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Does task-specific knowledge improve audit quality: Evidence from audits of income tax accounts☆

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ABSTRACT

Two forms of expertise can influence audit quality: industry and task-specific expertise. If tax knowledge is predominately task-specific, audit offices with increased exposure to complex tax issues will develop tax task-specific expertise. Using outcomes related to income tax account audits, we examine whether tax task-specific knowledge (TSK) accumulates at the audit office level and affects the income tax accounts' audit quality. We find that tax TSK increases the income tax accounts' audit quality, suggesting individual tax TSK accumulates at the office level. Additionally, semi-structured interviews of partners/senior managers at Big 4 audit firms validate group information processing as a theory that explains TSK developing at the office level and confirms that tax knowledge is predominately task-specific with some industry-specific knowledge. We contribute to and extend the literature examining audit office expertise by providing evidence that exposure to complex tax issues develops TSK at the office level and enhances audit quality. These findings provide archival and qualitative evidence of how TSK develops at the office level.

1. Introduction

The audit literature focuses on industry expertise and provides evidence that it improves audit quality (e.g., Anantharaman & Wans, 2019; Chi & Chen, 2011; Ferguson, Francis, & Stokes, 2003; Reichelt & Wang, 2010). However, forward-looking accounts are complex, technical, and rely on non-industry-specific knowledge. In that case, audits of accounts that rely on this forward-looking information could benefit from task-specific knowledge (TSK). Prior literature suggests that TSK develops through auditors' experiences influencing their judgments and is generally associated with enhanced audit quality (e.g., Bonner, 1990; Bonner, Davis, & Jackson, 1992; Bonner & Lewis, 1990). This study leverages a focused setting – the audits of income tax accounts – to examine TSK development. Although other accounts and audit procedures rely on forward-looking information (i.e., fair value estimates, going concern opinions, goodwill impairments), the nature of auditing income tax accounts provides a setting to examine TSK while reducing industry and other confounding influences. Our study examines whether audit offices develop task-specific knowledge based on the office's experiences with specific tasks, such as the audits of income tax accounts, and whether this expertise influences audit quality.

Prior studies use group processing theories to explain how TSK influences group outcomes in a formal setting, such as the audit committee or board of directors (McDonald, Westphas, & Graebner, 2008; Shepardson, 2019). This study extends the TSK literature by considering TSK development in a broader, potentially less formal group setting. While an audit office might be viewed as a group (i.e., collective goals are similar), its structure lends itself to function more as an organization, with different mediums of transferring knowledge and information than the group setting (Argote,

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McEvily, & Reagans, 2003). For example, TSK may develop among auditors and accumulate at the office level through audit documentation and professional interactions. However, audit partners make engagement decisions independent of other audit partners, unlike audit committees' collective decisions. The independence between decision-makers within the audit office structure can restrict information flow within the audit office. Thus, it is unknown whether TSK develops at the audit office level because of these structural differences.

Information processing theory explains how prior experiences lend themselves to analytical reasoning when making decisions (McDonald, Westphal, & Graebner, 2008; Shephardson, 2019; Sternberg, 1977). Thus, group information processing (GIP) collectively integrates individuals' expertise and knowledge when making decisions in a group setting (Shepardson, 2019). We extend prior studies that rely on group processing theories and explore whether the audit process structure, the hierarchy of the audit documentation review, and personnel assignment within an office accumulate TSK at the audit office level. Personnel, tools, and tasks (structure of the audit process, the hierarchy of the audit documentation review, and the assignment of personnel) are different means to transfer knowledge acquired by an individual to others in the same organization (Argote & Ingram, 2000; Vagner, 2017).

To consider whether TSK develops at an office level, we identify whether conditions necessary to develop TSK exist when auditing the income tax accounts. These three necessary conditions include 1) common elements across tasks, 2) a thorough understanding of the domain, and 3) prior knowledge organized to allow the application to other tasks (Larkin, 1989). We also consider whether the knowledge acquired by specific individuals on an audit team transfers to others within the same office through personnel, tools, and tasks accumulating TSK at the office level (Argote & Ingram, 2000).

Although the literature has yet to examine whether TSK accumulates at the office level, we follow the literature examining TSK in experimental (Bonner & Lewis, 1990) and corporate governance settings (McDonald et al., 2008; Shepardson, 2019) and suggest that audit offices develop TSK through the audit process. We posit that when audit offices have clients with complex tax positions, the audit office develops TSK, and audits of the income tax accounts are of higher quality than in audit offices where TSK is minimal or does not exist.

We use two research methods to examine whether TSK develops at the office level—the first is an archival estimation of audit office audit quality, and the second is semi-structured interviews with practitioners. Combining the archival analyses and the semi-structured interviews allows for the triangulation of results (Kenno, McCracken, & Salterio, 2017). Furthermore, the qualitative analyses of interview data can complement and corroborate archival results and test whether GIP explains the empirical findings (Lune & Berg, 2017).

Our archival method uses a post-Sarbanes-Oxley sample of clients audited by Big 4 and second-tier audit offices tax misstatements that result in a financial reporting restatement as a proxy for audit quality. The archival findings show that an interquartile increase in complex tax issues and uncertain tax benefits (proxies for TSK) decreases the probability of a tax misstatement by 32 and 44 percent, respectively. We also document a positive association between tax-industry expertise (as measured by McGuire, Omer, & Wang, 2012) and the probability of tax misstatements. These results support the notion that tax knowledge benefiting the income tax account audits is predominately task-specific rather than predominately industry-specific. Finally, we examine our tax TSK measure's discriminant validity by examining the association between our TSK measures and non-tax misstatements and fail to find an association for either measure. These results suggest that tax TSK is unique to the income tax accounts' audit quality versus other financial account audits.

The qualitative analysis includes interviews of 15 personnel from Big 4 accounting firms at the partner or senior manager level with experience providing attestation for the income tax accounts from both the audit and tax perspectives. The results of these interviews suggest that audits of the income tax accounts require TSK insomuch as offices mitigate complexities associated with auditing these complex accounts by predominately employing a *task-specific* focus rather than an *industry-specific* focus. Furthermore, an audit office structure is conducive to sharing knowledge at the office level through audit documentation review, assignment of personnel within the office, and formal training (Argote & Ingram, 2000). This knowledge sharing accumulates TSK at the office level, supporting the notion that GIP likely explains tax TSK accumulation at the audit office level.

We perform several additional analyses. First, we examine the role of learning among audit offices that discover tax misstatements. Consistent with the office contagion literature (i.e., Larkin, 1989; Francis & Michas, 2013; Swanquist & Whited, 2015), we find audit offices with low TSK levels are significantly more likely to have a future tax misstatement after discovering a tax misstatement. However, audit offices with higher TSK levels substantially reduce the likelihood of future tax misstatements suggesting audit offices with higher TSK are faster at identifying and correcting issues that generate audit failures. We also provide evidence that TSK's effect on tax misstatements is more pronounced when the audit offices provide lower levels of auditor-provided tax services (APTS). This finding suggests that tax TSK enhances the audit quality and is an integral part of audit quality, and tax TSK is not dependent on the level of APTS. Our results are robust to several additional specifications that mitigate concerns of correlated omitted variables, including a first differences model.

This study provides several contributions to the literature. First, we extend the audit office expertise literature that provides evidence of industry expertise (e.g., Carcello & Nagy, 2004; Gul, Fung, & Jaggi, 2009; Reichelt & Wang, 2010). This study provides evidence on whether audit offices develop task-specific expertise through experience, a component of the overall audit quality that provides insight into the tax audit process. Prior studies find evidence that industry expertise enhances auditors' ability to identify errors and internal weaknesses (Solomon, Shields, & Whittington, 1999; Anatharam & Wans 2019, respectively) and this ability is prevalent when examining accounts specific to their expertise (Hammersley, 2006). We provide evidence that experience develops TSK and enhances audit quality in addition to industry experience. By focusing on an audit procedure that engages the same tax professionals from the audit office across numerous engagements to collaborate and assist with income tax account audits, we provide additional evidence on the effects of TSK on audit quality. Our findings that experience develops TSK and contributes to those accounts' overall audit quality are consistent with Shepardson (2019) that provides evidence for individual task-specific expertise on the audit committee influencing financial reporting outcomes. We extend Shepardson (2019) by documenting the findings persist in another setting outside of the audit committee experience. Our study also provides insight into the tax audit process by providing archival and qualitative evidence of how tax expertise develops within an audit office and evidence that individual TSK extends to audit offices. This finding is important because audit offices that serve more diverse industries might require more than industry expertise (Gal-or, Hoitash, & Hoitash, 2017).

Second, we contribute to the call for studies that examine the

association between auditor competency and audit quality (DeFond & Zhang, 2014). Providing evidence on the association between audit quality and TSK allows us to understand the association between competence and performance (Bonner et al., 1992; Shepardson, 2019). Because the income tax accounts' audit process is different from other financial statement accounts, our TSK measures identify audit offices that better recognize the potential for tax-related misstatements. This result is important given inconsistent evidence of an association between audit office industry expertise and misstatements (Beardsley, Goldman, & Omer, 2020; Francis, Michas, & Yu, 2013; Gaver & Utke, 2018) and the notion that tax issues are not necessarily industry-specific (Hux, Bedard, & Noga, 2019).

Third, we contribute to the intersection of audit and tax literature by directly examining the audit quality of income tax accounts. Because income tax accounts are large, complex, and prone to earnings management, they represent a quantitative and qualitative account of interest. These accounts are relevant given income taxes are common areas of concern for the PCAOB (Acito, Hogan, & Mergenthaler, 2017; Drake, Goldman, & Lusch, 2016) and are one of the most common accounts labeled as a critical audit matter by auditors (Drake, Goldman, Lusch, & Schmidt, 2021).

The remainder of the paper is as follows. The next sections provide background and hypothesis development, empirical and qualitative sample descriptions, and research design. Finally, we discuss our results and provide concluding remarks.

2. Literature review and hypothesis

DeFond and Zhang (2014) state, "… audit quality is a continuous construct that assures financial reporting quality, with high-quality auditing providing greater assurance of high-quality financial reporting (p. 276)." Thus, audit quality improves financial reporting, and audit office personnel competencies and audit plans directly influence audit quality (Francis, 2011; PCAOB, 2015). Auditor competence is the knowledge and understanding of the audit process developed through experience and training. Experience and expertise are not mutually exclusive, and different exposure and experiences develop different expertise (e.g., Moroney & Carey, 2011; Reichelt & Wang, 2010). The accounting literature provides evidence of two forms of expertise influencing audit quality: industry and task-specific (Bonner, 1990; Bonner & Lewis, 1990; Carcello & Nagy, 2004; Gul et al., 2009; Libby & Frederick, 1990; McGuire et al., 2012; Moroney & Carey, 2011; Reichelt & Wang, 2010).

2.1. Industry audit expertise

Industry expertise is the knowledge acquired through national and city industry specialization. Studies find that industry expertise positively contributes to the general knowledge required for all audits (Carcello & Nagy, 2004; Craswell, Francis, & Taylor, 1995; Gul et al., 2009; Palmrose, 1986; Reichelt & Wang, 2010; Shockley & Holt, 1983). The archival literature examining auditor industry expertise relies on audit office market share or client portfolio characteristics to proxy for industry expertise. Somewhat related to this study is McGuire et al. (2012), examining the association between tax outcomes (e.g., effective tax rates) and audit and tax *industry* expertise. They find an association between industry tax expertise and lower effective tax rates for clients. However, the study cannot speak to the audit quality of income tax accounts or the auditing process for these income tax accounts.[1] We extend and complement this and prior studies by examining whether tax task-specific expertise improves audit quality of income tax accounts.

