
	Observations with missing data after merging with DIB database		(14,046)
	Final Sample		<u>22,441</u>
Panel B: Sample distribution over industries			
Code	Industry Name	<i>N</i>	%
A	Agriculture, Forestry, Animal Husbandry, and Fishery	279	1.24
B	Mining	500	2.23
C	Manufacturing	14,805	65.97
D	Production and Supply of Electric Power, Thermal Power, Gas and Water	725	3.23
E	Construction	638	2.84
F	Wholesale and Retail	1,156	5.15
G	Transport, Storage and Postal	623	2.78
H	Hotels and Catering	71	0.32
I	Information Transmission, Software, and IT Service	1,461	6.51
K	Real estate	814	3.63
L	Leasing and Commercial Service	279	1.24
M	Scientific Research and Technology Service	222	0.99
N	Water Conservancy, Environment and Public Facility Management	318	1.42
O	Industry Of Resident Service, Repair and Other Services	3	0.01
P	Education	27	0.12
Q	Health and Social Work	61	0.27
R	Culture, Sports and Entertainment	322	1.43
S	Diversified	137	0.61
	Total	22,441	100
Panel C: Sample distribution by year			
	2013	1,723	7.68
	2014	1,896	8.45
	2015	2,028	9.04
	2016	2,333	10.40
	2017	2,522	11.24
	2018	3,002	13.38
	2019	2,791	12.44
	2020	3,052	13.60
	2021	3,094	13.79

Table 2: Descriptive statistics

	<i>N</i>	Mean	SD	Min	Median	Max
<i>AUITEXP</i>	22,441	0.002	0.002	0.000	0.001	0.016
<i>ICINDEX</i>	22,441	6.269	1.124	0.000	6.492	6.693
<i>STRGHIR</i>	22,441	5.949	1.125	0.000	6.233	6.778
<i>BUISSLV</i>	22,441	5.961	1.048	0.000	6.132	6.844
<i>RELIBTY</i>	22,441	6.541	1.141	0.000	6.765	6.909
<i>LGCOMP</i>	22,441	6.600	1.174	0.000	6.909	6.909
<i>ASAFETY</i>	22,441	6.048	1.058	0.000	6.272	6.552
<i>SIZE</i>	22,441	22.302	1.276	20.009	22.124	26.237
<i>AGE</i>	22,441	19.886	5.559	8.000	20.000	34.000
<i>REC_INV</i>	22,441	0.266	0.160	0.010	0.249	0.727
<i>LEV</i>	22,441	0.430	0.202	0.065	0.421	0.900
<i>CURR</i>	22,441	2.273	2.008	0.322	1.637	12.55
<i>ROA</i>	22,441	0.037	0.066	-0.259	0.037	0.212
<i>LOSS</i>	22,441	0.117	0.321	0.000	0.000	1.000
<i>TOP10</i>	22,441	0.598	0.490	0.000	1.000	1.000
<i>BRDSIZE</i>	22,441	8.450	1.614	5.000	9.000	14.000
<i>BRDIND</i>	22,441	0.377	0.054	0.333	0.364	0.571
<i>SUPSIZE</i>	22,441	3.491	0.965	3.000	3.000	7.000
<i>CONCTOWN</i>	22,441	0.581	0.147	0.241	0.588	0.901

Notes: All continuous variables are winsorized at 1% and 99% level. Variable definitions are provided in Appendix A.

Table 3: Pearson's correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	
(1) AUITEXP	1.00																			
(2) ICINDEX	0.02	1.00																		
(3) STRGHIR	0.02	0.91	1.00																	
(4) BUISSLV	0.02	0.96	0.92	1.00																
(5) RELIBTY	0.02	0.97	0.91	0.98	1.00															
(6) LGCOMP	0.02	0.95	0.90	0.96	0.97	1.00														
(7) ASAFETY	0.02	0.96	0.91	0.98	0.98	0.97	1.00													
(8) SIZE	-0.05	0.04	0.10	0.07	0.03	0.03	0.01	1.00												
(9) AGE	0.01	-0.06	-0.06	-0.05	-0.06	-0.07	-0.06	0.18	1.00											
(10) REC_INV	0.00	0.03	0.03	0.05	0.04	0.03	0.03	-0.04	-0.03	1.00										
(11) LEV	-0.06	-0.12	-0.08	-0.10	-0.11	-0.13	-0.13	0.50	0.16	0.25	1.00									
(12) CURR	0.04	0.06	0.03	0.05	0.06	0.07	0.07	-0.36	-0.11	-0.07	-0.67	1.00								
(13) ROA	-0.01	0.29	0.33	0.29	0.25	0.27	0.27	0.02	-0.08	-0.07	-0.36	0.24	1.00							
(14) LOSS	0.02	-0.28	-0.31	-0.27	-0.24	-0.26	-0.26	-0.07	0.06	-0.01	0.20	-0.11	-0.68	1.00						
(15) TOP10	0.02	0.05	0.05	0.05	0.05	0.05	0.04	0.08	-0.06	-0.01	0.00	0.01	0.08	-0.05	1.00					
(16) BRDSIZE	-0.02	0.01	0.03	0.01	0.01	0.01	0.01	0.28	0.08	-0.09	0.14	-0.13	0.01	-0.03	0.02	1.00				
(17) BRDIND	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02	-0.02	0.01	-0.01	0.02	-0.02	0.03	0.01	-0.54	1.00			
(18) SUPSIZE	-0.06	-0.01	0.02	0.00	-0.01	0.00	-0.01	0.30	0.11	-0.10	0.20	-0.15	-0.04	0.00	0.01	0.32	-0.10	1.00		
(19) CONCTOWN	-0.04	0.08	0.10	0.08	0.07	0.08	0.06	0.16	-0.14	-0.06	-0.06	0.07	0.23	-0.16	0.11	0.02	0.03	0.01	1.00	

Notes: This table shows Pearson correlation matrix. Bold numbers indicate significance based on two-tailed t-tests, at the 0.10 level at least. All continuous variables are winsorized at 1% and 99% level. Variable definitions are provided in Appendix A.

Table 4: The effect of auditors' IT experience on achieving internal control objectives

