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Monitoring Quality of Group Audits: Internal and Regulatory Inspections of Component Audits of U.S. Issuers

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ABSTRACT

This study responds to concerns regarding the quality of global group audits by examining internal quality reviews (IQRs) and regulatory inspections of non-U.S. component audits (CAs) performed on behalf of U.S. lead auditors. Our investigation is guided by a conceptual model of factors influencing risks that both CA and lead team supervisors fail to detect deficiencies. In their IQR programs, firms target larger and more complex CA engagements in which knowledge of U.S. standards may be lacking, in countries with weaker regulation and less U.S. CA experience. IQR deficiencies are associated with larger CA engagements applying PCAOB standards, performed by larger CA firms in countries with less CA activity. PCAOB Part I deficiencies are more often found in larger CA firms auditing smaller components (suggesting less attention relative to the firm's local clients), and greater scope of audit work, longer tenure and higher engagement profitability (suggesting incentives for client retention).

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I. INTRODUCTION

We investigate audit quality control in global group audits (GGAs) of U.S. multinational issuers, studying post-audit internal quality reviews (IQRs) and regulatory inspections of non-U.S. component audits (CAs) in those engagements. The quality of CA work by non-U.S. firms has recently been questioned by findings of widespread audit deficiencies by Public Company Accounting Oversight Board (PCAOB) inspections. PCAOB enforcement actions tie instances of CA noncompliance to U.S. issuer restatements, delisting, and violations of debt covenants.[1] Emerging academic research (e.g., Downey and Bedard 2019; Burke, Hoitash and Hoitash 2020; Downey and Westermann 2021) also identifies audit quality issues associated with using CA firms for portions of GGAs, and audit committee chairs identify "managing global audit operations" as an area in need of improvement (PCAOB 2021). In response to these concerns, the PCAOB and the International Auditing and Assurance Standards Board (IAASB) are revising auditing standards with the goal of improving engagement-level supervision in GGAs (PCAOB 2017a; IAASB 2020a) as well as firms' quality control systems in general (PCAOB 2019; IAASB 2020b). This study contributes to the developing literature on GGAs by providing empirical evidence of factors affecting the risk that supervisors in both the non-U.S. CA and U.S. lead teams fail to detect instances of CA noncompliance with auditing standards, which are subsequently detected by IQRs or PCAOB inspections.

Investigation of audit quality in the CA context is important as the GGA engagement structure provides challenges to effective supervision. In purely domestic audits, all subordinates are supervised by more senior personnel in the same firm (often the same office), allowing supervisors to directly observe performance of the work and to review it in real time. In contrast, responsibilities assigned by the lead team

[1] For example, the Japanese CA of Baldwin failed to address red flags regarding revenue. When subsequently discovered, the issuer restated its financials causing a violation in financial covenants and eventual delisting (PCAOB 2014). Similarly, the Brazilian CA of Sara Lee failed to address red flags around accounts receivable, which later resulted in a restatement for the issuer (PCAOB 2017c). Finally, the Mexican CA of EZCORP failed to test portions of the loan loss reserve and did not test dozens of ICFR controls (despite asserting testing of these controls to the lead auditor), resulting in a subsequent restatement (PCAOB 2018).

to CA teams are supervised by local personnel in the foreign firm. Lead team personnel may not be able to observe CA work papers due to national legal restrictions. According to prior research, lead teams often received only high-level summary reports of completed work during our sample period (Sunderland and Trompeter 2017; Downey and Bedard 2019). While information asymmetry between client and auditor is an inherent characteristic of all engagements (Causholli and Knechel 2012), the GGA context provides an additional layer of information asymmetry (i.e., between lead and CA teams) that threatens audit quality. Other challenges to supervision in GGAs include differences in business context and culture across countries, varying quality control systems across firms, and local auditors' lack of knowledge of U.S. audit standards (PCAOB 2016).

Audit firms aim to mitigate such concerns through global firm networks (GNFs), which promote consistency and quality of service across their members (e.g., EY 2019; KPMG 2019; Deloitte 2020).[2] GNFs are organized in a loose structure based on cooperative agreements; each member firm is a legally separate and autonomous national- or regional-level entity subject to the laws of the country in which it operates.[3] The extent to which audit quality is consistent across GNF members is an important question examined by recent research that identifies problems in financial reporting quality of subsidiaries and CA work associated with country, firm, and CA team characteristics (e.g., Bik and Hooghiemstra 2018; Beuselinck, Cascino, Deloof, and Vanstraelen 2019; Downey and Bedard 2019; Burke et al. 2020). Together, these studies cast doubt on the presumption that supervision effectiveness and audit work quality are similar across member firms.

Inspections of completed engagements in which firms served in either the lead or CA role are a key

[2] In this paper, "firm" refers to individual country- or regional-level entities legally licensed to perform audits in those jurisdictions, and "global network firm" (GNF) refers to the umbrella organizations to which those entities belong (but which do not themselves perform audits). The lead (U.S.) firms and CA (foreign) firms in our sample are all members or affiliates of the largest six GNFs: BDO International Limited, Deloitte Touche Tohmatsu Limited, Ernst & Young Global Limited, Grant Thornton International Limited, KPMG International Cooperative, and PricewaterhouseCoopers (PwC) International Limited.

[3] This structure limits member firms' legal exposure, while promoting continuity of service to multinational entities across country borders (e.g., Downey and Westermann 2021). Legal restrictions on licensing and education within countries essentially require lead auditors to rely on GNF members within each jurisdiction to perform audit work, especially when local laws require a stand-alone (i.e., "statutory") audit of local operations.

monitoring control employed by audit firms and regulators. IQRs, which are required as a condition of GNF membership, are intended to identify previously undetected deficiencies in compliance with auditing standards and firm policies, and to prevent future deficiencies through internal disclosure of findings, training, and improvement in firms' quality control systems and procedures. The challenges to effective supervision in GGAs increase the likelihood of noncompliance undetected by supervisors (relative to purely domestic engagements), thus increasing the importance of IQRs to identify those problems. Current audit firm publications (e.g., KPMG 2019; PwC 2020) report that global leadership provides IQR oversight and training to encourage consistency and independence in application. However, the level of coordination may vary across time and among countries, suggesting a mix of local and central control over the IQR process. Regulatory inspections by the PCAOB also examine whether auditors of U.S. issuers obtained sufficient evidence to support the audit opinion and complied with PCAOB standards. IQR and PCAOB inspection programs are both important, as negative findings can impact auditors' professional reputations, career advancement, and compensation (Houston and Stefaniak 2013; Bell, Causholli, and Knechel 2015; Downey and Westermann 2021). However, PCAOB inspections imply greater litigation and regulatory risk to firms, due to public disclosure of findings to stakeholders, albeit without identifying specific clients.

In sum, this study builds on research examining IQRs and/or regulatory inspections of the work of lead firms by investigating inspections at the CA level, consistent with recent research citing the value of studying financial reporting quality at the subsidiary level (e.g., Beuselinck et al. 2019; Docimo, Gunn, Li, and Michas 2020). Recognizing the dispersed structure of accountability in the CA setting, we employ a model that conceptualizes risk of noncompliance in two supervision layers. At the CA firm level, noncompliance risk is associated with knowledge and experience of the CA team relevant to meeting U.S. requirements, engagement profitability, and the country environment. The first layer of supervision occurs within the CA team; the risk of CA supervisors failing to detect noncompliance is associated with the CA firm's relative size, structure, and independence (i.e., length of tenure). Instances of noncompliance not detected by CA supervisors remain in the work transmitted to the lead team. At the lead team level, we

expect that the risk of failure to detect noncompliance is associated with the scope and extent of CA work and factors inhibiting communication between teams. We study the influence of factors at both levels on selection of targets for IQR inspections and on IQR and PCAOB inspection outcomes. While we test the same factors for both IQR and PCAOB programs, specific results may differ (see also Aobdia 2019); e.g., PCAOB inspectors might target certain procedures and/or accounts in each cycle, while IQR inspectors may also address their own firms' specific methodology (Houston and Stefaniak 2013).

Our data are derived from the PCAOB's international inspection program, which focuses on work of non-U.S. firms in lead and component roles for U.S. issuer engagements.[4] In advance of inspection, non-U.S. firms provide information to the PCAOB on all their engagements pertaining to U.S. issuers, including those in which they sign the audit opinion (i.e., foreign domiciled issuers) and those in which they audit only a component on behalf of the lead auditor.[5] From this array of clients, PCAOB staff select specific issuer and CA engagements to inspect. For CAs, the firms report information on engagement characteristics (e.g., number of CA audit hours, nature of audit work performed, workpaper location and language), whether the engagement was subjected to IQR, and whether the IQR detected deficiencies. We also obtain data from the PCAOB on whether a CA engagement was selected for inspection, and whether a Part I deficiency was disclosed in the firm's public PCAOB inspection report. In addition, we collect characteristics of issuers and CA firms from public sources.

Our full sample comprises 3,145 CA engagements performed by non-U.S. affiliates of the six largest GNFs from 2010-2017. Of those, about ten percent were subject to IQRs by their firms within two years of submitting data to the PCAOB. IQR outcomes for 281 engagements were available at the time of

[4] In contrast, the U.S. domestic inspection program (studied by Aobdia 2019) focuses on audits for which U.S. firms sign the audit opinion. Those engagements may be purely domestic (i.e., all work is done by U.S. firm personnel), or group audits led by U.S. firms, in which case only workpapers archived in the U.S. are available for inspection by U.S. regulators. Because non-U.S. CA firm activities are generally archived by the local (not the lead) audit firm, their work is inspected by the PCAOB's international inspection program, the source of our data. Further, some prior research investigates publicly available data on PCAOB inspections of non-U.S. *lead* auditors (e.g., Fung, Raman, and Zhu 2017), which are also distinct from the CA inspections that we study. Thus, there is no data overlap between our study and prior research.

[5] Regardless of geographic location, firms auditing fewer (more) than 100 issuers are inspected triennially (annually).

the firm's submission, of which 23.5 percent were identified as deficient. In contrast, the rate of CA engagements inspected by the PCAOB is lower (3.5 percent), with more deficient engagements (36.7 percent).[6] Rates of both IQR and PCAOB inspections in our CA sample are lower than reported by Aobdia (2019) for U.S.-domiciled auditors, suggesting both firms and regulators may allocate less attention to monitoring CA quality. However, deficiency rates are higher in both inspection programs than those reported by Aobdia (2019) for U.S. firms, highlighting the importance of IQR and regulatory inspections as quality control mechanisms in the CA setting.

We investigate factors associated with IQR selection and detection of a deficiency for CA engagements, using both independent probit models and bivariate probit to examine selection and outcomes jointly. Lacking an available instrument for the bivariate probit, we follow Aobdia (2019) and Choudhary, Merkley, and Schipper (2019) by testing robustness to varying assumptions of the correlation between unobservables in the selection and outcome equations (for details, see Cook, Newberger, and Lee 2020). In addition to publicly available firm- and issuer-level characteristics of prior studies (e.g., Burke et al. 2020), our test variables include a number of engagement-level (e.g., the nature and extent of audit testing) and firm-level (e.g., engagement profitability) characteristics not available to prior research.

Highlighting some of our key findings, results of the IQR selection model reveal risk factors of significant concern to firms in designing their inspection programs, including insufficient knowledge/experience of CA teams pertaining to U.S. standards, clients not having short tenure, firms with a relatively narrow personnel structure (i.e., fewer staff per partner), and country environments with greater risk (i.e., the auditing regulator is not internationally affiliated, and the country has fewer U.S. CA engagements). IQR selection also implies concern for risk that the U.S. lead team will have difficulty supervising CA personnel, including greater CA work (both in audit hours relative to the group, and proportion of issuer revenues) and complexity (full-scope engagements, as opposed to limited procedures). Controlling for IQR selection, we find several factors increasing the risk of IQR deficiencies, including

[6] Only 0.7 percent of sample engagements are inspected by both programs. Our data do not include information on the nature or severity of deficiencies identified in either inspection program.

auditing to PCAOB standards, lower levels of U.S. CA work in the country, larger CA firms, and larger components. Thus, while CA firms select inspection targets based on tenure, country regulatory risk, and full scope audit work, these factors are not associated with actual deficiencies in the inspected sample.

