Coordination and Communication Challenges in Global Group Audits

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ABSTRACT

This paper investigates coordination and communication challenges faced by auditors in performing global group audits. Prior research suggests that managing geographically distributed work can be problematic when diverse teams perform interdependent activities in complex business environments. Studying factors that differentiate global group audit experiences perceived as challenging, we find that complexity arising from client size/regulatory status and global structure contribute strongly to challenges, while language/cultural barriers are less important. We investigate the extent to which three specific coordination and communication strategies mitigate these effects: (1) tacit coordination methods (leveraging common ground between team members based on shared knowledge); (2) modularization (planned reduction of interdependencies between team members); and (3) ongoing communication methods (building and using communication channels). Results show that greater component auditor knowledge and engagement experience (tacit coordination) are associated with lower probability of challenges overall. Effects of other strategies are contingent on the nature and level of complexity. Our results provide initial evidence on factors contributing to challenges faced by group auditors and offer insights on how to address them.

Keywords: Group audits; Geographically distributed work; Coordination; Communication; Audit quality

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I. INTRODUCTION

Global group audits have gained prominence in the past two decades due to the increasing globalization of business. Based on inspection findings, the U.S. Public Company Accounting Oversight Board (PCAOB) has expressed concern about U.S. group auditors' supervision and review of work performed by audit firms in foreign jurisdictions (termed "component auditors"). The key root causes of deficiencies identified by the PCAOB are challenges associated with the coordination and communication of work across international boundaries among the multiple firms involved (Doty 2011c; Munter 2014; PCAOB 2016). The purposes of this research are to increase understanding of these root causes by identifying factors contributing to these challenges in managing global group audits, and to provide initial evidence regarding whether strategies used by audit firms mitigate their effects.[1]

The PCAOB's concerns extend to engagements in which group and component auditors are members of the same global network firm (Doty 2013). Given that global network firms operate under common branding, with shared reputational risk (e.g., Cahan, Emanuel, and Sun 2009; Saito and Takeda 2014), knowledge management systems (Carson 2009), and electronic work tools (Dowling 2009), this is perhaps surprising. However, performing the lead role in auditing a global entity is a considerable management feat, even within a global network. As the lead team, the group auditor must supervise work of multiple, geographically dispersed teams to produce the audit opinion under time and budget constraints. While many large U.S. audit engagements involve multiple domestic offices, the difficulties of managing teams are exacerbated when significant components are located overseas. Not only are the affiliate firms different legal entities, with their own governance and incentive structures, but differences in language, culture, customs, professional training and experience are also likely to complicate

[1] Consistent with International Standard on Auditing 600 (ISA 600; IFAC 2007), we refer to the consolidated entity as the "group" and local business units of the client as "component(s)" of the entity. We refer to the lead auditor who signs the consolidated financial statement opinion as the "group auditor" or "group engagement team". The "component auditor" or "component engagement team" refers to audit firms engaged in foreign jurisdictions to perform work over local business units. We use the term "firm" to refer to the audit firm only, and "client" to refer to the audited entity. ISA 600 is the primary base for the methodologies of the global firm networks, which include certain other procedures required by the PCAOB (PCAOB 2016).

engagement management (PCAOB 2016). Further, local laws and regulations can prevent auditors from sharing workpapers across geographic boundaries. These features of the group audit environment create additional sources of complexity that could inhibit coordination and communication across teams, beyond those experienced in a domestic audit.

Thus, study of global group audits is important due to the deficiencies identified by PCAOB inspections, and the potentially broad impact that a global group audit failure could have on the financial system (Doty 2011c). However, only a few studies consider the interaction of audit firms on engagements across international boundaries. Asthana, Raman, and Xu (2015) and Hung, Ma, and Wang (2014) both show that audits of foreign U.S. issuers signed by non-U.S. audit firms have lower audit quality relative to those signed by U.S. audit firms. These studies imply that U.S. group auditors might have difficulty in managing the work of foreign auditors when they perform component work; however, due to data limitations these samples are not limited to group audits. Dee, Lulseged, and Zhang (2015) provide more direct evidence, showing lower audit quality and negative market reactions for U.S. issuers using a component auditor that does not itself sign audit opinions in the U.S. (likely to be small, foreign firms), relative to U.S. issuers with a comparable principal auditor and foreign revenues.[2] While these studies suggest audit quality issues in global group audits, they do not address the PCAOB's concern regarding problems in coordination and communication among U.S. and non-U.S. firms as a source of deficiencies. To gain insight into this issue, audit process data are needed. Barrett, Cooper, and Jamal (2005) provide relevant evidence from a single 1997 engagement involving a Canadian component auditor and a small European firm acting as group auditor. Their interview data identify coordination and communication problems, despite the low-risk nature of the engagement and considerable client-specific experience of participants. In sum, while limited extant research provides glimpses into the group audit, research has not

[2] Archival research on U.S. group audits is limited because disclosure of component auditors is not required. Carson, Simnett, Trompeter, and Vanstraelen (2016), using disclosures in Australia, find no differences in quality for group audits of Australian issuers performed by Big 4 firms when a component auditor is involved, whether the component auditor is within or outside the group auditor's network. However, that study does not directly address the PCAOB's concern about participation of non-U.S. firms in U.S. audits, as all audit opinions in their sample are signed by Australian firms.

yet investigated factors that exacerbate coordination and communication challenges or the effectiveness of strategies designed to mitigate the impact of exacerbating factors on those challenges.

We address this topic by studying a sample of audits of multinational entities led by U.S. group auditors in the current regulatory environment, using data obtained through the Center for Audit Quality.[3] We ground the study in the management literature on coordination and communication challenges that arise when work is distributed across multinational boundaries. This literature indicates that such challenges are likely to be exacerbated when teams perform interdependent activities in a complex environment. Particularly, challenges increase when teams working interdependently have difficulty anticipating each others' actions and cannot directly view those actions; that is, when "reciprocal predictability of action" is inhibited (Srikanth and Puranam 2011, 849). The more complex the environment, the greater the coordination and communication challenges, as teams will have difficulty viewing and monitoring each others' work. We study the influence of several sources of complexity suggested by prior research in auditing and other contexts, as well as regulators' concerns, including client size, regulatory status, and cultural/language barriers between firms.

To mitigate the challenges arising from performing distributed work in complex environments, the management literature identifies several strategies that organizations may adopt. First, studies of geographically distributed work note that *tacit coordination* strategies (leveraging and developing common ground between team members through shared experience and knowledge) can increase reciprocal predictability of action, thereby reducing the effects of complexity on coordination and communication challenges (Srikanth and Puranam 2011, 2014). Second, the management literature suggests that the effects of complexity can be attenuated through *modularization* of work; i.e., advance planning to minimize interdependencies and standardize interactions between team members (Sanchez and Mahoney 1996; MacDuffie 2007; Srikanth and Puranam 2011). Third, prior research indicates that *ongoing communication* strategies (frequent and open communication, and employing methods providing

[3] All group auditors in our sample are member firms of large global networks, and are subject to the U.S. regulatory environment and legal system (i.e., the typical situation in audits of U.S. multinational entities). Limitations on data availability prevent comparing this sample with group audits led by smaller U.S.-based firms, or by non-U.S. firms.

more situational information and informational cues) can increase ability to anticipate and review others' actions, mitigating effects of complexity (e.g., Walther 2002; Vlaar, van Fenema, and Tiara 2008; Srikanth and Puranam 2011). This literature leads to our main effects hypotheses that sources of complexity will be positively associated with challenging global group audits, and coordination/communication strategies will mitigate challenges overall. However, there is tension in these questions, as prior studies are conducted in routine business settings (e.g., student virtual teams and offshoring of back office services and call centers). Therefore, the extent to which these findings generalize to the highly complex, regulated context of auditing is unknown. In addition to addressing these hypotheses, we also study whether coordination/communication strategies mitigate the effects of specific sources of complexity on challenges faced in managing global group audits.[4] To investigate, we include in our models a series of interactions of complexity factors and strategy factors. Because the literature provides insufficient basis for predictions at this level of specificity, we pose the following research question: which coordination and communication strategies reduce challenges associated with specific sources of complexity?

We address our research purposes using perceptions of highly experienced U.S. audit professionals regarding actual global audits in which they participated as a member of the group engagement team. In order to distinguish factors contributing to difficulty in managing these engagements, we used two versions of an experiential questionnaire: one in which participants selected and described a component of an engagement with significant challenges, and another in which challenges were of little significance (hereafter termed "non-challenging"). Our sample comprises 147 observations with complete data on within-network global group audits from multiple participating Big 4 firms. From prior literature, audit regulation, and assistance of professionals at participating firms, we developed measures of the constructs of complexity and strategies (modularization, tacit coordination, and ongoing communication) relevant to global group audits. We developed factors representing each

[4] For example, does modularization of work mitigate challenges experienced in managing group audits of very large clients, or when language/cultural barriers are higher?

construct, and address our hypotheses and research question using probit regressions whose dependent variable represents an engagement selected by the participant as challenging vs. non-challenging. Independent variables include main effects for complexity factors, strategy factors, and the interactions of complexity and strategy factors. As all three strategies are costly for firms to implement, it is important to identify when a particular strategy shows greater benefit, i.e., mitigating the effect of a given source complexity on challenges across the sample, or when that source of complexity is relatively high.[5]

Factor analysis of complexity variables yields three significant factors, representing the client's size/regulatory status, the client's global structure (a greater number of components and requirement that the component team also perform the statutory audit)[6], and language/cultural barriers. Model results suggest that tacit coordination strategies are highly important in mitigating the impact of complexity on engagement challenges. Specifically, greater component auditor engagement experience and staff stability mitigate effects of complexity due to both client global structure and language/cultural barriers. Component auditor engagement experience also mitigates the effects of complexity due to large/public clients. Further, greater component auditor knowledge mitigates challenges associated with all three sources of complexity. For audit firms, these results suggest that staffing experienced, stable, and knowledgeable component audit teams is valuable in achieving a smooth and efficient global group audit. However, the extent to which group auditors have knowledge of component auditor qualifications, and can influence staffing of component teams, are open questions (e.g., Goelzer 2009; Asthana et al. 2015).

Results for the other strategies are not as pervasive, despite their prevalence in large global networks. For example, modularization involves advance scripting of work to be done by component teams to reduce later interdependencies. The only circumstances in which we find that greater

[5] Our tests measure the associations of group auditors' perceptions of sources of complexity and use of strategies with the likelihood that engagements were selected as challenging vs. non-challenging. The nature of these data does not permit assertions of causality. While a methodological concern is that strategy choice may be endogenous (i.e., certain strategies are more likely to be adopted for more complex clients), the empirical correlations between complexity and strategy factors in our sample are low. We use the term "mitigate" as shorthand to describe significant negative coefficients of strategies in the models.

[6] Local statutes in foreign jurisdictions often require that an audit be performed over the financial statements of the local business operations. While requirements vary, such audits are typically referred to as "statutory audits".

modularization mitigates challenges are when complexity due to size/regulatory status is low (i.e., smaller, nonpublic companies) and when complexity due to global structure is high (i.e., there are many components, and statutory audit requirements create different incentives). These results imply that the greatest net benefit of modularization is observed when the group auditor is managing a larger number of component teams, inhibiting effective monitoring.

We also find some instances in which ongoing communication strategies mitigate challenges, contingent on the level of complexity. Greater involvement of the component auditor in meetings (engagement kickoff, discussion of instructions, and fraud brainstorming) mitigates challenges associated with more complex global structures as well as with higher language/cultural barriers. Greater availability/use of electronic tools also mitigates challenges from higher language/cultural barriers. While this finding is valuable, it is interesting that electronic tools do not mitigate effects of complexity due to size/regulatory status or global structure, given their prevalence in U.S. Big 4 firms. While the firms often tout their global methodologies, it may be that availability/use of electronic tools across global firm networks is limited compared to their U.S. affiliates (e.g., Saito and Takeda 2014).

At a high level, our results show that group auditors face complexity from a number of sources, and that the most effective mechanism to address challenges is an experienced, stable, and knowledgeable component auditor team. While other strategies, such as advance partitioning of engagement activities and greater availability/use of electronic tools, help in some circumstances, they do not always provide the intended benefit. In producing these findings, this study contributes to the literatures in auditing and geographically distributed work. While limited prior research provides some support for regulators' concerns regarding quality of global group audits, the current study provides unique evidence of the sources of complexity that increase challenges that group audit leaders encounter on these engagements and strategies to mitigate such effects. Thus we contribute to the understanding of how global group audits are managed, as well as mechanisms that might improve effectiveness and efficiency.

This paper proceeds as follows. The next section presents relevant background and prior research. The third section reviews theory and develops hypotheses. The fourth section describes the research

method. The fifth section presents the results, and the final section provides conclusions and limitations.

II. BACKGROUND AND PRIOR AUDITING RESEARCH

The Global Group Audit Environment

Many companies headquartered in the U.S. maintain foreign operations and/or assets in other countries. In 2012, U.S.-domiciled multinational corporations added $4.7 trillion of value to the global economy, employing 35.2 million people worldwide (BEA 2014). For many of these corporations, foreign operations are highly significant to the overall business.[7] The ability to provide cross-border audit services to large, global companies is important to audit firms, who have worked with trade organizations and nation-states to promote the globalization of auditing over the last several decades (Suddaby, Cooper, and Greenwood 2007). At the same time, audit firms themselves have grown into large international entities, expanding their global networks to encompass hundreds of national partnerships or affiliates operating under a common brand (Suddaby et al. 2007). The network structure permits group auditors to more easily leverage qualified professionals across jurisdictions, and comply with the requirement in most countries that audit professionals be locally licensed to provide services (Carson et al. 2016).