	(1) <i>ICINDEX</i>	(2) <i>STRGHIR</i>	(3) <i>BUISSLV</i>	(4) <i>RELIBTY</i>	(5) <i>LGCOMP</i>	(6) <i>ASAFETY</i>
<i>AUITEXP</i>	11.798*** (3.935)	13.050*** (4.542)	10.450*** (3.704)	12.393*** (4.102)	12.987*** (4.267)	9.063*** (3.028)
<i>SIZE</i>	0.078*** (7.279)	0.110*** (10.995)	0.090*** (8.694)	0.064*** (5.837)	0.075*** (6.711)	0.038*** (3.626)
<i>AGE</i>	-0.005*** (-2.890)	-0.006*** (-3.542)	-0.005*** (-2.785)	-0.006*** (-3.184)	-0.006*** (-3.140)	-0.004** (-2.438)
<i>REC_INV</i>	0.501*** (6.655)	0.481*** (6.663)	0.546*** (7.734)	0.468*** (6.028)	0.480*** (6.110)	0.358*** (5.035)
<i>LEV</i>	-0.704*** (-6.776)	-0.420*** (-4.431)	-0.582*** (-6.186)	-0.687*** (-6.509)	-0.783*** (-7.343)	-0.617*** (-6.433)
<i>CURR</i>	-0.023*** (-3.849)	-0.025*** (-4.439)	-0.021*** (-3.881)	-0.022*** (-3.721)	-0.022*** (-3.622)	-0.021*** (-3.868)
<i>ROA</i>	2.724*** (10.676)	3.643*** (15.864)	2.808*** (12.084)	2.468*** (9.445)	2.545*** (9.618)	2.464*** (10.409)
<i>LOSS</i>	-0.498*** (-10.608)	-0.512*** (-12.022)	-0.405*** (-9.526)	-0.411*** (-8.743)	-0.465*** (-9.758)	-0.445*** (-10.229)
<i>TOP10</i>	0.043** (2.384)	0.039** (2.281)	0.049*** (2.941)	0.050*** (2.755)	0.057*** (3.041)	0.036** (2.128)
<i>BRDSIZE</i>	-0.000 (-0.039)	0.001 (0.130)	-0.004 (-0.666)	-0.002 (-0.257)	0.003 (0.386)	0.001 (0.094)
<i>BRDIND</i>	0.098 (0.516)	0.220 (1.175)	0.035 (0.195)	0.047 (0.241)	0.092 (0.467)	0.018 (0.099)
<i>SUPSIZE</i>	0.004 (0.378)	0.012 (1.141)	0.004 (0.398)	0.005 (0.469)	0.013 (1.075)	0.006 (0.548)
<i>CONCTOWN</i>	0.025 (0.349)	0.010 (0.149)	0.020 (0.305)	0.000 (0.005)	0.058 (0.799)	-0.048 (-0.736)
Intercept	4.837*** (19.652)	3.722*** (16.185)	4.258*** (17.684)	5.483*** (21.501)	5.264*** (20.636)	5.610*** (23.662)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,441	22,441	22,441	22,441	22,441	22,441
R-squared	0.113	0.148	0.114	0.090	0.102	0.100
Adjusted R ²	0.111	0.146	0.111	0.087	0.099	0.097

Notes: Robust standard errors adjusted for clustering at the firm level. T-statistics in parentheses. ***, **, * Indicates significance at 1 per cent, 5 per cent, and 10 per cent levels, respectively, based on two-tailed tests. Variable definitions are provided in Appendix A.

Table 5: Moderating role of financial constraints (KZIndex) on the association between auditors' IT experience and achieving internal control objectives

	<i>ICINDEX</i>		<i>STRGHIR</i>		<i>BUISSLV</i>		<i>RELIBTY</i>		<i>LGCOMP</i>		<i>ASAFETY</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	HighKZ	LowKZ	HighKZ	LowKZ	HighKZ	LowKZ	HighKZ	LowKZ	HighKZ	LowKZ	HighKZ	LowKZ
<i>AUITEXP</i>	17.346*** (3.862)	4.464 (1.157)	18.231*** (4.448)	6.433 (1.633)	17.811*** (4.429)	1.180 (0.309)	18.996*** (4.266)	4.008 (1.008)	20.923*** (4.641)	2.784 (0.690)	13.955*** (3.027)	2.636 (0.720)
<i>SIZE</i>	0.095*** (6.109)	0.049*** (4.172)	0.122*** (8.518)	0.089*** (7.702)	0.094*** (6.396)	0.080*** (6.885)	0.082*** (5.140)	0.035*** (2.889)	0.095*** (5.788)	0.043*** (3.484)	0.047*** (3.063)	0.019* (1.666)
<i>AGE</i>	-0.005* (-1.731)	-0.007*** (-3.182)	-0.005* (-1.960)	-0.008*** (-3.974)	-0.005* (-1.750)	-0.006*** (-2.918)	-0.006** (-2.258)	-0.006*** (-2.903)	-0.005* (-1.865)	-0.007*** (-3.344)	-0.004 (-1.512)	-0.005*** (-2.591)
<i>REC_INV</i>	0.504*** (4.587)	0.408*** (5.004)	0.433*** (4.127)	0.483*** (5.933)	0.538*** (5.253)	0.469*** (6.063)	0.479*** (4.222)	0.356*** (4.263)	0.464*** (4.052)	0.381*** (4.430)	0.347*** (3.331)	0.285*** (3.690)
<i>LEV</i>	-0.996*** (-6.667)	-0.327*** (-2.677)	-0.640*** (-4.754)	-0.156 (-1.330)	-0.814*** (-6.063)	-0.284** (-2.487)	-0.944*** (-6.271)	-0.346*** (-2.773)	-1.051*** (-6.881)	-0.431*** (-3.368)	-0.817*** (-5.971)	-0.363*** (-3.144)
<i>CURR</i>	-0.036*** (-4.066)	-0.009 (-1.359)	-0.040*** (-4.500)	-0.014** (-2.088)	-0.031*** (-3.662)	-0.010* (-1.711)	-0.033*** (-3.573)	-0.011* (-1.655)	-0.034*** (-3.616)	-0.010 (-1.421)	-0.032*** (-3.753)	-0.011* (-1.820)
<i>ROA</i>	3.449*** (9.132)	1.732*** (6.130)	4.143*** (12.273)	2.934*** (11.131)	3.377*** (9.830)	2.028*** (7.816)	3.251*** (8.411)	1.401*** (4.904)	3.410*** (8.802)	1.383*** (4.723)	3.331*** (9.562)	1.308*** (4.977)
<i>LOSS</i>	-0.375*** (-6.069)	-0.581*** (-6.768)	-0.406*** (-7.299)	-0.596*** (-7.637)	-0.314*** (-5.657)	-0.451*** (-5.777)	-0.289*** (-4.681)	-0.482*** (-5.572)	-0.329*** (-5.272)	-0.552*** (-6.352)	-0.320*** (-5.630)	-0.518*** (-6.531)
<i>TOP10</i>	0.052** (2.012)	0.031 (1.503)	0.054** (2.166)	0.026 (1.250)	0.064*** (2.632)	0.034* (1.791)	0.063** (2.344)	0.038* (1.838)	0.074*** (2.682)	0.040* (1.856)	0.050** (2.012)	0.022 (1.144)
<i>BRDSIZE</i>	-0.003 (-0.310)	0.002 (0.305)	-0.006 (-0.647)	0.009 (1.056)	-0.006 (-0.648)	-0.003 (-0.433)	-0.004 (-0.345)	-0.000 (-0.042)	-0.001 (-0.060)	0.006 (0.750)	-0.001 (-0.053)	0.001 (0.169)
<i>BRDIND</i>	-0.101 (-0.361)	0.197 (0.890)	-0.037 (-0.140)	0.402* (1.761)	-0.079 (-0.299)	0.040 (0.188)	-0.085 (-0.295)	0.072 (0.313)	-0.060 (-0.204)	0.146 (0.626)	-0.118 (-0.440)	0.052 (0.244)
<i>SUPSIZE</i>	0.008 (0.570)	0.001 (0.044)	0.021 (1.507)	0.004 (0.363)	0.006 (0.468)	0.002 (0.186)	0.008 (0.551)	0.003 (0.223)	0.015 (1.004)	0.009 (0.736)	0.008 (0.570)	0.006 (0.471)
<i>CONCTOWN</i>	0.084 (0.922)	-0.004 (-0.047)	0.020 (0.225)	0.027 (0.332)	0.055 (0.641)	0.018 (0.235)	0.041 (0.433)	-0.008 (-0.094)	0.120 (1.242)	0.028 (0.324)	-0.027 (-0.309)	-0.041 (-0.538)
Intercept	4.782*** (13.862)	5.235*** (17.873)	3.774*** (11.732)	3.919*** (13.689)	4.502*** (13.703)	4.280*** (14.942)	5.418*** (15.169)	5.905*** (19.722)	5.178*** (14.230)	5.735*** (18.935)	5.712*** (16.925)	5.820*** (20.664)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,083	10,922	11,083	10,922	11,083	10,922	11,083	10,922	11,083	10,922	11,083	10,922
R-squared	0.138	0.071	0.170	0.109	0.136	0.074	0.111	0.054	0.126	0.062	0.124	0.060
Adjusted R ²	0.133	0.065	0.165	0.104	0.131	0.069	0.106	0.048	0.121	0.056	0.118	0.054