Investigating detection of Part I deficiencies by PCAOB inspectors, we find that most factors influencing Part I and IQR deficiencies differ across models, consistent with process differences noted in prior studies (e.g., Houston and Stefaniak 2013; Aobdia 2019). The only common finding is the positive association of deficiencies with larger CA firms, suggesting greater risk when non-U.S. firms doing work referred from U.S. lead auditors have a larger local book of business. Other factors significantly influencing risk of Part I deficiencies include higher billing rates, longer CA firm tenure, and performing a full scope audit. These findings suggest that foreign firms' IQRs may not detect deficiencies in CA engagements with greater incentives for client retention, specifically those with established relationships, greater scale of activities and higher profitability.

This study contributes to auditing research and practice by investigating processes and outcomes of monitoring CA engagements through inspections, using previously unobservable engagement characteristics. Our investigation of firms' IQR programs adds to scant research on those monitoring activities. Further, our examination of the PCAOB's CA inspections builds on prior literature studying audit market interventions (e.g., DeFond and Zhang 2014) by examining a previously unstudied regulatory program. Guided by a model conceptualizing the risk that both CA and lead team levels will fail to detect noncompliance in CA work, we investigate specific factors at both levels that likely affect selection of CA inspection targets and outcomes. In addition to its contribution to research, results of our analysis provide information useful to audit practice, as understanding factors affecting noncompliance with auditing standards at the CA level can assist GNFs and their members in designing and executing IQR programs. Further, our findings address topics of concern to the PCAOB and IAASB as they develop standards relating to firms' system of quality controls and audit supervision in the GGA context.

II. BACKGROUND AND HYPOTHESIS DEVELOPMENT

Background and Prior Research

Internal Quality Reviews of Audit Engagements

IQR programs investigate completed engagements for sufficiency of evidence supporting the audit opinion and compliance with firm procedures and auditing standards. Their purposes are to evaluate personnel on the quality of their work, and highlight pervasive issues that require changes to firm practice or further training (e.g., Houston and Stefaniak 2013; Bell et al. 2015). As a condition of belonging to a GNF, member firms are required to conduct IQRs of their audits, including CAs. Selection of inspection targets is risk-based, and each partner's performance is assessed on at least one engagement every three to five years (Houston and Stefaniak 2013; Deloitte 2020). Recently available transparency reports from GNFs and their member firms cite network oversight of the process.[7] To the extent that IQR processes are centrally controlled, there should be more consistency across countries. While the extent of GNF control of member firms' IQR programs during our sample period is unknown, regulatory attention in recent years has encouraged GNF member firms to improve monitoring of CAs (e.g., Doty 2013; PCAOB 2020).

Due to IQRs' proprietary nature, empirical research is scant. Houston and Stefaniak (2013) report that IQR outcomes affect auditors' professional reputations, compensation and promotions. Internationally, Downey and Westermann (2021) report that IQRs have consequences for member firms, with deficient firms being put on training plans, subject to greater global firm involvement, and reviewed more regularly for compliance with global methodology. IQRs' importance to firm quality control is also confirmed by Bell et al. (2015). Examining archival data from a single U.S. firm during the pre-SOX period, they find that IQR outcomes for issuer clients improve with auditor tenure and non-audit services. Bell et al. (2015) report that the firm's selection model is proprietary. Relevant to our international context, Bik and Hooghiemstra (2018) analyze one GNF's IQR data from 29 member firms. While they find that variation across firms in compliance with GNF policies on fraud risk assessment is based on cultural differences, they do not study the selection process.

[7] For example, EY (2019) reports that "the EY Professional Practice group has a central role in developing, monitoring and enhancing the quality of Assurance practices … and monitors audit quality and risks through internal inspections processes."

Recent research uses data on IQRs submitted by U.S. GNF member firms to the PCAOB to study association with publicly available audit quality measures. Aobdia (2019) provides univariate comparisons of factors distinguishing internally inspected issuer audits, finding that inspected engagements are larger, more complex, and riskier. Unsatisfactory outcomes are more often identified in smaller engagements and are associated with restatements, supporting that IQR deficiencies are meaningful indicators of audit quality. Further, Aobdia and Petacchi (2020) show that engagement effort increases following unfavorable internal inspection outcomes, which in turn is associated with improved financial reporting quality. Both Houston and Stefaniak (2013) and Aobdia and Petacchi (2020) suggest that partners can predict inspection targets, which could reduce effectiveness of IQRs relative to independent PCAOB inspections.

In sum, information from audit practice and limited academic research validates the role of IQRs in improving audit quality. Despite the importance of CA audit quality, the processes and outcomes of IQRs for CAs of U.S. issuer engagements are as yet unstudied. We build on prior research by investigating risk factors affecting both selection and outcomes of IQRs of CA engagements in non-U.S. members of the largest GNFs.

Regulatory Inspections of Audit Engagements

The PCAOB's international inspection program (covering both lead and CA work by foreign firms) was initiated in 2005, and began to examine substantial numbers of CAs in 2010. Information provided by the PCAOB indicates that about 27 percent of international engagement inspections covered CA work during our sample period (2010-2017).[8] The PCAOB's international program is distinct from the U.S. domestic inspection program (e.g., engagement selection). Thus, CA work by foreign firms is often not

[8] PCAOB inspection reports for non-U.S. firms separately disclose engagements in which they played a lead or other (component) role. For instance, the 2017 PCAOB inspection report for PricewaterhouseCoopers Auditores Independentes, the Brazilian firm of PwC, shows that in the 2017 inspection year, this firm led audits of nine U.S. issuers, and had a CA role for 78 other U.S. issuers. PCAOB inspectors examined two issuer engagements and one CA, identifying Part I deficiencies in all three engagements (PCAOB 2017b). Regarding the CA, the report states (p. 5), "One of the deficiencies was of such significance that it appeared to the inspection team that the Firm had not obtained sufficient appropriate audit evidence to fulfill the objectives of its role in the audit."

inspected for the same period as the group audit work performed by the U.S. firm (Downey and Westermann 2021).

In general, PCAOB inspection outcomes have more impact than IQRs, as they are publicly reported and can lead to legal sanctions.[9] Considerable research finds that PCAOB inspections of U.S. domestic audit work are consequential for audit quality, audit firms, and individual auditors.[10] We focus our discussion on research examining foreign triennially inspected firms, consistent with our sample. Several studies confirm the value of PCAOB international inspections (e.g., Lamoreaux 2016; Krishnan, Krishnan, and Song 2017; Fung et al. 2017; Kim, Su, Zhou, and Zhu 2020). Studying foreign-domiciled U.S. issuers audited by non-U.S. firms, Bishop, Hermanson, and Houston (2013) and Flasher and Schenk (2019) find fewer Part I deficiencies among GNF members. Bishop et al. (2013) also find that deficiencies are more often identified for smaller firms with larger portfolios of U.S. issuer clients. Further, Flasher and Schenck (2019) find fewer deficiencies identified among GNF members that primarily do CA engagements for U.S. firms, implying a positive influence of greater experience with the U.S. clients. In summary, evidence from prior research suggests that PCAOB inspections of non-U.S. firms improve audit quality at the firm level, and that Part I deficiencies are more likely for certain types of non-U.S. firms.

Hypotheses Development

The above cited literature on both IQRs and PCAOB inspections describes selection of target engagements as risk-based. As our data comprise a number of potentially relevant risk factors, we apply a conceptual model to organize our analysis, shown in Figure 1. The model considers factors affecting the

[9] For example, CA partners were censured, fined, and barred from working for a public accounting firm registered with the PCAOB in enforcement actions involving CA audits of Baldwin (Japan), EZCORP (Mexico), and Sara Lee (Brazil), see PCAOB (2014; 2017c; 2018).

[10] For instance, prior research documents that Part I deficiencies for U.S. firms are associated with other measures of audit quality. For instance, Aobdia (2019) finds association with restatements and abnormal accruals. Several studies document subsequent improvement in audit quality following identification of Part I deficiencies: engagement effort increases (DeFond and Lennox 2017) and auditor reporting improves (going concern reporting, Gramling, Krishnan and Zhang 2011; and material weakness reporting, DeFond and Lennox 2017). Other studies (Daugherty, Dickins, and Tervo 2011; Abbott, Gunny, and Zhang 2013; Aobdia 2018) find that involuntary dismissal by clients increases after deficiency reports. Johnson, Keune, and Winchel (2019) and Westermann, Cohen, and Trompeter (2019) describe the difficulty of the inspection process for individual auditors and the penalties following negative outcomes. Daugherty and Tervo (2010) report concern that inspections damage ability to attract and retain audit personnel.

risk that CA supervisors at two levels will fail to detect noncompliance: (1) the CA engagement team within the non-U.S. firm; and (2) the lead U.S. team.[11] The model's constructs apply to both inspection selection and occurrence of noncompliance, although specific significant factors may differ between selection and outcome models, and between internal and PCAOB inspection processes (e.g., Aobdia 2019).

Insert Figure 1 About Here

Level 1: Factors Affecting Risk of Component Auditor's Noncompliance

The first element in Level 1 concerns the risk of CA firm noncompliance; i.e., the work done in response to lead team instructions is not performed according to PCAOB standards. CA firm personnel's relative familiarity with PCAOB standards is likely a key risk factor. The auditing literature has long recognized that sufficient relevant knowledge specific to the task domain (e.g., knowledge of the client, its business setting, and deep familiarity with auditing standards) is crucial in achieving audit quality. This knowledge is not necessarily gained from education or general experience, but rather builds through multiple direct exposures to task demands (e.g., Knechel, Krishnan, Pevzner, Shefchik, and Velury 2013). While non-U.S. firm personnel may have requisite knowledge for local engagements using IAASB or country-specific auditing standards, the CA setting requires auditing to PCAOB standards and compliance with stringent U.S. financial regulation. Downey and Bedard (2019) report U.S. lead auditors' view that knowledgeable and experienced CA personnel are essential to achieving a high-quality global group audit. However, lead auditors are likely to have little control over CA staff assignment as client location, GNF membership, and the CA partner usually determine staff assignments (Downey and Westermann 2021).

As illustrated in Figure 1, we propose that CA noncompliance risk increases with factors potentially associated with lower task knowledge, including engagement-level requirements (i.e., local application of U.S.-specific PCAOB standards and CA team testing of internal controls over financial reporting; ICFR). This construct also includes short CA firm tenure, theorized to be associated with lower audit quality due

[11] Our construct level hypotheses are worded as non-directional for convenience. We propose signs for some individual variables based on support in prior literature.

to insufficient client knowledge.[12] Most prior studies on determinants of PCAOB inspection findings do not address audit firm tenure, as publicly available data do not identify inspected engagements. However, using proprietary data from the PCAOB on U.S. firms, Aobdia (2019) finds univariate evidence of more Part I deficiencies for first year clients, while Gipper, Hail, and Leuz (2020) find more Part I deficiencies in the initial partner cycle (years one through five) after a firm switch. Similarly, Bell et al. (2015) find more negative IQR outcomes among first-year clients. However, none of the above studies consider firm tenure at the CA level, where the primary relationship with client leadership is maintained by the lead firm. Further, we examine the influence of the firm's experience with U.S. issuer audits, found by prior research to be associated with PCAOB Part I deficiencies (Hermanson, Houston, and Rice 2007). Our first construct-level hypothesis is:

H1: Selection of inspection targets and deficiencies in compliance with auditing standards will be associated with relevant knowledge and experience of CA firm personnel.

The second element in Level 1 concerns CA engagement economics. The total GGA fee is allocated across participants through negotiation between the lead and CA firms based on planned work and local wage rates (Sunderland and Trompeter 2017; Downey and Westermann 2021). Sunderland and Trompeter (2017, 178) note that the outcome of this negotiation has potential consequences for audit quality: "Allocating too much to component auditors may leave too little for effective group audit and coordination of the global engagement, while too little may result in insufficient incentive for the component auditor to provide a quality audit." This allocation is important because CA firms do not bear the same legal and/or regulatory liabilities as the lead auditor (Downey and Westermann 2021) and therefore may choose to preserve profitability by decreasing effort when allocated insufficient fees.

Prior studies have investigated issuer-level engagement profitability using proprietary data from firms, abnormal fees developed from publicly available information, or PCAOB-provided data. Of the few

[12] We measure both ends of the tenure spectrum, classifying the variables in different categories of the model based on the primary risk associated with each. Specifically, short tenure is a Level 1 factor due to the greater risk of CA noncompliance associated with lack of client knowledge. Long tenure is a Level 2 factor, due to greater risk of the CA supervisor's failure to detect or report instances of noncompliance, associated with client dependence.

studies explicitly measuring profitability using billing rates (fee per audit hour) or realization rates (the ratio of the audit fee billed to the standard audit fee), most are limited in linking to audit quality as firms generally suppress client identities when providing proprietary data. Further, all focus at the issuer level. A number of studies proxy for engagement profitability using abnormal audit fees, but the direction of association with audit quality is unclear. Pre-SOX studies generally find lower audit quality with higher abnormal fees, consistent with economic bonding (e.g., Asthana and Boone 2012). In contrast, some post-SOX research finds lower audit quality with lower abnormal fees, consistent with constrained resources (e.g., Blankley, Hurtt, and MacGregor 2012; Lobo and Zhao 2013).[13] Our second hypothesis is:

H2: Selection of inspection targets and deficiencies in compliance with auditing standards will be associated with engagement profitability.