To opine on the financial statements of a multinational corporation, audit firms often engage foreign firms within and/or outside their global networks to audit the company's operations in foreign jurisdictions. These component auditors, on average, perform work over one-third to one-half of total assets and total revenues for the consolidated company (PCAOB 2016). "For many large, multinational companies, a significant portion of the audit may be conducted abroad – even half of the total audit hours" (Doty 2011b). Further, component auditors are involved in approximately 55 percent of audits performed by U.S. global network firms and 80 percent of audits of Fortune 500 companies (PCAOB 2016). PCAOB observations suggest that U.S. audit firms rely largely on component auditors within their global network (Doty 2011b, 2011c), likely due to ease/efficiency and the common audit methodologies typically espoused across these networks (e.g., Winograd, Gerson, and Berlin 2000).

[7] For example, foreign operations of The Coca-Cola Company accounted for $27 billion (58 percent of total net operating revenues for the consolidated company) in 2013 (Coca-Cola Co. 2014).

All global audit firm networks have policies that are intended to promote continuity in client service across the brand name (Humphrey, Loft, and Woods 2009). However, member firms are also subject to the laws and regulations of their local jurisdictions, and primarily focus on providing services to locally owned entities, as opposed to local components of multinational corporations (Cooper, Greenwood, Hinings, and Brown 1998; Carson 2009). Thus, member firms do not passively adopt global methodologies, but rather adapt them to their local environments (Barrett et al. 2005). This raises the question of the extent of consistency achieved across global networks. Two recent studies examine audit quality in U.S.-listed foreign companies, finding that audit quality is lower when non-U.S. auditors sign the financial statement opinion, relative to U.S. auditors (Asthana et al. 2015; Hung et al. 2014). Although initial PCAOB inspections are associated with improvements in audit quality for non-U.S. firms, differences in quality are still observed. These results underscore the higher deficiency rates for non-U.S. member firms observed in PCAOB inspections (PCAOB 2016).

Global Group Audit Methodologies and Prior Research

International Standard on Auditing (ISA) 600, the basis for global network firms' methodologies (PCAOB 2016), requires the group auditor to direct and supervise all work pertaining to the financial statement audit opinion for the consolidated entity, including work performed by component auditors (IFAC 2007). The group auditor is responsible for setting the overall audit strategy, including materiality at both the group and component levels. For sufficient and appropriate evidence to be obtained, all components that are financially significant to the group must be audited and procedures must be performed over components presenting significant risk of material misstatement (IFAC 2007).

When relying on a component auditor to perform a portion of the audit work, the group auditor is required to discuss risks with the component auditor, communicate requirements and relevant information, and evaluate the component auditor's work (IFAC 2007). To evaluate the component auditor's work, the group auditor reviews what is commonly referred to in practice as a "reporting package", summary documentation of the work performed and the conclusions reached. Due to legal restrictions, reporting packages typically do not contain the actual supporting workpapers or original

evidence, and the group and component auditors typically do not possess access to each other's engagement files. Following the evaluation of the component auditor's reporting package, auditing standards require the group auditor to discuss significant matters that have arisen and to determine whether review of additional documentation is necessary (IFAC 2007).

In sum, the group auditor typically has full responsibility for signing the audit opinion, but must rely on multiple other firms performing parts of the overall engagement, with limited ability to observe the processes that the other firms use to perform their duties. Under these circumstances, audit quality depends on effective coordination and communication between group and component auditors. However, in 2013 PCAOB inspections identified audit deficiencies in more than 40 percent of work performed on group audits by foreign component auditors, which are linked to coordination and communication failures (PCAOB 2016). Examples include unresolved issues between the group and component auditors, noncompliance with group auditor instructions, insufficient audit testing, and failure of component auditors to communicate significant issues (Doty 2011c; Munter 2014; PCAOB 2016). Figure 1 presents detailed quotes describing inspection observations and global group audit concerns from the PCAOB.[8]

Insert Figure 1 About Here

While regulators are concerned about the quality of global group audits, very limited empirical research specifically investigates the effects of reliance on component auditors. Dee et al. (2015) compare U.S. audits for which PCAOB Form 2 disclosure indicates participation of a component auditor that does not sign an opinion for any U.S. issuer. Comparing those engagements to a matched sample with no disclosure (which may or may not have component auditors that *do* sign U.S. audit opinions in their own right), they find that initial disclosure of other audit participants is associated with a negative market reaction, declining earning response coefficients, and higher discretionary accruals.

The qualitative study by Barrett et al. (2005) provides information on interactions among participants in a single global group audit in the late 1990's, primarily focusing on a Canadian component audit team and its interactions with a smaller European network member firm serving as group auditor.

[8] International regulators have expressed similar concerns about group audits (e.g., IFAC 2015).

The engagement was perceived as "satisfactory" by participating auditors, the client was low risk, and team leaders had considerable client-specific experience. To coordinate the component audit work, the group auditor relied heavily on inter-office instructions to create a standardized plan. At the time of data collection, the network was also rolling out a revised audit methodology intended to achieve international consistency through use of technology. Prior management research that we cite in the following section suggests that these features should mitigate the effects of complexity on coordination and communication, and yet Barrett et al. (2005) find evidence that difficulties still persisted.

Building on this limited base of audit research, we study factors that differentiate global group audits in which communication and coordination are not perceived as satisfactory. In the next section, we review theory and develop our expectations regarding specific features of the client and the engagement.

III. THEORY AND RESEARCH EXPECTATIONS

Sources of Complexity

We first consider sources of complexity that could lead to challenges in performing global group audit engagements. The management literature suggests that coordinating and communicating activities are facilitated when teams have "reciprocal predictability of action" (Puranam and Raveendran 2012).[9] When work is interdependent, failures in coordination and communication (e.g., delays and misunderstandings) can result when others' actions are difficult to predict (Puranam and Raveendran 2012). In auditing, interdependence of work arises from the need to integrate results of group and component teams' work to produce the final opinion. In the context of global group audits, we propose that the difficulties associated with performing interdependent work are likely to be exacerbated by complexity arising from client characteristics and the nature of the work, the structure of the engagement, and cultural/language barriers. Below, we discuss examples of each of these three types of complexity.

First, communication difficulties are likely to increase when the client is larger, an SEC registrant, and/or the work is more complex (e.g., Hay, Knechel, and Wong 2006). Larger, public U.S. companies require more extensive audit work and pose greater risk (e.g., audit, litigation, and regulatory).

[9] See Hanes (2013) for a recent summary of this literature and its applications to the auditing context.

Component auditors in other countries may find it difficult to predict and/or understand the group auditor's actions and instructions due to differences with the local jurisdiction. Further, larger public companies are likely to engage in transactions that increase the complexity of the component auditor's work (e.g., acquisition activity or multi-deliverable revenue arrangements). Such features of larger, public companies increase the auditor's coordination and communication costs, possibly leading to challenges in performing the engagement (Hinds and Bailey 2003; Jensen and Szulanski 2004; Kankanhalli, Tan, and Wei 2006).

Second, the structure of a global group audit is also likely to impact its level of complexity. Global group audits can differ considerably in the number of components spread across the globe. As the number of components increases, the group auditor must explain the audit strategy to more component teams and monitor their work to assess the sufficiency and appropriateness of the evidence obtained. In these situations, the coordination and communication required to obtain adequate understanding of each component's activity could constrain group auditor resources, amplifying challenges. Group audits can also differ in organizational structure, including the involvement of other teams, multiple levels of reporting, and the component's statutory audit responsibilities. Figure 2 shows that for some engagements, the group engagement team engages a team other than the component auditor to perform work over a portion of the component (e.g., accounts receivable processed at a shared service center). In such instances, the other team is likely to communicate with the group auditor, who must then disseminate relevant findings to the component auditor. In other engagements, the group team works directly with a "supervising component" team, which manages audit work done by one or more sub-components and reports the consolidated work to the group auditor. As a result, the sub-components report indirectly to the group auditor through the supervising component team. The resulting multiple levels of required coordination and communication could reduce reciprocal predictability of action between group and component teams, exacerbating challenges (Puranam and Raveendran 2012). Statutory audits are also likely to increase the complexity of group audits, requiring work be performed on different timelines, at a lower materiality level, and to a varying extent than the group audit. In

creating conflicting pressures and incentives for component auditors, statutory audits create another level of work that could impact coordination and communication challenges experienced on the group audit.

Insert Figure 2 About Here

Third, engaging component auditors in foreign jurisdictions in which the client does business is also likely to increase the difficulty of performing interdependent work due to complexities associated with differences in language and culture, as noted by the PCAOB (2016). Such differences could create greater variation in team members' judgments and decisions (Nolder and Riley 2014), and make it more difficult for teams to establish a mutual understanding (e.g., Kiesler and Cummings 2002).

In sum, limited prior literature and regulators' concerns identify a number of factors that might be associated with increased challenges in performing a global group audit. While we propose the following general hypothesis on effects of complexity, there is insufficient basis for an ex ante prediction regarding which specific sources might be relatively more important in this context.

> **H1:** Sources of greater complexity are positively associated with coordination and communication challenges experienced in global group audits.

Coordination and Communication Strategies

Once a given engagement is undertaken by a U.S. firm, the sources of complexity identified above are largely determined. However, the group audit firm and engagement team can implement specific strategies intended to reduce the impact of those features on engagement management. We consider several coordination and communication strategies, which the management literature supports as ways to improve success in managing interdependencies between teams performing distributed work: (1) *tacit coordination*; (2) *modularization*; and (3) *ongoing communication*, (illustrated in Figure 3). As detailed below, these strategies resonate in the auditing context, as they are discussed by audit firms as part of their operating practices, and/or are topics of auditing research. The management literature promotes them as theoretically appealing, and finds some to be effective in simple contexts (e.g., student virtual teams, or offshoring of routine tasks such as back office services and call centers). However, extension of these findings to the global group auditing context is uncertain, as this context features

interaction of multiple teams from independent firms across countries, performing a highly complex and judgmental task within a limited time, often with regulatory restrictions on information sharing.

Insert Figure 3 About Here

Tacit Coordination

Tacit coordination focuses on establishing a common ground of understanding between team members, which should allow teams to predict each other's actions and improve coordination (Srikanth and Puranam 2011). Underscoring the importance of this strategy, the PCAOB (2016, 18) notes situations in which component auditor personnel "lacked the necessary industry experience or knowledge of PCAOB and SEC rules and standards … and the applicable financial reporting framework to perform the work requested by the lead auditor."

We investigate several specific ways in which firms can improve tacit coordination. Walther (1997) notes that because information and knowledge transfer are slower in geographically distributed work, better outcomes are achieved when groups have long-term membership. Thus, staffing distributed teams with individuals who previously worked together could improve understanding of actions and coordination of work in the global group audit, leading to increased predictability of action between group and component auditors. This implies that longer audit partner and manager tenure on the engagement, as well more prior joint work by group and component auditors, could mitigate the effects of complexity.

While seasoned group and component audit team members are likely to have more shared engagement-specific knowledge to leverage, prior research emphasizes that knowledge of contextual features is also important (Sole and Edmondson 2002). The U.S. regulatory environment, as well as GAAP, GAAS, and industry standards, are key features of the context in which the group auditor operates. A greater understanding of these features should assist component auditors to appropriately apply information communicated, increasing predictability of action from the perspective of the group auditor. Training focused on cultural differences also might aid teams in building common understanding of contextual features that could be leveraged (Srikanth 2007; Srikanth and Puranam 2011).

Another mechanism to obtain a greater mutual understanding is temporary assignment of the component auditor to the U.S. firm (i.e., a secondment), or the group auditor to the local firm (i.e., expatriate). Such experience provides the opportunity for direct observation, contextual cues, and questioning, all of which could reduce challenges for geographically distributed teams by enabling effective knowledge sharing (Straus and Olivera 2000; Sole and Edmondson 2002; Mäkelä 2007). Further, to ease communication difficulty and reduce the effects of complexity, distributed team members (in our context, the component and group engagement teams) should help each other to understand the remote decision-making process, making local contextual features explicit (Srikanth and Puranam 2011).

Modularization

Theory and empirical results from the management literature suggest that a second strategy to alleviate the effects of complexity in global group audits is to "modularize" activities in advance, so as to minimize interdependence during the actual performance of work (Sanchez and Mahoney 1996; MacDuffie 2007). Modularization allows for coordination of actions between team members "by simply adhering to an operating procedure that specifies what each must do individually so that their joint actions are coordinated," thus potentially reducing coordination complexity (Srikanth and Puranam 2011, 853). While research supports a possible effect of modularization in global group audits, this strategy has only been tested for well-defined business activities such as mortgage processing, in which the "architecture" of the process (Srikanth and Puranam 2011, 854) is well understood. Extension of these results to the more complex and fluid context of auditing is an empirical question.[10]

In the context of global group audits, modularization strategies imply tailoring component audit instructions and organizing local fieldwork so that it can be performed without reliance on group auditors, as well as developing standardized plans or procedures for future interactions. Additionally, to minimize interdependencies the group auditor may elect to have the component auditor scope the work to be

[10] Unlike more static contexts, findings from initial audit procedures can alter requirements for subsequent testing and follow-up. The iterative nature of auditing, whereby the audit plan is continually revised to address new information discovered during risk assessment and internal controls testing, may make modularization more difficult and ultimately less successful than in previously tested environments that are more predictable.

performed over the component, i.e., design/determine the type of work.[11] Tasking the component auditor with the scoping of the work to be performed may further separate the component audit work from the group audit work. In so doing, the component auditor might improve efficiencies between the group audit and local statutory requirements. However, successful integration of modularized work at the conclusion of the audit requires compliance by the component auditor with the instructions or plan laid out by the group auditor. It seems that such advance scripting of work might be more successful in large global network firms, as their public pronouncements and prior research suggest that work practices and knowledge management are distributed through their networks (e.g., Carson 2009; Dowling 2009). However, there is tension in this question, as other research suggests variation in the application of firm practices across global networks (e.g., Barrett et al. 2005; Saito and Takeda 2014). Additionally, some evidence suggests that before the advent of PCAOB oversight, component auditors exercised considerable discretion in executing instructions from the group team (Barrett et al. 2005). Whether local "appropriation" of modularization efforts persists in the current, more highly regulated context, is unknown.