Notes: Robust standard errors adjusted for clustering at the firm level. T-statistics in parentheses. ***, **, * Indicates significance at 1 per cent, 5 per cent, and 10 per cent levels, respectively, based on two-tailed tests. Variable definitions are provided in Appendix A.

Table 6: The effect of state ownership on the relationship between auditors' IT experience and achieving internal control objectives

	<i>ICINDEX</i>		<i>STRGHIR</i>		<i>BUISSLV</i>		<i>RELIBTY</i>		<i>LGCMP</i>		<i>ASAFETY</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	SOE=1	SOE=0	SOE=1	SOE=0	SOE=1	SOE=0	SOE=1	SOE=0	SOE=1	SOE=0	SOE=1	SOE=0
<i>AUITEXP</i>	3.639 (0.681)	16.093*** (4.484)	6.727 (1.434)	16.796*** (4.702)	4.396 (0.895)	14.034*** (4.126)	6.063 (1.244)	15.969*** (4.245)	7.607 (1.528)	16.375*** (4.355)	1.514 (0.264)	12.726*** (3.729)
<i>SIZE</i>	0.093*** (5.452)	0.059*** (3.982)	0.126*** (7.967)	0.087*** (6.163)	0.098*** (6.027)	0.071*** (4.921)	0.073*** (4.290)	0.051*** (3.272)	0.083*** (4.829)	0.061*** (3.861)	0.038** (2.288)	0.032** (2.228)
<i>AGE</i>	-0.003 (-0.915)	-0.007*** (-2.925)	-0.002 (-0.784)	-0.008*** (-3.646)	-0.002 (-0.634)	-0.007*** (-3.027)	-0.003 (-0.856)	-0.008*** (-3.328)	-0.003 (-1.012)	-0.008*** (-3.321)	-0.001 (-0.416)	-0.006*** (-2.799)
<i>REC_INV</i>	0.542*** (4.619)	0.508*** (5.233)	0.498*** (4.438)	0.500*** (5.373)	0.610*** (5.616)	0.538*** (5.906)	0.463*** (3.981)	0.498*** (4.896)	0.495*** (4.157)	0.509*** (4.944)	0.370*** (3.348)	0.379*** (4.112)
<i>LEV</i>	-0.522*** (-3.154)	-0.754*** (-5.511)	-0.219 (-1.478)	-0.475*** (-3.747)	-0.379** (-2.571)	-0.638*** (-5.041)	-0.480*** (-2.945)	-0.763*** (-5.341)	-0.579*** (-3.531)	-0.877*** (-6.085)	-0.446*** (-2.982)	-0.666*** (-5.156)
<i>CURR</i>	-0.012 (-0.830)	-0.026*** (-3.835)	-0.008 (-0.568)	-0.031*** (-4.712)	-0.012 (-0.879)	-0.024*** (-3.795)	-0.010 (-0.715)	-0.026*** (-3.717)	-0.012 (-0.855)	-0.026*** (-3.655)	-0.011 (-0.830)	-0.024*** (-3.651)
<i>ROA</i>	3.681*** (6.358)	2.528*** (8.909)	4.205*** (8.081)	3.613*** (14.046)	4.146*** (7.928)	2.498*** (9.631)	3.374*** (5.660)	2.215*** (7.569)	3.426*** (5.726)	2.282*** (7.695)	3.445*** (6.366)	2.182*** (8.278)
<i>LOSS</i>	-0.475*** (-6.503)	-0.477*** (-7.873)	-0.509*** (-8.274)	-0.480*** (-8.483)	-0.359*** (-5.700)	-0.393*** (-7.041)	-0.343*** (-5.051)	-0.422*** (-6.763)	-0.381*** (-5.532)	-0.487*** (-7.668)	-0.372*** (-5.851)	-0.458*** (-7.984)
<i>TOP10</i>	0.048 (1.397)	0.038* (1.847)	0.064** (2.023)	0.023 (1.124)	0.079*** (2.603)	0.034* (1.740)	0.061* (1.807)	0.044** (2.042)	0.071** (2.062)	0.049** (2.225)	0.048 (1.568)	0.030 (1.504)
<i>BRDSIZE</i>	0.005 (0.476)	-0.007 (-0.632)	0.010 (1.062)	-0.011 (-1.072)	-0.003 (-0.321)	-0.008 (-0.769)	0.006 (0.580)	-0.010 (-0.931)	0.012 (1.199)	-0.009 (-0.800)	0.009 (1.042)	-0.008 (-0.778)
<i>BRDIND</i>	-0.089 (-0.313)	0.087 (0.324)	0.106 (0.374)	0.056 (0.213)	-0.110 (-0.408)	0.052 (0.205)	-0.134 (-0.468)	0.027 (0.095)	-0.036 (-0.122)	-0.011 (-0.038)	-0.180 (-0.672)	0.034 (0.131)
<i>SUPSIZE</i>	-0.007 (-0.484)	0.003 (0.194)	-0.002 (-0.131)	0.005 (0.279)	-0.009 (-0.678)	0.000 (0.020)	-0.004 (-0.312)	-0.002 (-0.108)	-0.000 (-0.029)	0.004 (0.245)	0.002 (0.122)	-0.004 (-0.231)
<i>CONCTOWN</i>	-0.118 (-0.852)	0.068 (0.854)	-0.079 (-0.651)	0.011 (0.143)	-0.061 (-0.506)	0.056 (0.753)	-0.146 (-1.106)	0.057 (0.699)	-0.155 (-1.139)	0.143* (1.718)	-0.167 (-1.371)	0.004 (0.059)
Intercept	4.495*** (12.770)	5.333*** (14.841)	3.254*** (9.924)	4.455*** (12.968)	4.077*** (11.929)	4.718*** (13.545)	5.245*** (15.120)	5.894*** (15.397)	5.046*** (14.192)	5.759*** (15.175)	5.521*** (16.547)	5.852*** (16.990)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,669	14,772	7,669	14,772	7,669	14,772	7,669	14,772	7,669	14,772	7,669	14,772
R-squared	0.131	0.116	0.163	0.153	0.146	0.110	0.103	0.095	0.111	0.110	0.113	0.105
Adjusted R ²	0.124	0.112	0.156	0.149	0.139	0.106	0.095	0.091	0.103	0.106	0.105	0.101

Notes: Robust standard errors adjusted for clustering at the firm level. T-statistics in parentheses. ***, **, * Indicates significance at 1 per cent, 5 per cent, and 10 per cent levels, respectively, based on two-tailed tests. Variable definitions are provided in Appendix A.