Figure 1 next presents the influence of relative strength of the national regulatory environment and audit market in supporting high-quality CAs. Our focus on auditing regulation includes the local audit regulator's international affiliations, identified as cooperation agreements with the PCAOB and membership in the International Forum of Independent Audit Regulators (IFIAR). While Bishop et al. (2013) find no differences in Part I deficiencies based on whether the PCAOB acts alone or cooperates with a local regulator in conducting the inspection, a later study by Krishnan et al. (2017) observes greater improvement in audit quality in countries with cooperative agreements requiring joint PCAOB inspections, relative to stand-alone inspections. This construct further considers the national environment with regard to U.S. referred audit work. More extensive exposure to U.S. CA work in the country as a whole should lead to development of formal and informal norms that facilitate local firms in complying with standards required by the lead auditor. Our third hypothesis is:

H3: Selection of inspection targets and deficiencies in compliance with auditing standards will be associated with country environment; i.e., regulatory strength and U.S. business presence.

Level 1 also includes the risk that CA team supervisors will fail to detect noncompliance before the work is communicated to the lead team. One factor likely contributing to supervision failure is the relative

[13] Although a few studies use PCAOB data on realization rates (e.g., Aobdia, Choudhary, and Newberger 2021; Gipper et al. 2020; Zimmerman, Barr-Pulliam, Lee, and Minutti-Meza 2020), they are not related to the CA context.

size of the audit firm. At the issuer level, several studies find higher audit quality for larger firms leading engagements (Hermanson et al. 2007; Bishop et al. 2013), consistent with more centralized procedures and controls that should support supervisors in monitoring engagement quality. However, the CA context differs because it features conflict between local engagements and referred work from other countries (Sunderland and Trompeter 2017). Particularly, large non-U.S. firms may focus on their own premier local clients at the expense of CA work where they play more of a "supporting" role. If so, these firms may not assign their best supervisors to CA engagements, or appropriately incentivize personnel to perform and scrutinize CA work, relative to locally led engagements (Sunderland and Trompeter 2017; Downey and Westermann 2021). Burke et al. (2020) address firm size in the GGA context, finding that issuer level restatements are more likely when the aggregate percentage of hours allocated to small CA firms is relatively high. While this finding suggests lower audit quality among small non-U.S. firms, it is also possible that the financial reporting problems result from characteristics of issuers or lead teams in those situations. Our analysis at the CA firm level is needed to complement their findings.

Firm structure (i.e., the ratio of staff to partners) may also affect the risk of CA firm supervision failure. A longstanding line of management research argues that supervisors have greater difficulty controlling work as their span of control (number of subordinates) increases (e.g., Thiel, Hardy, Peterson, Welsh, and Bonner 2018). While this implies that deficiencies should be associated with a higher ratio of staff to partners, two studies of PCAOB issuer audit inspections (Hermanson et al. 2007; Bishop et al. 2013) find deficiencies are instead associated with a lower ratio of staff to partners. Thus, the expected direction of firm structure is unclear.

Level 1 also includes longer CA firm tenure, as dependence on client revenues could affect CA supervision quality through failure to closely scrutinize engagement personnel. DeFond and Zhang (2014) report that while most studies find higher audit quality for longer-tenure engagements, some find the opposite effect. We are aware of only one study of inspection outcomes that differentiates long (relative to mid-range) firm tenure. In a pre-SOX sample, Bell et al. (2015) find higher audit quality for long-tenure

issuer clients. In the GGA context, Downey and Westermann (2021) report that CA teams do not always appreciate U.S. norms around independence, which could lead to greater client dependence in the CA setting, relative to U.S. lead firms.

H4: Selection of inspection targets and deficiencies in compliance with auditing standards will be associated with factors affecting detection and reporting of noncompliance by CA supervisors.

Level 2: Factors Affecting Risk of the Lead Auditors' Failure to Detect CA Noncompliance

Figure 1, Level 2 presents the risk that the lead team will fail to detect instances of noncompliance in the CA's work. This level of the model represents the unique scenario in which the personnel of one audit firm are supervising the work of another legally separate firm. As we note above, lead teams are challenged by lack of visibility into detailed processes and outcomes of CA work. They typically must rely on summary memoranda from the CA teams, rather than original workpapers (e.g., Downey and Bedard 2019). Under these conditions, the lead team will likely have more difficulty monitoring work when CA activities are more extensive; i.e., a full scope audit versus limited procedures, and/or a larger proportion of group audit hours. However, the direction of influence of the relative size of the component to the consolidated issuer is less clear. While CA work on a larger component may be more challenging to monitor, larger components may have stronger local management, systems, and controls (e.g., Doyle, Ge, and McVay 2007).

H5: Selection of inspection targets and deficiencies in compliance with auditing standards will be associated with the extent of CA work.

Relative communication difficulty between teams is another element of GGA supervision risk. While language is a possible factor, prior research is limited, and findings differ. Burke et al. (2020) find that non-U.S. auditors' participation is more detrimental to audit quality when more aggregate audit hours are allocated to countries with relatively low use of English. In contrast, Downey and Bedard (2019) find that lead team personnel do not perceive that language and cultural barriers significantly affect challenges in group audits, which may be explained by their reliance on summary memoranda written in English. However, these studies do not directly observe the language used in the workpapers. While documentation

and compliance by CA personnel may improve when using the native language, the reporting package sent to the lead team is in English. If some details are lost in translation, CA noncompliance may not be detected (Downey and Westermann 2021). Distance is a further factor in communication difficulty, as found by several recent studies showing that lower audit quality is associated with greater distance between clients and auditors (e.g., Choi, Kim, Qiu, and Zang 2012; Francis, Golshan, and Hallman 2019). In the GGA context specifically, Burke et al. (2020) find that audit quality decreases as more aggregate audit hours are allocated to CA teams that are farther away from lead teams.

H6: Selection of inspection targets and deficiencies in compliance with auditing standards will be associated with factors affecting communication between the CA firm and lead team.

III. METHOD

Sample Development

We develop a sample of CA engagements for GNF-audited U.S. issuers, using proprietary data from the PCAOB and public sources.[14] Information on IQRs is derived from PCAOB data, required to be completed by non-U.S. audit firms in advance of their inspection period, covering CA engagements for U.S. issuers. As shown in Table 1, our sample period starts in 2010, the first fiscal year that data were widely compiled by the PCAOB, and ends in 2017, the latest year that data are available for our research. We begin with 13,376 unique CA engagements in 2010-2017 where the group CIK is provided. We then merge with the Compustat Fundamental Annual Domestic dataset, resulting in the loss of 6,324 observations, including: components of groups that do not issue debt/equity in the U.S., components of foreign U.S. issuers, and invalid CIKs. We omit 723 benefit plan audits, and remove 809 duplicate observations (i.e., the same CIK, country of CA, year, and engagement hours). Another 2,375 observations are omitted due to missing values for at least one variable in our models (with the exception of *COMP_BILLRATE_TO_COUNTRY,* the profitability of the CA engagement relative to others in its country/year). The full sample comprises 3,145 observations (1,829 unique components and 788 unique

[14] As our data are derived from information submitted by foreign audit firms in advance of PCAOB inspections, our sample does not include countries that do not allow PCAOB inspections within their borders (e.g., the People's Republic of China).

U.S. issuers) that we use for descriptive analysis. Our procedure for computing *COMP_BILLRATE_TO_COUNTRY* requires at least five observations in a country/year, resulting in a loss of 537 observations; thus, Model 1 is estimated on 2,608 observations.

Insert Table 1 About Here

Dependent Variables and Models

Our hypotheses concern determinants of internal inspection selection, as well as IQR and PCAOB inspection outcomes. Table 2 defines dependent and independent variables, listing sources of data and expected signs. Table 2 Panel A shows that the dependent variable for Model 1, *IQR_INSPECTION,* derived from PCAOB data, asks the firm whether or not the CA engagement was selected for IQR within the prior two years. Model 1 is a probit with robust standard errors clustered on the country of the CA work:

$$IQR\_INSPECTION = \beta_0 + \beta_1\text{-}\beta_{10}\ [Factors\ affecting\ risk\ of\ CA\ noncompliance\ with\ standards;\ H1\text{-}H4] + \beta_{11}\text{-}\beta_{15}\ [Factors\ affecting\ risk\ of\ the\ lead\ auditor's\ failure\ to\ detect\ CA\ noncompliance;\ H5\text{-}H6] + [control\ variables] + [year\ fixed\ effects] + \varepsilon \quad (1)$$

Insert Table 2 About Here

We test our hypotheses regarding determinants of IQR deficiencies using Model 2, a probit with robust standard errors estimated in the subsample of CAs selected by the firm for IQR. The dependent variable *IQR_DEF,* defined in Table 2 Panel B, indicates whether or not the IQR revealed a deficiency in the CA work. Model 2 is:

$$IQR\_DEF = \beta_0 + \beta_1\text{-}\beta_{10}\ [Factors\ affecting\ risk\ of\ CA\ noncompliance\ with\ standards;\ H1\text{-}H4] + \beta_{11}\text{-}\beta_{15}\ [Factors\ affecting\ risk\ of\ the\ lead\ auditor's\ failure\ to\ detect\ CA\ noncompliance;\ H5\text{-}H6] + [control\ variables] + [year\ fixed\ effects] + \varepsilon \quad (2)$$

In addition to estimating the above models independently, we also apply the Heckman maximum likelihood procedure with Model 1 as the selection equation and Model 2 as the outcome equation. Following prior auditing research in contexts in which a valid exclusion variable is not available (Aobdia 2019; Choudhary et al. 2019), we use the approach of Altonji, Elder, and Taber (2005) through Stata code provided by Cook et al. (2020), testing sensitivity to varying assumptions of the correlation between

unobservables in the selection and outcome equations (*rho*).[15]

Model 3 is a probit of similar form, investigating determinants of Part I deficiencies in the subsample of PCAOB-inspected engagements. Table 2 Panel C defines the dependent variable, *PCAOB_DEF,* which indicates whether a Part I deficiency was identified in CA work. Model 4 is a Poisson regression using an alternative dependent variable, *PCAOB_DEF _NUM,* which equals the number of Part I deficiencies identified.[16] As with the IQR models, we also model PCAOB deficiencies jointly with our estimated PCAOB selection equation, which includes the same independent variables as Model 1. To do so we use Heckman maximum likelihood and test sensitivity to variation in the assumed level of *rho*.[17]

$$PCAOB\_DEF/\ PCAOB\_DEF\_NUM = \beta_0 + \beta_1\text{-}\beta_{10}\ [Factors\ affecting\ risk\ of\ CA\ noncompliance\ with\ standards;\ H1\text{-}H4] + \beta_{11}\text{-}\beta_{15}\ [Factors\ affecting\ risk\ of\ the\ lead\ auditor's\ failure\ to\ detect\ CA\ noncompliance;\ H5\text{-}H6] + [control\ variables] + [year\ fixed\ effects] + \varepsilon \quad (3/4)$$

Test Variables

Level 1: Factors Affecting Risk of Component Auditor's Noncompliance

Level 1 of Figure 1 focuses on the risk that instances of noncompliance occur, and are not detected by CA firm supervisors.[18] Specific measures are shown in Table 2 Panel A. H1 concerns the CA team's knowledge and experience. *COMP_PCAOB_STDS* indicates whether the CA team conducts the audit under PCAOB standards or relies on the lead auditor to convert work from local to PCAOB standards. We expect a positive sign, as risk increases when the CA team conducts the audit under less familiar PCAOB standards. Similarly, we expect greater risk of noncompliance when the CA team tests internal controls (*COMP_ICFR*), as ICFR testing is required in few non-U.S. jurisdictions. *COMP_SHORT_TENURE* indicates whether the CA firm has held the engagement for three or fewer years. We expect a positive sign

[15] Following Aobdia (2019), we test robustness assuming *rho* = 0.1, 0.2, 0.3, 0.4, and 0.5 against our independent models that assume *rho* = 0.0 (untabled). Inferences are similar across all values of *rho.*

[16] Model 4 is limited in that we are unable to control for selection bias. The heckpoisson procedure cannot be used as we lack a valid exclusion variable, and the Cook et al. (2020) *rho* sensitivity procedure does not yet allow for application to Poisson models.