Ongoing Communication

The third strategy that may mitigate effects of complexity on a global group audit is ongoing communication. Prior research indicates that the content, method, and ease of communication between distributed team members provide opportunities to facilitate predictability and coordination in geographically distributed work (Srikanth and Puranam 2011). The content of communication between the group and component auditors is driven in part by audit regulations (i.e., ISA 600), which require the group auditor to communicate the work to be performed, including the risks to be addressed, the purpose of such work to the group audit team, and information to be reported upon completion of the audit (IFAC 2007). The group auditor may either include the component auditor in meetings on such topics (e.g., an

[11] The scope of the audit refers to designing/determining the type of work to be performed. The group auditor may elect to design/determine the type of work to be performed over the component, or have the component auditor design/determine the type of work on the group auditor's behalf (IFAC 2007).

engagement kickoff meeting, discussion of instructions, or fraud brainstorming), or communicate results of the meeting to the component auditor after the fact.

Prior literature also shows that face-to-face communication allows for a greater number of information cues to be communicated and observed, reducing the effects of complexity by promoting a mutual understanding between team members (Hinds and Mortensen 2005). In the audit studied by Barrett et al. (2005), on-site visits were important to both group and component auditors. However, due to cost and time constraints, on-site visits are likely to be sporadic. Absent face-to-face communication, employing synchronous communication methods (e.g., telephone or web conferencing) could help reduce the effects of complexity relative to asynchronous communication methods such as email (Montoya-Weiss, Massey, and Song 2001; Cummings, Espinosa, and Pickering 2009). Synchronous communication methods provide a conversational flow to organize information, allowing immediate feedback.

To assist teams in navigating the nuances of coordinating and communicating across geographic boundaries, the management literature advocates providing guidance on how to work remotely (Weisband 2002). Additionally, research argues that actually seeing another team member's work can promote a shared understanding and contribute to successful coordination (Karsenty 1999; Fussell, Kraut, and Siegel 2000; Gutwin, Penner, and Schneider 2004), although limitations on audit workpaper sharing prohibit direct observation in some jurisdictions. Srikanth and Puranam (2011) suggest that investing in technologies to facilitate remote collaboration and employing electronic tools to share work in process can increase reciprocal predictability of action, and thus reduce communication challenges.

The literature also suggests that ease of communication between distributed team members impacts the overall success of geographically distributed work arrangements (Srikanth and Puranam 2011). For instance, distributed team members should engage in frequent and spontaneous communication to improve reciprocal predictability of action, easing communication difficulty (Hinds and Mortensen 2005; Srikanth and Puranam 2011). Achieving a congruent understanding when team members possess different views and expectations also requires free exchange of information (Vlaar et al.

2008). While the PCAOB (2016) reports that some audit firms are focusing on improving communication with component auditors, significant deficiencies continue to be identified.

Summary

The management literature proposes three strategies that could improve coordination and communication in the global group audit by mitigating the influence of complexity in interdependent work. As previously noted, it is uncertain whether previous findings in simpler contexts will generalize to the context of auditing. We propose the following hypothesis:

> **H2:** Tacit coordination, modularization, and ongoing communication strategies are negatively associated with coordination and communication challenges experienced in global group audits**.**

H1 and H2 propose main effects of complexity (positive) and strategies (negative) on challenges experienced in global group audits. However, instead of an overall effect, it may be that a given strategy is only effective with a particular source of complexity, or at a particular level of complexity (high or low). Prior research does not provide guidance at this level of specificity, yet it is important for both auditing research and audit practice to understand the nuances of factors affecting the relative difficulty of managing global group audits. We propose the following research question to guide our exploratory analysis regarding these possibilities:

> **R1:** Which coordination and communication strategies reduce the effects of specific sources of complexity on challenges experienced in global group audits?

IV. METHOD

Data and Participants

To investigate global group audits, we used an experiential questionnaire to solicit information from highly experienced audit professionals on engagements in which they, as members of the group engagement team, relied on auditors at foreign locations to perform audit work over components of the consolidated financial statements of a U.S.-based entity. The Center for Audit Quality distributed two versions of the questionnaire to senior managers with multiple global group audit experiences. One asks participants to recall an engagement where they encountered significant challenges, while the other asks

about an engagement in which any challenges encountered were of little significance.[12] Within the selected engagements, the questionnaire asks participants to focus on a single component that best represents the level of challenges experienced. This design follows previous studies in auditing that employ a retrospective approach, by focusing on specific engagement experiences and avoiding "leading" questions to promote accurate recall and reporting (e.g., Gibbins, Salterio, and Webb 2001; Nelson, Elliott, and Tarpley 2002; Rennie, Kopp and Lemon 2014; Cannon and Bedard 2016).[13]

From multiple participating Big 4 firms, 151 senior managers provided data on 190 global group audit experiences, of which 149 observations have complete data on variables used in our analyses.[14] We remove two observations for which the component auditor is not a member of the same global network as the group auditor.[15] Of those, 74 (50.3 percent) are challenging and 73 (49.7 percent) are non-challenging. The majority of experiences (68.0 percent) occurred less than a year prior to the time of response, while 16.3 percent occurred between one and two years prior. The recency of sample experiences should improve recall of engagement circumstances. On average, the global group audits involve about nine components, ranging from one to 54 components. Eighty-six percent of clients in the sample are SEC registrants, in the manufacturing (30.6 percent), technology (21.8 percent), retail (7.5 percent), consumer products (6.8 percent), financial services (6.1 percent), and energy/utilities (6.1 percent) industries. Forty-

[12] Data provided through the CAQ and participating firms indicate that 74.51 percent of the auditors solicited for the study completed the questionnaire, and that response rates do not differ between versions of the questionnaire.

[13] This design follows the precepts of the Critical Incident Technique, originated by Flanagan (1954), and used extensively in industrial and organizational psychology and other business disciplines. In focusing on highly salient experiences, extensive prior research shows that the Critical Incident Technique leads to more accurate recalls.

[14] About 85 percent of the 151 participants were senior managers at the time of the global group audit experience, while 14.8 percent were managers at that time. Participants described one or two global group audit experiences based on the preference of their firm; 72.2 percent described a single experience, and the remaining 27.8 percent described both a challenging and a non-challenging experience. Firms preferring to have participants describe two global group audit experiences randomly distributed two versions of the questionnaire to mitigate any order effects: one that first requests information on a challenging engagement and, another that first requests information on a non-challenging engagement. We omit responses of one individual who responded to the "challenging" version, but noted in an open-ended response that (s)he had no challenging engagements to supply. To ensure anonymity, no identifying information was collected, including identity of the group auditor's firm.

[15] While comparing within-network to out-of-network global group audits is interesting and important, the few out-of-network component auditors in our sample prevent that comparison. In contrast, Carson et al. (2016) report 19 percent of group audits led by Australian teams involve component auditors that are all within-network. One factor contributing to this difference is our focus on Big 4 firms, which are more likely than smaller firms to have network affiliates located where components are domiciled.

one percent have consolidated annual revenues of greater than $5 billion, 35.4 percent between $1 and $5 billion, 15.0 percent between $200 million and $1 billion, 4.8 percent between $25 and $200 million, and 3.4 percent have consolidated annual revenues of $25 million or less.

Questionnaire Design and Collection Procedures

To develop the instrument, we conducted a series of interviews with senior managers from several of the participating firms, and solicited additional feedback from audit partners. The final questionnaire reflects the feedback of these professionals, the literature on geographically distributed work, and ISA 600. In selecting a global group audit experience, the questionnaire instructs participants to choose a continuing audit (not a first year audit), where the work performed by the component auditor was fairly extensive. Following this general prompt, the questionnaire asks them to choose an engagement for which they are familiar with how their team coordinated and communicated with the component auditors, and how the component engagement teams' work was integrated into the overall audit. Within the selected engagement, the questionnaire asks participants to focus responses on a single component that best represents the engagement's challenging or non-challenging nature, respectively. In the "challenging" version, the questionnaire focuses the study's purpose by instructing participants to choose an engagement where significant coordination and communication challenges were encountered, exemplifying at least one of several broad types derived from concerns of the PCAOB and the firms providing data. These include difficulties related to the execution of the component audit work, variation in the risk assessed or the quality work performed by the component auditor, and issues of timeliness.[16]

To provide ample time to consider the criteria, choose a relevant engagement, and consider the details of that experience through recall or search of workpapers, a firm liaison sent a letter on our behalf to each participant several days in advance of sending the questionnaire, explaining the study. Both the

[16] Results of preliminary verbal protocols and pretests demonstrated that providing a list was necessary to gather experiences related to coordination and communication problems, the scope of this study. The challenge types were developed with advice from partners at the firms providing data to cover non-industry-specific issues addressed in ISA 600, and cover key aspects of audit quality.

letter and the questionnaire assured participants of anonymity, asking for responses to be as specific as possible without including information that might identify the client, the firm, or the participant.

Variables

In order to investigate sources of complexity distinguishing challenging global group audits, and whether the use of specific strategies mitigates the effects of complexity, we develop test variables using polychoric factor analysis within the theoretically derived categories of complexity and mitigating strategies. Below we first present the underlying variables by category, and subsequently describe the development of the factors used for empirical tests.

Complexity

Table 1 Panel A contains measures of *complexity* present in a global group audit. To measure company complexity features, we include *REVENUE* (measured in broad categories from 1 ("<=$25 million") to 5 (">$5 billion") to ensure anonymity of clients), an indicator for *SEC_REGISTRANT*, and *NUMBER_COMPONENTS*. Measures of the nature of the component audit work arising from company characteristics include an indicator for the component auditors' responsibility for the local *STATUTORY_AUDIT*, and the group auditor's perception of the component auditor's *WORK_ COMPLEXITY*, measured on a scale ranging from 1 ("Very Low") to 11 ("Very High"). Measures of organizational structure include *SUPERV_COMPONENT* (equal to 1 if the component has a number of sub-components under its supervision; 0 otherwise), *SUB_COMPONENT* (equal to 1 if the component reports indirectly to the group auditor through another component engagement team; 0 otherwise), and *OTHER_TEAM* (a team other than the component auditor performs a portion of the work; 0 otherwise).[17] Complexity may also be introduced into the global group audit through language/cultural differences between the group and component auditor. *LANG_BARRIERS* and *CULTURAL_BARRIERS* are measured on scales ranging from 0 ("Not At All") to 11 ("Very High").

Insert Table 1 About Here

[17] For example, the auditor of a shared service center may test receivables for the entire region or centralized IT specialists may test general controls over the ERP system. In both instances a portion of the component audit work is performed by an auditor other than the component engagement team.

Tacit Coordination

Table 1 Panel B shows variables comprising the *tacit coordination* strategy. Measures relating to component auditors include *CA_MGR_EXPERIENCE* and *CA_PTR_EXPERIENCE,* (the number of years the component audit leaders worked on the engagement). The stability of component audit staff, *CA_STABILITY,* equals 1 if the component audit staff did not turn over from prior periods; 0 otherwise. Exposure to the U.S. audit environment is measured by *CA_US_TOUR* (which equals 1 if a member of the component audit team had worked in the U.S. in the last five years; 0 otherwise) and *CA_US_EXPAT* (equaling 1 if the component audit team included a member of the U.S. firm working abroad; 0 otherwise). The extent of the component auditors' knowledge of U.S. regulations and the industry is measured by *CA_KNOW_GAAP*, *CA_KNOW_GAAS*, *CA_KNOW_REG_ENV*, and *CA_KNOW_INDUSTRY,* using scales ranging from 1 = "Very Low" to 11 = "Very High". Tacit coordination variables relating to group auditors include *GA_MGR_EXPERIENCE* and *GA_PTR_EXPERIENCE*. Further, we include an indicator for group audit team training on cultural differences *(CULTURAL_TRAINING*). We also measure past interactions through which group and component auditors could have shared knowledge on prior engagements (*WORK_TOGETHER_PRIOR,* measured on a scale ranging from 0 = "Not at All" to 11 = "Very High"). Finally, *DECISIONS_EXPLAINED* captures the extent to which group auditors made their reasoning processes explicit to the component team in the current engagement (measured on a scale ranging from 0 = "Not at All" to 11 = "Very High").

Modularization

Table 1 Panel C presents variables representing the coordination strategy of *modularization,* which involves reducing interdependencies and standardizing interactions between group and component auditors. Category variables *TAILORED_INSTRUCTIONS, TAILORED_WORK* and *PLANNED_ INTERACTIONS* measure the extent to which the group auditor reduced interdependencies and standardized interactions through audit planning activities (measured on a scale ranging from 0 = "Not at

All" to 11 = "Very High"). We also include *CA_SCOPED*, an indicator for whether or not the component auditors scoped the component audit procedures.

Ongoing Communication

Table 1 Panel D contains variables representing the *ongoing communication* strategy, which focuses on communication content, method, and ease of communication. Measures of communication content include indicators for direct involvement of the component auditor in the *KICKOFF_MEETING*, *INSTRUCTIONS_DISCUSSION* and *FRAUD_BRAINSTORMING*. We measure the extent to which firms provide guidance and tools to assist global group auditors in overcoming the challenges introduced by working across geographic boundaries using *GUIDANCE_WORK_REMOTELY*, *TECHNOLOGY_AVAILABLE*, and *ELECTRONIC_TOOLS_USE*, respectively (each measured on a scale ranging from 0 = "Not at All" to 11 = "Very High"). We measure ease of communication through *COMMUNICATION_FREQ* (the average number of times per week the group and component auditor communicated), as well as *COMMUNICATION_SPONT* and *FREE_EXCHANGE* (measured on a scale ranging from 0 = "Not at All" to 11 = "Very High"). Additionally, we measure *SYNCHRONOUS_VALUED*, *SYNCHRONOUS_FREQ* and *ONSITE_VISIT*, which are indicators for whether the most valued (frequently used) communication method was synchronous and whether the group audit leader(s) visited the component audit location.

Control Variables

Table 1 Panel E defines a control variable for significance of changes occurring during the audit (*AUDITPLAN_CHANGE*) measured on a scale from 0 ("Not at All") to 11 ("Very High").[18] We also include industry indicators in the models, but do not table these variables.