Table 5: The effect severity of internal control weaknesses on the relationship between auditors' IT experience and achieving internal control objectives

	<i>ICINDEX</i>		<i>ICINDEX</i>		<i>ICINDEX</i>	
	<i>SEVERITY</i>		<i>FRSEVERITY</i>		<i>NFRSEVERITY</i>	
	(1) HighS	(2) LowS	(3) HighFS	(4) LowFS	(5) HighNFS	(6) LowNFS
<i>AUITEXP</i>	54.777*** (3.045)	20.700 (0.936)	40.411** (2.474)	124.710*** (2.691)	50.288*** (2.933)	35.769 (1.184)
<i>SIZE</i>	0.065 (1.248)	0.145** (2.157)	0.040 (0.819)	0.412*** (3.261)	0.109** (2.153)	-0.053 (-0.638)
<i>AGE</i>	-0.001 (-0.094)	0.011 (0.832)	0.005 (0.482)	-0.007 (-0.307)	0.011 (1.004)	-0.022 (-1.256)
<i>REC_INV</i>	0.886** (2.243)	0.606 (1.131)	0.767** (2.182)	0.804 (0.652)	0.792** (2.075)	0.944 (1.249)
<i>LEV</i>	-0.850** (-2.063)	-1.189* (-1.915)	-0.850** (-2.229)	-0.390 (-0.440)	-0.770* (-1.899)	-1.427* (-1.906)
<i>CURR</i>	-0.043 (-1.181)	-0.041 (-0.905)	-0.049 (-1.506)	0.101 (1.067)	-0.031 (-0.837)	-0.083 (-1.641)
<i>ROA</i>	6.699*** (6.424)	3.820** (2.114)	6.527*** (6.762)	7.232*** (2.625)	6.457*** (6.279)	6.649*** (3.089)
<i>LOSS</i>	-1.157*** (-5.631)	-0.402 (-1.391)	-1.052*** (-5.707)	-0.266 (-0.486)	-1.055*** (-5.297)	-0.703* (-1.940)
<i>TOP10</i>	0.334*** (3.173)	0.063 (0.459)	0.277*** (2.949)	0.261 (0.956)	0.307*** (3.020)	0.137 (0.825)
<i>BRDSIZE</i>	0.013 (0.320)	0.009 (0.179)	0.033 (0.939)	-0.095 (-1.199)	-0.001 (-0.034)	0.102 (1.584)
<i>BRDIND</i>	0.474 (0.407)	0.661 (0.421)	0.997 (1.015)	-2.507 (-0.844)	-0.266 (-0.244)	4.082** (2.236)
<i>SUPSIZE</i>	0.100* (1.794)	0.056 (0.901)	0.102** (2.263)	-0.029 (-0.173)	0.086 (1.605)	0.066 (0.851)
<i>CONCTOWN</i>	-0.272 (-0.651)	0.367 (0.738)	-0.160 (-0.462)	-0.265 (-0.255)	-0.034 (-0.084)	-0.213 (-0.349)
Intercept	3.890*** (3.305)	1.957 (1.083)	4.083*** (3.672)	-2.370 (-0.714)	3.102*** (2.687)	4.963** (2.405)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,384	710	2,734	360	2,451	643
R-squared	0.254	0.203	0.237	0.323	0.243	0.256
Adjusted R ²	0.233	0.127	0.219	0.184	0.222	0.178

Table 6: The effect of auditors' IT experience on achieving internal control objectives, alternative measures for auditors' IT experience

	(1) <i>ICINDEX</i>	(2) <i>ICINDEX</i>	(3) <i>ICINDEX</i>	(4) <i>ICINDEX</i>	(5) <i>ICINDEX</i>
<i>AUITEXP1</i>	10.425*** (3.776)				
<i>ITASSETS</i>		0.016*** (2.817)			
<i>AFITEXP</i>			61.227*** (2.693)		
<i>AUITEXP_Top</i>				0.051*** (2.886)	
<i>AUITEXP</i>					10.449*** (2.959)
<i>SIZE</i>	0.078*** (7.286)	0.070*** (6.348)	0.080*** (7.390)	0.078*** (7.308)	0.075*** (6.779)
<i>AGE</i>	-0.005*** (-2.879)	-0.006*** (-2.926)	-0.005*** (-2.824)	-0.005*** (-2.877)	-0.005*** (-2.608)
<i>REC_INV</i>	0.502*** (6.666)	0.494*** (6.564)	0.500*** (6.645)	0.501*** (6.648)	0.455*** (5.853)
<i>LEV</i>	-0.704*** (-6.784)	-0.703*** (-6.746)	-0.708*** (-6.825)	-0.705*** (-6.787)	-0.666*** (-6.215)
<i>CURR</i>	-0.023*** (-3.851)	-0.024*** (-4.115)	-0.022*** (-3.822)	-0.023*** (-3.847)	-0.024*** (-3.804)
<i>ROA</i>	2.726*** (10.680)	2.725*** (10.530)	2.700*** (10.580)	2.720*** (10.654)	2.734*** (10.279)
<i>LOSS</i>	-0.498*** (-10.599)	-0.498*** (-10.555)	-0.498*** (-10.594)	-0.498*** (-10.601)	-0.522*** (-10.662)
<i>TOP10</i>	0.042** (2.377)	0.038** (2.143)	0.053*** (2.814)	0.043** (2.392)	0.034* (1.847)
<i>BRDSIZE</i>	-0.000 (-0.042)	0.001 (0.148)	0.000 (0.003)	-0.000 (-0.029)	-0.003 (-0.390)
<i>BRDIND</i>	0.098 (0.516)	0.141 (0.743)	0.104 (0.545)	0.096 (0.506)	0.056 (0.284)
<i>SUPSIZE</i>	0.004 (0.379)	0.002 (0.192)	0.004 (0.347)	0.004 (0.370)	0.002 (0.164)
<i>CONCTOWN</i>	0.025 (0.354)	0.032 (0.450)	0.026 (0.375)	0.020 (0.285)	0.029 (0.399)
Intercept	4.836*** (19.640)	4.744*** (18.617)	4.749*** (18.776)	4.839*** (19.668)	4.941*** (19.670)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes
Observations	22,441	21,988	22,441	22,441	20,980
R-squared	0.113	0.113	0.113	0.113	0.112
Adjusted R ²	0.111	0.111	0.111	0.111	0.109

Notes: Robust standard errors adjusted for clustering at the firm level. T-statistics in parentheses. ***, **, * Indicates significance at 1 per cent, 5 per cent, and 10 per cent levels, respectively, based on two-tailed tests. Variable definitions are provided in Appendix A.