[17] We are unable to present the results of our estimated PCAOB selection equation "to preserve the confidentiality of the PCAOB inspection process" (Aobdia 2018, 54).

[18] As we expect that audit firms assess the risk of noncompliance when selecting engagements for their internal inspection programs, variables and expected signs are similar across models.

based on results of Bell et al. (2015), Aobdia (2019) and Gipper et al. (2020). *FIRM_US_ISSUER_ EXP* indicates the number of U.S. issuer audits for which the CA firm signs the opinion in year *t*. We expect a negative sign, as fewer U.S issuer audits suggest less expertise with U.S. standards and regulations.

H2 predicts that supervision risk is associated with engagement profitability. To account for variation in exchange rates and labor markets across countries, we compute *COMP_BILLRATE_TO_ COUNTRY* as the bill rate for the engagement (CA fees over CA hours), divided by the average bill rate for CA engagements in country *i* in year *t* (requiring at least five observations with available bill rate in the country/year). Given the lack of research directly addressing the CA setting, we do not predict a sign for this variable.

H3 concerns the country environment. We measure regulatory strength through international cooperation with other regulators. *COUNTRY_REG_RISK* indicates that the local regulator does not have a cooperation agreement with the PCAOB, and is not a member of IFIAR. We expect a positive sign, signaling weaker regulatory strength in jurisdictions not having these relationships. We also address the local business environment using *COUNTRY_US_COMP_EXP;* i.e., the number of CAs within the CA country in year *t*. Jurisdictions where CAs are more common benefit from an increased concentration of U.S. business (and business norms); thus, we expect a negative sign on this variable.

H4 concerns risk that CA firm supervisors will fail to detect noncompliance during the engagement. Factors in this category include *FIRM_LN_TOTAL_CPAS,* the natural logarithm of the total number of certified accountants in the CA firm. We do not predict a sign ex ante: while prior research on issuers shows that larger CA firms may be more developed in both talent and quality control, CA work may be less important in a larger firm's portfolio and thus provide less incentive for close supervision. *FIRM_STAFF_ TO_ PARTNER_RATIO* measures the number of staff relative to partners at the CA firm. We do not predict a sign; the span of control literature suggests greater risk with more staff to partners, but research on PCAOB inspections of issuer audits cited above suggests deficiencies increase with fewer staff to partners.

COMP_LONG_ TENURE indicates that the CA firm has held the engagement for ten or more years. While longer tenure may impair CA firm independence, prior literature at the issuer level produces mixed results.

Level 2: Factors Affecting Risk of the Lead Auditors' Failure to Detect CA Noncompliance

Level 2 encompasses factors pertaining to the risk that the lead auditor does not detect noncompliance with auditing standards in work of the CA team. H5 considers the nature and extent of CA work under the lead auditor's oversight. *COMP_FULL_SCOPE* indicates whether the CA team performs a full scope audit of the local component financial statements or more limited audit procedures. We expect a positive coefficient as full scope audits require greater supervision; there is more work to supervise, and the CA team likely has greater discretion in a full audit. We also measure relative size of the CA engagement to the total group audit using two measures. *COMP_GROUP_HOURS* is the percentage of CA hours to total audit hours for the group. We expect a positive sign, as a higher percentage should increase the lead auditor's difficulty in reviewing the work performed. We also use *COMP_GROUP_REV,* a revenue-based measure of the relative size of the component to the issuer.[19] We do not predict a sign; although larger components may be more difficult to monitor, they may benefit from stronger local management, systems, and controls (e.g., Doyle et al. 2007).

H6 considers communication difficulties as a factor potentially contributing to the risk that the lead auditor will fail to detect noncompliance in CA work. *COMP_NON_ENGLISH* indicates whether CA workpapers are maintained in a language other than English, representing a barrier to lead auditor review. We do not predict a direction for *COMP_NON_ENGLISH*. Documentation and compliance may improve when CA personnel use their native language, but the translation needed to prepare the English-language reporting may lead to errors or omissions (Downey and Westermann 2021). *COMP_TIME_ZONE_DIFF* measures absolute hours between CA firm and lead auditor offices. We expect a positive sign, as lead auditors should experience greater challenges communicating with CA personnel when there is less overlap in working hours, increasing reliance on asynchronous communication.

[19] We measure relative size using assets for three observations for which component revenues are not available.

IV. RESULTS

Descriptive Statistics

Table 3 presents descriptive statistics on IQRs and PCAOB inspections of CA engagements in our sample. Table 3 Panel A shows that of the 3,145 CA engagements in the full sample, 9.9 percent were subject to IQR within the last two years, and 3.5 percent were inspected by the PCAOB.[20] Table 3 Panel B shows a notably lower rate of deficiencies in IQRs (23.5 percent) relative to PCAOB inspections (36.7 percent). This suggests that the PCAOB inspection process is more stringent, consistent with Aobdia (2019) and qualitative research such as Westermann et al. (2019). Interestingly, the rates of deficiencies identified in both IQR and PCAOB inspections for non-U.S. CA engagements are higher than inspections of audits with opinions signed by U.S. firms as reported by Aobdia (2019) (23.5 vs. 7.7 percent for IQRs; 36.7 vs. 27.5 percent for PCAOB). Table 3 Panel C shows that Big 4 firms represent 98.5 percent of the full sample, and is similarly high in the inspection subsamples. Further, untabled analysis shows that U.S. lead auditors nearly always rely on non-U.S. member firms of their own networks (99.1 percent of the full sample).

Insert Table 3 About Here

Of the 49 countries in which the PCAOB inspected audit firms during the sample period, 35 are represented in our full sample.[21] Table 3 Panel D provides descriptive statistics for these countries. Column 1 shows that the greatest numbers of observations are in the U.K., Germany, Mexico, Japan, France, Brazil, and Canada. Untabulated analyses show that 24 of the 35 countries report selecting CAs for IQR, where the number of CAs selected for IQR by country range from one to 52. The remaining countries did not report any IQRs for the CAs in our sample (including Singapore with 63 CAs performed). For countries reporting IQRs, the number of IQR deficiencies range from zero to 13 with eight countries identifying no IQR deficiencies (including the Netherlands, with 125 CAs performed and 8 IQR inspections).[22] Column 2

[20] PCAOB inspections are reported on a one-year window, while internal inspections are reported for a two-year window, and thus their frequency is overstated.
[21] In the other 14 instances, the inspected firms either did not provide the data necessary to be included in our sample, or signed the audit opinion only for a foreign domiciled U.S. issuer (i.e., led a U.S. issuer audit and did not serve as a CA team on any additional U.S. engagements).
[22] We are unable to table IQR descriptives by country to preserve the confidentiality of the CA firms.

shows the number of CAs selected for PCAOB inspection, and Column 3 shows the number of CAs with at least one Part I deficiency. While PCAOB inspections of CAs in many countries identify no deficiencies, others have a fairly high proportion (e.g., France, Germany, Mexico, and South Africa). Columns 4 indicates that in 19 countries, the local regulator maintains a cooperation agreement with the PCAOB for international inspections. Column 5 shows that of the 16 countries without PCAOB cooperation agreements, ten are also not members of IFIAR (and thus, *COUNTRY_REG_RISK* = 1 for firms in those countries).

Table 4 presents descriptive statistics for test and control variables. The full sample is described in Columns 1-3, while Columns 4-6 and 7-9 present subsamples for which *IQR_INSPECTION* = 1 or 0, respectively. These descriptive statistics provide new information on CA characteristics; below, we discuss these characteristics, ordered by engagement and firm level. First, our data provide insight on CA engagement characteristics, including the nature, documentation, and extent of CA work; the auditor/client relationship; and engagement economics. Most CA engagements (87 percent) are conducted in accordance with PCAOB standards (*COMP_PCAOB_STDS)*; in the remainder, the lead auditor is presumably responsible for translating from ISA/local to PCAOB standards. A large percentage of CAs involve ICFR testing (65 percent), which prior research suggests can be challenging for non-U.S. auditors (Downey and Westermann 2021). Full scope audits are conducted in 38 percent of the sample. Engagements in which workpapers are not in English constitute 51 percent of the sample. In countries where English is not the primary language, workpapers are frequently documented in the local language (76 percent, untabled), implying translation is needed to prepare the reporting package for the lead auditor. The ratio of the engagement billing rate relative to its country/year (*COMP_BILLRATE_TO_ COUNTRY*) is 1.01 with a wide range (0.14 to 5.86, untabled). The average CA firm tenure is 7.92 years (untabled).[23] Table 4 shows that 30 percent of the full sample have tenure of three or fewer years (*COMP_SHORT_TENURE*), while 38 percent have tenure of ten to 106 years *(COMP_LONG_ TENURE*).

[23] In comparison, lead auditor tenure is longer, averaging 25.70 years, and ranging from one to 122 years. CA firm tenure and lead auditor tenure are positively (but not highly) correlated at 26.2 percent.

Insert Table 4 About Here

We measure the extent of CA work in terms of both hours and operations covered. Mean *COMP_GROUP_HOURS* is 5.36 percent, ranging from 0.06 to 48.02 percent of total group engagement hours. Engagements at the low end of the range likely involve procedures around a single audit process (e.g., inventory observation), while the high end of the range suggests more extensive work (e.g., full scope audits). Mean component relative to group revenues *(COMP_GROUP_REV)* is 6.43 percent, ranging from zero to 60.00 percent. The low end of this range suggests cost centers (e.g., subsidiaries with limited assets or revenues) and/or components scoped in due to specific risks, while the high end implies that revenue-generating activities of some components are larger than any remaining component of the group.

Second, we measure the size, structure, and experience of non-U.S. firms performing CA work for U.S. issuer audits. These firms average 1,199 total CPAs (6.57 when logged), and their average *FIRM_STAFF_TO_PARTNER_RATIO* is 14.91, ranging from 5.56 to 33.33. This range implies considerable variation in hierarchical structure; the span of control for partners in some firms is narrow (i.e., fewer staff per partner) and for others is wide (more staff per partner). The mean of *FIRM_US_ISSUER_EXP* indicates that sample firms on average signed approximately nine U.S. issuer audit opinions per year, beyond their CA work, ranging from no opinions (e.g., several firm/years in Malaysia) to 68 opinions (one firm/year in Canada) signed. In the following sections, we present results of our hypothesis testing models.

Results of Model 1: Selection of Engagements for Internal Inspection

Model 1 tests hypotheses regarding risk factors affecting selection of CA engagements for the firms' IQRs. The dependent variable *IQR_INSPECTION* equals 1 if the firm reported to the PCAOB that the CA engagement was subjected to IQR within two years of the reporting date; 0 otherwise. Table 5 Columns 1-2 present results of a probit model with robust standard errors clustered on country. The Pseudo R^2 is 11.6 percent and ROC area is 0.749 (acceptable discrimination). Columns 3-4 present results of Model 1 estimated as the selection equation in a Heckman maximum likelihood model (with Model 2 as the

outcome equation).[24]

Insert Table 5 About Here

Level 1: Factors Affecting Risk of Component Auditor's Noncompliance

H1 proposes that noncompliance risk in CA engagements is associated with relevant knowledge and experience of non-U.S. firm CA personnel. In Model 1, this implies that firms target IQRs toward CA engagements with risk factors related to knowledge and experience of CA personnel. Table 5 Column 1 Panel A shows that *COMP_PCAOB_STDS* and *COMP_ICFR* are both positive and significant (0.181, p <0.10; and 0.314, p <0.01, respectively), suggesting that the firm assesses risk when CA personnel are working under U.S.-specific auditing standards that they may infrequently encounter. Stata's *margins* command (with other variables held at their observed values) shows that the predicted probability of IQR is 7.6 (10.1) percent when the CA is not (is) conducted under PCAOB standards, and 6.7 (11.2) percent when ICFR are not (are) tested. *COMP_SHORT_TENURE* is unexpectedly negative and significant (-0.425, p <0.01, two-tailed); the predicted probability of IQR is 11.7 percent when CA firm tenure is more than three years and 5.8 percent otherwise. This sign is inconsistent with prior research at the issuer level, indicating that the firms do not assess higher risk from lack of client knowledge in the early years of CA firm tenure, perhaps because the lead team's client experience compensates.[25] Instead, the greater focus on clients not new to the firm suggests concern for lack of independence as tenure increases. Column 1 further shows that *FIRM_US_ ISSUER_EXP* is negative and significant (-0.011, p<0.01); predicted probability of IQR is 11.5 (7.6) percent at one standard deviation below (above) the sample mean (i.e., zero versus 23.5 U.S. issuer engagements, respectively).