Factor Analysis

Our theoretical constructs of complexity and mitigating strategies each contain multiple variables derived from prior research and input from participating firms. As many of these individual variables are

[18] We also measured *CLIENTBUS_CHANGE*, the number of changes in the company's and/or the component's business during the audit period (e.g., financial health, mergers/acquisitions, management turnover, and system implementation). This variable is not significant in any of the models, and so is not included for parsimony.

correlated data reduction is needed prior to estimating models.[19] Due to the primarily binary and ordered categorical nature of the measures, we use polychoric factor analysis with varimax rotation within the constructs to develop parsimonious measures of the latent constructs (e.g., Drasgow 1988; Dorantes, Chan, Peters, and Richardson 2013; Harris, Petrovits, and Yetman 2015). The Appendix presents results of factor analysis, including factor loadings. Table 2 provides variable names and interpretations of the resulting factors, the percent of variance explained by each factor, and correlations among them.

Insert Table 2 About Here

Complexity

Table 2 first describes the factors derived from polychoric factor analysis of complexity variables. Three factors have eigenvalues greater than 1.0, together explaining 78.1 percent of the variance of the original measures. Using factor loadings of at least 0.40, we interpret these factors as *COMPLEXITY_SIZE* (23.5 percent of variance explained), *COMPLEXITY_STRUCTURE* (24.4 percent), and *COMPLEXITY_ BARRIERS* (30.2 percent), consistent with prior research cited above. Variables loading positively on *COMPLEXITY_SIZE* include client revenues and SEC registrant status. With respect to *COMPLEXITY_STRUCTURE,* variables loading positively include the component auditor performing a statutory audit and number of components involved in the engagement. For *COMPLEXITY_BARRIERS*, the extent of language and cultural barriers load positively, while sub-component structure loads negatively. The signs of these loadings imply that language/cultural barriers occur less often when the component reports to the group auditor through an additional layer (e.g., a component in Italy reports through a European supervisory team; see Figure 2).

Tacit Coordination

Table 2 next shows five factors relating to tacit coordination measures with eigenvalues over 1.0, explaining 70.6 percent of the variance of the original measures. Variables loading positively on *TACIT_CA_EXPERIENCE* (12.3 percent of variance explained) include engagement experience of the

[19] For instance, significantly correlated variables include: *LANG_BARRIERS* and *CULTURAL_BARRIERS* (0.67); *CA_KNOW_GAAP* and *CA_KNOW_GAAS* (0.86); *TAILORED_INSTRUCTIONS* and *TAILORED_WORK* (0.58); and *TECHNOLOGY_AVAILABLE* and *ELECTRONIC_TOOLS_USE* (0.54).

component audit manager and the extent to which group and component auditors have previously worked together. For *TACIT_CA_STABILITY* (11.1 percent), the extent to which the component team did not change from the prior year loads positively. For *TACIT_CA_EXPAT* (10.0 percent), a U.S. expatriate on the component auditor team loads positively. With respect to *TACIT_CA_KNOWLEDGE* (25.4 percent), variables loading positively include extent of the component auditor's knowledge of U.S. GAAP, GAAS, regulatory environment and industry. For *TACIT_GA_ EXPERIENCE* (11.8 percent) group partner experience loads positively, while cultural training loads negatively.[20] The opposing signs within this factor suggest that cultural training is more often used by less experienced group partners, although the overall mean of cultural training is low (4.1 percent).

Modularization

Table 2 next shows that factor analysis of modularization variables yields one factor with an eigenvalue over 1.0, explaining 93.8 percent of the variance of the original measures. The extent to which tailored instructions, tailored work, and planned interactions are used within the engagement to minimize interdependencies all load positively on *MODULARIZATION*.

Ongoing Communication

Factor analysis of ongoing communication measures yields three factors with eigenvalues over 1.0, explaining 79.9 percent of the variance of the original measures. We identify these factors as *ONGOING_CONTENT* (35.4 percent of variance explained), *ONGOING_ELECTRONIC* (25.5 percent), and *ONGOING_FTF* (19.0 percent). Variables loading positively on *ONGOING_CONTENT* include the extent to which the group auditor involves the component auditor in the kickoff meeting, discussion of instructions, and fraud brainstorming; and when the communication method most valued is synchronous. Variables loading positively on *ONGOING_ELECTRONIC* include the extent to which the group team received guidance in how to work remotely with component auditors, and the availability and use of

[20] Cultural training also loads negatively on *TACIT_CA_EXPERIENCE*. This suggests that group auditors are more likely to receive cultural training when component auditors are less experienced.

electronic tools on the engagement. For *ONGOING_FTF*, the extent of use of synchronous communication methods and extent of face-to-face meetings between teams load positively.

Models

To summarize, we measure three sources of complexity and three mitigating strategies, deriving variables representing each construct from the factor analyses presented above.[21] Model 1 is a preliminary main effects probit model, testing overall associations of complexity and strategy variables with the probability that an engagement is identified as a highly challenging global group audit.

$$\begin{aligned} CHALLENGING = {} & \beta_0 + \beta_1 COMPLEXITY\_SIZE + \beta_2 COMPLEXITY\_STRUCTURE \\ & + \beta_3 COMPLEXITY\_BARRIERS + \beta_4 TACIT\_CA\_EXPERIENCE + \beta_5 TACIT\_CA\_STABILITY \\ & + \beta_6 TACIT\_CA\_EXPAT + \beta_7 TACIT\_CA\_KNOWLEDGE + \beta_8 TACIT\_GA\_EXPERIENCE \\ & + \beta_9 MODULARIZATION + \beta_{10} ONGOING\_CONTENT + \beta_{11} ONGOING\_ELECTRONIC \\ & + \beta_{12} ONGOING\_FTF + \{Control\ Variables\} + \varepsilon \end{aligned} \quad (1)$$

Models 2-4 are interaction models, testing whether the mitigating effect of each strategy varies by source of complexity. A significant coefficient on the interaction between a specific strategy and a particular source of complexity implies that the effect of a given source of complexity on engagement challenges varies according to the level of specific strategies used. We estimate a separate model for each source of complexity: in Model 2 *[complexity]* is measured as *COMPLEXITY_SIZE*, in Model 3 as *COMPLEXITY_STRUCTURE*; and in Model 4 as *COMPLEXITY_BARRIERS*.[22] In each model, the source of complexity of interest is interacted with each strategy, and other sources of complexity are retained as main effects.

$$\begin{aligned} CHALLENGING = {} & \beta_0 + \beta_1 COMPLEXITY\_SIZE + \beta_2 COMPLEXITY\_STRUCTURE \\ & + \beta_3 COMPLEXITY\_BARRIERS + \beta_4 TACIT\_CA\_EXPERIENCE + \beta_5 [complexity]*CAEXP \\ & + \beta_6 TACIT\_CA\_STABILITY + \beta_7 [complexity]*STABILITY + \beta_8 TACIT\_CA\_EXPAT \\ & + \beta_9 [complexity]*EXPAT + \beta_{10} TACIT\_CA\_KNOWLEDGE + \beta_{11} [complexity]*KNOWL \\ & + \beta_{12} TACIT\_GA\_EXPERIENCE + \beta_{13} [complexity]*GAEXP + \beta_{14} MODULARIZATION \\ & + \beta_{15} [complexity]*MODULAR + \beta_{16} ONGOING\_CONTENT + \beta_{17} [complexity]*CONTENT \\ & + \beta_{18} ONGOING\_ELECTRONIC + \beta_{19} [complexity]*ELECTRONIC + \beta_{20} ONGOING\_FTF \\ & + \beta_{21} [complexity]*FTF + \{Control\ Variables\} + \varepsilon \end{aligned} \quad (2)\text{-}(4)$$

V. RESULTS

[21] All models include control variables for the auditor's judgment of the extent of changes in the audit (*AUDITPLAN_CHANGE*) and the client industry. The models are estimated using robust standard errors clustered on participant.

[22] Results do not differ qualitatively if all sources of complexity are tested in one model.

Descriptive Statistics

Information About the Nature of Significantly Challenging Global Group Audits

Prior to discussing our main results, we present descriptive information on the importance and breadth of challenges experienced by participants in the components selected as having significant challenges, the extent to which those challenges were anticipated, and specific challenges encountered. Table 3 Panel A shows that the challenges experienced on the selected components were rated as more than moderately important to the overall global group audit (mean = 7.0). On average, nearly a third of all components on sample engagements possess significant challenges (29.6 percent), and the challenges were moderately anticipated (mean = 5.6).[23] Table 3 Panel B shows that challenges often relate to *execution* of audit work, including *OBTAINING_CLARITY* (52.7 percent), *COMMUNICATING_ COORDINATING* (52.7 percent), *ADDITIONAL_PROCEDURES* (33.7 percent), and *INVOLVING_GA* (25.7 percent). In 12.2 percent of engagements, challenges involve variation in risks assessed by the component and group auditors. In 31.1 percent, group auditors report that the work performed by the component auditors does not always comply with instructions. Table 3 also highlights the prevalence of *timing* challenges in global group audits: *NONTIMELY_COMMUNICATION* and *NONTIMELY_ COMPLETION* are common (41.9 and 58.1 percent, respectively), but *SUBSEQUENT_ DISCOVERY* is rare (6.8 percent).

Insert Table 3 About Here

Sources of Complexity and Mitigating Strategies

Table 1 presents descriptive statistics for responses to all questions submitted to factor analysis and control variables. Table 1 shows means (standard deviations) for continuous and scale variables, or the percent equal to 1 for indicators, for the entire sample, as well as univariate tests of differences between subsamples of challenging and non-challenging experiences. For efficiency of presentation, we highlight certain interesting overall trends in the data, but do not discuss univariate comparisons.

[23] Interestingly, the proportion of components possessing significant challenges in our sample is comparable to rate of audit failures identified by the PCAOB during 2013 for "referred work" inspections (Munter 2014).

Complexity. Table 1 Panel A describes measures of *complexity* inherent in the global group audit. Most sample entities are very large (averaging 4.1 on the 5-point scale of annual revenues), 86.4 percent are SEC registrants, and they average 8.9 components. In 87.1 percent of experiences, the component auditor also performs a *STATUTORY_AUDIT*. Group auditors on average judge the component auditor's work to be moderately complex (6.3 on the 11-point scale).

Tacit Coordination. Table 1 Panel B describes measures related to the *tacit coordination* strategy (i.e., leveraging experience and knowledge), first presenting variables related to component auditors, then group auditors, and then interactions between them. Mean *CA_MGR_EXPERIENCE* is 8.0 years, nearly twice that of *GA_MGR_EXPERIENCE* (4.2 years), while means of *CA_PTR_EXPERIENCE* (3.6 years) and *GA_PTR_EXPERIENCE* (3.5 years) are lower, consistent with SEC limits on partner tenure. About 21 (19.7) percent of component engagement teams have a *CA_US_TOUR* (*CA_US_EXPAT). CULTURAL_TRAINING* for group auditors, which might provide knowledge of key contextual features, is rare (4.1 percent). Component auditor knowledge of US GAAP, GAAS, regulation and the relevant industry are rated on average moderately high (7.2 to 9.0).

Modularization. Table 1 Panel C describes measures related to the *modularization* strategy. Descriptive statistics indicate that group auditors regularly employ *TAILORED_INSTRUCTIONS* (7.9), *TAILORED_WORK* (7.0), and *PLANNED_INTERACTIONS* (8.4) as coordination strategies. Component auditors scope relatively few sample engagements (10.9 percent; *CA_SCOPED*).

Ongoing Communication. Table 1 Panel D describes measures related to the *ongoing communication* strategy. Component auditors frequently participate in meetings for engagement kickoff, communication of instructions, and fraud brainstorming (54.4 to 79.6 percent). The extent of *TECHNOLOGIES_AVAILABLE* to facilitate remote communication is moderate (5.1) and *ELECTRONIC_TOOLS_USE* is fairly low (4.2). Thus, although technologies and electronic tools are often considered to be common across global networks, our participants do not rate them as extensively available or employed in the global group audit context. Group and component auditors communicate on average 1.8 times per week. Synchronous communication methods are highly valued

(*SYNCHRONOUS_VALUED*, 73.5 percent) relative to the infrequent use of those methods (*SYNCHRONOUS_FREQ*, 10.9 percent). This suggests a tendency to use communication methods with fewer information cues, despite the recognized value of richer communication methods.

Results of Multivariate Models

As a preliminary analysis, we first estimate Model 1, a main effects probit model of *CHALLENGING* with complexity and strategy factors. Results in Table 4 Column A show that both *COMPLEXITY_STRUCTURE* and *COMPLEXITY_SIZE* have the expected positive signs ($p<0.10$ and 0.05, respectively). The only strategies significantly associated with lower probability of a challenging engagement are tacit coordination factors related to component auditors: *TACIT_CA_EXPERIENCE*, *TACIT_CA_STABILITY*, and *TACIT_CA_KNOWLEDGE* (all at $p<0.01$). Main effects model results thus suggest that across the sample, engagements identified as challenging tend to be performed on clients that are large SEC registrants with a greater number of components and statutory audit requirements in the component countries. Further, this analysis suggests that the only strategy effective in reducing the overall probability of challenges is the consistent employment of an experienced, knowledgeable component auditor team. Main effects findings do not show that language and cultural barriers increase the challenges experienced in global group audits overall, or that some strategies employed by the profession mitigate challenges (including modularization of work, increasing interaction between teams through meetings, or availability/use of electronic tools). However, this model presents a simplistic picture, as some strategies may be effective only for specific sources or levels of complexity, i.e., higher or lower.