Table 9: The effect of auditors' IT experience on components of internal control

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>ICQ</i>	<i>CTRENV</i>	<i>RISKAS</i>	<i>CTRACT</i>	<i>IFOCOM</i>	<i>MONITOR</i>
<i>AUITEXP</i>	1.878*** (4.105)	3.626** (2.560)	0.545 (0.782)	1.636 (1.166)	2.302** (2.188)	2.849** (2.546)
<i>SIZE</i>	0.018*** (12.238)	0.023*** (6.171)	0.023*** (10.262)	0.013*** (3.189)	0.024*** (6.925)	0.024*** (7.146)
<i>AGE</i>	-0.000 (-0.008)	-0.001 (-1.162)	-0.000 (-0.870)	-0.002** (-2.256)	-0.004*** (-6.855)	0.003*** (4.014)
<i>REC_INV</i>	0.040*** (3.735)	0.095*** (3.523)	0.009 (0.531)	0.063** (2.152)	0.043* (1.770)	0.068** (2.549)
<i>LEV</i>	-0.078*** (-6.939)	-0.212*** (-6.996)	-0.033** (-2.005)	-0.158*** (-4.866)	0.053** (2.141)	-0.096*** (-3.167)
<i>CURR</i>	-0.002** (-2.358)	0.000 (0.032)	-0.004*** (-2.878)	0.001 (0.641)	-0.003* (-1.725)	-0.004** (-2.039)
<i>ROA</i>	0.094*** (3.569)	0.306*** (3.867)	-0.151*** (-4.123)	0.187** (2.343)	-0.045 (-0.802)	0.332*** (4.292)
<i>LOSS</i>	-0.032*** (-6.825)	-0.055*** (-3.748)	-0.027*** (-4.633)	-0.007 (-0.469)	-0.022** (-2.258)	-0.085*** (-5.720)
<i>TOP10</i>	0.005* (1.901)	0.009 (1.243)	0.025*** (6.152)	0.015** (1.971)	0.012** (2.118)	-0.013* (-1.960)
<i>BRDSIZE</i>	0.003*** (3.005)	0.016*** (5.590)	0.001 (0.800)	-0.004 (-1.351)	-0.006** (-2.384)	0.004 (1.515)
<i>BRDIND</i>	0.089*** (3.042)	0.418*** (5.699)	0.018 (0.411)	-0.183** (-2.067)	0.010 (0.150)	0.071 (0.972)
<i>SUPSIZE</i>	0.005*** (3.052)	0.028*** (7.281)	0.004 (1.558)	-0.009** (-1.970)	-0.018*** (-5.001)	0.009** (2.387)
<i>CONCTOWN</i>	0.043*** (4.351)	0.200*** (7.803)	0.025 (1.629)	-0.000 (-0.003)	0.053** (2.395)	-0.019 (-0.741)
Intercept	3.086*** (87.081)	1.054*** (11.537)	1.365*** (26.171)	2.002*** (19.028)	0.693*** (8.230)	1.698*** (20.109)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,441	22,441	22,441	22,441	22,441	22,441
R-squared	0.171	0.123	0.236	0.052	0.245	0.087
Adjusted R ²	0.169	0.120	0.234	0.049	0.243	0.084

Notes: Robust standard errors adjusted for clustering at the firm level. T-statistics in parentheses. ***, **, * Indicates significance at 1 per cent, 5 per cent, and 10 per cent levels, respectively, based on two-tailed tests. Variable definitions are provided in Appendix A.

Table 7: The effect of auditors' IT experience on achieving internal control objectives after controlling the internal control aggregate component

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>ICINDEX</i>	<i>STRGHIR</i>	<i>BUISSLV</i>	<i>RELIBTY</i>	<i>LGCMP</i>	<i>ASAFETY</i>
<i>AUITEXP</i>	8.850*** (3.007)	10.506*** (3.713)	7.870*** (2.828)	9.194*** (3.111)	9.412*** (3.159)	6.533** (2.190)
<i>SIZE</i>	0.050*** (4.739)	0.086*** (8.710)	0.066*** (6.437)	0.034*** (3.134)	0.041*** (3.764)	0.013 (1.306)
<i>AGE</i>	-0.005*** (-2.976)	-0.006*** (-3.619)	-0.005*** (-2.860)	-0.006*** (-3.289)	-0.006*** (-3.262)	-0.004** (-2.498)
<i>REC_INV</i>	0.438*** (6.018)	0.426*** (6.106)	0.491*** (7.189)	0.399*** (5.338)	0.404*** (5.339)	0.304*** (4.398)
<i>LEV</i>	-0.582*** (-5.797)	-0.315*** (-3.429)	-0.476*** (-5.209)	-0.554*** (-5.455)	-0.635*** (-6.209)	-0.512*** (-5.501)
<i>CURR</i>	-0.020*** (-3.380)	-0.023*** (-4.026)	-0.019*** (-3.439)	-0.019*** (-3.216)	-0.018*** (-3.089)	-0.019*** (-3.430)
<i>ROA</i>	2.576*** (10.429)	3.515*** (15.777)	2.678*** (11.891)	2.307*** (9.163)	2.365*** (9.316)	2.337*** (10.179)
<i>LOSS</i>	-0.448*** (-9.956)	-0.468*** (-11.405)	-0.360*** (-8.835)	-0.356*** (-7.935)	-0.404*** (-8.925)	-0.401*** (-9.593)
<i>TOP10</i>	0.035** (2.009)	0.033* (1.942)	0.042*** (2.604)	0.042** (2.370)	0.047*** (2.635)	0.029* (1.773)
<i>BRDSIZE</i>	-0.005 (-0.757)	-0.003 (-0.510)	-0.009 (-1.352)	-0.007 (-1.030)	-0.003 (-0.446)	-0.004 (-0.552)
<i>BRDIND</i>	-0.041 (-0.224)	0.100 (0.548)	-0.086 (-0.490)	-0.104 (-0.552)	-0.077 (-0.406)	-0.101 (-0.573)
<i>SUPSIZE</i>	-0.003 (-0.244)	0.006 (0.575)	-0.002 (-0.197)	-0.003 (-0.231)	0.004 (0.333)	-0.000 (-0.036)
<i>CONCTOWN</i>	-0.042 (-0.621)	-0.048 (-0.751)	-0.039 (-0.620)	-0.072 (-1.057)	-0.024 (-0.344)	-0.106* (-1.663)
<i>ICQ</i>	1.570*** (16.450)	1.355*** (15.106)	1.374*** (15.262)	1.704*** (17.284)	1.904*** (19.121)	1.347*** (14.615)
Intercept	-0.008 (-0.021)	-0.459 (-1.283)	0.019 (0.052)	0.225 (0.565)	-0.611 (-1.522)	1.452*** (3.885)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,441	22,441	22,441	22,441	22,441	22,441
R-squared	0.152	0.177	0.147	0.134	0.154	0.132
Adjusted R ²	0.149	0.175	0.145	0.131	0.151	0.129

Notes: Robust standard errors adjusted for clustering at the firm level. T-statistics in parentheses. ***, **, * Indicates significance at 1 per cent, 5 per cent, and 10 per cent levels, respectively, based on two-tailed tests. Variable definitions are provided in Appendix A.