While some archival literature focuses on the association between auditor characteristics (beyond industry expertise) and audit quality (e.g., Ghosh & Moon, 2005; Mansi, Maxwell, & Miller, 2004), experimental studies examine audit quality on a more granular level in an attempt to identify how industry expertise improves audit quality (Hammersley, 2006; Solomon et al., 1999). For example, Solomon et al. (1999) consider the accuracy of recall and memory to examine whether industry knowledge influences auditors' ability to assess ratio fluctuations using an error and non-error explanation. Their finding suggests that industry knowledge (i.e., expertise) enhances the accuracy of explaining fluctuations that are not errors but finds mixed evidence on auditors' accuracy of explaining ratio fluctuations related to errors. Despite Solomon et al. (1999) finding mixed evidence of whether industry knowledge influences the error explanations, Hammersley (2006) finds evidence that auditors with industry expertise can more accurately assess the risk of material misstatement. These findings suggest that auditors with industry expertise can provide higher audit quality with knowledge specific to that industry to identify patterns associated with potential misstatements. Like industry expertise, TSK may allow auditors to identify specific patterns and cues to potential risks or misstatements when auditing the tax accounts.

2.2. Task-specific expertise

Prior literature suggests that TSK develops independent of industry experience through the knowledge and understanding necessary to audit complex accounts (Francis, 2011; PCAOB, 2015). More recent studies find the influence of task-specific expertise on financial reporting at the individual level (McDonald et al., 2008; Shepardson, 2019). These studies suggest that individuals' knowledge and experiences influence group outcomes and improve group effectiveness.

We posit that TSK is essential for improving the income tax accounts' audit quality. The client industry is not the only determinant or the primary determinant of personnel assigned to the income tax accounts' audits. In many cases, industry experience is a secondary consideration, especially when compared to personnel areas of expertise (i.e., multinational, R&D tax credits, state and local income taxation, among others) (DeMelis, Guiliante, Mills, & Omer, 2016). The tax setting allows us to consider the tax audit process by examining whether TSK develops at the audit office level and benefits tax audit quality while minimizing industry and other confounding influences.

We suggest auditing the income tax accounts requires TSK beyond industry-specific knowledge. Tax TSK enhances auditors' ability to identify current tax positions' problems regardless of industry (Bonner et al., 1992). This knowledge is particularly relevant to manage engagements' audit risk because tax issue complexity increases inherent risk, threatening the income tax accounts' audit quality. The audit procedures, environment, and the professionals auditing the income tax accounts differ from other financial statement accounts (Cuccia & Magro, 2017). Similar to the fair value estimates and goodwill impairments, auditing the income tax accounts requires analyses of facts, circumstances, and effects on future outcomes (i.e., forward reasoning). In contrast, audits of other financial statement accounts require examining outcomes first and attesting to recording the underlying economic events (i.e., backward reasoning) (Bonner et al., 1992).

Bedard and Graham (1994) suggest that auditors organize and

[1] The McGuire et al. (2012) objective was not related to audit quality. Thus, we cannot infer that the additional tax avoidance associated with tax or audit expertise was accompanied by higher audit quality of the financial statements generally or the income tax accounts specifically.

recall information relevant to tax procedures differently. These differences affect how auditors store and share relevant knowledge (Bedard & Graham, 1994; Cuccia & Magro, 2017). For example, tax procedures tend to be less procedural and require specific knowledge (Bedard & Graham, 1994; Cuccia & Magro, 2017). Also, the environment in which tax professionals operate frequently includes client advocacy, whereas audit professionals must maintain auditor independence (Cuccia & Magro, 2017). Researching tax codes and regulations from an amalgam of resources is unique to income tax account audits (Cuccia & Magro, 2017).

2.3. Transfer of TSK

The transfer of knowledge within an organization is "the process through which one unit (e.g., individual, group, or division) is affected by the experience of another" (Argote & Ingram, 2000, p. 152). Larkin (1989) suggests three necessary conditions facilitating the acquisition and transfer of task-specific knowledge: (1) a thorough understanding of the base knowledge, (2) common elements across jobs, and (3) prior knowledge organized in a manner applicable to other jobs. Upon further consideration of the audit of income tax accounts, each of these three conditions exists, suggesting the audit of income tax accounts likely facilitates task-specific tax knowledge. The first condition requires auditors possess the base knowledge of the U.S. GAAP rules governing the accounting for income taxes (i.e., ASC 740) and the Internal Revenue Code (IRC) that applies to each of the tax positions to attest to the fairness of the presentation of the income tax accounts. The second condition, common elements across assignments, occurs because auditing of the income tax accounts requires forward-looking reasoning, and audit procedures vary by the financial accounts audited (Bonner et al., 1992; PCAOB, 2010). The overly complicated nature of taxes creates a task-specific domain that draws on experiences and training (Cuccia & Magro, 2017). Lastly, the third necessary condition to transfer knowledge is the workpaper transfer of audit approaches and strategies among professionals (Hux et al., 2019; Vagner, 2017).

Prior literature provides empirical evidence that the audit process for the income tax accounts develops TSK (Bedard & Graham, 1994; Cuccia & Magro, 2017). Vagner (2017) and Thibodeau (2003) provide support for TSK transferability across industries. Anantharaman and Wans (2019) provide evidence supporting audit offices' benefits from collective audit experience on an aggregated level. Specifically, they document that audit offices with greater exposure to internal control audits are timelier in reporting material weaknesses. They also find that industry internal controls expertise and client tenure enhance the timeliness of reporting material weaknesses. Although TSK is necessary when auditing the income tax accounts and the three conditions suggested by Larkin (1989) apply to the audit of income tax accounts, audit offices' ability to develop office-level TSK is unknown.

2.4. Group information processing

Information processing theory explains one's ability to recall data or knowledge obtained from prior experiences and apply analytical reasoning. Prior literature examines TSK in a group setting (e.g., McDonald et al., 2008; Shepardson, 2019) and relies on information processing theory to explain the influence of TSK on group outcomes. Group information processing (GIP) is the collective application of incorporating individuals' TSK when making decisions as a group (Shepardson, 2019). The greater the expertise and TSK of individuals within the group, the better the decisions made by groups (Kerr & Tindale, 2004). Thus, group experiences and expertise, such as the group's experience in auditing income tax accounts, can influence the group's capability (McDonald et al., 2008).

Although studies provide evidence that GIP can occur within a formal group setting, audit offices are inherently different from a board or audit committees and likely transfer knowledge differently. For example, the audit office structure does not facilitate group processing in the same manner because there are formal audit procedures and hierarchies of review within the audit process rather than the more interactive forum of the board or audit committee meeting. Knowledge transfer can occur through personnel, training, tools, tasks, or a combination of these mediums. Vagner (2017) examines effective mediums for transferring TSK from an expert auditor on an engagement team to a more junior auditor and finds enhanced auditor performance when communicating information in a more media-rich setting. An audit office's hierarchy could restrict transferring TSK because audit partners individually make engagement decisions without utilizing other partners' experiences when making decisions related to specific tasks. However, one powerful medium for transferring TSK at the audit office level is having the same audit personnel assigned to audit the income tax accounts and prescribed audit procedures.

Furthermore, while shared information influences group decisions more than non-shared information (Kameda, Ohtsubo, & Takezawa, 1997; Kerr & Tindale, 2004), working papers may provide more opportunities to share information (shared and non-shared) without a dependency on member centrality, where centrality suggests dependence on the knowledge of specific individuals (i.e., expertise). This notion lends itself more effectively to developing TSK. Also, the complexity of auditing the income tax accounts and the stress of meeting client deadlines may increase the reliance on shared information (Kameda et al., 1997).

Fig. 1 presents the standard Big N audit team composition for a mid-size manufacturing client. Members include a partner, a manager, two seniors, and four staff auditors. Notably, the core tax team involved in an audit is not necessarily the individuals working on APTS for the clients; instead, their focus aligns with the core audit team and does not focus on the client's tax position (Hux et al., 2019).

Typically, the partner, manager, and seniors within an audit team serve clients primarily in one industry. In contrast, the staff is either similarly limited in industry experience or they serve clients across different industries. Each audit team member has specific audit tasks, summarized in the boxes below each audit personnel. Staff and senior auditors on an audit team, supervised by managers and the partner, audit most of the income statement and balance sheet accounts. In response to an audit office's client industry portfolios, the audit office might devote more training and resources to understanding the risk factors associated with particular industries, thus creating audit industry expertise (Reichelt & Wang, 2010).

Fig. 2 presents the tax audit team composition, which illustrates the collaboration between audit professionals and tax professionals when auditing the income tax accounts.

In contrast to the structure of the audit team (Fig. 1), the tax audit team assisting the audit team in the audit of the income tax accounts is autonomous from the audit engagement team and specializes in tax-specific issues (i.e., depreciation, R&D tax credits, and transfer pricing) rather than industry-specific issues (DeMelis et al., 2016). For example, suppose Client A has foreign operations and R&D activities. In that case, the tax audit team likely consists of individuals with specialized knowledge in multinational entities and R&D tax credits qualifications. Meanwhile, if Client B has foreign operations but no R&D activities, the tax audit team might not include individuals with R&D tax credit knowledge. Because these tax audit teams perform tasks that do not vary by industry,

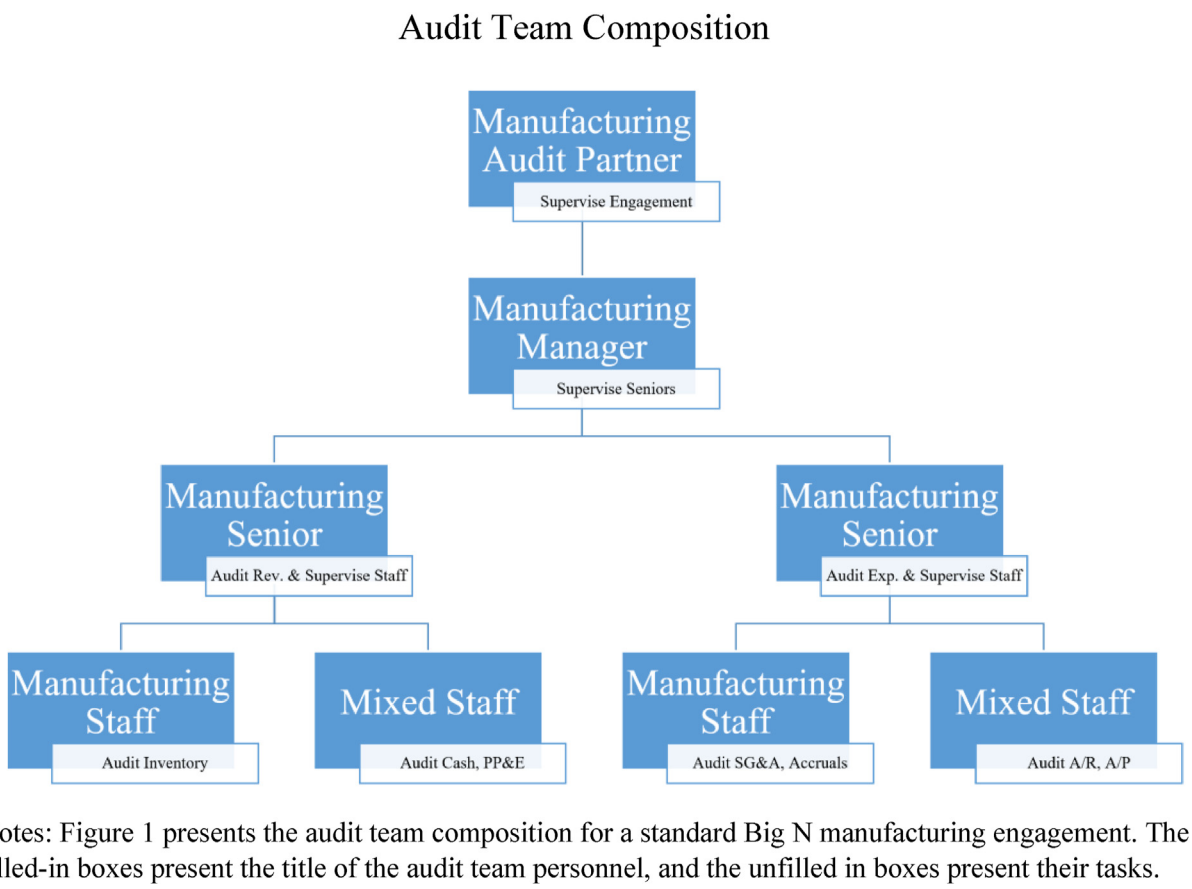


Fig. 1. Audit Team Composition.
Notes: Fig. 1 presents the audit team composition for a standard Big N manufacturing engagement. The filled-in boxes present the title of the audit team personnel, and the unfilled in boxes present their tasks.