Insert Table 4 About Here

Models 2-4 build on Model 1 by adding interactions of complexity and strategy factors, testing whether the effects of strategies are contingent on the levels and types of complexity characteristics of the sample global group audits.[24] Model 2 interacts the three strategies (tacit coordination, modularization,

[24] Models 2-4 have Pseudo-R^2 values ranging from 0.21 to 0.28, and ROC areas of 0.80 to 0.83, indicating excellent discrimination (Hosmer and Lemeshow 2000). Table 2 presents Pearson correlations among factors. While a few correlations are significant ($p<0.05$, two-tailed), the highest values are -0.41 (*TACIT_CA_ EXPERIENCE* and

and ongoing communication) with *COMPLEXITY_SIZE*, Model 3 with *COMPLEXITY_STRUCTURE*, and Model 4 with *COMPLEXITY_BARRIERS*.[25] Table 4 presents the results of these models in Columns B-D, and Figure 4 graphs predicted probabilities for significant interactions at the mean and one standard deviation above/below the mean (which we describe in the text as "higher/lower" values of the factors), with other variables held at their means.

Insert Figure 4 About Here

Interactions of Strategies with Complexity Related to Company Size/Regulatory Status

Table 4 Column B shows results of Model 2, interacting strategy use with *COMPLEXITY_SIZE* (higher revenues and SEC registrant status). Main effects for *TACIT_CA_EXPERIENCE*, *TACIT_CA_STABILITY*, and *TACIT_CA_KNOWLEDGE* remain negative and significant in the presence of the interaction terms ($p<0.01$). The insignificant interaction with *TACIT_CA_KNOWLEDGE* implies that greater component auditor knowledge of US GAAS, GAAP and industry norms reduces challenges across the range of *COMPLEXITY_SIZE*. However, significant interactions with *TACIT_CA_ EXPERIENCE* and *TACIT_CA_STABILITY* show that effects of these strategies are contingent on company size. Specifically, *COMPLEXITY_SIZE*CAEXP* is negative and significant ($p<0.05$), implying that component auditor experience has a greater mitigating effect on challenges as size increases. Figure 4 Panel A shows that for higher *COMPLEXITY_SIZE*, the predicted probability is 0.33 (0.76) for higher (lower) *TACIT_CA_EXPERIENCE*. For lower *COMPLEXITY_SIZE*, the predicted probability of a challenging audit does not differ. In contrast, *COMPLEXITY_SIZE*STABILITY* is positive and marginally significant ($p<0.10$), implying that lack of turnover in component auditor staff mitigates challenges as size complexity decreases. Figure 4 Panel B confirms this pattern. For higher *COMPLEXITY_SIZE*, the predicted probability does not differ, but for lower *COMPLEXITY_SIZE* the predicted probability is 0.30 (0.77) for higher (lower) *TACIT_CA_STABILITY*.

TACIT_CA_ STABILITY) and 0.22 (*COMPLEXITY_ SIZE* and *ONGOING_ELECTRONIC*). Variance inflation statistics in all models are low (the largest is 3.00), indicating that multicollinearity is not a concern.

[25] Industry control variables (untabled) consistently show that the financial services industry is less often represented in challenging engagements, consistent with greater regulation in that industry.

Table 4 Column B shows that *COMPLEXITY_SIZE*EXPAT* is negative and significant ($p<0.01$), with a disordinal pattern illustrated in Figure 4 Panel C. For higher *COMPLEXITY_SIZE*, including a U.S. expatriate is associated with a lower predicted probability of a challenging audit: 0.40 (0.69) for higher (lower) *TACIT_CA_EXPAT*. For lower *COMPLEXITY_SIZE*, the predicted probability of a challenging audit is 0.73 (0.32) for higher (lower) inclusion of a U.S. expatriate on the component audit team.[26] Model 2 results also show that *COMPLEXITY_SIZE*MODULAR* is positive and significant ($p<0.05$), illustrated in Figure 4 Panel D. For higher *COMPLEXITY_SIZE*, the predicted probability of a challenging audit is 0.62 (0.47) when *MODULARIZATION* is higher (lower). For lower *COMPLEXITY_SIZE*, modularization reduces challenges, as the predicted probability of a challenging audit is 0.32 (0.67) for higher (lower) modularization.

Taken together, results for Model 2 imply that greater component auditor knowledge is uniformly associated with lower probability of challenging group audits, regardless of company size. When company size is higher, both engagement experience of component audit team leaders and expatriate experience on the component team help mitigate challenges, and by that standard are highly useful. However, merely having a stable component staff only mitigates challenges when size complexity is lower. Results further show that modularization only mitigates challenges when size complexity is low, and may be counterproductive when size complexity is high. Model 2 shows no impact of ongoing communication strategies on mitigating challenges associated with company size.

Interactions of Strategies with Structural Complexity

Table 4 Column C presents results of Model 3, with interactions based on complexity measured as client structure (i.e., number of global components of the entity, and statutory audit requirements of the selected component). Model results show that *COMPLEXITY_STRUCTURE* is positive and significant ($p<0.01$). This effect must be interpreted in light of significant interactions discussed below. *TACIT_CA_EXPERIENCE*, *TACIT_CA_STABILITY*, and *TACIT_CA_KNOWLEDGE* are all negative and

[26] This effect should be interpreted with caution due to relatively fewer expatriates involved on engagements on small, private companies. Only three expats were involved on engagements below the mean of *COMPLEXITY_SIZE*, while 26 were involved were involved on engagements above the mean.

significant ($p<0.01$) and their associated interactions are insignificant, implying that longer component auditor engagement experience, stability of component audit staff year-over-year, and greater component auditor knowledge are associated with lower probability of challenges overall.

Turning to the interaction terms in Model 3, we find that *COMPLEXITY_STRUCTURE* **MODULAR* is negative and significant ($p<0.05$). Figure 4 Panel E shows that for higher *COMPLEXITY_STRUCTURE*, the predicted probability of a challenging audit is 0.45 (0.82) for higher (lower) modularization, while for lower *COMPLEXITY_STRUCTURE* this order reverses ((0.49 (0.18) for higher (lower) modularization). The interaction with *ONGOING_CONTENT* is also negative and significant ($p<0.05$) in Model 3. As this interaction is similar in shape to Figure 4 Panel E, it is not graphed. For higher *COMPLEXITY_ STRUCTURE*, predicted probabilities of a challenging audit are 0.49 (0.77) for higher (lower) component auditor involvement in meetings. However, for lower *COMPLEXITY_STRUCTURE*, the predicted probabilities of a challenging audit are 0.52 (0.16) for higher (lower) component auditor involvement.

Taken together, results of Model 3 imply that structural complexity is strongly associated with challenging global group audits. An experienced, stable and knowledgeable component team helps mitigate its effects, as the impact of these strategies holds across the range of structural complexity. In addition, the two significant interaction terms (with *MODULARIZATION* and *ONGOING_CONTENT*) in Model 3 exhibit a common pattern. For both strategies, our results imply similar effectiveness in mitigating coordination and communication problems for components with higher vs. lower structural complexity. However, the opportunity cost of *not* engaging in these strategies is evident from the striking increase in probability of a challenging audit for lower strategy use as structural complexity rises.

Interactions of Strategies with Complexity Due to Language/Cultural Barriers

Table 4 Column D shows results of Model 4, which interacts strategies with *COMPLEXITY_BARRIERS* (complexity measured as language and/or cultural barriers). Results show that *TACIT_CA_EXPERIENCE, TACIT_CA_STABILITY,* and *TACIT_CA_KNOWLEDGE* are negative and significant ($p<0.01$, $p<0.05$ and $p<0.01$, respectively), implying that greater component auditor manager

experience, staff stability, and component auditor knowledge are associated with lower probability of a challenging engagement overall. Both *COMPLEXITY_ BARRIERS*CONTENT* and *COMPLEXITY_ BARRIERS*ELECTRONIC* are negative and significant ($p<0.10$ and $p<0.05$, respectively), with patterns similar to Figure 4 Panel C. For higher *COMPLEXITY_BARRIERS*, predicted probabilities of a challenging audit are 0.48 (0.57) for higher (lower) component auditor involvement in engagement kick-off, discussion of instructions, and fraud brainstorming (*ONGOING_CONTENT*). For lower *COMPLEXITY_ BARRIERS,* this order reverses, and involvement of component auditors in meetings is associated with a higher probability of challenges (0.58 vs. 0.38). For higher *COMPLEXITY_BARRIERS,* greater availability/use of electronic communication (*ONGOING_ELECTRONIC*) is associated with a lower predicted probability of a challenging audit: 0.44 vs. 0.61 for lower electronic communication availability/use. In contrast, for lower language/cultural barriers, greater electronic communication availability/use is associated with a higher predicted probability of challenges (0.60 vs. 0.36).

Taken together, results of Model 4 continue to show the value of experienced, stable and knowledgeable component auditors in mitigating challenges due to differences in language and culture across teams. Higher levels of component auditor involvement in initial engagement meetings and use of electronic tools have value in mitigating challenges when language and culture differ across teams. However, they are not advantageous when language/cultural barriers are lower.

VI. CONCLUSIONS AND LIMITATIONS

This study contributes to the literature by providing insights on global group audits derived from the salient experiences of highly experienced auditing professionals. Regulators are concerned about the potentially broad impact of low quality global group audits on the financial system (Doty 2011c; PCAOB 2016). However, few studies to date examine this important auditing context. Our results provide the first descriptive evidence available in the literature on work processes in a sample of U.S. global group audit engagements, conducted by Big 4 audit firms in the post-Sarbanes-Oxley environment. Our analysis yields a number of findings new to the literature, summarized in Table 5.

Insert Table 5 About Here

The theoretical basis for our tests is derived from the management literature on geographically distributed work, which proposes that coordination and communication challenges will be exacerbated in complex environments where interdependent teams have low reciprocal predictability of action. In auditing, most client and engagement characteristics that increase complexity (e.g., size, regulatory status, global structure, and countries in which the client operates) are outside the control of the group auditor once the engagement is contracted. The literature on distributed work also proposes several strategies that auditors might adopt to mitigate the challenges faced by interdependent teams in these complex client situations. Of the three strategies we study, we find that the strategy of increasing *tacit coordination* has the highest impact, implying that establishing common ground between team members increases reciprocal predictability of action. Several elements of that strategy are significantly associated with reduction in the probability of challenging engagements across all models. Greater component auditor knowledge has the most widespread effect, mitigating overall effects of three sources of complexity. Additionally, the mitigating effects of greater component auditor experience apply to all levels of global structure and language/cultural barriers, as well as to larger, public companies. Stability in the component audit team mitigates challenges for two sources of complexity (global structure and language/cultural barriers), but is ineffective for larger, public companies. This implies that while a stable component team can assist group auditors to manage engagements when component team structures and team members are diverse, there will still be roadblocks to performing effective and efficient audits for large, public U.S. entities unless the component auditors possess high levels of knowledge and experience specific to the engagement context. In contrast, we find no effect of group audit partner experience, likely because the range is limited due to the five-year limitation on partner tenure for public clients imposed by the Sarbanes-Oxley Act.

The above findings suggest that group auditors should explore opportunities to improve component auditor staffing and cultivate greater knowledge of the industry and U.S. practice. But to what degree are group audit leaders able to influence the composition of foreign component teams to improve tacit coordination? We did not design our study to investigate this issue, but one participant noted in a

comment that group auditors have little control over staffing the component team, especially at lower levels. This issue may be exacerbated when component auditors are out of network, as recent research outside of the auditing context suggests that control over tacit coordination mechanisms may be more difficult if the distributed team members do not belong to the same firm (Srikanth and Puranam 2014).

Our results regarding other strategies show that their effects are contingent on the nature and level of complexity. Particularly, results on modularization are not widespread. Barrett et al. (2005) note that participants in their study relied on a standardized plan to manage work in a low-risk group audit. Our data show that the modularization of work is associated with a reduction of challenges only when clients are small/nonpublic and when global structure is relatively complex (i.e., the group auditor is working with many component teams and the component team performs a statutory audit). Thus, while modularization helps manage a larger number of teams with various incentives, it is apparently counterproductive for large, public clients and does not help to mitigate language/cultural barriers. While a modularization strategy might seem efficient, auditors may fail to appreciate that to work well teams must understand and adhere to the defined plan (or operating procedure) (Srikanth and Puranam 2011).

We also find limited effects of ongoing communication strategies. Greater component auditor involvement in meetings (related to engagement kickoff, discussion of instructions, and fraud brainstorming) is shown to mitigate the effects of a more complex global structure and language/cultural barriers. Greater availability and reliance on electronic tools are also helpful when complexity due to language/cultural barriers is high. Taken together with the weak effects of modularization, our results suggest that "handing off" work to foreign components following preliminary separation and scripting of activities will be ineffective, unless accompanied by continued involvement of component personnel as work is begun and throughout the engagement

For audit practice, these results imply that group auditors should continue to explore opportunities to involve component auditors in initial engagement meetings as a way to increase reciprocal predictability of action. While firms espouse that audit training and tools are largely consistent across global networks, our data show that electronic tools and technologies are employed on a limited basis, and

may not be available to all team members. This may be due to situated practices (i.e., component teams are unfamiliar with or unwilling to adopt such tools) or issues associated with accessing technologies (e.g., internet connectivity). In some respects our results support recent efforts by the PCAOB (2016) to increase communication between the group and component auditor, although it is unclear whether the written communication proposed by regulators will mitigate challenges. While greater communication helps increase reciprocal predictability in teams performing interdependent work (Puranam and Raveendran 2012), written words may be misinterpreted (Cramton 2001) particularly when language and culture of the sender and receiver differ. Further, our findings provide mixed results for written communication as utilized in the modularization strategy, raising questions as to whether regulators' preference for documentation is actually helpful in organizing key aspects of global engagements.

Generalization of the above results is limited by features inherent in our research method and by specific design choices. First, our sample comprises highly challenging and non-challenging global group audit experiences, limiting generalizability to the entire population of global group audits. Second, our use of experiential data may lead to some degree of recall bias. However, we sought engagement experiences that are particularly salient and therefore easier to recall (e.g., Gogan, McLaughlin, and Thomas 2014). To further limit recall bias, we follow prior research (e.g., Gibbins and Trotman 2002) in avoiding leading questions and asking details about the specific experiences before asking about factors that could impact them. Information pertinent to the study was distributed to participants several days in advance to provide ample time for recall, and participants were assured that all responses would remain anonymous and confidential. While some of the variables represent judgments, others are based on factual information that could have been sourced from workpapers if the participant chose to do so.