H2 proposes that noncompliance risk is associated with the engagement's relative billing rate. While the coefficient on *COMP_BILLRATE_TO_COUNTRY* is negative and significant (-0.143, p <0.05),

[24] Statistical conclusions are generally similar across standard probit and Heckman versions of all models. When they differ, we rely on the Heckman version when those findings are consistent across assumed values of *rho* estimated using the Cook et al. (2020) procedure.

[25] Untabled statistics show that in the full sample, the lead auditor's tenure is greater than three years in 89.5 percent of the observations in which the CA firm is new to the client.

this finding is not robust to controlling for selection bias (Column 3). H3 predicts that risk of noncompliance is greater in country environments not conducive to supporting high quality CA work. Consistent with H3, *COUNTRY_REG_RISK* is positive and significant (0.335, p <0.01). The probability of IQR for a CA engagement is 14.9 percent when the country regulator does not have a cooperation agreement with the PCAOB and is not a member of IFIAR; 9.0 percent otherwise. Also consistent with H3, *COUNTRY_US_COMP_EXP* is negative and significant (-0.002, p <0.10); IQR probability is 11.5 (8.3) percent at one standard deviation below (above) the mean (29.1 versus 153.8 CAs in the country/year).

H4 proposes risk factors affecting CA firm supervisors' failure to detect or report instances of noncompliance. Firm size (*FIRM_LN_TOTAL_CPAS*) is not a factor in internal inspection selection. However, firm structure matters, as *FIRM_STAFF_TO_PARTNER_RATIO* is significant (-0.036, p < 0.01). The predicted probability of IQR is 13.1 (7.3) percent at one standard deviation below (above) the sample mean of *FIRM_STAFF_TO_PARTNER_RATIO* (9.7 versus 19.9 staff per partner). The finding that IQR is more likely when there are fewer staff to partners suggests concern for a relatively narrow personnel structure (i.e., fewer lower-level personnel to perform CA work, relative to a wider structure). *COMP_LONG_TENURE* (ten to 106 years) is insignificant, implying that firms do not differentially select CA engagements with a client relationship longer than ten years, which might compromise independence.

Level 2: Factors Affecting Risk of the Lead Auditors' Failure to Detect CA Noncompliance

H5 proposes that the lead team's supervision ability is associated with the CA engagement's scope or size. Table 5 Column 1 Panel B shows that the coefficient on *COMP_FULL_SCOPE* is positive and significant (0.305, p <0.01); predicted probability of IQR is 7.9 (12.7) percent when the local auditor performs limited procedures (a full scope audit of the component). Further, *COMP_GROUP_HOURS* is positive and significant (0.015, p <0.01); the predicted probability is 8.5 (11.4) percent at one standard deviation below (above) the sample mean (zero versus 12.4 percent). *COMP_GROUP_REV* is also positive and significant (0.008, p <0.10); the predicted probability is 9.1 (10.9) percent at one standard deviation below (above) the sample mean (i.e., zero versus 15.0 percent of total group revenue). H6 concerns

communication difficulties between teams. In Model 1, neither *COMP_NON_ENGLISH* workpapers nor *COMP_TIME_ZONE_DIFF* between lead and CA teams are significant. [26,27]

Summary

Results of Model 1 support several hypotheses regarding risk of noncompliance with auditing standards in CA engagements. We find that engagements are more likely to be targeted for IQR when the CA uses PCAOB standards or tests ICFR, when tenure is longer than three years, and when the CA firm has less experience as lead auditor of U.S. issuers (H1). Engagement profitability does not significantly affect IQR selection (H2). IQR is more likely in countries with environments weaker in supporting CA work for U.S. audits (H3). IQRs are more likely when there are fewer staff per partner, supporting firms' concern for insufficient staff to perform CA work, and/or insufficient seniors/managers to supervise it (H4). We also find several results supporting the risk that the lead U.S. team will fail to detect deficiencies in CA work. Inspections are more likely when the CA engagement comprises a full array of audit procedures and a relatively large share of the group audit, especially when measured using audit hours (H5). Model results do not support an influence of communication difficulty in selection of internal inspection targets (H6).

Results of Model 2: Deficiencies Identified by Internal Inspection

Model 2 tests hypotheses regarding risk factors associated with detection of noncompliance in IQRs of CA engagements. The dependent variable *IQR_DEF* indicates that the IQR found the CA deficient in the prior two years. Table 5 Columns 5-6 present Model 2, estimated as a probit with robust standard errors (Pseudo R^2 =15.7 percent; ROC area =0.751). For robustness, Columns 7-8 present Model 2 as the outcome equation in the Heckman maximum likelihood procedure with Model 1 as the selection equation.[28]

Level 1: Factors Affecting Risk of Component Auditor's Noncompliance

H1 concerns CA firm personnel's relevant knowledge and experience. Table 5 Column 5 Panel A

[26] We test the sensitivity of our models to measuring communication difficulties in miles (i.e., transportation concerns), instead of time zone difference (i.e., concurrent workdays). The alternative measure is nonsignificant in all tests.
[27] IQR probability increases with issuer size, *GROUP_LN_REVENUE* (0.144, p <0.01), and decreases with financial strength as measured as cash flow from operations, *GROUP_CFO* (-1.086, p <0.05). While *GROUP_GEO_SEG* is marginally significant in Column 1 (0.011, p <0.10), it is not robust to controlling for selection bias (Column 3).
[28] The number of countries relative to sample size prevent clustering standard errors on country in Models 2-4.

shows that only one H1 variable is significant: *COMP_PCAOB_STDS* (0.617, p <0.05). The predicted probability of IQR deficiency is 12.8 (26.5) percent when the CA uses local (PCAOB) auditing standards.[29] H2 is not supported, as *COMP_BILLRATE_TO_COUNTRY* is insignificant. H3 is supported in Model 2, as *COUNTRY_US_COMP_EXP* is negative and significant (-0.006, p <0.01). The probability of deficiency detection is 36.1 (17.5) for firms whose number of CAs for U.S. issuers is one standard deviation below (above) the mean of the internally inspected subsample (22.3 versus 136.5). Examining factors associated with CA firm supervisors' detection/reporting of noncompliance by their subordinates (H4), we find that *FIRM_LN_TOTAL_CPA* is positive and significant when controlling for selection bias (Column 7; 0.076, p <0.05). *FIRM_STAFF_TO_PARTNER_RATIO* and *COMP_LONG_TENURE* do not significantly affect IQR deficiency detection.

Level 2: Factors Affecting Risk of the Lead Auditors' Failure to Detect CA Noncompliance

H5 proposes that the risk of lead auditor failure to detect CA firm noncompliance with auditing standards is associated with the scope and extent of CA work. Consistent with H5, Table 5 Column 5 Panel B shows a positive sign for *COMP_GROUP_ HOURS* (0.018, p <0.10). The probability of a deficiency is 21.6 (29.2) at one standard deviation below (above) the mean (zero versus 16.1 percent of total group audit hours). H6 (communication difficulty) is not supported in Model 2. [30]

Summary

Results of Model 2 show that deficiency detection by IQRs is associated with measures relating to four of our six hypotheses. Regarding risk of CA firm noncompliance, we find more IQR deficient engagements where CA teams are auditing to PCAOB standards (H1). Deficient engagements are also more likely in countries with relatively few CAs of U.S. issuers (H3), and for relatively large CA firms (H4).

[29] While *COMP_ICFR* has an unexpectedly negative sign in Column 5 (-0.466, p <0.10), Column 7 shows it is not robust to controlling for selections bias. Further, while Column 7 shows that deficiencies are more likely for countries with greater regulatory risk (*COUNTRY_REG_RISK*) when controlling for selection bias (0.137, p <0.10), this result is not robust to alternative assumptions for *rho*.

[30] While *GROUP_LN_REVENUE* is negative and significant in Model 2 (-0.120, p <0.05), it is not robust to controlling for selection. We exclude *BIG_4* from Model 2 control variables due to perfect prediction (all deficiencies are detected in Big 4 firms, which dominate the sample).

Regarding risk of lead team failure to detect noncompliance (H5), internally detected deficiencies are more likely when the CA engagement forms a larger share of group hours.

Results of Models 3 and 4: Deficiencies Identified by PCAOB Inspections

Table 6 presents results of testing H1-H6 in the context of PCAOB inspections. The dependent variable is *PCAOB_DEF,* indicating detection of at least one Part I deficiency in the inspected CA engagement. Columns 1-2 present results of Model 3 estimated as a probit with robust standard errors (Pseudo R^2 =38.3 percent; ROC area=0.886). Columns 3-4 present results of Model 3 as the outcome equation of a Heckman maximum likelihood procedure in which the selection equation estimates factors associated with PCAOB inspections. Table 6 Columns 5-6 present results of Model 4, a Poisson regression whose dependent variable *PCAOB_DEF_NUM* is the number of PCAOB Part I deficiencies (Pseudo R^2 =33.0 percent).[31]

Insert Table 6 About Here

Level 1: Factors Affecting Risk of Component Auditor's Noncompliance

Testing H1 with regard to Part I deficiencies, we find that the only significant variable is *COMP_SHORT_TENURE* in Model 4 (Column 5; -1.181, p <0.05 two-tailed), which is unexpectedly negative. This implies that the number of Part I deficiencies is lower in early CA firm tenure, consistent with a beneficial effect of greater independence rather than less client knowledge.[32] Regarding H2, Model 3 results (Column 1) show that *COMP_BILLRATE_TO_ COUNTRY* is positive and significant (0.985, p <0.01). This implies that PCAOB inspectors are more likely to detect noncompliance in more profitable, rather than under-resourced, engagements. The predicted probability of a PCAOB Part I deficiency is 26.4 percent at one standard deviation below the subsample mean ratio of the CA's bill rate to other CAs in its country/year (41.5 percent), and 57.0 percent at one standard deviation above the mean (177 percent). We also observe a significant positive association of *COMP_BILLRATE_ TO_COUNTRY* in Model 4 (Column

[31] The dispersion parameter *alpha* for Model 4 is effectively zero; all model results are robust to using a negative binomial regression.

[32] As previously noted, a large proportion of new CA firms work with lead teams who are experienced with the client.

5; 0.765, p <0.01), implying the number of Part I deficiencies is greater for more profitable engagements. Neither H3 test variable is significant in Models 3 or 4.

Regarding H4, Column 1 shows that *FIRM_LN_TOTAL_CPAS* is positive and significant (0.793, p <0.01); the predicted probability of a Part I deficiency is 23.3 (60.5) percent at one standard deviation below (above) the subsample mean (5.4 versus 7.5; equivalent to 186 to 1,518 CPAs, unlogged). Column 5 shows significance for *FIRM_LN_TOTAL_CPAS* in Model 4 (0.868, p <0.05). These results suggest that for larger non-US firms (with a more dominant position in their local markets), CA work for U.S. issuers might not receive as much attention relative to local clients. *COMP_LONG_TENURE* is positive and significant (1.497, p <0.01); predicted probability of a deficiency is 25.2 (59.7) percent when CA firm tenure is fewer than ten (ten or more) years. Column 5 shows that *COMP_LONG_TENURE* is also significant in Model 4 (0.961, p <0.01). Thus, these models support risk associated with the CA firm's economic dependence on the U.S. CA work with respect to occurrence and number of Part I deficiencies.