Table 8: The effect of auditors' IT experience on achieving internal control objectives after controlling the internal control components

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>ICINDEX</i>	<i>STRGHIR</i>	<i>BUISSLV</i>	<i>RELIBTY</i>	<i>LGCOMP</i>	<i>ASAFETY</i>
<i>AUITEXP</i>	8.205*** (2.875)	9.840*** (3.605)	7.292*** (2.722)	8.715*** (3.078)	8.622*** (2.991)	5.884** (2.045)
<i>SIZE</i>	0.047*** (4.591)	0.082*** (8.542)	0.062*** (6.258)	0.032*** (3.049)	0.038*** (3.672)	0.010 (0.965)
<i>AGE</i>	-0.007*** (-4.290)	-0.008*** (-4.890)	-0.007*** (-4.318)	-0.008*** (-4.696)	-0.008*** (-4.610)	-0.006*** (-3.914)
<i>REC_INV</i>	0.414*** (5.996)	0.404*** (6.069)	0.470*** (7.260)	0.378*** (5.344)	0.373*** (5.229)	0.282*** (4.310)
<i>LEV</i>	-0.580*** (-6.041)	-0.322*** (-3.670)	-0.478*** (-5.493)	-0.559*** (-5.779)	-0.617*** (-6.345)	-0.515*** (-5.819)
<i>CURR</i>	-0.018*** (-3.062)	-0.021*** (-3.608)	-0.016*** (-3.060)	-0.017*** (-2.911)	-0.017*** (-2.875)	-0.017*** (-3.045)
<i>ROA</i>	2.364*** (10.047)	3.328*** (15.718)	2.485*** (11.675)	2.093*** (8.775)	2.113*** (8.786)	2.138*** (9.841)
<i>LOSS</i>	-0.404*** (-9.615)	-0.426*** (-11.112)	-0.317*** (-8.372)	-0.313*** (-7.496)	-0.356*** (-8.406)	-0.357*** (-9.174)
<i>TOP10</i>	0.051*** (3.074)	0.047*** (2.954)	0.058*** (3.743)	0.059*** (3.493)	0.064*** (3.756)	0.045*** (2.897)
<i>BRDSIZE</i>	-0.005 (-0.739)	-0.002 (-0.377)	-0.008 (-1.332)	-0.006 (-0.851)	-0.005 (-0.725)	-0.003 (-0.475)
<i>BRDIND</i>	-0.003 (-0.019)	0.142 (0.827)	-0.042 (-0.255)	-0.026 (-0.148)	-0.088 (-0.495)	-0.059 (-0.355)
<i>SUPSIZE</i>	-0.005 (-0.429)	0.006 (0.582)	-0.004 (-0.354)	-0.002 (-0.237)	-0.002 (-0.237)	-0.002 (-0.157)
<i>CONCTOWN</i>	0.016 (0.254)	0.010 (0.172)	0.024 (0.420)	0.004 (0.061)	0.015 (0.239)	-0.043 (-0.734)
<i>CTRENV</i>	0.098*** (5.764)	0.041*** (2.602)	0.036** (2.417)	0.045*** (2.732)	0.275*** (16.114)	0.032** (2.133)
<i>RISKAS</i>	0.058 (1.332)	0.040 (0.964)	0.067* (1.661)	0.068 (1.541)	0.070 (1.550)	0.042 (1.021)
<i>CTRACT</i>	0.068*** (4.100)	0.041** (2.576)	0.039** (2.552)	0.125*** (7.576)	0.064*** (3.600)	0.036** (2.303)
<i>IFOCOM</i>	0.110*** (4.081)	0.143*** (5.411)	0.082*** (3.203)	0.106*** (3.803)	0.095*** (3.425)	0.098*** (3.863)
<i>MONITOR</i>	0.997*** (22.217)	0.928*** (22.097)	0.961*** (22.619)	1.064*** (22.728)	1.055*** (22.432)	0.967*** (22.185)
Intercept	2.750*** (10.915)	1.867*** (7.820)	2.361*** (9.576)	3.213*** (12.248)	2.893*** (11.018)	3.737*** (14.989)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,441	22,441	22,441	22,441	22,441	22,441
R-squared	0.229	0.247	0.234	0.218	0.233	0.219
Adjusted R ²	0.227	0.244	0.231	0.215	0.231	0.217

Notes: Robust standard errors adjusted for clustering at the firm level. T-statistics in parentheses. ***, **, * Indicates significance at 1 per cent, 5 per cent, and 10 per cent levels, respectively, based on two-tailed tests. Variable definitions are provided in Appendix A.

Table 12: Endogeneity: Controlling for audit committee

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>ICINDEX</i>	<i>STRGHIR</i>	<i>BUISSLV</i>	<i>RELIBTY</i>	<i>LGCOMP</i>	<i>ASAFETY</i>
<i>AUITEXP</i>	14.591*** (2.850)	17.488*** (3.318)	10.412* (1.869)	13.715*** (2.617)	15.483*** (2.857)	10.908** (1.962)
<i>SIZE</i>	0.102*** (4.821)	0.133*** (6.616)	0.120*** (5.730)	0.086*** (3.832)	0.094*** (4.198)	0.061*** (2.840)
<i>AGE</i>	0.003 (0.665)	0.001 (0.161)	0.003 (0.679)	0.003 (0.645)	0.002 (0.502)	0.004 (1.151)
<i>REC_INV</i>	0.468*** (3.105)	0.483*** (3.278)	0.591*** (3.993)	0.403** (2.498)	0.472*** (2.980)	0.321** (2.184)
<i>LEV</i>	-0.675*** (-3.057)	-0.387* (-1.883)	-0.587*** (-2.798)	-0.635*** (-2.791)	-0.713*** (-3.073)	-0.657*** (-3.103)
<i>CURR</i>	-0.030** (-2.340)	-0.035*** (-2.712)	-0.028** (-2.239)	-0.026* (-1.954)	-0.027* (-1.943)	-0.028** (-2.273)
<i>ROA</i>	1.343*** (2.611)	2.536*** (5.188)	1.785*** (3.586)	1.184** (2.187)	1.105** (2.025)	1.006** (2.019)
<i>LOSS</i>	-0.458*** (-4.095)	-0.504*** (-4.888)	-0.443*** (-4.223)	-0.410*** (-3.543)	-0.454*** (-3.961)	-0.456*** (-4.319)
<i>TOP10</i>	0.050 (1.442)	0.051 (1.459)	0.048 (1.417)	0.052 (1.445)	0.058 (1.539)	0.037 (1.108)
<i>BRDSIZE</i>	0.006 (0.534)	0.010 (0.852)	-0.004 (-0.375)	0.005 (0.385)	0.010 (0.850)	0.009 (0.765)
<i>BRDIND</i>	0.183 (0.550)	0.359 (1.101)	0.003 (0.009)	0.086 (0.247)	0.230 (0.647)	0.106 (0.320)
<i>SUPSIZE</i>	0.000 (0.028)	0.005 (0.347)	-0.004 (-0.229)	0.002 (0.145)	0.000 (0.012)	0.010 (0.595)
<i>CONCTOWN</i>	0.296** (2.214)	0.248* (1.955)	0.277** (2.183)	0.316** (2.292)	0.401*** (2.852)	0.243* (1.905)
<i>ACSIZE</i>	-0.007 (-0.309)	-0.002 (-0.096)	-0.006 (-0.242)	-0.012 (-0.520)	-0.019 (-0.762)	-0.018 (-0.797)
<i>ACIND</i>	-0.052 (-0.295)	-0.058 (-0.340)	0.032 (0.185)	-0.147 (-0.836)	-0.100 (-0.559)	-0.300* (-1.848)
<i>ACMEETS</i>	-0.005 (-0.511)	-0.004 (-0.408)	-0.002 (-0.221)	-0.003 (-0.295)	-0.009 (-0.815)	-0.002 (-0.262)
Intercept	3.862*** (8.179)	2.882*** (6.491)	3.302*** (6.979)	4.632*** (9.612)	4.327*** (8.728)	4.834*** (10.600)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,226	4,226	4,226	4,226	4,226	4,226
R-squared	0.098	0.145	0.118	0.079	0.089	0.083
Adjusted R ²	0.083	0.131	0.104	0.064	0.074	0.068

Notes: Robust standard errors adjusted for clustering at the firm level. T-statistics in parentheses. ***, **, * Indicates significance at 1 per cent, 5 per cent, and 10 per cent levels, respectively, based on two-tailed tests. Variable definitions are provided in Appendix A.