Third, we limit our focus to the perspective of one party – the group auditor.[27] Further research should investigate the nature and extent of challenges experienced from the perspective of the component auditor. The component auditor perspective may also permit researchers to explore factors that influence

[27] Another limitation is due to the very small representation of out-of-network component auditors in our sample. Thus, results might not generalize beyond within-network group audits.

engagement staffing (i.e., auditor assignment). The nature of the staffing process for global group audits, both domestically and abroad, is a key research topic for future research to address. Finally, we measure associations among variables and do not imply causation. Future research could specifically assess the contexts in which specific strategies are most effective. For instance, future research could explore contextual features that are most likely to allow for modularization (the strategy most frequently employed in our sample) to overcome challenges as well as whether regulatory requirements (e.g., greater documentation) impact the effectiveness of this strategy.

APPENDIX
Factor Loadings

Variables	*Complexity Factors*			*Strategy Factors*				
	SIZE	***STRUCTURE***	***BARRIERS***	***TACIT_CA_ EXPERIENCE***	***TACIT_CA_ STABILITY***	***TACIT _CA_ EXPAT***	***TACIT_CA_ KNOWLEDGE***	***TACIT_GA_ EXPERIENCE***
Panel A. Complexity								
REVENUE	**0.70**	0.33	-0.07					
SEC_REGISTRANT	**0.70**	-0.04	0.17					
NUMBER_COMPONENTS	0.08	**0.60**	0.03					
STATUTORY_AUDIT	0.18	**0.71**	0.00					
WORK_COMPLEXITY	0.18	0.38	-0.01					
SUPERV_COMPONENT	-0.05	0.14	-0.18					
SUB_COMPONENT	0.00	0.23	**-0.45**					
OTHER_TEAM	0.38	0.21	-0.27					
LANG _ BARRIERS	0.05	0.02	**0.78**					
CULTURAL_BARRIERS	-0.01	0.01	**0.76**					
Cumulative variance explained	23.5%	47.9%	78.1%					
Panel B. Tacit Coordination								
CA_MGR_EXPERIENCE				**0.93**	0.05	-0.06	0.04	0.07
CA_PTR_EXPERIENCE				0.37	-0.02	-0.16	0.08	0.23
CA_STABILITY				0.08	**0.93**	-0.02	0.13	-0.12
CA_US_TOUR				0.04	-0.12	0.14	-0.01	0.01
CA_US_EXPAT				-0.06	-0.05	**0.90**	0.23	0.06
CA_KNOW_GAAP				0.06	0.02	0.12	**0.90**	0.02
CA_KNOW_GAAS				0.02	0.12	0.07	**0.95**	0.07
CA_KNOW_REG_ENV				0.00	0.12	0.12	**0.77**	0.03
CA_KNOW_ INDUSTRY				0.07	0.04	0.09	**0.42**	0.00
GA_MGR_EXPERIENCE				0.07	-0.05	0.10	0.06	0.13
GA_PTR_EXPERIENCE				0.12	-0.12	0.08	0.04	**0.94**
CULTURAL_TRAINING				0.28	**-0.48**	0.30	-0.26	**-0.49**
WORK_TOGETHER_PRIOR				**0.44**	0.02	0.21	0.14	0.12
DECISIONS_EXPLAINED				0.04	0.12	0.08	0.21	0.06
Cumulative variance explained				12.3%	23.4%	34.4%	58.8%	70.6%

APPENDIX (continued)
Factor Loadings

Variables	***Strategy Factors***			
	MODULARIZATION	***ONGOING_ CONTENT***	***ONGOING_ ELECTRONIC***	***ONGOING_FTF***
Panel C. Modularization				
TAILORED_ INSTRUCTIONS	**0.69**			
TAILORED_WORK	**0.69**			
PLANNED_INTERACTIONS	**0.40**			
CA_SCOPED	0.20			
Cumulative variance explained	93.8%			
Panel D. Ongoing Communication				
KICKOFF_MEETING		**0.78**	0.08	0.12
INSTRUCTIONS_ DISCUSSION		**0.47**	0.00	0.29
FRAUD_BRAINSTORMING		**0.74**	-0.06	0.14
GUIDANCE_WORK_REMOTELY		0.28	**0.48**	-0.17
TECHNOLOGY_ AVAILABLE		0.00	**0.73**	-0.03
ELECTRONIC_ TOOLS_USE		-0.04	**0.65**	0.03
COMMUNICATION_FREQ		0.00	0.13	0.15
COMMUNICATION_ SPONT		-0.09	0.03	-0.20
FREE_EXCHANGE		0.25	0.03	-0.01
SYNCHRONOUS_VALUED		**0.53**	0.11	0.36
SYNCHRONOUS_FREQ		0.31	-0.10	**0.70**
ONSITE_VISIT		0.13	0.37	**0.44**
Cumulative variance explained		35.4%	60.9%	79.9%

Notes: Variables are defined in Table 1. We use polychoric factor analysis with varimax rotation to identify factors within theoretically derived categories of complexity and mitigating strategies. We retained all factors with eigenvalues greater than 1.0 and use factor loadings of at least .40 to interpret these factors. The bold values represent factor loadings greater than 0.40. Cronbach's alpha is between 0.53 and 0.69 for the three strategies, but is lower for complexity (0.24), indicating this construct has a variety of disparate dimensions. However, Cronbach's alpha assumes underlying continuous distributions, and is biased downward when data are not continuous (Zumbo, Gadermann, & Zeisser 2007).

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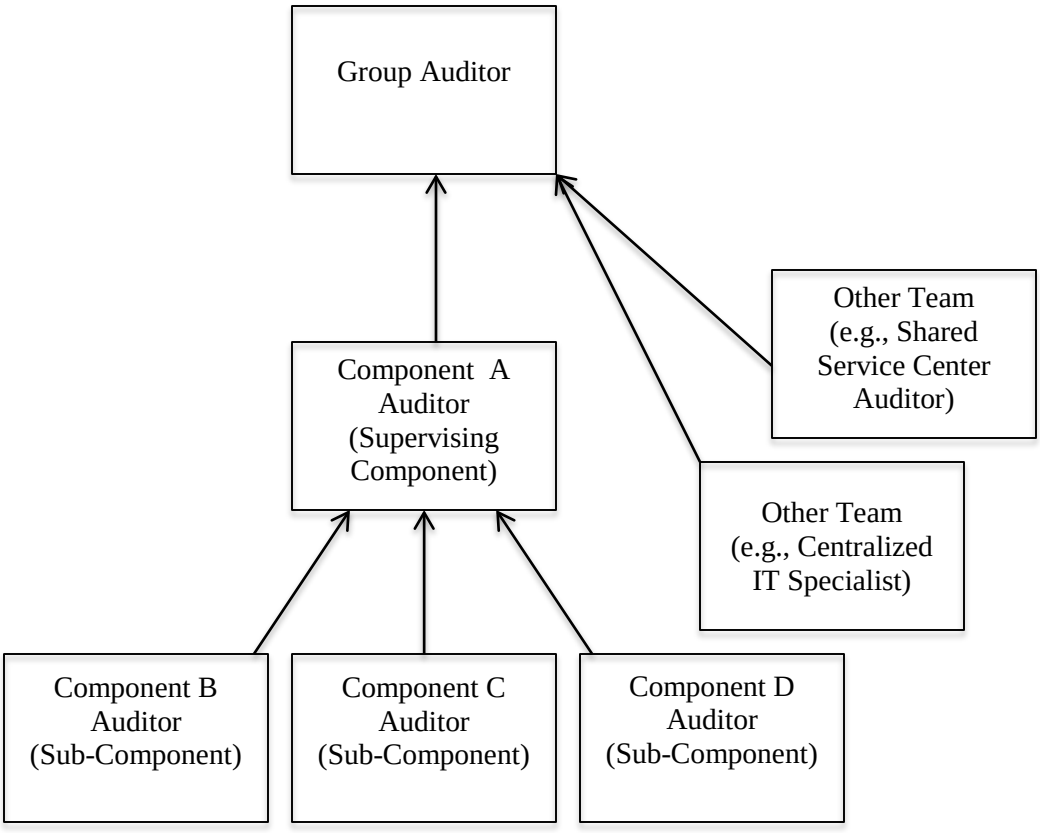
FIGURE 1
Examples of PCAOB Global Group Audit Inspection Observations and Concerns

Citation	Quote
Modesti 2014	"***Auditing is an activity that by necessity, occurs across borders. As the largest corporations in the world have become increasingly global, so has the audit. Even in the case of audit reports signed by U.S. audit firms for their largest public company clients, much, if not most, of the audit is done outside the U.S.*** While the benefits of globalization to capital formation and investment opportunities are significant, ***globalization also introduces unique audit risks***. These risks include divergent cultural biases and business norms, inadequate knowledge of U.S. accounting and audit standards, and differing corporate governance practices. …These risks can exist either in both the company's financial reporting and disclosure supply chain and the execution of the audit by affiliated network firms.
Munter 2014	"***Inspections staff routinely inspect portions of multiple-firm audits, including the audit work performed by both domestic and non-U.S. firms that played a role in the audit, commonly referred to as referred work. In 2013, our inspectors identified in more than a third of referred work engagements inspected, findings that were so significant that they appeared in Part I of the inspection report***. This statistic is significant and concerning — more needs to be done to ensure that all the component auditors involved get it right. Many of these deficiencies related to the testing of revenue and inventory, including testing of controls over those accounts, and insufficient substantive procedures in response to risks of material misstatement. ***A main lesson to be learned from our multiple-firm inspections is that communication along with supervision and review leads to a better audit***."
Doty 2011a	"***Nearly if not all audits of large companies have some international component today. In the case of many of the largest companies, half or more of the audit may be performed abroad. And in all these cases that means coordination among the various audit firms that make up a network is key.*** This topic touches on several particularly challenging areas for the PCAOB. As has been widely reported, the PCAOB is unable to inspect audits of firms that have registered with the PCAOB in order to be able to conduct or participate in audits of U.S. public companies but that are located in certain jurisdictions that have resisted inspections. This means enormous components of the audits of multi-national companies escape review, even when the firm that signed the audit report is a large U.S. accounting firm."
Doty 2011c	"PCAOB inspectors have reviewed portions of numerous components of audits that principal auditors had determined were necessary and instructed affiliates to perform. If you are involved in multi-national audits, this should be of significance to you: ***in many cases, inspectors determined that the affiliate failed to accomplish the objectives of the instructions provided by the principal auditor, sometimes in multiple respects.*** These deficiencies were identified both abroad and here in the U.S. That is, some were in situations where the principal auditor was outside the U.S., but the subsidiary auditor was in the U.S., and the rest vice versa. ***Inspectors have found obvious errors that could have, and should have, been picked up by the principal auditor, if communication between the two auditors had been more robust.*** For example, inspectors have found unresolved audit issues between affiliates. One inspection team found a situation where the affiliate consistently failed to perform audit procedures, unbeknownst to the principal auditor until our inspectors conducted their review.

Notes: This figure presents above excerpts from speeches by PCAOB board and staff members, illustrating concerns for global group audits, particularly relating to coordination and communication challenges (emphases added). These quotes provide insight into global group audit challenges beyond publicly available inspection reports, which do not distinguish issues related to global group audits, group auditor work, or component audit work from other audit work.

FIGURE 2
Organizational Structure of the Engagement: Supervising Component, Sub-Component, and Other Team Reporting



Notes: Component A Auditor supervises Component B, C, and D Auditors, reporting the consolidated component work to the group auditor. Component B, C, and D Auditors indirectly report to the group auditor through the auditor of Component A. The Other Teams report their portion of the component audit work performed (e.g., receivables tested at the Shared Service Center or general controls over the ERP system) to the Group Auditor for consolidating with the other component audit work or communication to the component engagement team.

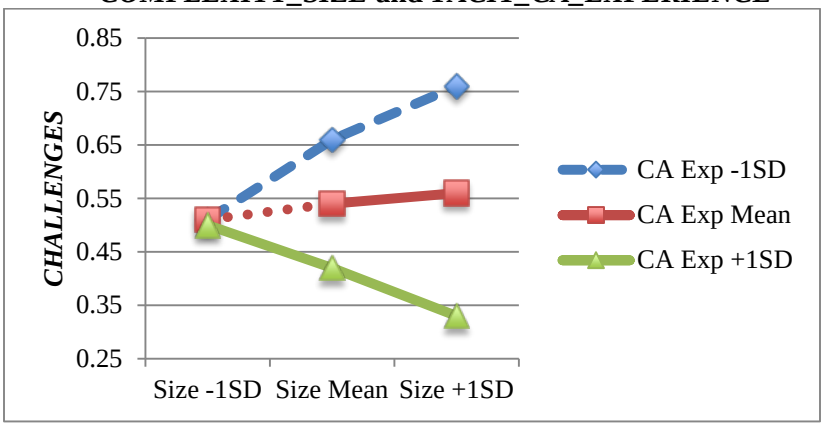
FIGURE 3
Coordination and Communication Strategies

Tacit Coordination	**Modularization**	**Ongoing Communication**
Leverage common ground through shared experience and knowledge	*Efforts to reduce interdependencies through advance coordination of work*	*Content, method, and ease of communication during the engagement*
Experience: • Tenure of the group and component audit leaders • Previous experience working together • Turnover of component audit staff Knowledge: • U.S. regulatory environment, GAAP, GAAS, and industry standard knowledge • Cultural training • U.S. tour for component auditor • Secondment to component location for group auditor • Explaining implicit local contextual features influencing decision making	• Tailoring component audit instructions and work • Standardized procedures (or a plan) for interactions • Component auditor scopes work to be performed	Content: • Kickoff meeting • Discussion of written instructions • Fraud brainstorming meeting Method: • On-site visits • Synchronous communication (e.g., telephone or web conferencing). • Guidance on how to work remotely • Availability and use of technologies/ electronic tools to share work-in-process Ease of communication: • Frequency of communication • Spontaneous communication • Free exchange of information

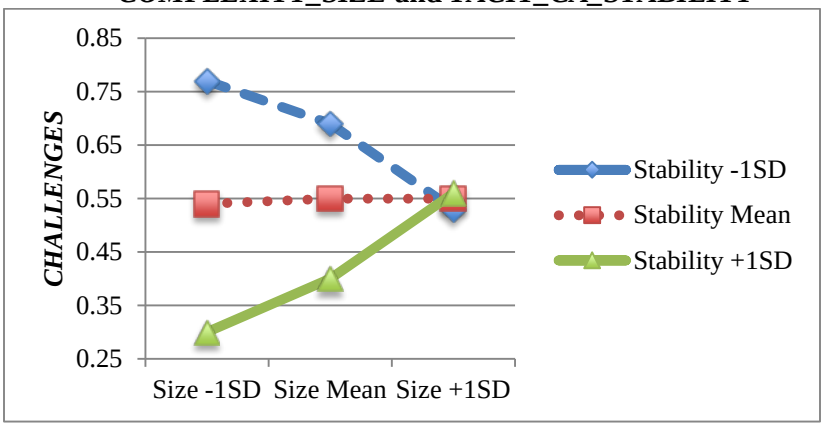
Notes: This figure illustrates the three coordination and communication strategies of focus in our analysis.