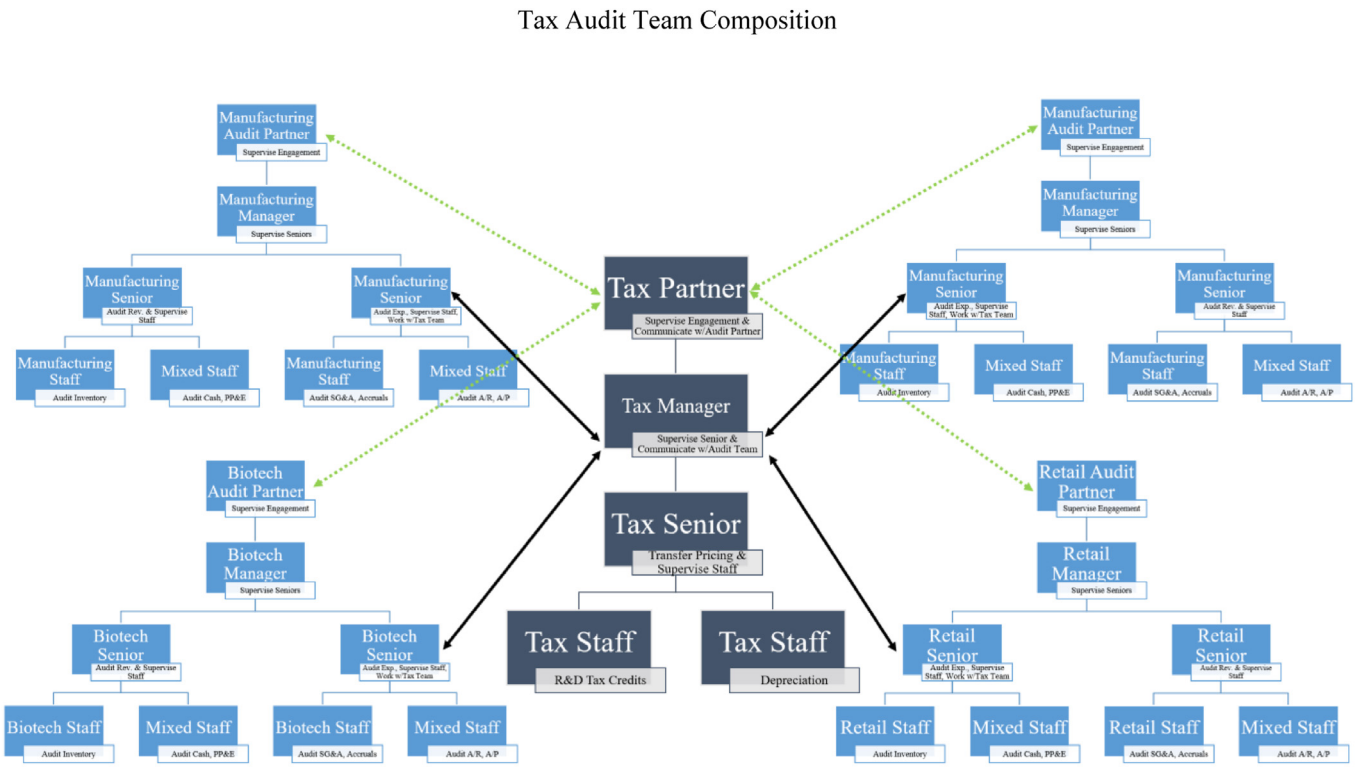
the tax audit team forms around task-specific knowledge rather than industry knowledge.

The tax manager transfers the substantive and analytical tax work to the audit team and is the primary communicator with the audit team on tax issues (see the solid arrow in Fig. 2). The audit team then reviews the tax work and subsequently submits the tax work through the audit review process (i.e., the audit manager and partner).[2] Before finalizing the audit, the audit partner, tax partner, and senior client management (i.e., controller, tax director, CFO) meet to discuss and reach a consensus on the final numbers (see the dashed arrow in Fig. 2). This meeting's timing reflects that the income tax accounts are typically the last financial statement accounts finalized. The discussion revolves around the risk of material misstatements of the income tax accounts (Dhaliwal, Gleason, & Mills, 2004). This collaboration between the audit and tax teams is relatively consistent across all audit clients in an audit office when auditing the income tax accounts. Furthermore, the communications between the audit and tax personnel are constant throughout the audit (Hux et al., 2019). As a result, members of the tax audit team receive feedback or provide input relevant to the finalization of the audit for all clients regardless of industry.

Based on prior literature, auditors likely apply TSK when auditing the income tax accounts. This knowledge can transfer from one engagement to another through personnel or working papers (Vagner, 2017). The prior literature finds that audit offices with more industry-specific knowledge generally provide higher audit quality (Ferguson et al., 2003; Reichelt & Wang, 2010). We suggest that audit office tax TSK contributes to that overall audit quality separate from the industry-specific knowledge.

Alternatively, the decision-making process and audit office structure are significantly different from a board or audit committee, impeding the office's ability to develop tax TSK. Additionally, TSK might not develop at the audit office level, or the necessary knowledge to audit the income tax accounts could be specific to an industry. For example, McGuire et al. (2012) find that tax industry expertise lowers client effective tax rates. If industry tax expertise also applies to income tax account audits, then TSK might not provide an incremental improvement in these audits. If tax complexity exposure does not develop tax TSK at the office level, more tax misstatements are likely for audit offices with greater tax complexity in their client portfolio. However, consistent with the task-specific knowledge literature, we suggest audit office personnel experience with complex income tax accounts develops TSK at the audit office level. In turn, TSK enhances the quality of the audits of income tax accounts. We state our hypothesis as follows:

[2] One Anonymous Interviewee (AI) detailed the two different approaches to dividing tax work between the audit and tax teams: *"So one approach is the tax senior or manager will prepare the tax work papers or at least the memos that support the documentation and items for the provision. … And then the audit team is reviewing [reviews] it to make sure that it's following auditing standards and we get the right level of evidence and support."* The other approach described by the same AI was, *"… [when] the audit team prepares [the working papers], … the tax individuals will be reviewing more so from a perspective of understanding the tax law to make sure that all that has been [was] applied correctly …"* For illustrative purposes Fig. 2 details the former approach. Regardless of the approach employed by the team, the focus of the division is to capitalize on each team's expertise.



Notes: Figure 2 presents the tax audit team composition for a standard Big N audit office. The dark shaded boxes present the tax audit team, the light shaded boxes present the audit teams, and the unshaded boxed below each person their responsibilities. The solid arrows indicate direct communication between the tax and audit teams, whereas the dashed arrows indicate indirect communications between the tax and audit partners.

Fig. 2. Tax Audit Team Composition.
Notes: Fig. 2 presents the tax audit team composition for a standard Big N audit office. The dark shaded boxes present the tax audit team, the light shaded boxes present the audit teams, and the unshaded boxed below each person their responsibilities. The solid arrows indicate direct communication between the tax and audit teams, whereas the dashed arrows indicate indirect communications between the tax and audit partners.

Hypothesis 1. *There is a positive association between an audit office's exposure to complex income tax accounts and the income tax accounts' audit quality.*

3. Methods

We use two methods to examine TSK at the office level and its influence on the audit of income tax accounts. First, we use archival methods to examine the association between an audit office's exposure to complex tax issues and the income tax accounts' audit quality. Second, we perform semi-structured interviews of partners/senior managers of Big 4 audit offices to support our findings and validate that our findings are consistent with GIP. Considering insights from practitioners directly involved in providing attestation services for the income tax accounts allows us to triangulate the results and evaluate GIP as a reasonable explanation for our results (Malsch & Salterio, 2016).

3.1. Archival research design

3.1.1. Audit quality of income tax accounts

Consistent with prior research (Aobdia, 2019; Francis et al., 2013; Kinney, Palmrose, & Scholz, 2004), we measure audit quality using misstatements identified from financial statements restatements. We use this measure of audit quality for two reasons. First, recent studies suggest that auditors and investors view restatements as "the most readily available public signal of low audit quality" (Christensen, Glover, Omer, & Shelley, 2016, p. 3). DeFond and Zhang (2014, p. 277) suggest that restatements indicate "egregious audit failure." Thus, while restatements can vary in qualitative and quantitative significance, a restatement's mere existence signals lower audit quality. Second, using restatements allows us to identify tax-related audit failures, thus separating misstatements related to tax and non-tax issues.

We obtain our sample of restatements from the Audit Analytics dataset. For each client-year observation, we create an indicator variable equal to one in the year the misstatement occurred if one of the reasons listed for restatement is "Tax expense/benefit/deferral/other (FAS 109) issues" (*TaxMisstatement*) and zero otherwise.

3.1.2. Tax task-specific knowledge

We proxy for tax TSK using the audit office's exposure to complex tax planning. Exposure to complexity leads to more TSK because audit offices must increase training to address that complexity. The auditors inherently have more experience dealing with those task-specific issues (Bonner & Lewis, 1990; Larkin, 1989). Further, the complexity associated with the income tax accounts increases the overall audit risk by increasing the inherent risk associated with the income tax accounts, demanding that audit firms develop methods to mitigate this increase in audit risk. We use two measures of audit offices' exposure to complex tax issues — complex tax reporting and uncertain tax benefit (UTB) disclosures.

First, we follow Bratten, Gleason, Larocque, and Mills (2017), who provide evidence that foreign operations, research and development expenditures, and tax-loss carryforwards are

measures of tax planning complexity.[3] These components represent tax complexity because of the correlation with common tax planning issues such as multinational income shifting and transfer pricing (foreign operations), research and development tax credits (R&D expenditures), and mergers and acquisitions (tax-loss carryforwards) and require the understanding of the Internal Revenue Code. Prior literature also suggests these components represent tax complexity because R&D and foreign operations are two of the most common channels for complex tax planning (Dyreng, Hanlon, & Maydew, 2019). The components are among the most common items reported to the IRS as uncertain tax positions (Towery, 2017).[4] Thus, we rely on Bratten et al. (2017) to develop an audit office proxy for clients' complex tax issues.[5]

For each client, we determine its R&D activities, foreign operations, or tax-loss carryforwards (0 if the client has none of the attributes, 1 if the client has one attribute, 2 if the client has two attributes, and 3 if the client has all attributes).[6] We sum the audit office's client values to proxy for the audit office's exposure to complex tax issues (*TaxScore*). Audit offices with low *TaxScore* have clients with fewer complex tax issues, and those with high *TaxScore* have more complex tax issues. Thus, we propose that audit offices with high *TaxScore* have high tax TSK levels while audit offices with low *TaxScore*, have low tax TSK levels.