Level 2: Factors Affecting Risk of the Lead Auditors' Failure to Detect CA Noncompliance

Results in Column 1 support H5 by showing that *COMP_FULL_SCOPE* is positive and significant (0.690, p <0.05). The probability of a Part I deficiency of 44.9 (28.7) percent for full scope (limited procedures) engagements. *COMP_GROUP_REV* is negative and significant in Model 4 (Column 5; -0.040, p <0.05). This suggests that numbers of deficiencies tend to increase when a larger proportion of the group is audited. Regarding H6, the coefficient on *COMP_NON_ENGLISH* is positive and significant in Model 4 (0.755, p <0.05), implying that the number of deficiencies increases when workpapers are maintained in a language other than English, consistent with the findings of Burke et al. (2020) who measure English proficiency at the country level.[33]

Summary

Models 3 and 4 results show that PCAOB inspectors are more likely to identify (and identify more)

[33] Table 6, Column 1, Panel C shows that Part I deficiencies are also associated with components of smaller issuers (*LN_REVENUE_GROUP* in Model 3 (-0.549, $\underline{p}$ <0.01) and Model 4 (-0.663, p <0.01)), and more complex issuers (*GROUP_BUS_SEG* in Model 4 (0.141, p <0.01) and *GROUP_GEO_SEG* in Model 3 (0.073, p <0.10) and Model 4 (0.069, p <0.10)).

deficiencies in more profitable CA engagements (H2) and as CA firm tenure increases (short tenure, H1; long tenure, H4). Both results suggest lack of independence at the CA firm as a possible underlying cause. We further find more Part I deficiencies associated with larger CA firms (H4) suggesting that supervisors might apply less attention to monitoring CA work from the U.S., relative to their own local clients. Regarding factors affecting lead teams' failure to detect CA noncompliance, results show more Part I deficiencies among more complex CAs (full scope audits) of smaller components (H5). Further, Part I deficiencies are more often detected when workpapers are not maintained in English, implying communication difficulties between lead and CA teams (H6).

CONCLUSIONS AND LIMITATIONS

Component audit quality is of interest to the PCAOB, whose international inspection program provides evidence of deficiencies in the work of many foreign firms contributing to audits of U.S. issuers, as well as to other auditing regulators worldwide. This study contributes to the literature on CA audit quality through inspections of completed engagements by both firms and the PCAOB. Inspections are important as they reveal audit process deficiencies that were not prevented or detected by firms' quality controls system during the engagement, and thus provide insight regarding where those systems are least effective. While extant literature analyzes data from inspections of U.S. firms' domestic work on issuers for which they sign the audit opinion, we examine CAs performed by foreign firms under the direction of U.S. lead teams. Research specifically at the CA level is important: the audit quality of lead U.S. firms might not apply to non-U.S. affiliates due to the many factors that potentially inhibit supervision across national lines (e.g., information asymmetry from the lead team's lack of visibility into CA work, variation in GNF member firms' adoption of network procedures, prioritization of local clients over CA work from other countries, and variation in country regulatory and business environments).

Our study of risk factors affecting selection and outcomes of IQR and PCAOB inspection programs of foreign CA firms in U.S. issuer engagements yields a number of specific findings, summarized in Table 7. Below, we discuss several key findings in light of prior literature. First, our data reveal that rates of both

IQRs and PCAOB inspections are lower for CAs than for U.S. firms on issuer engagements for which they sign the audit opinion (Aobdia 2019). This is not surprising, as the portion of the client audited by a given CA is usually (but not always) smaller than the lead firm. However, relative to Aobdia's (2019) data on U.S. firms, our results also show a higher rate of CA noncompliance in both IQR and PCAOB inspections. These results imply that CAs inspections are particularly critical to improving audit quality, and warrant greater focus by both firms and regulators.

Insert Table 7 About Here

Second, we present a number of findings on engagement-level characteristics, many of which are new to the literature. Particularly, our data reveal a high level of variability in CA engagements. In addition to variation in size (also demonstrated by publicly available Form AP data), we find that CA engagements differ considerably in the procedures performed, and that these differences are associated with our dependent measures. For example, firms focus IQRs on full-scope CA engagements, implying they assess higher risk due to greater complexity of a full audit and the greater discretion available to local firms in performing full audits relative to more specific procedures. PCAOB inspection findings bear out this concern, as Part I deficiencies are more likely for full-scope engagements. Another dimension on which CAs vary is whether they apply PCAOB standards or test ICFR. The firms' greater focus on such engagements in IQRs implies higher risk due to lack of familiarity among foreign auditors who predominately work with IAS or local standards. Consistent with this concern, IQR inspectors find more deficiencies in engagements conducted under PCAOB standards.

Another key factor on which CA engagements vary is relative engagement profitability, which we proxy using engagement billing rate relative to the country/year to remove effects of varying labor rates and currency fluctuation. While engagement profitability does not affect IQR selection or deficiencies, we find that Part I deficiencies are associated with more profitable CA engagements. Although our empirical methods are limited in directly comparing across programs,[34] these results suggest that greater revenue

[34] Although results within each sample are obtained using control for selection bias, cross-model comparisons are limited in that controlling for such bias does not guarantee that results can be generalized to the entire CA population.

dependence at the CA level may result in less objective internal inspections in non-U.S. firms relative to the PCAOB.

We also investigate CA engagement tenure, finding that Part I deficiencies are less likely for short tenure CAs. While this result contrasts with several studies finding greater risk of noncompliance for newer clients (Bell et al. 2015; Aobdia 2019; Gipper et al. 2020), it can be explained by considering that CAs involve two auditors. Our data show that most CA turnovers occur with experienced lead firms, implying that knowledge sharing between lead and CA teams early in the client relationship prevents errors due to the CA's lack of client knowledge. Further, we find greater risk of Part I deficiencies for longer CA tenure (i.e., greater than ten years), suggesting greater conciliation toward clients to retain revenues.

Third, our results for firm-level risk measures provide insight on CA quality. While IQRs are more likely to target non-U.S. firms that lead fewer U.S. issuer audits, this experience measure is not associated with either IQR or Part I deficiencies. Rather, our results point to firm size as a contributing factor, as we find more Part I deficiencies for larger CA firms. In combination, these factors suggest less attention toward CA work in these firms, relative to the local clients that make up most of their business. However, our finding of more Part I deficiencies for larger CA firms differs from Burke et al. (2020), who find issuer restatement is more likely when the audit aggregates to a relatively high use of smaller CA firms. It is not clear why research at the individual firm and aggregate levels should find differing results on firm size, but reconciliation is complicated by other differences across studies; e.g., our sample comprises more Big 4 firms, and our models control for other significant CA engagement and firm-level factors such as tenure and profitability. Future research should investigate this issue, as firm size is a key publicly available characteristic of audit firms.

In sum, this study provides an unprecedented view of the details of CAs and the factors associated with audit quality in those engagements. While data provided by the PCAOB enable this analysis, our study is limited by several features of these data:, including: (1) the nature and format of the information that firms submit to the PCAOB determines our variables; and (2) that we cannot trace deficiencies at the CA

level to consequences at the issuer level, because lead and CA firm inspections are not concurrent, and virtually all CA inspections are triennial.

Our findings suggest opportunities for further research to advance knowledge in this area. We suggest three possible directions, while recognizing that such research requires support from firms that may be difficult to obtain. First, the literature would be advanced if research could investigate firm quality control activities more directly through access to archival data. The availability of more detailed IQR information (such as examined by Bell et al. 2015) would enhance our understanding the nature of deficiencies detected internally, and the more rigorous remediation processes that firms currently report. Second, our findings on the great variability in CA activities lead to the question of how lead teams determine which components are in scope for GGAs, and which specific procedures the CA must perform over those components to achieve target assurance at the group level. While some prior research notes the importance of this highly complex issue (e.g., Sunderland and Trompeter 2017) or proposes models intended to guide practice (e.g., Stewart and Kinney 2013), we are unaware of research investigating how partners make these decisions, whether there is variation across firms or individual partners, and whether/how audit quality is associated with existing variation. Third, the literature would benefit from study of interactions between individual member firms and the "umbrella level" GNFs in performing quality control procedures. Qualitative research could describe the nature and extent of GNFs involvement in IQRs, and whether that involvement is contingent on certain features of the member firms (e.g., results of prior PCAOB inspections). In addition, interview or survey studies could investigate the experiences of auditors in non-U.S. firms when their engagements are inspected, either internally or externally. In sum, while our study provides an initial view of audit quality of U.S. CA work through the lens of inspections, much remains to be learned about this key aspect of audit quality.

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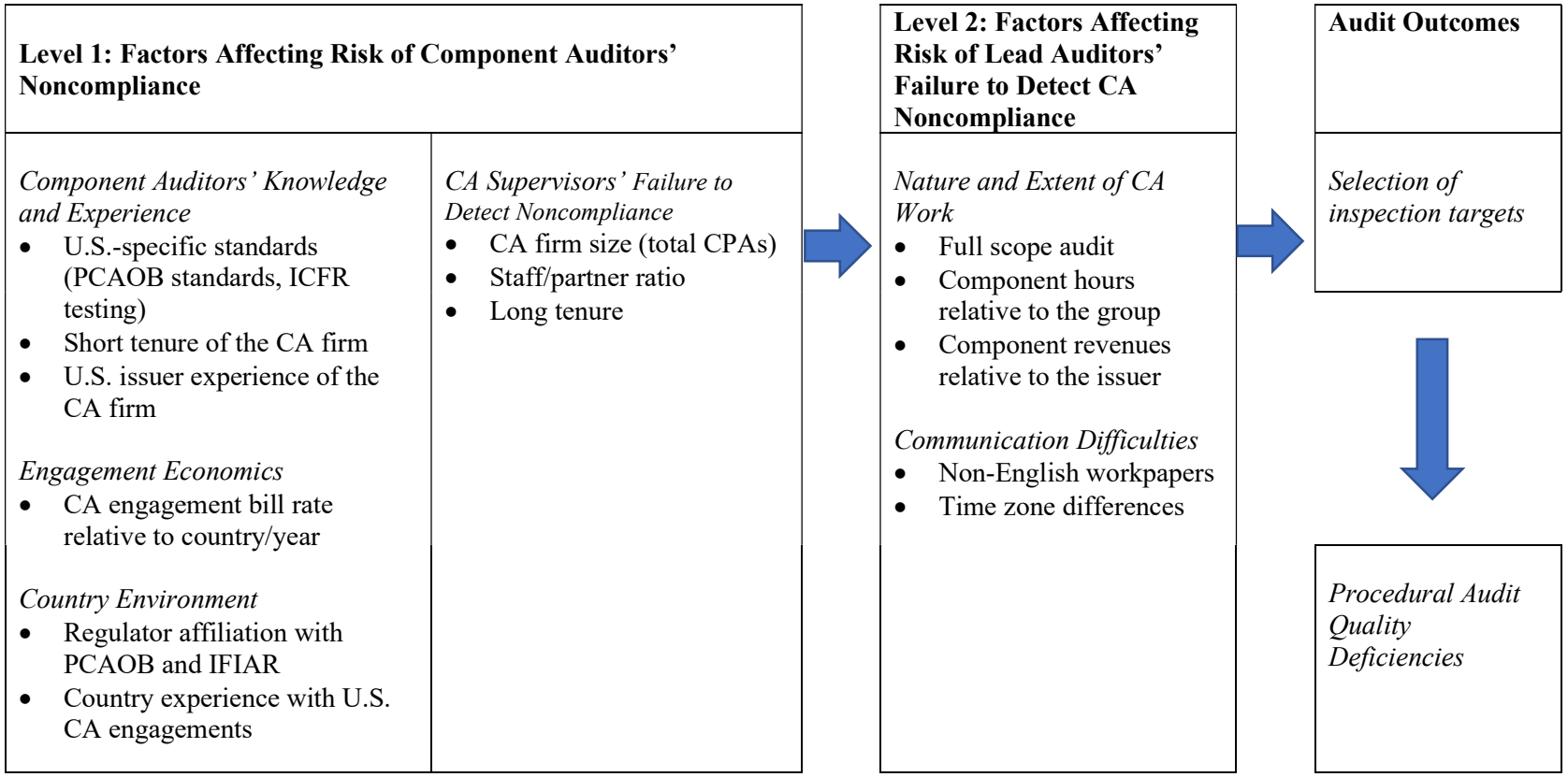
Figure 1: Conceptual Model of Component Audit Engagement Supervision



Notes: This figure presents our conceptual model of component audit engagement supervision. The model provides a framework in which to consider the risks associated with supervision of CA work at two levels: (1) the CA engagement team within the non-U.S. firm; and (2) the lead U.S. team.

Table 1: Sample Selection

All observations available for countries the PCAOB inspected from 2010 to 2017.	13,376
Less: observations for that are not present in Compustat, Fundamental Annual, Domestic dataset (i.e., components of non-issuers; components of foreign U.S. issuers; components with incomplete or invalid group CIK).	(6,324)
Less: observations for which the reported component is the issuer's employee benefit plan (e.g., 401k)	(723)
Less: observations where the component was reported in duplicate (i.e., same CIK, country, year, issuer name, component engagement hours, and component revenues)	(809)
Less: observations with a missing value for any variable included in Models 1 and 2	(2,375)
Full sample, used for descriptive statistics	3,145
Less: observations for which the component audit (CA) team's billing rate is missing, or there are insufficient observations with billing rate information in the country/year (i.e., fewer than five) to compute *COMP_BILLRATE_TO_COUNTRY*	(537)
Model 1 Sample	2,608

Notes: This table details the sample step-down from all data available from the PCAOB to the full sample of 3,145 used for descriptive statistics, and the Model 1 sample of 2,608.