FIGURE 4
Predicted Probabilities for Interactive Effects of Complexity and Strategies on *CHALLENGING*

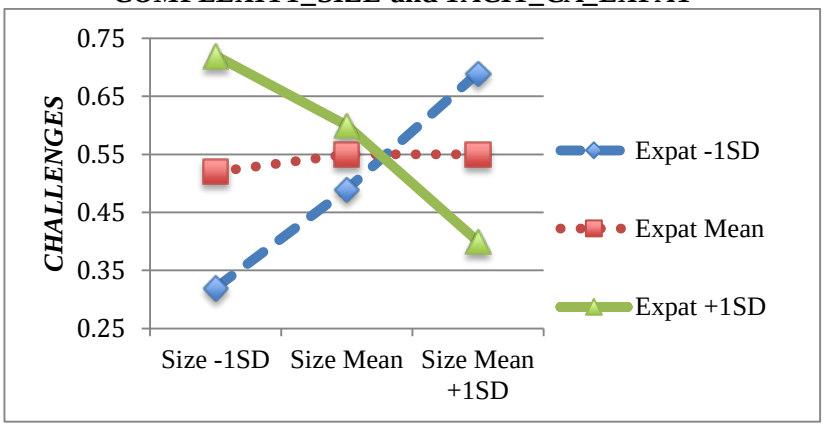
Panel A. Interaction of Size with Component Auditor Experience
COMPLEXITY_SIZE* and *TACIT_CA_EXPERIENCE



Panel B. Interaction of Size with Component Auditor Stability
COMPLEXITY_SIZE* and *TACIT_CA_STABILITY



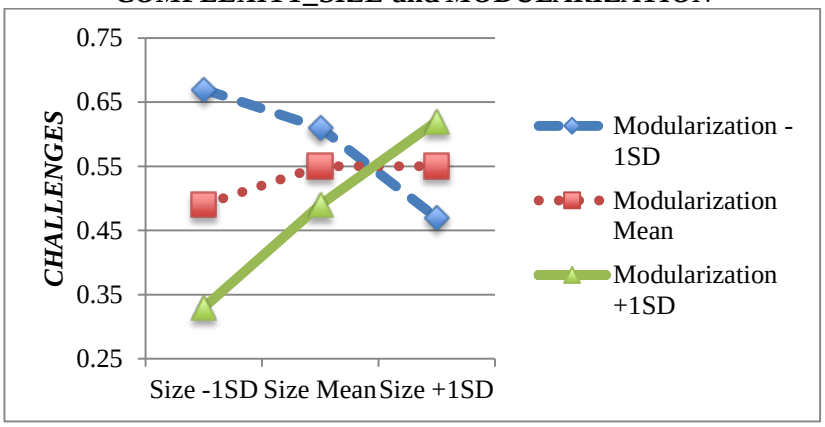
Panel C. Interaction of Size and Component Auditor Expat
***COMPLEXITY_SIZE* and *TACIT_CA_EXPAT* ***



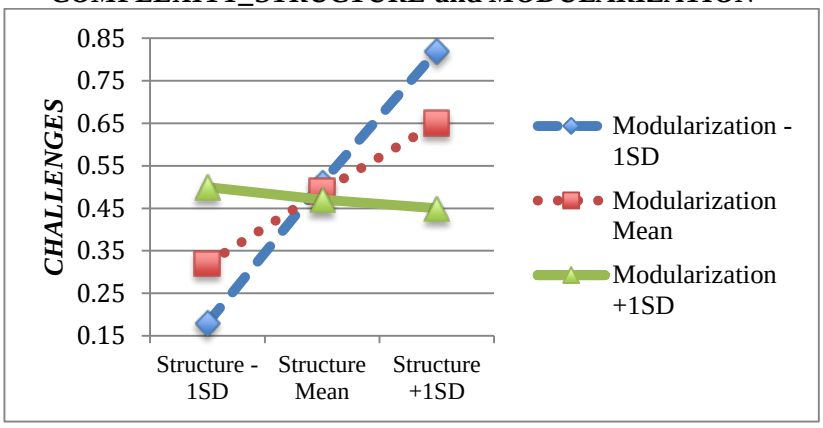
A similar pattern is also observed for language and cultural barriers (COMPLEXITY_BARRIERS***) and content of ongoing communication (***ONGOING_CONTENT***), as well as ***COMPLEXITY_BARRIERS*** and the availability/use of electronic communication (***ONGOING_ELECTRONIC***).

FIGURE 4 (continued)
Predicted Probabilities for Interactive Effects of Complexity and Strategy on *CHALLENGING*

Panel D. Interaction of Size and Modularization
COMPLEXITY_SIZE* and *MODULARIZATION



Panel E. Interaction of Structure and Modularization
***COMPLEXITY_STRUCTURE* and *MODULARIZATION* ***



A similar pattern is also observed for structure (COMPLEXITY_STRUCTURE***) and content of ongoing communication (***ONGOING_CONTENT***).

Notes: This figure illustrates patterns of predicted probabilities of *CHALLENGES* for significant interactions at the mean of each factor, and one standard deviation above and below the mean, with other independent variables held at the average of their predicted values. For brevity, similar patterns are only illustrated once, as noted in the respective panels.

TABLE 1
Variable Definitions and Descriptive Statistics (Means and Std. Dev)

Variable Name	*Variable Description*	*Total Sample*	*Challenging (n=74)*	*Non-Challenging (n=73)*	*t or Z*
		Mean (Std. Dev) or %=1			
Dependent Variable					
CHALLENGING	1 = Global group audit experience was identified as challenging; 0 = Non-challenging				
Panel A. Complexity					
REVENUE	Annual revenues of the company at the time of the experience; from 1 ("<=$25 million") to 5 (">$5 billion")	4.1 (1.0)	4.2 (0.9)	3.9 (1.1)	1.8**
SEC_REGISTRANT	1 = Client is an SEC registrant; 0 = Otherwise	86.4%	85.1%	87.7%	-0.4
NUMBER_COMPONENTS	Number of components involved in this global engagement	8.9 (8.6)	10.7 (9.8)	7.1 (6.8)	2.7***
STATUTORY_AUDIT	1 = Component auditor performed a statutory audit in addition to the work completed for the group audit; 0 = Otherwise	87.1%	90.5%	83.6%	1.3
WORK_COMPLEXITY	Complexity of audit work performed by component auditor; from 1 ("Very Low") to 11 ("Very High")	6.3 (1.9)	6.3 (1.6)	6.3 (2.1)	0.1
SUPERV_COMPONENT	1 = Component with a number of sub-components under its supervision; 0 = Otherwise	8.8%	6.8%	11.0%	-0.9
SUB_COMPONENT	1 = Component auditor reported indirectly to the group auditor through another component engagement team; 0 = Otherwise	9.5%	9.5%	9.6%	-0.3
OTHER_TEAM	1 = Team other than the component auditor performs a portion of the audit work; 0 Otherwise	51.0%	52.7%	49.3%	0.4
LANG_ BARRIERS	Extent to which a language barrier existed between the group and component auditors; from 0 ("Not At All") to 11 ("Very High")	2.9 (2.8)	3.1 (3.0)	2.5 (2.5)	1.3*
CULTURAL_BARRIERS	Extent to which a cultural barrier existed between the group and component auditors; from 0 ("Not At All") to 11 ("Very High")	3.9 (2.7)	4.1 (2.7)	3.7 (2.7)	0.8
Panel B. Tacit Coordination					
CA_MGR_EXPERIENCE	Number of years the component audit manager had worked on this engagement	8.0 (3.4)	7.4 (3.6)	8.6 (3.2)	-2.1**
CA_PTR_EXPERIENCE	Number of years the component audit partner had worked on this engagement.	3.6 (2.2)	3.5 (2.3)	3.8 (2.1)	-0.9

TABLE 1 (continued)
Variable Definitions and Descriptive Statistics (Means and Std. Dev)

Variable Name	*Variable Description*	*Total Sample*	*Challenging (n=74)*	*Non-Challenging (n=73)*	*t or Z*
		Mean (Std. Dev) or %=1			
CA_STABILITY	1 = Component engagement team did not include new staff; 0 = Otherwise	64.6%	54.1%	75.3%	-2.7***
CA_US_TOUR	1 = Component engagement team included a local auditor who worked as an expat in the U.S. in the last five years; 0 = Otherwise	21.1%	17.6%	24.7%	-1.1
CA_US_EXPAT	1 = Component engagement team included a member of the U.S. firm (e.g., secondment or expatriate); 0 = Otherwise	19.7%	18.9%	20.5%	-0.2
CA_KNOW_GAAP	Extent to which the component engagement team understood U.S. GAAP; from 1 ("Very Low") to 11 ("Very High")	8.3 (1.8)	8.0 (1.8)	8.6 (1.7)	-2.2**
CA_KNOW_GAAS	Extent to which the component engagement team understood U.S. GAAS; from 1 ("Very Low") to 11 ("Very High")	8.1 (1.7)	7.7 (1.7)	8.6 (1.7)	-3.0***
CA_KNOW_REG_ENV	Extent to which the component engagement team understood U.S. regulatory oversight; from 1 ("Very Low") to 11 ("Very High")	7.2 (2.2)	6.7 (2.0)	7.7 (2.2)	-2.9***
CA_KNOW_INDUSTRY	Extent to which the component engagement team understood the component's industry; from 1 ("Very Low") to 11 ("Very High")	9.0 (1.6)	8.7 (1.7)	9.4 (1.5)	-2.7***
GA_MGR_EXPERIENCE	Number of years the group audit manager had worked on this engagement	4.2 (2.8)	4.0 (2.8)	4.4 (2.8)	-0.8
GA_PTR_EXPERIENCE	Number of years the group audit partner had worked on this engagement	3.5 (2.5)	3.7 (2.7)	3.3 (2.4)	1.0
CULTURAL_TRAINING	1 = Group engagement team received training on cultural differences prior to the engagement commencing; 0 = Otherwise	4.1%	4.1%	4.1%	0.2
WORK_TOGETHER_PRIOR	Extent to which the group engagement team worked with the component engagement team in prior periods or another engagement; from 0 ("Not At All") to 11 ("Very High")	7.2 (2.9)	6.6 (3.1)	7.8 (2.6)	-2.6***
DECISIONS_EXPLAINED	Extent the group auditor was aided in understanding how the component auditor arrived at decisions in planning, executing and concluding field work; from 0 ("Not At All") to 11 ("Very High")	7.4 (2.0)	7.0 (2.0)	7.7 (1.9)	-2.0**

TABLE 1 (continued)
Variable Definitions and Descriptive Statistics (Means and Std. Dev)

Variable Name	*Variable Description*	*Total Sample*	*Challenging (n=74)*	*Non-Challenging (n=73)*	*t or Z*
		Mean (Std. Dev) or %=1			
Panel C. Modularization					
TAILORED_INSTRUCTIONS	Extent to which the initial instructions were tailored to minimize need for interactions between the group and component auditor; from 0 ("Not At All") to 11 ("Very High")	7.9 (2.0)	7.7 (2.1)	8.1 (1.8)	-1.5*
TAILORED_WORK	Extent to which the component work was tailored to minimize need for interactions between the group and component auditor; from 0 ("Not At All") to 11 ("Very High")	7.0 (2.2)	6.7 (2.2)	7.3 (2.3)	-1.7**
PLANNED_INTERACTIONS	Extent to which the initial engagement plan stipulated the nature and timing of substantially all interactions between group and component auditor; from 0 ("Not At All") to 11 ("Very High")	8.4 (1.8)	8.3 (1.8)	8.5 (1.8)	-0.6
CA_SCOPED	1 = Component audit procedures were scoped (i.e., designed/determined) by the component engagement team; 0 = Otherwise	10.9%	8.1%	13.7%	-1.1
Panel D. Ongoing Communication					
KICKOFF_MEETING	1 = Component auditor participated with the group auditor in the kick-off or planning meeting; 0 = Otherwise	72.1%	74.3%	69.9%	0.6
INSTRUCTIONS_DISCUSSION	1 = Component auditor participated with the group auditor in discussions of the audit plan/instructions; 0 = Otherwise	79.6%	74.3%	84.9%	-1.6*
FRAUD_BRAINSTORMING	1 = Component auditor participated with the group auditor in the fraud brainstorming meeting; 0 = Otherwise	54.4%	50.0%	58.9%	-1.1
GUIDANCE_WORK_REMOTELY	Extent to which the group engagement team received guidance on working remotely with component auditors efficiently and effectively; from 0 ("Not At All") to 11 ("Very High")	4.7 (2.9)	4.9 (2.8)	4.5 (2.9)	0.9
TECHNOLOGY_AVAILABLE	Extent to which technologies were available to communicate information, e.g., shared platforms, databases, web portals, or dedicated intranet sites; from 0 ("Not At All") to 11 ("Very High")	5.1 (3.6)	5.2 (3.5)	5.1 (3.7)	0.2
ELECTRONIC_TOOLS_USE	Extent to which electronic tools were used to enable remote collaboration, e.g., Net Meeting, instant messaging, application sharing; from 0 ("Not At All") to 11 ("Very High")	4.2 (3.1)	4.3 (3.0)	4.1 (3.2)	0.5