For our second measure, we use audit office clients' UTB disclosures. UTB balances indicate complex tax positions with a greater than 50 percent likelihood of being overturned upon an IRS audit (Scholes et al., 2019; Towery, 2017). Towery (2017) uses proprietary access to IRS data to document that R&D tax credits, international transfer pricing, accelerated deductions, capitalizations, and M&A activities are among the most common uncertain tax positions and the most common components of UTB balances. Furthermore, Lisowsky, Robinson, and Schmidt (2013) and Gupta, Mills, and Towery (2014) use similar proprietary access to IRS data to document an association between UTB disclosures and tax sheltering. As a result, clients with higher UTB balances are more likely to have higher tax complexity. Importantly, UTBs represent a wide array of tax positions, meaningfully representing clients' tax complexity. Because all clients must disclose UTBs, we identify clients in an audit office with high UTB balances (i.e., exceeding two percent of assets). Thus, our second measure, *UTB*, is the number of clients in the audit office with a UTB balance exceeding two percent of their total assets audited.[7] Again, we suggest that audit offices with more clients with UTBs exceeding two percent of total assets have higher tax TSK levels.[8]

3.1.3. Empirical model

Inherent differences in client or audit office characteristics could influence the association between tax TSK and the quality of the income tax accounts' audits. Thus, we apply entropy balancing to remove the potential effects of these differences from our results to address this concern. Entropy balancing assigns weights to adjust the covariate sample distribution differences between treatment and control observations (Hainmueller, 2012; Hainmueller & Xu, 2013). We balance covariates on all three moments (mean, variance, and skewness) of their distributions.[9] We create two different entropy balanced samples. First, we create two indicator variables representing whether the observations have high tax TSK, *HighTS* and *HighUTB*. *HighTS* equals one (zero otherwise) if the audit office's *TaxScore* is greater than or equal to 0.50. *HighUTB* equals one (zero otherwise) if the audit office's *UTB* is greater than the median. We then create the first entropy balanced sample where the treatment group is *HighTS* and a second entropy balanced sample where the treatment group is *HighUTB*. To test the association between the income tax accounts' audit quality and tax TSK, we estimate the following Probit model using the entropy balanced samples:

$$Pr(TaxMisstatement_{i,t}=1)=\beta_0+\beta_1 TaxScore_{f,t}\,(UTB_{f,t})+\beta_k Controls_{f,t}+\beta_k Controls_{i,t}+Year+Industry+MSA+\varepsilon_{i,t} \quad (1)$$

Following the prior literature, we control for variables related to the likelihood of a tax misstatement (Francis et al., 2013; Seetheraman, Sun, & Wang, 2011). Prior research finds that office size positively influences audit quality (Francis, Michas, & Yu, 2009). Thus, we include audit office variables such as audit office size (*Office*), total audit office fees (*OfficeFees),* and whether the audit office is a Big N audit firm (*BIGN)*. We also control for different expertise measures because studies indicate a positive association between expertise and audit quality (e.g., Reichelt & Wang, 2010). We include local tax expertise (*LocalTaxExp)*, local audit expert (*LocalAudExp),* and audit industry expertise (*NatAudExp)* because of their potential effect on the audit quality of income tax accounts. We also include a control for auditor changes (*AuditorChange*) because audit quality can change in the first year of audit engagements. Romanus, Maher, and Fleming (2008) suggest that auditor changes can uncover previously missed misstatements. We also control for client-specific audit-related variables that can influence auditors' opinions and reports. These include client importance (*Influence*), total audit fees (*Audit*), total non-audit fees (*NonAudit*),

[3] Bratten et al. (2017) include seven factors when measuring tax complexity. Three of these factors (foreign, R&D, and net operating losses) pertain to tax planning-related activities, whereas the other four (GAAP ETR volatility, changes in quarterly GAAP ETR, having a low GAAP ETR, and being in a loss position) pertain to tax financial reporting. Because we are interested in whether the audit office's exposure to complex tax planning issues generates tax TSK and thereby increases tax audit quality, we focus our attention on the complex tax planning factors, and throughout the paper, we refer to complex tax planning issues as complex tax issues. In additional analyses, we also examine the tax financial reporting factors. We also perform a battery of robustness analyses to ensure that our findings are not affected by including other factors not identified by Bratten et al. (2017).

[4] Measuring tax complexity using financial statement information is inherently limited because we are not able to link the data directly to actual tax positions. We caveat our analysis that we are subject to the assumption that the presence of certain financial statement fundamentals relate to their corresponding tax positions (e.g., the presence of R&D expenses means that the observation likely has R&D tax credits).

[5] In untabulated analysis, we examine the correlations between tax misstatements and each client's individual R&D expenses, foreign earnings, and NOLs. We find that R&D and foreign operations are positively correlated with tax misstatements and NOLs are not associated with tax misstatements. As a result, we validate that the three components suggested by Bratten et al. (2017) are significantly or directionally associated with tax complexity. Interestingly, this validation at the client level increases the audit risk and potential for misstatements, and thus provides tension as to why we may not expect to find an increase in tax audit quality with an increase in audit risk.

[6] While foreign operations, R&D, and tax loss carry forwards are associated with tax positions that carry a significant amount of tax complexity, we acknowledge that other factors can also contribute to tax complexity. One such component not mentioned in Bratten et al. (2017) is multi-state tax planning activities. In untabulated analysis, we use Exhibit-21 data to identify firms with operating segments in more than one U.S. state and include this fourth component in our measure for tax complexity. Our inferences remain unchanged.

[7] UTBs are only available from 2007 and beyond. In untabulated analysis, when examining *TaxScore,* we also restrict our sample to 2007 and beyond, our inferences are unchanged.

[8] The use of these measures is consistent with tax matters that require specific expertise or knowledge –foreign operations, transfer pricing, valuation allowance, R&D credits, and fixed assets among complex tax issues that require specialized knowledge.

[9] This method does not correct for incorrect assignment to treatment and control groups which can arise with archival proxies for separation. However, it does provide assurance that differences between observable covariates for treatment and control groups do not overly influence results.

Table 1
Sample selection.

The intersection of Compustat and Audit Analytics Clients from 2003 to 2015	81,844
Less: Clients not audited by a Big 4 or second-tier Auditor	(24,742)
Less: Clients operating in a regulated industry	(16,938)
Less: Observations in an office of three or fewer clients	(4874)
Less: Observations missing data to calculate independent variables	(21,592)
Total client-year observations	13,698

and audit office tenure (*LogTenure*). We also include a client-level measure for auditor-provided tax services (*APTS)* consistent with Seetheraman et al. (2011), who provide evidence of higher audit quality with APTS. Finally, we control for several client-specific variables that can affect the association between tax misstatements and audit quality. For client complexity and performance that can increase the inherent risk associated with the audit and increase the potential for restatements, we include client size (*Size*), client losses (*Loss*), discretionary accruals (*AbsDA*), change in receivables (*ΔReceivables*), change in inventory (*ΔInventory*), change in cash sales (*ΔCashSales*), change in earnings (*ΔEarnings*), issuance of new debt or equity (*ActualIssuance*), and the market to book ratio (*MB*). See Appendix B for a detailed discussion of each variable. We winsorize all continuous variables at the 1st and 99th percentiles. We include year-fixed effects to control for year-specific variation in tax audit quality and Fama-French 48 industry fixed effects to controls for industry-specific variation in tax audit quality. We also include MSA fixed effects to control other factors associated with the audit office location not represented by other control variables. Lastly, we cluster standard errors by client. Following HYPOTHESIS 1, we expect a negative and significant β_1, supporting an association between tax TSK and a lower likelihood of tax-related misstatements (i.e., higher audit quality).

3.1.4. Sample selection

We use a sample of client-year observations from the intersection of Compustat and Audit Analytics for clients with Big 4 or second-tier auditors during 2003–2015 to examine the association between tax TSK and the income tax accounts' audit quality.[10] Our sample begins in 2003 to include only observations in the post-Sarbanes-Oxley era and ends in 2015 to allow sufficient time for the public disclosure of restatements. Table 1 provides details for our sample selection. Observations associated with smaller audit offices have innate audit quality differences among audit firms' different tiers (DeFond, Erkens, & Zhang, 2016; Hogan & Martin, 2009). Thus, we remove these observations because smaller audit firms likely have different processes when auditing the income tax accounts or cannot offer APTS to clients, affecting the association between tax-related audit quality and tax TSK.

Similarly, to allow offices to develop tax TSK, we remove observations from an audit office with three or fewer clients.[11] We use this sample to calculate *TaxScore* and *UTB*.[12] Next, we eliminate client-year observations in regulated industries because they have different financial reporting incentives and auditing requirements.[13] Finally, we eliminate client-year observations that do not have available data for each variable of interest and the control variables. Our final sample consists of 13,698 (4313) client-year observations for the full sample (*UTB* sample).

3.2. Qualitative methods

3.2.1. Interviewees

To complement the empirical findings, we interviewed 15 Big 4 accounting professionals – nine assurance partners or senior managers and six tax partners or senior managers – regarding auditing the income tax accounts. Using semi-structured interviews allows us to determine whether the interpretation of our archival results is consistent with institutional experiences at these accounting firms (Qu & Dumay, 2011) and examine whether GIP explains our empirical findings. Specifically, process tracing allows us to examine whether an increase in exposure to complex tax accounts develops TSK at the office level (Ittner, 2013).

On average, the interviewees have 18 years of experience in public accounting, with four of the partners having 30 plus years of experience. To ensure the interviewees' anonymity, we do not disclose individual demographics, and throughout the paper, we refer to participants as anonymous interviewees (AI). Of the six AIs that were partners, three (three) primarily served in the attestation (tax) function. Of the nine AIs that were senior managers, six (three) served in the attestation (tax) function. All AIs have significant involvement in providing attestation for the income tax accounts. Four AIs worked in more than one audit office, including one that completed a rotation at their firm's national office and another with employment experience at two different Big 4 firms. Their geographic location was across the continental US, and five AIs elaborated on their exposure to clients with international operations where two AIs are qualified as a subject matter specialist for international tax.

3.2.2. Interview script

Public accounting firms have different service lines (i.e., assurance/audit, tax, consulting), and audit teams often include professionals from the tax or consulting service. Our interviewees included professionals from the audit and tax service lines. Therefore, we can better determine if and how tax TSK accumulates at the office level by seeking insight from audit and tax professionals. Prior studies suggest TSK develops at the individual level (e.g., McDonald et al., 2008); however, we examine whether TSK develops at the office level. The semi-structured interviews also enable us to identify whether GIP explains the archival results that provide evidence consistent with TSK development at the office level (Malsch & Salterio, 2016). We asked initial screening questions that ensure each AI has experience providing attestation for income tax accounts at a Big 4 accounting firm. Our interview script consists of questions about how the process of auditing income tax accounts lends itself to knowledge sharing and the development of expertise or TSK. We summarize the qualitative data corresponding to questions 7–12 (see Interview Script Appendix A) here within.

Throughout our analysis of the responses, we identify statements made by AIs that represent a consensus among the AIs. We also perform a deviant case analysis on comments contradicting

[10] Consistent with Hogan and Martin (2009), we define second-tier auditors as RSM, BDO, Grant Thornton, and Crowe.

[11] In untabulated analysis, we vary the number clients defining small (5 or more clients and 6 or more clients). Our primary inferences remain unchanged.

[12] Because clients were not required to disclose UTBs until after 2007, our *UTB* sample is from 2007 to 2015.

[13] In untabulated analysis, we calculated *TaxScore* and *UTB* excluding regulated industries. Our primary inferences remain unchanged.

group processing theory and report these throughout the result summary. We conduct a member check to validate the qualitative data by sending a results draft to 3 AIs. The member check ensures our interpretation of AI's comments and responses are consistent with their intended meaning (Malsch & Salterio, 2016). Lastly, we consider the context in which we quote each interviewee and ensure each quote was obtained free of pressure or misleading. This quote validity analysis ensures that quotes referenced in the paper are not biased in favor of our study or taken out of context. The results of all three of these analyses do not indicate any issues with our qualitative analyses' results.[14]

4. Results

4.1. Archival results

4.1.1. Descriptive statistics

Table 2, Panel A, provides descriptive statistics for the final sample. Three percent of the client-year observations have misstatements related to tax issues. The average *TaxScore* is 41.22, and the average number of auditors with clients in an audit office with UTBs that exceed two percent of total assets audited (*UTB)* is 4.34. *Misstatements* occur for about 10 percent.

Twenty-six percent of client-year observations experience net losses; almost seven percent change audit offices. For 51 percent of the observations, the audit office is a local audit industry market leader. On average, observations experience a ten, nine, and eight percent increase in receivables, inventory, and cash sales from the prior year to the current year, respectively. On average, 19 percent of the total fees paid to the auditor by clients are APTS.[15] Panels B and C of Table 2 provide the descriptive statistics for the two entropy balanced samples and indicate both samples' balance on three moments (mean, variance, and skewness).

An untabulated correlation matrix shows a negative and significant correlation between tax misstatements (*TaxMisstatement)* and an audit office's tax TSK proxies (*TaxScore* and *UTB)*. This association provides univariate evidence consistent with Hypothesis 1. All other correlations appear consistent with prior studies.