Table 9: Endogeneity: Propensity score matching

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>ICINDEX</i>	<i>STRGHIR</i>	<i>BUISSLV</i>	<i>RELIBTY</i>	<i>LGCOMP</i>	<i>ASAFETY</i>
<i>AUITEXP</i>	10.996*** (3.673)	11.687*** (4.074)	9.989*** (3.659)	11.910*** (4.001)	12.785*** (4.273)	7.980*** (2.618)
<i>SIZE</i>	0.071*** (6.322)	0.103*** (9.783)	0.084*** (7.714)	0.059*** (5.074)	0.068*** (5.729)	0.029*** (2.673)
<i>AGE</i>	-0.004** (-2.295)	-0.006*** (-3.168)	-0.004** (-2.153)	-0.005** (-2.536)	-0.005*** (-2.663)	-0.003* (-1.806)
<i>REC_INV</i>	0.481*** (6.291)	0.453*** (6.157)	0.521*** (7.292)	0.450*** (5.737)	0.457*** (5.737)	0.334*** (4.629)
<i>LEV</i>	-0.623*** (-5.810)	-0.336*** (-3.432)	-0.499*** (-5.133)	-0.606*** (-5.557)	-0.685*** (-6.188)	-0.532*** (-5.371)
<i>CURR</i>	-0.019*** (-3.183)	-0.021*** (-3.621)	-0.018*** (-3.184)	-0.019*** (-3.065)	-0.018*** (-2.904)	-0.018*** (-3.198)
<i>ROA</i>	2.858*** (10.895)	3.735*** (15.799)	2.946*** (12.418)	2.592*** (9.721)	2.667*** (9.819)	2.586*** (10.663)
<i>LOSS</i>	-0.542*** (-10.553)	-0.541*** (-11.680)	-0.431*** (-9.339)	-0.442*** (-8.680)	-0.500*** (-9.645)	-0.488*** (-10.325)
<i>TOP10</i>	0.036** (1.997)	0.035** (1.999)	0.042** (2.535)	0.045** (2.426)	0.048** (2.535)	0.030* (1.805)
<i>BRDSIZE</i>	0.000 (0.026)	0.001 (0.101)	-0.003 (-0.517)	-0.001 (-0.192)	0.004 (0.466)	0.000 (0.055)
<i>BRDIND</i>	0.152 (0.795)	0.271 (1.439)	0.073 (0.403)	0.103 (0.526)	0.143 (0.720)	0.051 (0.282)
<i>SUPSIZE</i>	0.004 (0.345)	0.012 (1.040)	0.004 (0.343)	0.005 (0.444)	0.013 (1.037)	0.006 (0.558)
<i>CONCTOWN</i>	0.016 (0.217)	-0.002 (-0.036)	0.012 (0.181)	-0.007 (-0.088)	0.043 (0.565)	-0.052 (-0.758)
Intercept	4.903*** (18.866)	3.816*** (15.796)	4.311*** (17.104)	5.509*** (20.500)	5.335*** (19.715)	5.719*** (22.807)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,210	20,210	20,210	20,210	20,210	20,210
	0.118	0.149	0.116	0.093	0.104	0.105
Adjusted R ²	0.115	0.146	0.114	0.090	0.101	0.102

Notes: Robust standard errors adjusted for clustering at the firm level. T-statistics in parentheses. ***, **, * Indicates significance at 1 per cent, 5 per cent, and 10 per cent levels, respectively, based on two-tailed tests. Variable definitions are provided in Appendix A.

Table 14: Endogeneity: Heckman two-stage analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>ICINDEX</i>	<i>STRGHIR</i>	<i>BUISSLV</i>	<i>RELIBTY</i>	<i>LGCOMP</i>	<i>ASAFETY</i>
<i>AUITEXP</i>	11.410*** (3.834)	12.590*** (4.416)	9.918*** (3.541)	11.964*** (3.993)	12.637*** (4.184)	8.729*** (2.939)
<i>SIZE</i>	0.053*** (2.832)	0.080*** (4.539)	0.056*** (3.187)	0.037* (1.884)	0.052*** (2.661)	0.016 (0.898)
<i>AGE</i>	-0.008*** (-3.249)	-0.009*** (-4.020)	-0.008*** (-3.602)	-0.008*** (-3.528)	-0.008*** (-3.315)	-0.006*** (-2.804)
<i>REC_INV</i>	0.490*** (6.499)	0.467*** (6.474)	0.530*** (7.517)	0.455*** (5.857)	0.470*** (5.975)	0.348*** (4.901)
<i>LEV</i>	-0.559*** (-3.973)	-0.249* (-1.908)	-0.385*** (-2.991)	-0.527*** (-3.635)	-0.653*** (-4.469)	-0.493*** (-3.755)
<i>CURR</i>	-0.011 (-1.167)	-0.012 (-1.283)	-0.005 (-0.616)	-0.009 (-0.973)	-0.012 (-1.187)	-0.011 (-1.281)
<i>ROA</i>	3.051*** (9.064)	4.031*** (12.972)	3.256*** (10.517)	2.830*** (8.112)	2.840*** (8.066)	2.746*** (8.662)
<i>LOSS</i>	-0.494*** (-10.477)	-0.507*** (-11.848)	-0.399*** (-9.342)	-0.407*** (-8.604)	-0.462*** (-9.637)	-0.441*** (-10.095)
<i>TOP10</i>	0.025 (1.208)	0.018 (0.924)	0.025 (1.281)	0.031 (1.450)	0.041* (1.884)	0.020 (1.053)
<i>BRDSIZE</i>	0.009 (0.987)	0.012 (1.350)	0.009 (0.988)	0.009 (0.896)	0.012 (1.154)	0.009 (0.994)
<i>BRDIND</i>	0.424 (1.488)	0.606** (2.208)	0.482* (1.791)	0.408 (1.379)	0.386 (1.285)	0.298 (1.101)
<i>SUPSIZE</i>	0.001 (0.116)	0.009 (0.790)	0.000 (0.006)	0.002 (0.168)	0.010 (0.826)	0.003 (0.297)
<i>CONCTOWN</i>	0.174 (1.503)	0.187* (1.703)	0.224** (2.085)	0.166 (1.391)	0.192 (1.587)	0.080 (0.742)
<i>IMR</i>	-1.489 (-1.622)	-1.765** (-2.012)	-2.041** (-2.392)	-1.649* (-1.736)	-1.345 (-1.386)	-1.280 (-1.477)
Intercept	6.427*** (6.433)	5.606*** (5.890)	6.436*** (6.933)	7.243*** (6.985)	6.699*** (6.357)	6.976*** (7.389)
<i>Year and Ind</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,441	22,441	22,441	22,441	22,441	22,441
R-squared	0.114	0.149	0.114	0.090	0.102	0.100
Adjusted R ²	0.111	0.146	0.111	0.087	0.100	0.098

Notes: In the first stage we use the *DIGITAL* as an exclusion constraint and we observe that it positive and significant with *HIGH_AUITEXP* ($z= 2.09$; $p\text{-value}= 0.001$). Robust standard errors adjusted for clustering at the firm level. T-statistics in parentheses. ***, **, * Indicates significance at 1 per cent, 5 per cent, and 10 per cent levels, respectively, based on two-tailed tests. Variable definitions are provided in Appendix A.