Table 2: Variable Definitions

Variable Name	Expected Direction	Variable Description	Source
Panel A. Variables in Model 1			
Dependent Variable:			
IQR_INSPECTION		1 if the component audit (CA) was selected for internal inspection in the prior two years; 0 otherwise.	PCAOB
Independent Variables:			
Level 1: Factors Affecting Risk of Component Auditor's Noncompliance			
H1 – Component Auditors' Knowledge and Experience			
COMP_PCAOB_STDS	(+)	1 if the CA team applies PCAOB standards; 0 otherwise.	PCAOB
COMP_ICFR	(+)	1 if the CA includes internal control testing; 0 otherwise.	PCAOB
COMP_SHORT_TENURE	(+)	1 if the CA firm has led the component engagement for three years or less; 0 otherwise.	PCAOB
FIRM_US_ISSUER_EXP	(-)	The number of U.S. issuer audits for which the CA firm signs the audit opinion in year *t*.	PCAOB
H2 – CA Engagement Economics			
COMP_BILLRATE_TO_COUNTRY		The CA bill rate (component hours divided by component fees) as a ratio of the average bill rate for country *i* in year *t*.	PCAOB
H3 – Country Environment			
COUNTRY_REG_RISK	(+)	1 if the PCAOB does not have a cooperation agreement with the local regulator, and the local regulator is not a member of IFIAR in year *t*; 0 otherwise.	Public Inspection Agreements and IFIAR Membership List
COUNTRY_US_COMP_EXP	(-)	The number of CAs within the country of the component in year *t*.	PCAOB
H4 – CA Supervisors' Failure to Detect Noncompliance			
FIRM_LN_TOTAL_CPAS		Natural logarithm of the total number of certified (or chartered accountants) reported by the CA firm.	PCAOB
FIRM_STAFF_TO_PARTNER_ RATIO		The ratio of staff to partner for the CA firm in year *t*.	Public PCAOB Inspection Reports
COMP_LONG_TENURE		1 if the CA firm has led the component engagement for ten or more years; 0 otherwise.	PCAOB
Level 2: Factors Affecting Risk of the Lead Auditors' Failure to Detect CA Noncompliance			
H5 – Nature and Extent of CA Work			
COMP_FULL_SCOPE	(+)	1 if the CA team performs a full scope audit of the local component; 0 otherwise.	PCAOB

Table 2: Variable Definitions (continued)

Variable Name	Expected Direction	Variable Description	Source
COMP_GROUP_HOURS	(+)	CA hours as a percentage of total audit hours for the issuer.	PCAOB
COMP_GROUP_REV		Component revenues as a percentage of issuer revenues (assets are used for three observations where component revenues are not available).	PCAOB
H6 – Communication Difficulty			
COMP_NON_ENGLISH		1 if the CA workpapers are not in English; 0 otherwise.	PCAOB
COMP_TIME_ZONE_DIFF	(+)	The time difference (in absolute hours) between the CA and lead auditor location.	PCAOB (CA); Audit Analytics (group)
Control Variables - *Group (Issuer) Characteristics*			
GROUP_LN_REVENUE		Natural logarithm of the issuer's revenues ($REVT_t$).	Compustat
GROUP_CFO	(-)	Issuer's cash flow from operations deflated by beginning assets (OANCFt/ATt-1).	Compustat
GROUP_BUS_SEG	(+)	Number of issuer business segments (BUSSEGt).	Compustat
GROUP_GEO_SEG	(+)	Number of issuer geographic segments (GEOSEGt).	Compustat
BIG_4		1 if the CA firm belongs to a Big 4 network; 0 otherwise.	PCAOB
Panel B. Dependent Variable in Model 2			
IQR_DEF		1 if the internal inspection finds the CA to be deficient; 0 otherwise.	PCAOB
Panel C. Dependent Variables in Models 3 and 4			
PCAOB_DEF		1 if the PCAOB inspection finds the CA to be deficient; 0 otherwise.	Compendium
PCAOB_DEF_NUM		The number of deficiencies identified on the CA during the PCAOB inspection.	Compendium

Notes: Panel A describes dependent, test and control variables for Model 1. Panel B describes the dependent variable for Model 2, while Panel C describes dependent variables for Models 3 and 4.

Table 3: Sample Description

Panel A: Inspections Rates in the Sample

Internal Quality Reviews (IQRs), Full Sample

IQR_INSPECTION	Observations	Percent
0	2,839	90.3
1	306	9.9
Total	**3,145**	**100.0%**

PCAOB Inspections, Full Sample

PCAOB_INSPECTION	Observations	Percent
0	3,036	96.5
1	109	3.5
Total	**3,145**	**100.0%**

Panel B: Inspections Outcomes

IQR Subsample

IQR_DEF

	Observations	Percent
0	209	68.3
1	72	23.5
Total determined outcomes	**281**	91.8
Total undetermined outcomes at time of data collection	25	8.2
Total inspections	**306**	**100.0%**

PCAOB Inspected Subsample

PCAOB_DEF

	Observations	Percent
0	69	63.3
1	40	36.7
Total Inspections	**109**	**100.0%**

PCAOB Inspected Subsample

PCAOB_DEF_NUM

	Observations	Percent
0	69	63.3
1	18	16.5
2	12	11.0
3		
4	1	0.9
5	3	2.8
8	1	0.9
Total Inspections	**109**	**100.0%**

Panel C: Full Sample and Inspected Subsamples by Big 4/Non-Big 4 and Year

Full Sample

Year	Big 4	Non-Big 4	Total
2010	43	2	45
2011	272	2	274
2012	500	14	514
2013	572	2	574
2014	404	5	409
2015	439	13	452
2016	475	4	479
2017	394	4	398
Total	**3,099**	**46**	**3,145**
Percent	**98.5%**	**1.5%**	**100%**

IQR Subsample

Year	Big 4	Non-Big 4	Total
2010	3	0	3
2011	20	0	20
2012	63	0	63
2013	44	2	46
2014	37	1	38
2015	35	0	35
2016	54	0	55
2017	43	3	46
Total	**299**	**6**	**306**
Percent	**97.4%**	**2.6%**	**100%**

PCAOB Inspection Subsample

Year	Big 4	Non-Big 4	Total
2010	2	0	2
2011	10	0	10
2012	17	0	17
2013	18	0	18
2014	22	0	22
2015	12	2	14
2016	16	1	17
2017	7	2	9
Total	**104**	**5**	**109**
Percent	**95.4%**	**4.6%**	**100%**

Table 3: Sample Description (continued)

Panel D: Inspections, Outcomes and Country-level Variables, by Country

Country Name	(1) Total Obs.	(2) Number of PCAOB Inspections	(3) Number of PCAOB Inspections with Part I Deficiencies	(4) PCAOB Cooper-ative Agreement	(5) IFIAR Member
Argentina	59	1	0	N	N
Australia	104	5	0	Y	Y
Bermuda	14	3	0	N	N
Brazil	208	4	1	N	Y
Canada	194	3	0	Y	Y
Chile	17	1	1	N	N
Colombia	19	2	1	N	N
Denmark	11	5	0	Y	Y
Finland	2			Y	Y
France	224	12	11	Y	Y
Germany	455	5	4	Y	Y
Greece	3			Y	Y
India	27	6	1	N	N
Indonesia	4	2	0	N	Y
Israel	40	3	2	Y	N
Italy	7			Y	Y
Japan	233	9	2	Y	Y
Malaysia	6			N	Y
Mexico	246	6	4	N	N
Netherlands	125	3	2	Y	Y
Norway	39	4	0	Y	Y
Panama	2	1	0	N	N
Peru	4	2	0	N	N
Philippines	16	3	2	N	Y
Russia	30	2	0	N	N
Singapore	63	1	0	Y	Y
South Africa	39	5	4	N	Y
South Korea	30	1	1	Y	Y
Spain	113	6	1	Y	Y
Sweden	34	2	1	Y	Y
Switzerland	106	2	0	Y	Y
Taiwan	35	3	1	Y	Y
Thailand	24	1	0	N	Y
Turkey	5	1	0	N	Y
United Kingdom	607	5	1	Y	Y
Total	**3,145**	**109**	**40**		

Table 3: Sample Description (Continued)

Notes: This table presents descriptive statistics for inspection selection and outcome variables overall, and by year, firm type, and country. Panel A describes the rate of selection for IQR inspections and PCAOB inspections in the full sample. Panel B describes the rate of deficiencies for IQR (*IQR_DEF*) and PCAOB inspected engagements (*PCAOB_DEF* and *PCAOB_DEF_ NUM*). Panel C describes inspections and outcomes by year and firm type. Panel D presents data by country in the full sample. Column 1 describes total observations. Columns 2-3 show observations inspected by the PCAOB and found to be deficient. Column 4 indicates whether the local regulator maintains a cooperation agreement with the PCAOB, and Column 5 indicates whether the local regulator is a member of IFIAR. We combine these measures to form *COUNTRY_REG_RISK,* defined in Table 2, which indicates lower levels of regulatory cooperation. For countries that entered into a cooperation agreement or joined IFIAR during our sample period, Columns 4 and 5 presents their most recent category of regulatory cooperation. However, the test variables in our models categorize countries based on their status in each sample year.

Table 4: Descriptive Statistics

Variable	*IQR_INSPECTION* Full Sample (n=3,145)			*IQR_INSPECTION* = 1 (n=306)			*IQR_INSPECTION* = 0 (n=2,839)		
	(1) Mean	(2) Median	(3) S.D.	(4) Mean	(5) Median	(6) S.D.	(7) Mean	(8) Median	(9) S.D.
Panel A. ***Level 1: Factors Affecting Risk of Component Auditor's Noncompliance***									
H1 - Component Auditors' Knowledge and Experience									
COMP_PCAOB_STDS	0.87			0.93***			0.87		
COMP_ICFR	0.65			0.82***			0.64		
COMP_SHORT_TENURE	0.30			0.19			0.31***		
FIRM_US_ISSUER_EXP	8.95	4.00	14.27	7.93	4.00	13.43	9.06	4.00	14.36
H2 - Engagement Economics									
COMP_BILLRATE_TO_COUNTRY	1.01 (n=2,608)	0.92	0.51	0.95 (n=258)	0.92	0.33	1.01* (n=2,350)	0.91	0.52
H3 - Country Environment									
COUNTRY_REG_RISK	0.14			0.23***			0.13		
COUNTRY_US_COMP_EXP	90.02	81.00	62.90	81.08	68.00	55.61	90.99**	81.00	63.57
H4 – CA Supervisors' Failure to Detect Noncompliance									
FIRM_LN_TOTAL_CPAS	6.57	6.63	1.09	6.47	6.61	1.10	6.58	6.63	1.08
FIRM_STAFF_TO_PARTNER_ RATIO	14.91	14.29	5.42	14.19	14.29	4.62	14.98**	14.29	5.49
COMP_LONG_TENURE	0.38			0.44**			0.38		
Panel B. ***Level 2:Factors Affecting Risk of the Lead Auditors' Failure to Detect CA Noncompliance***									
H5 - Nature and Extent of CA Work									
COMP_FULL_SCOPE	0.38			0.53***			0.37		
COMP_GROUP_HOURS (%)	5.36	3.02	7.01	7.22***	5.04	8.06	5.16	2.86	6.86
COMP_GROUP_REV (%)	6.43	4.00	8.61	7.05	4.40	7.83	6.36	3.92	8.69
H6 - Communication Difficulty									
COMP_NON_ENGLISH	0.51			0.61***			0.50		
COMP_TIME_ZONE_DIFF	5.78	6.00	2.94	5.23	6.00	3.19	5.83***	6.00	2.91
Panel C. Control Variables - ***Group (Issuer) Characteristics***									
GROUP_LN_REVENUE	22.15	22.05	1.66	22.67***	22.62	1.54	22.10	22.01	1.67
GROUP_CFO	0.09	0.09	0.06	0.09	0.08	0.06	0.09	0.09	0.06
GROUP_BUS_SEG	2.93	3.00	2.48	2.94	3.00	2.77	2.93	3.00	2.45
GROUP_GEO_SEG	5.14	4.00	3.79	5.64**	4.00	4.30	5.09	4.00	3.73
BIG4	0.99			0.98			0.99		

Notes: This table presents means, medians, and standard deviations for most continuous variables, and percent = 1 for indicators, in the full sample (Columns 1-3), engagements selected (Columns 4-6) and not selected (Columns 7-9) for IQR. ***, **, and * indicate significant differences between CA engagements selected and not selected for IQR at p<0.01, 0.05, and 0.10, respectively, in two-tailed t- (Z-) tests for continuous (dichotomous) variables.