4.1.2. Multivariate analysis

Table 3 presents the results of estimating Model (1) using the entropy balanced samples examining the association between an audit office's tax TSK and tax-related misstatements. The dependent variable is *TaxMisstatement*, and the variables of interest are *TaxScore* and *UTB*.[16]

In Table 3, columns (1) and (2) we find negative and significant coefficients on *TaxScore* (coefficient = −0.003, t-stat = 1.69) and *UTB* (coefficient = −0.040, t-stat = 4.33).[17] These coefficients suggest that tax TSK reduces the probability of tax-related misstatements and improves the income tax accounts' audit quality. These results suggest that clients of audit offices with more tax TSK are less likely to have tax-related misstatements, resulting in higher audit quality of the income tax accounts. An interquartile change in tax TSK for an audit office decreases the probability of a tax misstatement by 32 (*TaxScore*) and 44 (*UTB*) percent. [18,19,20]

The results in columns (1) and (2) for the control variables are consistent with the prior literature. The positive coefficient on *LocalTaxExp* suggests that while industry tax expertise benefits the clients' tax planning activities, it could have an adverse effect (columns 1 and 2) on the audit quality of income tax accounts.[21] The prior literature finds no relation between industry expertise and misstatements (Beardsley et al., 2020; Francis et al., 2013). Overall, Table 3 results support Hypothesis 1, suggesting audit offices with more tax TSK improve the audit quality of the income tax accounts. [22,23]

Our results for our proxies for TSK could suggest an increase in audit effort because of clients' complexity. However, we suggest that the office-level controls and client-level controls reduce concerns that the exposure to complexity reflects additional audit

[14] We analyze our qualitative analyses for 1) biases towards one interviewee by disproportionately representing their responses in our quotes, 2) biases towards disproportionately focusing on one question in our summary, 3) a response effect related to the gender of the interviewer. We statistically test our qualitative data using a Friedman and Chi-square test. First, when testing whether one interviewee is disproportionately represented in our analyses, we fail to reject the null that the inclusion of quotes included in the summary disproportionately represents one interviewee (Friedman p-value = 0.916; Chi-squared p-value = 0.314). Second, the results of testing whether one question is disproportionately discussed using quotes in our analyses we fail to find evidence of a bias (Friedman p-value = 0.992; Chi-squared p-value = 0.333). We also review all interviewee responses for a potential response effect based on the gender of the interviewer. Eight of the interviews were conducted by a female and seven by a male. Out of the 15 participants, all but three of the participants (one interviewed by a female and two by a male) were quoted. However, all AIs' responses were evaluated when summarizing the findings. When statistically testing whether there is a difference between the selected quotes and the interviewer being male or female, we again fail to find a statistical difference when performing a test of means (p-value = 0.474). Overall, our statistical tests fail to find a bias in our summary of qualitative data.

[15] We follow Francis et al. (2013) for control variables; however, we note that when we estimate Model (1), our collinearity can be a concern. We address this issue two different ways. (1) By looking at the result with no controls, and (2) estimating Model (1) when dropping a problematic control (*Audit)*, and the inferences hold.

[16] ROC curves are not calculated when using an entropy balanced sample. However, when calculating the area under the ROC curves for all models without entropy balancing, all ROC curves suggest the models have adequate discrimination with ROC values of 0.75 and 0.77, respectively.

[17] When estimating Model (1) not using an entropy balanced sample, the coefficients on *TaxScore* and *UTB* remain negative and significant (p-value < 0.05 and < 0.01, respectively).

[18] The economic significance is calculated using the margins at the 25th and 75th percentile for *TaxScore* and *UTB*. Given that tax misstatements occur at a rate of 0.026991 in the sample, we take the average change at the margins for *TaxScore* (*UTB)* from the 25th to the 75th percentile (−0.0085741 and −0.0117488, respectively). Thus, the economic significance is 31.7% (−0.0085741/0.026991) for *TaxScore* and 43.5% (−0.0117488/0.026991) for *UTB*.

[19] We also estimate a fractional response logistic regression to examine the tax TSK effect on the percent of office level restatements. The dependent variable is the percent of clients experiencing a tax related misstatement for the current period. All other variables are consistent with Model (1) but calculated at the mean level for the audit office. Our results are consistent with our findings in Table 3 where *TaxScore* and *UTB* are negative and significant at the five and one percent level, respectively, suggesting the tax TSK of reduces the audit office's overall percentage of tax misstatements.

[20] To ensure *TaxScore* represents the construct tax TSK, we conduct a principal component analysis. We find one principal component with an eigenvalue of 2.44 and all item weights are 0.50 or higher. The loadings for the three factors included in *TaxScore* are: sum of R&D = 0.59, sum of foreign operations = 0.58, and sum of clients with net operating losses = 0.57. Because we find only one eigenvalue greater than one and all loadings are greater than 0.50, the results support *TaxScore* representing the construct tax TSK.

[21] To provide a measure of the portion of *TaxScore* that does not explain *LocalTaxExp,* we orthogonalize *LocalTaxExp* from *TaxScore* and re-estimate Model (1) in untabulated analyses. Our inferences remain unchanged.

[22] To measure the amount of *TaxScore* that is not explained by Foreign, R&D, and NOL, in robustness tests, we orthogonalize Foreign, R&D, and NOL from *TaxScore* and re-estimate Model (1). This approach removes potential confounding effects of Foreign, R&D, and NOL on tax misstatements. Our inferences remain unchanged.

[23] In untabulated analyses, we include an indicator variable if the audit office's total audit fees are above the median to control for the office level effect of APTS. The coefficients on *TaxScore* and *UTB* both remain negative and significant (p-value < 0.05 and < 0.01, respectively).

Table 2
Descriptive statistics.

Panel A: Descriptive Statistics for the Unbalanced Sample

Variable	N	Mean	P25	Median	P75	Std Dev
Dependent Variables						
$TaxMisstatement_{i,t}$	13,698	0.027	0.000	0.000	0.000	0.162
$Misstatement_{i,t}$	13,698	0.101	0.000	0.000	0.000	0.301
Variables of Interest						
$TaxScore_{f,t}$	13,698	41.220	11.000	26.000	60.000	40.909
$HighTS_{f,t}$	13,698	0.250	0.000	0.000	0.000	0.417
$UTB_{f,t}$[a]	4313	4.355	1.000	2.000	5.000	5.540
$HighUTB_{f,t}$[a]	4313	0.502	0.000	1.000	1.000	0.499
$AlwaysHighScore_{f,t}$	13,698	0.147	0.000	0.000	0.000	0.354
$NeverHighScore_{f,t}$	13,698	0.629	0.000	1.000	1.000	0.483
$AlwaysHighUTB_{f,t}$[a]	4313	0.185	0.000	0.000	0.000	0.389
$NeverHighUTB_{f,t}$[a]	4313	0.333	0.000	0.000	1.000	0.471
Independent Variables						
$Size_{i,t}$	13,698	6.655	5.167	6.658	8.113	2.153
$Office_{i,t}$	13,698	3.080	2.398	3.178	3.892	1.031
$OfficeFees_{f,t}$	13,698	17.082	16.111	17.251	18.142	1.488
$Loss_{i,t}$	13,698	0.261	0.000	0.000	1.000	0.439
$AuditorChange_{i,t}$	13,698	0.068	0.000	0.000	0.000	0.251
$Influence_{f,t}$	13,698	0.159	0.021	0.059	0.164	0.256
$NonAudit_{i,t}$	13,698	11.514	10.857	12.245	13.452	3.559
$Audit_{i,t}$	13,698	13.766	12.740	13.800	14.764	1.441
$LocalAudExp_{f,t}$	13,698	0.508	0.000	1.000	1.000	0.500
$LocalTaxExp_{f,t}$	13,698	0.446	0.000	0.000	1.000	0.497
$NatAudExp_{f,t}$	13,698	0.321	0.000	0.000	1.000	0.467
$BigN_{f,t}$	13,698	0.877	1.000	1.000	1.000	0.328
$AbsDA_{i,t}$	13,698	0.115	0.029	0.067	0.136	0.151
$\Delta Receivables_{i,t}$	13,698	0.101	−0.092	0.048	0.200	0.420
$\Delta Inventory_{i,t}$	13,698	0.085	−0.089	0.041	0.185	0.386
$\Delta CashSales_{i,t}$	13,698	0.076	−0.035	0.057	0.157	0.251
$\Delta Earnings_{i,t}$	13,698	−0.190	−0.741	−0.029	0.378	3.650
$ActualIssuanc_{i,t}e$	13,698	0.797	1.000	1.000	1.000	0.402
$MB_{i,t}$	13,698	1.841	0.527	1.687	2.147	1.540
$LogTenure_{i,t}$	13,698	2.278	1.609	2.485	2.996	0.951
$APTS_{i,t}$	13,698	0.191	0.000	0.068	0.238	0.322

Panel B: Descriptive statistics for entropy balanced sample

Variable	Treat ($HighTS = 1$)			Control ($HighTS = 0$)		
	Mean	Variance	Skewness	Mean	Variance	Skewness
$Size_{i,t}$	6.960	3.818	0.006	6.960	3.818	0.006
$Office_{f,t}$	3.083	1.047	−0.403	3.083	1.047	−0.403
$OfficeFees_{f,t}$	17.260	1.551	−0.867	17.260	1.551	−0.866
$Loss_{i,t}$	0.242	0.184	1.203	0.242	0.184	1.203
$AuditorChange_{i,t}$	0.050	0.047	4.148	0.050	0.047	4.148
$Influence_{f,t}$	0.145	0.062	3.014	0.145	0.062	3.014
$NonAudit_{i,t}$	11.860	10.670	−2.437	11.860	10.670	−2.437
$Audit_{i,t}$	14.030	1.749	−0.132	14.030	1.749	−0.132
$NatAudExp_{f,t}$	0.632	0.233	−0.547	0.632	0.233	−0.547
$LocalAudExp_{f,t}$	0.410	0.242	0.364	0.410	0.242	0.364
$AbsDA_{i,t}$	0.112	0.022	3.168	0.112	0.022	3.168
$\Delta Receivables_{i,t}$	0.101	0.155	2.533	0.101	0.155	2.533
$\Delta Inventory_{i,t}$	0.084	0.128	2.095	0.084	0.128	2.095
$\Delta CashSales_{i,t}$	0.077	0.058	1.298	0.077	0.058	1.298
$\Delta Earnings_{i,t}$	−0.137	12.590	−0.068	−0.137	12.590	−0.068
$ActualIssuance_{i,t}$	0.788	0.167	−1.406	0.788	0.167	−1.405
$MB_{i,t}$	1.542	2.404	2.546	1.542	2.404	2.546
$LogTenure_{i,t}$	2.428	0.824	−0.792	2.428	0.824	−0.792
$Big4_{f,t}$	0.984	0.016	−7.629	0.984	0.016	−7.623
$LocalTaxExpert_{f,t}$	0.251	0.244	−0.328	0.251	0.244	−0.328
$APTS_{i,t}$	0.203	0.105	3.138	0.203	0.105	3.138

Panel B: Descriptive statistics for entropy balanced sample

Variable	Treat ($HighUTB$=1)			Control ($HighUTB$=0)		
	Mean	Variance	Skewness	Mean	Variance	Skewness
$Size_{i,t}$	7.372	3.659	0.074	7.372	3.659	0.074
$Office_{f,t}$	3.106	0.850	−0.482	3.106	0.850	−0.482
$OfficeFees_{f,t}$	17.670	1.238	−0.657	17.670	1.238	−0.656
$Loss_{i,t}$	0.245	0.185	1.185	0.245	0.185	1.185
$AuditorChange_{i,t}$	0.029	0.029	5.572	0.029	0.029	5.572
$Influence_{f,t}$	0.132	0.044	3.162	0.132	0.044	3.162
$NonAudit_{i,t}$	11.740	12.620	−2.240	11.740	12.620	−2.240

Table 2 (*continued*)