TABLE 1 (continued)
Variable Definitions and Descriptive Statistics (Means and Std. Dev)

Variable Name	*Variable Description*	*Total Sample*	*Challenging (n=74)*	*Non-Challenging (n=73)*	*t or Z*
		Mean (Std. Dev) or %=1			
COMMUNICATION_FREQ	Average number of times per week that the group auditor communicated with the component auditor during the planning, fieldwork, and reporting phases of the audit	1.8 (1.3)	1.9 (1.3)	1.7 (1.3)	0.9
COMMUNICATION_SPONT	Extent to which communication between the group and component auditor was considered to be spontaneous; from 0 ("Not At All") to 11 ("Very High")	6.8 (2.1)	7.0 (2.0)	6.6 (2.1)	1.2
FREE_EXCHANGE	Extent to which information was considered to be freely exchanged between the group and component auditor; from 0 ("Not At All") to 11 ("Very High")	8.4 (2.0)	8.0 (2.3)	8.8 (1.6)	-2.5***
SYNCHRONOUS_VALUED	1 = Communication method most valued was a synchronous medium; 0 = Otherwise	73.5%	78.4%	68.5%	1.4*
SYNCHRONOUS_FREQ	1 = Communication method most frequently used was a synchronous medium; 0 = Otherwise	10.9%	9.5%	12.3%	-0.6
ONSITE_VISIT	1 = Group audit manager or partner visited the component audit location to review last year's work papers, or to plan and execute the current audit; 0 = Otherwise	57.8%	58.1%	57.5%	0.1
Panel E. Control Variables					
AUDITPLAN_CHANGE	Significance of changes in scoping, audit approach, materiality, or procedures; from 0 ("Not At All") to 11 ("Very High")	1.9 (3.2)	2.4 (3.5)	1.4 (2.7)	1.8**

Notes: This table presents descriptive statistics on variables submitted to polychoric factor analysis and control variables used in Models 1-4, for the sample of 147 observations with complete data. Differences between challenging and non-challenging components are tested using t- (Z-) statistics for continuous (dichotomous) variables. ***, **, * indicate significance at p<0.01, 0.05 and 0.10, respectively**.**

TABLE 2
Factor Descriptions and Inter-Factor Correlations

Factor [Interpretation]	***Percent of construct variance explained***	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***
Complexity Factors													
1. COMPLEXITY_SIZE [Complexity due to company size and SEC registrant status]	23.5%	1.00											
2.COMPLEXITY_STRUCTURE [Complexity due to statutory audit requirements and number of components included on the engagement]	24.4%	0.11	1.00										
3. COMPLEXITY_BARRIERS [Complexity due to language and cultural barriers]	30.2%	-0.00	0.05	1.00									
Tacit Coordination Factors													
4. TACIT_CA_EXPERIENCE [Component audit manager experience on the engagement and component auditor experience working with the group auditor]	12.3%	**0.19**	**0.19**	-0.02	1.00								
5. TACIT_CA_STABILITY [Component audit staff stability year-over-year]	11.1%	-0.06	-0.08	-0.08	**-0.41**	1.00							
6. TACIT_CA_EXPAT [Component audit team includes a U.S. expatriate]	10.0%	0.14	0.14	-0.05	-0.02	0.07	1.00						

TABLE 2 (continued)
Factor Descriptions and Inter-Factor Correlations

Factor [Interpretation]	***Percent of construct variance explained***	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***
7. TACIT_CA_KNOWLEDGE [Component auditor knowledge of U.S. standards, regulatory environment, and industry]	25.4%	0.11	-0.03	**-0.17**	0.14	**-0.19**	-0.07	1.00					
8. TACIT_GA_EXPERIENCE [Group audit partner experience on the engagement and cultural training]	11.8%	0.01	0.10	-0.02	0.16	-0.15	0.05	-0.02	1.00				
Modularization Factor													
9. MODULARIZATION [Minimizing interdependencies and standardizing interactions]	93.8%	0.04	-0.12	-0.08	0.14	-0.13	0.00	**0.19**	-0.03	1.00			
Ongoing Communication Factors													
10. ONGOING_CONTENT [Component auditor involvement in planning and fraud meetings, and the value of synchronous communication to group auditor]	35.4%	0.10	-0.02	-0.10	-0.01	**0.19**	-0.02	0.00	-0.01	0.01	1.00		
11.ONGOING_ELECTRONIC [Availability and use of technology/electronic tools, and guidance on how to work remotely]	25.5%	**0.22**	0.15	0.01	0.12	-0.10	0.03	0.11	0.01	0.02	0.03	1.0	
12. ONGOING_FTF [Group auditor visits component auditor to meet face-to-face and synchronous communication use]	19.0%	0.13	0.12	-0.09	0.09	-0.26	0.14	0.14	0.03	0.03	0.01	-0.02	1.0

Notes: This table presents names and interpretations for factor variables representing complexity and coordination/communication strategies used in the models, percentage of variance explained by the factors, and correlations among them. See the Appendix for details of polychoric factor analysis, as well as factor loadings. Means (standard deviations) for all factors are 0 (1). Significant correlations between factors at $p<0.05$ (two-tailed) are bolded.

TABLE 3
Descriptive Statistics - Coordination and Communication Challenges Experienced

Variable Name	***Variable Description***	***Mean (Std. Dev) or %=1***
Panel A. Importance, Breadth, and Anticipation of Challenges		
CHALLENGE_IMPORTANCE	Perceived importance of challenge experienced on the global group audit, from 1 ("Very Low") to 11 ("Very High")	7.0 (2.1)
CHALLENGING_COMPONENTS	The proportion of components where significant challenges were encountered to the total number of components involved in this engagement	29.6%
CHALLENGES_ANTICIPATED	The extent to which the group auditor anticipated the challenges prior to planning, from 0 ("Not At All") to 11 ("Very High")	5.6 (2.6)
Panel B. Types of Challenges Experienced		
Execution of Audit Work		
OBTAINING_CLARITY	1 = Challenge experienced related to obtaining clarity around documentation, open items, or matters arising from review; 0 = Otherwise	52.7%
COMMUNICATING_COORDINATING	1 = Challenge experienced related to communicating and coordinating the audit strategy, important updates and information; 0 = Otherwise	52.7%
ADDITIONAL_PROCEDURES	1 = Challenge experienced related to designing and performing additional audit procedures for the component; 0 = Otherwise	33.7%
INVOLVING_GA	1 = Challenge experienced related to appropriately involving the group auditor in the component auditor's work; 0 = Otherwise	25.7%
Variation		
RISK_VARIATION	1 = Challenge experienced related to variation between risks assessed by the component and the group auditors; 0 = Otherwise	12.2%
WORK_VARIATION	1 = Challenge experienced related to variation between work outlined in the instructions and work performed at the component; 0 = Otherwise	31.1%
Timing		
NONTIMELY_ COMMUNICATION	1 = Challenge experienced related to timely communication of exceptions identified, significant financial reporting or auditing matters, internal control issues, or other relevant matters; 0 = Otherwise	41.9%
NONTIMELY_ COMPLETION	1 = Challenge experienced related to timely and/or efficient completion of component audit work; 0 = Otherwise	58.1%
SUBSEQUENT_DISCOVERY	1 = Challenge experienced related to subsequent discovery of information during statutory audit work, which affected the group audit; 0 = Otherwise	6.8%

Notes: This table presents descriptive statistics on variables for the sample of 74 challenging observations with complete data. These variables are not previously defined in Table 1 and are not used in the polychoric factor analysis or probit models, but do provide insights into challenge(s) experienced on each engagement. Participants were asked to select all challenges that applied.

TABLE 4
Sources of Complexity and the Role of Mitigating Strategies in Distinguishing Challenging vs. Non-challenging Global Group Audits

Complexity measured as:	***A. Main Effects (Model 1)***	***B. Interactions with Size (Model 2)***	***C. Interactions with Structure (Model 3)***	***D. Interactions with Barriers (Model 4)***
Test Variables				
COMPLEXITY_SIZE (+)	0.25*	-0.02		
COMPLEXITY_STRUCTURE (+)	0.44**		0.57***	
COMPLEXITY_BARRIERS (+)	0.02			0.08
TACIT_CA_EXPERIENCE (-)	-0.39***	-0.41***	-0.40***	-0.38***
*[complexity]*CAEXP*		-0.39**	-0.17	0.11
TACIT_CA_STABILITY (-)	-0.29***	-0.49***	-0.31***	-0.28**
*[complexity]*STABILITY*		0.57*	-0.15	-0.11
TACIT_CA_EXPAT (-)	-0.03	0.18	-0.06	-0.04
*[complexity]*EXPAT*		-0.77***	-0.01	-0.07
TACIT_CA_KNOWLEDGE (-)	-0.33***	-0.39***	-0.45***	-0.35***
*[complexity]*KNOWL*		-0.09	-0.05	0.04
TACIT_GA_EXPERIENCE (-)	0.09	0.07	0.08	0.12
*[complexity]*GAEXP*		0.11	0.03	-0.11
MODULARIZATION (-)	-0.14	-0.21	-0.08	-0.09
*[complexity]*MODULAR*		0.52**	-0.65**	-0.07
ONGOING_CONTENT (-)	0.00	0.04	0.04	0.10
*[complexity]*CONTENT*		-0.29	-0.60**	-0.25*
ONGOING_ELECTRONIC (-)	0.09	0.16	0.12	0.07
*[complexity]*ELECTRONIC*		-0.16	0.06	-0.34**
ONGOING_FTF (-)	-0.15	-0.09	-0.16	-0.20
*[complexity]*FTF*		-0.22	-0.11	0.22
Control Variables				
COMPLEXITY_SIZE (+)			0.27*	0.50***
COMPLEXITY_STRUCTURE (+)		0.37**		0.28**
COMPLEXITY_BARRIERS (+)		0.05	-0.01	
AUDITPLAN_CHANGE (+)	0.07**	.09**	0.08**	0.08**
{Industry indicators}				
Intercept	-0.22	-0.13	-0.27	-0.21
Pseudo-R^2, Area under ROC	0.19, 0.78	0.28, 0.83	0.23, 0.81	0.21, 0.80
N	147	147	147	147

TABLE 4 (Continued)
Sources of Complexity and the Role of Mitigating Strategies in Distinguishing Challenging vs. Non-challenging Global Group Audits

Notes: This table presents results of probit regression models whose dependent variable is *CHALLENGING*, which equals 1 for engagements selected by participants as representing global group audit experiences with significant challenges; 0 for engagements selected as representing their non-challenging experiences. Independent variables are factors derive from polychoric factor analysis (see the Appendix for factor loadings and Table 2 for interpretations of meaning). Column A presents a main effects model, showing overall associations of sources of complexity and strategies with challenging engagements. Columns B through D present a series of models that interact specific strategy factors with each source of complexity, entered separately due to the large number of interactions that would occur in a single model. *[complexity]* in variable names for the interaction terms refers to the specific source of complexity interacted in each model. Column B presents interactions of strategies with *COMPLEXITY_SIZE*, Column C presents interactions of strategies with *COMPLEXITY_STRUCTURE*, and Column D presents interactions of strategies with *COMPLEXITY_BARRIERS*. Z-statistics are calculated based on robust standard errors clustered by respondent. ***, **, and * indicate significance at $p<0.01$, 0.05 and 0.10, respectively, with probabilities presented as one-tailed for directional expectations and two-tailed for all other results.

Table 5
Summary of Results

	A. Complexity due to size/regulatory status	***B. Complexity due to global structure***	***C. Complexity due to language/cultural barriers***
Component auditor engagement experience	**Decreasing** challenges when size is **higher**	**Decreasing** challenges overall	**Decreasing** challenges overall
Component audit staff stability year-over-year	**Decreasing** challenges when size is **lower**	**Decreasing** challenges overall	**Decreasing** challenges overall
Component audit team includes U.S. expat	**Decreasing (Increasing)** challenges when size is **higher (lower)**	N.S.	N.S.
Component auditor knowledge of GAAS, GAAP, and U.S. regulation	**Decreasing** challenges overall	**Decreasing** challenges overall	**Decreasing** challenges overall
Group audit partner engagement experience	N.S.	N.S.	N.S.
Modularization (minimizing interdependencies to reduce later communication)	**Increasing (Decreasing)** challenges when size is **higher (lower)**	**Decreasing (Increasing)** challenges when structural complexity is **higher (lower)**	N.S.
Component auditor involvement in engagement kickoff, discussion of instructions, fraud brainstorming meetings	N.S.	**Decreasing (Increasing)** challenges when structural complexity is **higher (lower)**	**Decreasing (Increasing)** challenges when language/cultural barriers are **higher (lower)**
Availability/use of electronic tools, and guidance on how to work remotely	N.S.	N.S.	**Decreasing (Increasing)** challenges when language/cultural barriers are **higher (lower)**
Face-to face-communication	N.S	N.S.	N.S.

Notes: This table summarizes results of models 2-4 presented in Table 4, investigating which specific sources of complexity are associated with significantly challenging global group audits, and whether audit firms' use of certain management strategies, discussed in the literature on geographically distributed work, mitigate the effect of complexity on those challenges. Complexity and strategy variables are developed from polychoric factor analysis. Shaded cells indicate effects of strategies that are significant across the sample, or when complexity is relatively high (i.e., when the strategy provides the most benefit). N.S. denotes non-significant results.