TABLE 5: Results of Estimating Models 1 and 2

	Model–1 - *IQR_INSPECTION*				Model–2 - *IQR_DEF*			
	Probit		Heckprobit		Probit		Heckprobit	
Variable (expected sign)	**(1) Coef.**	**(2) Z**	**(3) Coef.**	**(4) Z**	**(5) Coef.**	**(6) Z**	**(7) Coef.**	**(8) Z**
Panel A. ***Level 1: Factors Affecting Risk of Component Auditor's Noncompliance***								
H1 - Component Auditors' Knowledge and Experience								
COMP_PCAOB_STDS (+)	0.181*	1.36	0.186*	1.39	0.617**	1.67	0.178**	1.73
COMP_ICFR (+)	0.314***	5.15	0.314***	3.55	-0.446^	-1.87	-0.088	-1.3
COMP_SHORT_TENURE(+)	-0.425^^^	-4.61	-0.426^^^	-4.26	0.091	0.30	-0.042	-0.56
FIRM_US_ISSUER_EXP (-)	-0.011***	-3.26	-0.011***	-2.74	-0.001	-0.11	-0.001	-0.38
H2 - Engagement Economics								
COMP_BILLRATE_TO_ COUNTRY	-0.143**	-2.41	-0.143	-1.58	-0.403	-1.29	-0.116	-1.52
H3 - Country Environment								
COUNTRY_REG_RISK (+)	0.335***	2.36	0.331***	2.43	0.204	0.57	0.138*	1.37
COUNTRY_US_COMP_ EXP (-)	-0.002*	-1.41	-0.002**	-2.06	-0.006***	-2.48	-0.002***	-3.43
H4 - CA Supervisors' Failure to Detect Noncompliance								
FIRM_LN_TOTAL_CPAS	0.058	0.95	0.060	1.18	0.231	1.63	0.076**	2.15
FIRM_STAFF_TO_ PARTNER_RATIO	-0.036***	-5.05	-0.036***	-4.23	0.015	0.64	-0.003	-0.49
COMP_LONG_TENURE	-0.077	-0.93	-0.073	-0.87	0.129	0.59	0.008	0.14
Panel B. ***Level 2: Factors Affecting Risk of the Lead Auditors' Failure to Detect CA Noncompliance***								
H5 - Nature and Extent of CA Work								
COMP_FULL_SCOPE (+)	0.305***	5.54	0.304***	3.99	-0.110	-0.58	0.039	0.72
COMP_GROUP_HOURS (+)	0.015***	3.48	0.015***	3.16	0.018*	1.54	0.007**	2.11
COMP_GROUP_REV	0.008*	1.95	0.008*	1.86	-0.006	-0.49	0.000	0.02
H6 - Communication Difficulty								
COMP_NON_ENGLISH	0.094	1.03	0.094	1.07	-0.314	-1.37	-0.055	-0.90
COMP_TIME_ZONE_DIFF (+)	-0.017	-0.86	-0.017	-0.90	-0.058	-1.13	-0.015	-1.02
Panel C. Control Variables - ***Group (Issuer) Characteristics***								
GROUP_LN_REVENUE	0.144***	5.39	0.145***	5.74	-0.120*	-1.85	-0.005	-0.29
GROUP_CFO (-)	-1.086**	-1.95	-1.121**	-1.80	0.167	0.10	-0.108	-0.27
GROUP BUS_SEG (+)	0.001	0.11	0.001	0.09	-0.057	-1.54	-0.015	-1.55
GROUP GEO_SEG (+)	0.011*	1.30	0.011	1.20	-0.012	-0.49	0.000	0.06
BIG4	-0.353	-0.55	-0.461	-1.17				

TABLE 5: Results of Estimating Models 1 and 2 (continued)

	Model–1 - *IQR_INSPECTION*				Model–2 - *IQR_DEF*			
	Probit		Heckprobit		Probit		Heckprobit	
Variable (expected sign)	**(1) Coef.**	**(2) Z**	**(3) Coef.**	**(4) Z**	**(5) Coef.**	**(6) Z**	**(7) Coef.**	**(8) Z**
Year indicators	Included		Included		Included		Included	
Constant	-4.358***	-3.94	-4.285***	-5.86	2.238	1.22	0.042	0.09
N	2,608		2,608		235			
Pseudo R^2	0.116				0.157			
ROC	0.749				0.751			

Notes: This table presents results of Models 1 and 2. Model 1 investigates factors associated with audit firms' selection of the CA engagement as an IQR target; its dependent variable is *IQR_INSPECTION.* Model 2 investigates factors associated with a deficiency in compliance with auditing standards identified by internal inspectors (*IQR_DEF*). Columns 1-2 present results of Model 1 estimated as a probit with robust standard errors clustered on country, while Columns 5-6 present Model 2 as a probit with robust standard errors. Columns 3-4 present results of Model 1 as the selection equation using Heckman maximum likelihood estimation. Columns 7-8 present results of Model 2 as the outcome equation in that procedure. Due to lack of a valid exclusion variable, we use the approach of Altonji et al. (2005), testing sensitivity to varying assumptions of the value of *rho,* the correlation between unobservables across equations. We table results for the assumption that *rho* = 0.5; see the text for further information. We exclude *BIG_4* from Model 2 due to perfect prediction (all deficiencies are detected in Big 4 firms). All variables are defined in Table 2. ***, **, and * indicate significance at p<0.01, 0.05, and 0.10, respectively, one-tailed where there is a directional hypothesis and two-tailed otherwise. ^ and ^^^ indicate significance at p < 0.10 and p<0.01(two-tailed), respectively, where the sign is opposite the expected direction. In Model 1, the average VIF is 1.66, and the highest VIF for individual test or control variables is 2.24 for *COMP_TIME_ZONE_DIFF*. In Model 2, the average VIF is 2.13, and the highest VIF for an individual test or control variable is 3.22 for *COMP_TIME_ZONE_DIFF*. These values do not imply concern for multicollinearity.

TABLE 6: Results of Estimating Models 3 and 4

	Model 3 - *PCAOB_DEF*				Model 4 - *PCAOB_DEF_NUM*	
	Probit		Heckprobit		Poisson	
Variable (expected sign)	**(1) Coef.**	**(2) Z**	**(3) Coef.**	**(4) Z**	**(5) Coef.**	**(6) Z**
Panel A. ***Level 1: Factors Affecting Risk of Component Auditor's Noncompliance***						
H1 - Component Auditors' Knowledge and Experience						
COMP_PCAOB_STDS (+)	-1.148	-1.13	-0.959	-1.23	-0.616	-0.36
COMP_ICFR (+)	-0.171	-0.31	-0.094	-0.18	0.063	0.12
COMP_SHORT_TENURE (+)	-0.672	-1.43	-0.691	-1.25	-1.181^^	-2.20
FIRM_US_ISSUER_EXP (-)	-0.024	-1.11	-0.022	-1.06	-0.022	-1.24
H2 - Engagement Economics						
COMP_BILLRATE_TO_ COUNTRY	0.985***	3.34	1.008***	2.88	0.765***	3.86
H3 – Country Environment						
COUNTRY_REG_RISK (+)	0.193	0.30	0.247	0.42	0.529	0.84
COUNTRY_US_COMP_EXP (-)	-0.003	-0.63	-0.006	-1.08	0.005	1.19
H4 - CA Supervisors' Failure to Detect Noncompliance						
FIRM_LN_TOTAL_CPAS	0.793***	2.64	0.750***	2.91	0.868**	2.08
FIRM_STAFF_TO_PARTNER_ RATIO	0.048	1.18	0.043	1.28	0.046	0.87
COMP_LONG_TENURE	1.497***	3.17	1.397***	2.74	0.961***	2.73
Panel B. ***Factors Affecting Risk of the Lead Auditors' Failure to Detect CA Noncompliance***						
H5 - Nature and Extent of CA Work						
COMP_FULL_SCOPE (+)	0.690**	1.76	0.885**	2.15	0.352	1.08
COMP_GROUP_HOURS, (+)	0.003	0.14	0.011	0.47	-0.013	-0.75
COMP_GROUP_REV	-0.034*	-1.79	-0.024	-0.89	-0.040**	-2.47
H6 - Communication Difficulty						
COMP_NON_ENGLISH	0.719*	1.71	0.727	1.62	0.755**	2.11
COMP_TIME_ZONE_DIFF (+)	-0.126	-1.32	-0.079	-0.92	-0.146	-1.58
Panel C. Control Variables - ***Group (Issuer) Characteristics***						
GROUP_LN_REVENUE	-0.548***	-2.94	-0.472**	-2.48	-0.662***	-3.84
GROUP_CFO (-)	4.832	1.45	3.324	0.92	2.163	0.71
GROUP_BUS_SEG (+)	0.092*	1.37	0.083	1.04	0.141***	2.52
GROUP_GEO_SEG (+)	0.074*	1.44	0.072*	1.42	0.069*	1.62

TABLE 6: Results of Estimating Models 3 and 4 (continued)

	Model 3 - *PCAOB_DEF*				Model 4 - *PCAOB_DEF_NUM*	
	Probit		Heckprobit		Poisson	
	(1) Coef.	(2) Z	(3) Coef.	(4) Z	(5) Coef.	(6) Z
Year indicators	Included		Included		Included	
Constant	3.207	0.91	0.619	0.016	4.095	1.16
N	89				89	
Pseudo R^2	0.383				0.330	
ROC	0.886					

Notes: This table presents results of Models 3 and 4, which investigate factors associated with deficiencies in compliance with auditing standards identified through the PCAOB inspection process. The dependent variable in Model 3 indicates whether at least one Part I deficiency was identified by the PCAOB inspection (*PCAOB_DEF*). Columns 1-2 present results of Model 3 estimated as a probit with robust standard errors. Columns 3-4 present Model 3 estimated as the outcome equation using the Heckman maximum likelihood procedure. The dependent variable in the selection equation (untabled) is our estimate of the PCAOB's selection of the CA as an inspection target in its international inspection program. Due to lack of a valid exclusion variable, we use the approach of Altonji et al. (2005), which tests sensitivity to varying assumptions regarding the correlation between unobservables across equations. See the text for further information. Columns 5-6 present results of Model 4, a Poisson regression with robust standard errors whose dependent variable is the number of deficiencies identified in the PCAOB inspection (*PCAOB_INSP_DEF_NUM*). Test and control variables are defined in Table 2. ***, **, and * indicate significance at $p<0.01$, 0.05, and 0.10, respectively, one-tailed where there is a directional hypothesis and two-tailed otherwise. ^^ indicates significance at $p<0.05$ (two-tailed) where the sign is opposite the expected direction. In Models 3 and 4, the average VIF is 2.28, and the highest VIF for an individual variable is 2.49 for *COUNTRY_US_COMP_EXP,* which do not imply concern for multicollinearity.

TABLE 7: Summary of Hypothesis Tests

	Model 1: Internal Quality Review Selection	*Model 2: Internal Quality Review Deficiencies*	*Model 3/4: PCAOB Inspection Deficiencies*
Panel A. ***Level 1: Factors Affecting Risk of Component Auditor's Noncompliance***			
H1 - Component Auditors' Knowledge/Experience	+ PCAOB standards + ICFR testing - Short tenure - U.S. issuer experience of the CA firm	+ PCAOB standards	- Short tenure
H2 - Engagement Economics			+ Billrate relative to country
H3 – Country Environment	+ Regulatory risk - Country US CA experience	- Country US CA experience	
H4 – CA Supervisors' Failure to Detect Noncompliance	- Staff/partner ratio	+ Total CPAs	+ Total CPAs + Long tenure
Panel B. ***Factors Affecting Risk of the Lead Auditors' Failure to Detect CA Noncompliance***			
H5 - Nature and Extent of CA Work	+ Full scope audit + Component hours relative to the group + Component revenues relative to the issuer	+ Component hours relative to the group	+ Full scope audit - Component revenues relative to the issuer
H6 - Communication Difficulty			+ Non-English workpapers
Panel C. Control Variables - ***Group (Issuer) Characteristics***			
	+ Issuer revenues - Issuer operating cash flows		- Issuer revenues + Business segments + Issuer geographic segments

Notes: This table summarizes results of hypothesis testing in Models 1-4.