Panel B: Descriptive statistics for entropy balanced sample						
Variable	Treat (*HighUTB*=1)			Control (*HighUTB*=0)		
	Mean	Variance	Skewness	Mean	Variance	Skewness
$Audit_{i,t}$	14.490	1.343	0.039	14.490	1.343	0.040
$NatAudExp_{f,t}$	0.602	0.240	−0.417	0.602	0.240	−0.417
$LocalAudExp_{f,t}$	0.401	0.240	0.404	0.401	0.240	0.404
$AbsDA_{i,t}$	0.116	0.023	3.101	0.116	0.023	3.101
$\Delta Receivables_{i,t}$	0.098	0.177	2.455	0.098	0.177	2.455
$\Delta Inventory_{i,t}$	0.084	0.145	2.200	0.084	0.145	2.200
$\Delta CashSales_{i,t}$	0.061	0.064	1.458	0.061	0.064	1.458
$\Delta Earnings_{i,t}$	−0.218	12.920	−0.342	−0.218	12.920	−0.342
$ActualIssuance_{i,t}$	0.782	0.171	−1.363	0.782	0.171	−1.363
$MB_{i,t}$	1.510	2.219	2.632	1.510	2.219	2.632
$LogTenure_{i,t}$	2.561	0.613	−0.858	2.561	0.613	−0.858
$Big4_{f,t}$	0.977	0.022	−6.428	0.977	0.022	−6.428
$LocalTaxExpert_{f,t}$	0.551	0.248	−0.204	0.551	0.248	−0.204
$APTS_{i,t}$	0.145	0.043	3.164	0.145	0.043	3.164

Panel A presents the descriptive statistics for the unbalanced sample. Panel B presents the descriptive statistics for the entropy balanced sample when balancing on *HighTS*, an indicator variable equal to one (zero otherwise) if the audit office's *TaxScore* is greater than or equal to 0.50. Panel C presents the descriptive statistics for the entropy balanced sample when balancing on *HighUTB*, which is an indicator variable that is one (zero otherwise) if the audit office's *UTB* is greater than or equal to the median of *UTB*. We describe all variables in Appendix B.

[a] The number of observations is different compared to the other variables due to data availability.

effort rather than tax TSK.[24]

4.1.3. Sensitivity analysis

In sensitivity analyses, we conduct additional analyses of whether the observed positive association between tax TSK and tax audit quality is from tax TSK and not overall audit quality or local industry tax expertise. We also consider whether tax TSK proxies adequately represent the TSK developed from auditing the income tax accounts and whether audit office portfolio size influences the results. First, we examine whether the association between tax TSK and the audit quality of income tax accounts reflects knowledge applicable to financial statement accounts other than income tax accounts. We re-estimate Model (1) using the entropy balanced samples and non-tax related misstatements. Columns (1) and (2) in Table 4 present the association between tax TSK and other financial statement accounts' audit quality.

Contrary to the results in Table 3, the coefficients on *TaxScore* and *UTB* are insignificant in columns (1) and (2), respectively. These findings suggest the association between tax TSK and the audit quality of the income tax accounts is not the result of other audit process attributes and thus more attributable to the task-specific knowledge necessary to audit the income tax accounts.

Next, we balance the sample on *LocalTaxExp* to control for the unobservable differences between the clients of local tax experts. Our main analyses (Table 3) balance the sample on *HighTS (HighUTB);* however, balancing the sample on *LocalTaxExp* examines whether local industry tax expertise (*LocalTaxExp)* influences our results. Column (3) of Table 4 estimates Model (1) while excluding the independent variables of interest (*TaxScore* and *UTB)* to focus on *LocalTaxExp*. Consistent with Table 3, the results indicate a positive and significant coefficient on *LocalTaxExp* (p-value < 0.05), suggesting an association between local industry tax expertise and tax outcomes. The results are consistent when we entropy balance the sample on *LocalTaxExp*. Thus, our results do not appear to be a function of the local industry tax expertise.

We also consider whether our measures of exposure to complex tax issues (*TaxScore* and *UTB)* adequately proxy for specific tax complexities associated with tax positions by considering a measure of tax financial reporting activities. Bratten et al. (2017) define tax complexity using seven different tax-related variables. We create a measure of tax-related financial reporting complexity using four variables related to financial reporting that are more likely to incorporate knowledge related to ASC 740. These include the change in GAAP effective tax rates (GAAP ETRs) from Q3 to Q4, permanent differences in GAAP ETRs, the volatility of quarterly GAAP ETRs, and whether the firm operates at a loss.[25] Using these four variables that incorporate ASC 740 knowledge, we calculate a tax financial reporting risk index, *FRScore. FRScore* is the sum of the number of four occurrences for each client. We add 1 to *FRScore*, if GAAP ETRs decrease from Q3 to Q4, GAAP ETRs are more than 10 percent lower than the statutory rate, above median quarterly GAAP ETR volatility, or if the client operates in a loss position. This method produces an index that ranges from 0 to 4 for each client. Next, we aggregate client scores for each audit office. To create an entropy balanced sample, we create an indicator variable equal to one (zero otherwise) when *HighFRScore* is greater than the median value of *FRScore.* Table 4, column (4) presents Model (1) entropy balanced on *HighFRScore* substituting *FRScore* for *TaxScore*. The insignificant coefficient on *FRScore* fails to support an association between an audit office's TSK of complex financial reporting risk and tax-related misstatements. Combined with those in Table 3, these results support an association between audit offices' tax TSK and higher audit quality of the income tax accounts.

Next, we consider whether our TSK measures represent TSK's

[24] One alternative explanation for our findings is that clients with complex tax issues have more sophisticated tax departments. However, the results of our interviews suggest this is not always the case because complex tax issues require TSK regardless of the sophistication of the tax department. Furthermore, Bonner et al. (1992) highlight the difference in auditing and tax knowledge sets indicating client with more sophisticated tax departments do not improve the audit quality. For instance, when discussing the division of responsibilities between professionals, one AI stated that, "*There's technology skills, evaluations skills, there's actuarial skill, there's all these other things. To me, tax is just another one of those special skills you need to conduct an audit. And so, as the engagement partner it's my responsibility to make sure the engagement team collectively has that knowledge, whether that resides within the audit team or we have to go get it.*"

[25] Similar to *TaxScore,* we limit our components of *FRScore* to those included in Bratten et al. (2017). We caveat that there are numerous components of tax financial reporting complexity that could also be included such as M&A activity, indefinitely reinvested foreign earnings, valuation allowance, and tax loss carryforwards. In untabulated analysis, we include these different components and note that our inferences remain unchanged. As a result, our results do not appear to be a function of just the components used from Bratten et al. (2017).

Table 3
Hypothesis 1: Tax Misstatements as a function of task-specific tax knowledge.

VARIABLES	(1)	(2)
	TaxMisstatement	TaxMisstatement
$TaxScore_{f,t}$	−0.003**	
	(-1.69)	
$UTB_{f,t}$		−0.040***
		(-4.33)
$LocalTaxExp_{f,t}$	0.207***	0.236**
	(3.08)	(1.99)
$Size_{i,t}$	−0.072**	0.031
	(-2.19)	(0.53)
$Office_{f,t}$	−0.257**	−0.071
	(-2.44)	(-0.60)
$OfficeFees_{f,t}$	0.293***	0.298***
	(3.86)	(3.03)
$Loss_{i,t}$	−0.026	−0.013
	(-0.38)	(-0.12)
$AuditorChange_{i,t}$	−0.408**	−0.378
	(-2.54)	(-1.16)
$Influence_{f,t}$	0.124	0.537**
	(0.71)	(2.33)
$NonAudit_{i,t}$	0.005	0.018
	(0.41)	(0.82)
$Audit_{i,t}$	0.085	−0.145
	(1.49)	(-1.50)
$LocalAudExp_{f,t}$	−0.002	−0.115
	(-0.02)	(-0.89)
$NatAudExp_{f,t}$	0.068	−0.020
	(1.19)	(-0.20)
$AbsDA_{i,t}$	0.046	0.287
	(0.24)	(1.09)
$\Delta Receivables_{i,t}$	−0.098	−0.019
	(-1.13)	(-0.12)
$\Delta Inventory_{i,t}$	0.051	0.166
	(0.50)	(1.11)
$\Delta CashSales_{i,t}$	0.103	−0.110
	(0.66)	(-0.38)
$\Delta Earnings_{i,t}$	0.001	0.004
	(0.12)	(0.33)
$ActualIssuance_{i,t}$	0.064	−0.107
	(0.93)	(-1.03)
$MB_{i,t}$	−0.119***	−0.083*
	(-3.50)	(-1.68)
$LogTenure_{i,t}$	0.028	0.005
	(0.81)	(0.07)
$BigN_{f,t}$	−0.272	0.509*
	(-1.47)	(1.92)
$APTS_{i,t}$	0.041	−0.079
	(0.42)	(-0.34)
Constant	−10.427***	−9.246***
	(-9.44)	(-5.48)
Pseudo R-Square	0.1391	0.1345
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
MSA Fixed Effects	Yes	Yes
Observations	13,698	4313

Results are from the Probit estimation of Model (1) for the entropy balanced sample when balancing on *HighTS* (column 1) and *HighUTB* (column 2). *HighTS* is an indicator variable equal to one (zero otherwise) if the audit office's *TaxScore* is greater than or equal to 0.50. *HighUTB* is an indicator variable equal to one (zero otherwise) if *UTB* is greater than or equal to the median of UTB. ***, **, and * denote significance levels at the 0.01 [or 1 percent], 0.05 [or 5 percent], and 0.10 [or 10 percent] (one-tailed for the variable of interests and two-tailed for all other variables), respectively. *t*-values/*z*-values are in parentheses. The dependent variable, *TaxMisstatement*, and the variables of interest are *TaxScore* and *UTB*. We cluster standard errors by client. We describe all variables in Appendix B.

accumulation at the office level instead of individual TSK development. We complete two different analyses to address this concern. First, we estimate Model (1) but replace *TaxScore* with the lagged *TaxScore* for four years.

Table 5 presents the results when replacing *TaxScore (UTB)* with *LaggedTaxScore (LaggedUTB)* lagged by one, two, three, and four years. The coefficients on *LaggedTaxScore (LaggedUTB)* maintain similar magnitudes and remain statistically significant across the specifications, suggesting that tax TSK benefits accumulate over time.

Table 6 presents the results when estimating Model (1) and replacing *TaxScore (UTB)* with two different indicator variables. The first indicator is whether the audit office always has a high *TaxScore (UTB)* in our sample period, *AlwaysHighScore (AlwaysHighUTB)*. The second is whether the audit office never has a high *TaxScore (UTB)* in our sample, *NeverHighScore* (*NeverHighUTB*).

The coefficient on *AlwaysHighScore (AlwaysHighUTB)* indicates that those audit offices that always have high *TaxScore (UTB)* have a greater effect on reducing the likelihood of tax misstatements relative to audit offices that sometimes have high *TaxScore* (*UTB*). Meanwhile, the coefficients on *NeverHighScore (NeverHighUTB*) are insignificant. This finding suggests that audit offices that never have high *TaxScore* (*UTB*) have a similar effect on the likelihood of tax misstatements relative to audit offices that sometimes have high *TaxScore* (*UTB*). Overall, the results in Tables 5 and 6 suggest that tax TSK benefits accumulate over time, consistent with Gaver and Utke (2018), who find that expertise develops over time.

While we control for audit office size, our model specifications do not control whether all audit offices in an MSA have systematically higher *TaxScore* or *UTB* scores (i.e., New York, NC versus Charlotte, NC). Table 7 addresses this issue by converting *TaxScore* (*UTB*) to *TaxScoreAlt (UTBAlt)* by taking the *TaxScore (UTB)* measures scaled by the number of clients in an audit office. Columns (1) and (2) indicate negative and significant coefficients on *TaxScoreAlt* ($p < 0.05$) and *UTBAlt* ($p < 0.05$), respectively, suggesting the prior TSK measures do not proxy for a count of clients with complex tax accounts but represent tax TSK.