Appendix A: Variable Definitions

Variable Name	Definition
<i>ICINDEX</i>	= Natural logarithm of 1 plus aggregate internal control composite index provided by DIB
<i>STRGHIR</i>	= Natural logarithm of 1 plus strategic hierarchy sub-index, component of <i>ICINDEX</i>
<i>BUISSLV</i>	= Natural logarithm of 1 plus operations level sub-index, component of <i>ICINDEX</i>
<i>RELIBTY</i>	= Natural logarithm of 1 plus report reliability sub-index, component of <i>ICINDEX</i>
<i>LGCOMP</i>	= Natural logarithm of 1 plus legal compliance sub-index, component of <i>ICINDEX</i>
<i>ASAFETY</i>	= Natural logarithm of 1 plus asset safety sub-index, component of <i>ICINDEX</i>
<i>AUITEXP</i>	= The ratio of the IT related assets divided by total assets audited by an audit partner over the prior three-year
<i>SIZE</i>	= Natural logarithm of the firm's total assets
<i>AGE</i>	= Number of years since the firm has been established plus 1
<i>REC_INV</i>	= Sum of accounts receivable and inventory divided by total assets
<i>LEV</i>	= Total liabilities divided by total assets
<i>CURR</i>	= The ratio of total current assets divided by total current liabilities
<i>ROA</i>	= Net income divided by average of total assets
<i>LOSS</i>	= A dummy variable that equals 1 if the firm's net income is negative, and 0 otherwise
<i>TOP10</i>	= A dummy variable that equals 1 if a firm is audited by a domestic Top 10 audit firm, and 0 otherwise
<i>BRDSIZE</i>	= The total number of directors on the board of directors
<i>BRDIND</i>	= The proportion of independent directors on the board of directors
<i>SUPSIZE</i>	= The total number of supervisors on the supervisory board
<i>CONCTOWN</i>	= The shareholding ratio of the top ten shareholders
<i>SOE</i>	= A dummy variable that equals 1 if a firm is a state-owned enterprise (SOE) and 0 otherwise
<i>KZinx</i>	= The KZ index of financial constraints that obtained from CSMAR, and it is calculated as follows: $KZ\ Index = \alpha_1(cash\ flow/lagged\ assets) + \alpha_2(leverage) + \alpha_3(cash\ dividends/lagged\ assets) + \alpha_4(cash\ balances/lagged\ assets) + \alpha_5(Tobin's\ Q)$
<i>SEVERITY</i>	= Severity level of the internal control weaknesses; 3×material weaknesses + 2×significant weaknesses + 1×general weaknesses
<i>FRSEVERITY</i>	= Severity level of financial reporting-related internal weaknesses; 3×material weaknesses + 2×major weaknesses + 1×minor weaknesses
<i>NFRSEVERITY</i>	= Severity level of non-financial reporting-related internal weaknesses; 3×material weaknesses + 2×significant weaknesses + 1×general weaknesses
<i>AUITEXP1</i>	= The ratio of the IT related assets divided by total assets audited by an audit partner over the prior three-year
<i>ITASSETS</i>	= Natural logarithm of the IT related assets audited by an auditor over the prior five-year
<i>AFITEXP</i>	= The ratio of the IT related assets divided by total assets audited by an audit firm over the prior five-year
<i>AUITEXP_Top</i>	= A dummy variable that equals 1 if <i>AUITEXP</i> in the top quantile and 0 otherwise
<i>ACSIZE</i>	= The total number of members on the audit committee
<i>ACIND</i>	= The proportion of independent members on the audit committee
<i>ACMEETS</i>	= The total number of audit committee meetings
<i>DIGITAL</i>	= Natural logarithm of 1 plus the total number of words related to digital transformation in management discussion and analysis (MD&A) disclosures
<i>ICQ</i>	= Natural logarithm of 1 plus aggregate internal control system index provided by DIB
<i>CTRENV</i>	= Natural logarithm of 1 plus control environment sub-index, component of <i>ICQ</i>
<i>RISKAS</i>	= Natural logarithm of 1 plus risk assessment sub-index, component of <i>ICQ</i>
<i>TRACT</i>	= Natural logarithm of 1 plus control activity sub-index, component of <i>ICQ</i>
<i>IFOCOM</i>	= Natural logarithm of 1 plus information and communication sub-index, component of <i>ICQ</i>
<i>MONITOR</i>	= Natural logarithm of 1 plus monitoring activities sub-index, component of <i>ICQ</i>
<i>Ind</i>	= Industry fixed effects indicator variables
<i>Year</i>	= Year fixed effects indicator variables

Appendix B: Table A1: PSM balance tests

Panel A: Covariate balance test								
Variable	Unmatched Matched	Mean		Standardized mean difference (%bias)	Change in standardized mean difference (%reduct)	T-test		V(T) / V(C)
		Treated	Control			t	p> t	
<i>Size</i>	U	22.340	22.256	6.600		4.950	0.000	1.000
	M	22.279	22.256	1.800	72.500	1.300	0.193	0.980
<i>Age</i>	U	20.288	19.396	16.100		12.000	0.000	1.020
	M	19.685	19.396	5.200	67.600	3.750	0.000	0.980
<i>REC_INV</i>	U	0.265	0.267	-1.000		-0.780	0.438	0.980
	M	0.267	0.267	-0.300	66.700	-0.240	0.807	1.010
<i>Lev</i>	U	0.432	0.428	2.000		1.460	0.144	0.960*
	M	0.428	0.428	0.400	80.600	0.270	0.787	0.980
<i>Current</i>	U	2.240	2.314	-3.600		-2.730	0.006	0.890*
	M	2.286	2.314	-1.400	62.300	-0.960	0.337	0.970
<i>ROA</i>	U	0.036	0.039	-4.000		-2.960	0.003	1.120*
	M	0.038	0.039	-0.900	76.200	-0.690	0.493	1.040*
<i>Loss</i>	U	0.123	0.108	4.700		3.470	0.001	.
	M	0.110	0.108	0.400	90.700	0.320	0.752	.
<i>Top10</i>	U	0.601	0.594	1.600		1.160	0.246	.
	M	0.595	0.594	0.300	81.800	0.200	0.841	.
<i>BoardSize</i>	U	8.436	8.468	-2.000		-1.480	0.138	0.990
	M	8.460	8.468	-0.500	75.700	-0.340	0.732	1.000
<i>BoardInd</i>	U	0.377	0.377	-0.500		-0.410	0.682	0.990
	M	0.377	0.377	0.000	98.200	-0.010	0.994	1.000
<i>SuperSize</i>	U	3.485	3.499	-1.400		-1.030	0.303	0.980
	M	3.496	3.499	-0.300	77.000	-0.220	0.822	1.000
<i>ConcOwner</i>	U	0.578	0.585	-4.300		-3.180	0.001	0.980
	M	0.585	0.585	0.200	96.000	0.120	0.904	0.960*

Panel B: Summary of balance test								
Sample	Ps	R2	LR	chi2	p>chi2	MeanBias	MedBias	B
Unmatched	0.007	206.790	0.000	4.000	2.800	19.400	1.050	30
Matched	0.001	19.000	0.089	1.000	0.400	6.100	0.980	20