4.2. Interview results

4.2.1. Results of knowledge sharing and the development of tax TSK

After confirming that the core teams' structure and division of responsibilities were conducive to sharing knowledge (i.e., questions 1–6 in Appendix A), we asked questions about how personnel shares knowledge among colleagues within an audit office and expertise develops.

The AIs provided details surrounding how knowledge develops during one engagement and how teams apply it to another engagement. The responses were consistent with knowledge developing through exposure to specific work experience. For example, one AI stated,

> *"I think there's a lot of learning that happens during the tax provision process and when key members work on more than one engagement, that learning … benefits them on the next engagement."*

Other mechanisms mentioned by AIs to share knowledge beyond are formal training, documentation within the work papers, regularly scheduled calls sharing best practices, formal communications from the National Office, and debriefs after the audit is complete, and the importance of repetition.

> "*We focus … on debriefing out of every year end and … the transition of knowledge. . . . I mean, you certainly have … very formal training that you need to undergo even specific to auditing taxes. . . . But I think honestly where you learn the most is seeing it 100 times.*"

How teams disseminate knowledge within an audit office

Table 4
All Non-tax Misstatements as a function of task-specific tax knowledge, and Tax Misstatements as a function of local industry tax expertise, and Tax Misstatements as a function of task-specific knowledge of complex tax financial reporting.

VARIABLES	(1)	(2)	(3)	(4)
	Misstatement	Misstatement	TaxMisstatement	TaxMisstatement
$TaxScore_{f,t}$	0.000			
	(0.16)			
$SumUTB_{f,t}$		−0.014		
		(-1.52)		
$FRScore_{f,t}$				0.004
				(1.10)
$LocalTaxExp_{f,t}$	−0.140*	−0.144*	0.191**	0.222**
	(-1.81)	(-1.86)	(2.03)	(2.50)
$Size_{i,t}$	−0.116***	−0.116***	−0.037	−0.027
	(-3.37)	(-3.37)	(-0.66)	(-0.63)
$Office_{f,t}$	−0.301**	−0.260**	−0.304*	−0.354**
	(-2.38)	(-2.30)	(-1.95)	(-2.17)
$OfficeFees_{f,t}$	0.046	0.047	0.283**	0.336***
	(0.54)	(0.56)	(2.52)	(3.38)
$Loss_{i,t}$	0.037	0.032	0.139	0.039
	(0.52)	(0.45)	(1.61)	(0.49)
$AuditorChange_{i,t}$	−0.049	−0.046	−0.475***	−0.283*
	(-0.32)	(-0.30)	(-2.64)	(-1.79)
$Influence_{f,t}$	−0.157	−0.125	−0.005	0.278
	(-0.64)	(-0.52)	(-0.02)	(1.24)
$NonAudit_{i,t}$	0.015	0.016	0.062**	0.038***
	(1.23)	(1.28)	(2.31)	(2.76)
$Audit_{f,t}$	0.125**	0.118**	−0.070	−0.023
	(2.10)	(1.98)	(-0.83)	(-0.31)
$LocalAudExp_{f,t}$	0.107	0.113	0.029	−0.026
	(1.19)	(1.24)	(0.27)	(-0.26)
$NatAuditExp_{f,t}$	0.198***	0.204***	0.096	0.028
	(3.28)	(3.36)	(1.16)	(0.32)
$AbsDA_{i,t}$	−0.066	−0.074	0.313	−0.148
	(-0.43)	(-0.48)	(1.46)	(-0.68)
$\Delta Receivables_{i,t}$	−0.011	−0.008	0.232**	0.023
	(-0.18)	(-0.14)	(2.13)	(0.33)
$\Delta Inventory_{i,t}$	0.156***	0.155***	0.150	−0.033
	(2.65)	(2.61)	(1.34)	(-0.35)
$\Delta CashSales_{i,t}$	−0.082	−0.076	−0.219	0.025
	(-0.70)	(-0.63)	(-1.07)	(0.16)
$\Delta Earnings_{i,t}$	0.007	0.007	−0.009	−0.004
	(1.39)	(1.36)	(-0.73)	(-0.51)
$ActualIssuance_{i,t}$	0.094	0.095	−0.034	0.035
	(1.48)	(1.48)	(-0.34)	(0.43)
$MB_{i,t}$	−0.067**	−0.069**	−0.202***	−0.186***
	(-2.36)	(-2.43)	(-3.46)	(-3.87)
$LogTenure_{i,t}$	−0.106**	−0.107**	0.012	0.018
	(-2.37)	(-2.40)	(0.22)	(0.37)
$BigN_{f,t}$	0.560***	0.567***	0.111	−0.763***
	(2.92)	(2.93)	(0.35)	(-2.83)
$APTS_{i,t}$	0.073	0.072	0.008	−0.047
	(0.46)	(0.45)	(0.06)	(-0.44)
Constant	−6.151***	−6.202***	−9.524***	−8.957***
	(-5.43)	(-5.52)	(-6.30)	(-7.03)
Pseudo R-Square	0.101	0.102	0.231	0.169
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
MSA Fixed Effects	Yes	Yes	Yes	Yes
Observations	13,698	4317	13,698	13,698

Results in columns (1) and (2) are from the Probit estimation of Model (1) for the entropy balanced sample when balancing on *HighTS* (column 1) *HighUTB* (column 2). *HighTS* is an indicator variable equal to one (zero otherwise) if the audit office's *TaxScore* is greater than or equal to 0.50. *HighUTB* is an indicator variable equal to one (zero otherwise) if *UTB* is greater than or equal to the median of UTB. The dependent variable is *Misstatement,* and the variables of interest are *TaxScore* and *UTB.* Results in column (3) are from the Probit estimation of Model (1) for the entropy balanced sample when balancing on *LocalTaxExp*. Column (3) excludes *TaxScore* and *UTB* when the dependent variable is *TaxMisstatement,* and the variable of interest is *LocalTaxExp.* Results in column (4) are from the Probit estimation of Model (1) for the entropy balanced sample when balancing on *HighFRScore* (indicator variable equal to one when *FRScore* is greater than the median), when the dependent variable is *TaxMisstatement,* and the variable of interest is *FRScore.* ***, **, and * denote significance levels at the 0.01 [or 1 percent], 0.05 [or 5 percent], and 0.10 [or 10 percent] (two-tailed), respectively. *t*-values are in parentheses. We cluster standard errors by client. We describe all variables in Appendix B.

through personnel, tools, and tasks is consistent with groups leveraging tools (Argote & Ingram, 2000) to recall and share data, consistent with GIP at the office level. Thus, not only does the structure of teams engaged in auditing the income tax accounts facilitate knowledge sharing, but professionals involved in auditing the income tax accounts leverage multiple methods of disseminating knowledge among others within the same audit office.

Even though the responses confirmed tax TSK sharing within an audit office, we consider how experience with prior year restatements affects the audit processes. Expertise can be further

Table 5
Tax Restatements as a function of lagged task-specific tax knowledge.

VARIABLES	Lagged by 1 year		Lagged by 2 years		Lagged by 3 years		Lagged by 4 years	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TaxMisstatement	TaxMisstatement	TaxMisstatement	TaxMisstatement	TaxMisstatement	TaxMisstatement	TaxMisstatement	TaxMisstatement
$LaggedTaxScore_{f,t}$	−0.003**		−0.004**		−0.004***		−0.004***	
	(-1.74)		(-2.28)		(-2.86)		(-6.07)	
$LaggedUTB_{f,t}$		−0.046***		−0.034***		−0.063***		−0.050**
		(-3.01)		(-2.59)		(-3.25)		(-2.24)
$LocalTaxExp_{f,t}$	0.222***	0.318*	0.215***	0.289*	0.161***	0.158	0.187***	0.115
	(5.07)	(1.90)	(8.52)	(1.73)	(3.65)	(0.94)	(4.06)	(0.67)
$Size_{i,t}$	−0.077*	−0.005	−0.091*	−0.034	−0.101*	−0.059	−0.098*	−0.066
	(-1.73)	(-0.06)	(-1.77)	(-0.42)	(-1.94)	(-0.68)	(-1.84)	(-0.71)
$Office_{f,t}$	−0.297**	−0.181	−0.290**	−0.202	−0.312**	−0.087	−0.346**	−0.049
	(-2.34)	(-1.04)	(-2.47)	(-1.14)	(-2.39)	(-0.47)	(-2.46)	(-0.25)
$OfficeFees_{f,t}$	0.356***	0.276*	0.337***	0.260*	0.358***	0.218	0.373***	0.204
	(4.20)	(1.86)	(3.94)	(1.71)	(4.28)	(1.38)	(4.74)	(1.18)
$Loss_{i,t}$	−0.016	−0.087	−0.031	−0.089	−0.030	−0.084	−0.086***	−0.078
	(-0.74)	(-0.80)	(-1.55)	(-0.80)	(-0.75)	(-0.72)	(-2.59)	(-0.64)
$AuditorChange_{i,t}$	−0.465**	−0.857**	−0.475**	−0.865**	−0.427*	−0.926**	−0.414*	−0.978**
	(-2.42)	(-2.31)	(-2.20)	(-2.29)	(-1.81)	(-2.46)	(-1.65)	(-2.53)
$Influence_{f,t}$	0.213	0.181	0.126	0.144	0.098	0.065	0.061	0.136
	(1.51)	(0.48)	(0.87)	(0.38)	(0.69)	(0.17)	(0.38)	(0.36)
$NonAudit_{i,t}$	0.009	0.021	0.010	0.037	0.012	0.035	0.014	0.027
	(0.64)	(0.73)	(0.66)	(1.04)	(0.62)	(1.00)	(0.93)	(0.78)
$Audit_{i,t}$	0.070	−0.113	0.112	−0.095	0.120	−0.059	0.112	−0.022
	(0.86)	(-0.80)	(1.30)	(-0.64)	(1.24)	(-0.38)	(1.26)	(-0.13)
$LocalAudExp_{f,t}$	−0.046	−0.185	−0.045	−0.155	0.017	0.028	−0.008	−0.023
	(-0.94)	(-0.97)	(-0.80)	(-0.77)	(0.52)	(0.14)	(-0.22)	(-0.11)
$NatAudExp_{f,t}$	0.053*	0.004	0.082**	0.086	0.109**	0.124	0.117**	0.157
	(1.90)	(0.03)	(2.22)	(0.62)	(2.30)	(0.86)	(2.40)	(1.08)
$AbsDA_{i,t}$	0.028	0.326	0.075	0.394*	0.026	0.364	0.095	0.454
	(0.11)	(1.40)	(0.24)	(1.65)	(0.07)	(1.43)	(0.23)	(1.56)
$\Delta Receivables_{i,t}$	−0.070	0.017	−0.092	−0.057	−0.068	−0.076	−0.150*	−0.249
	(-1.17)	(0.12)	(-1.30)	(-0.40)	(-0.79)	(-0.49)	(-1.70)	(-1.35)
$\Delta Inventory_{i,t}$	0.029	0.197	0.087	0.316**	0.037	0.316**	0.007	0.277*
	(0.42)	(1.29)	(1.32)	(2.09)	(0.42)	(2.10)	(0.06)	(1.81)
$\Delta CashSales_{i,t}$	0.108	−0.127	0.141	−0.112	0.068	−0.120	0.039	−0.090
	(0.69)	(-0.69)	(0.84)	(-0.58)	(0.45)	(-0.55)	(0.25)	(-0.36)
$\Delta Earnings_{i,t}$	0.001	0.007	0.000	0.005	−0.000	0.010	−0.009*	0.007
	(0.13)	(0.61)	(0.09)	(0.42)	(-0.01)	(0.75)	(-1.95)	(0.49)
$ActualIssuance_{i,t}$	0.054	−0.149	0.044	−0.159	0.039	−0.150	0.055	−0.050
	(0.50)	(-1.44)	(0.40)	(-1.48)	(0.42)	(-1.32)	(0.57)	(-0.37)
$MB_{i,t}$	−0.123***	−0.081	−0.124***	−0.097	−0.108***	−0.072	−0.091***	−0.032
	(-4.57)	(-1.30)	(-5.44)	(-1.44)	(-5.30)	(-1.09)	(-4.13)	(-0.54)
$LogTenure_{i,t}$	0.045	0.028	0.050	0.016	0.057	−0.014	0.027	−0.072
	(0.78)	(0.30)	(0.78)	(0.17)	(0.82)	(-0.16)	(0.41)	(-0.79)
$BigN_{f,t}$	−0.369	−0.022	−0.340	0.322	−0.387	0.316	−0.413	0.473
	(-1.55)	(-0.07)	(-1.29)	(1.01)	(-1.55)	(0.97)	(-1.61)	(1.25)
$APTS_{i,t}$	−0.003	−0.283	0.023	−0.348	0.077	−0.088	0.078	−0.023
	(-0.04)	(-0.87)	(0.27)	(-1.03)	(1.01)	(-0.24)	(1.59)	(-0.06)
Constant	−10.921***	−8.239***	−10.982***	−8.150***	−11.370***	−8.068***	−11.352***	−8.229***
	(-8.92)	(-3.12)	(-8.58)	(-3.06)	(-8.47)	(-2.88)	(-10.63)	(-2.64)
Pseudo R-Square	0.147	0.143	0.155	0.143	0.162	0.144	0.157	0.131
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,634	3970	11,633	3604	10,854	3311	9759	2875

Results are from the Probit estimation of Model (1) for the entropy balanced sample when balancing on *HighTS* (columns 1, 3, 5, and 7) and *HighUTB* (columns 2, 4, 6, and 8). *HighTS* is an indicator variable equal to one (zero otherwise) if the audit office's *TaxScore* is greater than or equal to 0.50. *HighUTB* is an indicator variable equal to one (zero otherwise) if *UTB* is greater than or equal to the median of *UTB*. *TaxScore (UTB)* in columns 1, 3, 5, and 7 (2, 4, 6, and 8) are replaced with *LaggedTaxScore (LaggedUTB)* which are the *TaxScore (UTB)* measures lagged by 1 year (columns 1 and 2), lagged by 2 years (columns 3 and 4), lagged by 3 years (columns 5 and 6), and lagged by 4 years (columns 7 and 8). ***, **, and * denote significance levels at the 0.01 [or 1 percent], 0.05 [or 5 percent], and 0.10 [or 10 percent] (variables of interest one-tailed, all other variables two-tailed), respectively. *t*-values/*z*-values are in parentheses. The dependent variable is *TaxMisstatement* and the variables of interest are the lagged measures of *TaxScore* and *UTB*. We cluster standard errors by client. We describe all variables in Appendix B.

developed by learning and responding to prior errors, which would allow the identification of future errors (Hammersley, 2006). Additionally, the ability to disseminate new knowledge helps develop TSK at the office level. Thus, when a tax-related restatement occurs, it would be appropriate to expect a collective examination of the restatement's root cause and share this knowledge and procedures to prevent it from occurring again. Interestingly, none of the AIs had firsthand knowledge of tax restatements and only provided personal insight into how a prior year's restatement would affect the audit. When a restatement of any kind occurs, the audit office deems that area a significant risk. It allocates more effort by reducing materiality, increasing the income tax accounts in scope, gathering more substantive evidence to test and scrutinize the account, and potentially adding more staff or specialists

Table 6
Tax Restatements as a function of task-specific tax knowledge for clients with audit offices that always and never have high measures of TSK.

VARIABLES	(1)	(2)
	TaxMisstatement	TaxMisstatement
$AlwaysHighScore_{f,t}$	−0.724***	
	(-7.70)	
$NeverHighScore_{f,t}$	−0.113	
	(-0.75)	
$AlwaysHighUTB_{f,t}$		−0.311**
		(-1.83)
$NeverHighUTB_{f,t}$		−0.176
		(-1.13)
$LocalTaxExp_{f,t}$	0.201***	0.280**
	(6.38)	(1.96)
$Size_{i,t}$	−0.059	−0.024
	(-1.39)	(-0.31)
$Office_{f,t}$	−0.293*	−0.392**
	(-1.66)	(-2.21)
$OfficeFees_{f,t}$	0.288***	0.304*
	(2.92)	(1.86)
$Loss_{i,t}$	−0.030	−0.098
	(-1.34)	(-0.94)
$AuditorChange_{i,t}$	−0.410**	−0.882**
	(-2.33)	(-2.41)
$Influence_{f,t}$	0.107	−0.013
	(0.69)	(-0.03)
$NonAudit_{i,t}$	0.003	0.004
	(0.26)	(0.13)
$Audit_{i,t}$	0.071	−0.010
	(0.96)	(-0.07)
$LocalAudExp_{f,t}$	0.005	−0.112
	(0.18)	(-0.67)
$NatAudExp_{f,t}$	0.086***	0.013
	(3.17)	(0.10)
$AbsDA_{i,t}$	0.078	0.460*
	(0.29)	(1.85)
$\Delta Receivables_{i,t}$	−0.099	−0.111
	(-1.35)	(-0.71)
$\Delta Inventory_{i,t}$	0.036	0.263
	(0.59)	(1.58)
$\Delta CashSales_{i,t}$	0.125	−0.270
	(0.68)	(-1.25)
$\Delta Earnings_{i,t}$	0.001	0.010
	(0.12)	(0.90)
$ActualIssuance_{i,t}$	0.057	−0.075
	(0.62)	(-0.72)
$MB_{i,t}$	−0.114***	−0.072
	(-4.59)	(-1.32)
$LogTenure_{i,t}$	0.033	0.020
	(0.57)	(0.22)
$BigN_{f,t}$	−0.219	1.324*
	(-0.95)	(1.66)
$APTS_{i,t}$	0.045	−0.214
	(0.61)	(-0.65)
$BigN_{f,t}$	−0.219	1.324*
	(-0.95)	(1.66)
Constant	−10.151***	−10.355***
	(-8.02)	(-3.91)
Pseudo R-Square	0.149	0.126
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
MSA Fixed Effects	Yes	Yes
ROC Score	NA	NA
Observations	13,698	4313

Results in columns (1) and (2) are from the Probit estimation of Model (1) for the entropy balanced sample when balancing on *HighTS* (column 1) and *HighUTB* (column 2). *HighTS* is an indicator variable equal to one (zero otherwise) if the audit office's *TaxScore* is greater than or equal to 0.50. *HighUTB* is an indicator variable equal to one (zero otherwise) if *UTB* is greater than or equal to the median of UTB. Model 1 is modified in that *TaxScore (UTB)* is replaced with *AlwaysHighScore* and *NeverHighScore (AlwaysHighUTB* and *NeverHighUTB).* The dependent variable is *TaxMisstatement,* and the variables of interest are *AlwaysHighScore, NeverHighScore*, *AlwaysHighUTB,* and *NeverHighUTB. AlwaysHighScore (NeverHighScore)* is an indicator variable equal to one (zero otherwise) if the client is audited by an office where *TaxScore* exceeds the median value every year (never) in our sample period. Similarly, *AlwaysHighUTB* (*NeverHighUTB)* is an indicator variable equal to one (zero otherwise) if the client is audited by an office where *UTB* exceeds the median value every year (never) in our sample period. ***, **, and * denote significance levels at the 0.01 [or 1 percent], 0.05 [or 5 percent], and 0.10 [or 10 percent] (variables of interest one-tailed, all other variables two-tailed), respectively. We cluster standard errors by client. We describe all variables in Appendix B.

Table 7
Tax Misstatements as a function of task-specific tax knowledge using an alternative measure of tax TSK scaled by number of clients in an audit office.

VARIABLES	(1)	(2)
	TaxMisstatement	TaxMisstatement
$TaxScoreAlt_{f,t}$	−0.091**	
	(-1.95)	
$UTBAlt_{f,t}$		−0.882**
		(-1.76)
$LocalTaxExp_{f,t}$	0.182***	0.294*
	(4.94)	(1.95)
$Size_{i,t}$	−0.084**	−0.048
	(-2.20)	(-0.66)
$Office_{f,t}$	−0.166	−0.373**
	(-1.46)	(-2.39)
$OfficeFees_{f,t}$	0.170*	0.325**
	(1.90)	(2.48)
$Loss_{i,t}$	−0.042	−0.096
	(-1.21)	(-0.93)
$AuditorChange_{i,t}$	−0.363*	−0.893**
	(-1.81)	(-2.48)
$Influence_{f,t}$	0.097	0.161
	(0.85)	(0.44)
$NonAudit_{i,t}$	0.013	0.018
	(0.98)	(0.66)
$Audit_{i,t}$	0.089	−0.018
	(1.30)	(-0.13)
$LocalAudExp_{f,t}$	0.034	−0.151
	(1.11)	(-0.91)
$NatAudExp_{f,t}$	0.030	0.046
	(1.06)	(0.35)
$AbsDA_{i,t}$	0.010	0.481**
	(0.04)	(1.98)
$\Delta receivables_{i,t}$	−0.079	−0.026
	(-1.05)	(-0.19)
$\Delta inventory_{i,t}$	0.016	0.219
	(0.37)	(1.42)
$\Delta cashSales_{i,t}$	0.096	−0.268
	(0.61)	(-1.24)
$\Delta earnings_{i,t}$	0.003	0.013
	(1.04)	(1.11)
$ActualIssuance_{i,t}$	0.078	−0.085
	(0.80)	(-0.80)
$MB_{i,t}$	−0.121***	−0.074
	(-4.41)	(-1.26)
$LogTenure_{i,t}$	0.021	−0.016
	(0.35)	(-0.18)
$BigN_{f,t}$	−0.286	−0.110
	(-1.30)	(-0.35)
$APTS_{i,t}$	−0.011	−0.024
	(-0.16)	(-0.08)
Constant	−5.293***	−9.504***
	(-7.78)	(-4.14)
Pseudo R-Square	0.139	0.134
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
MSA Fixed Effects	Yes	Yes
Observations	13,698	4313

Results are from the Probit estimation of Model (1) for the entropy balanced sample when balancing on *HighTS* (column 1) and *HighUTB* (column 2). *HighTS* is an indicator variable equal to one (zero otherwise) if the audit office's *TaxScore* is greater than or equal to 0.50. *HighUTB* is an indicator variable equal to one (zero otherwise) if *UTB* is greater than or equal to the median of UTB. The estimation of Model (1) replaces *TaxScore (UTB)* with *TaxScoreAlt (UTBAlt).* ***, **, and * denote significance levels at the 0.01 [or 1 percent], 0.05 [or 5 percent], and 0.10 [or 10 percent] (one-tailed for the variable of interests and two-tailed for all other variables), respectively. *t*-values/*z*-values are in parentheses. The dependent variable, *TaxMisstatement,* and the variables of interest are *TaxScoreAlt* and *UTBAlt*. We cluster standard errors by client. We describe all variables in Appendix B.

the following year. Although the AIs did not identify firsthand experience with a prior tax restatement, the hypothetical response was to increase the risk level assigned to that account and the number of staff or level of review the following year. Increasing the number of professionals on the core teams would disseminate knowledge related to the tax restatement to more professionals in the audit office, supporting generating TSK at the office level specific to a tax restatement.

Prior studies provide evidence supporting APTS as a means for knowledge spillover (e.g., Kinney et al., 2004). Thus, we inquired whether providing APTS provides an advantage to income tax account audits. If the AIs experienced situations where there was APTS provision for attestation clients (14 out of 15 AIs), the responses were unanimous that providing APTS is beneficial in providing transparency and a more thorough understanding of clients. Furthermore, there is less risk that a crucial transaction is overlooked or unknown. A specific example of a benefit of providing APTS is when tax specialists provide services associated with expanding international operations.

> *"A common one would be if a company is trying to expand into international operations and start dealing with tax structures overseas …. Having a person at my firm help with setting up the legal entity structure and transfer pricing structure and all the other intricacies that come with [international operations] can be very helpful. That … helps us know early if there could be any potential issues or things to think about or auditing considerations in the tax accounts that we identify earlier in the process."*

While the literature addresses benefits associated with APTS, these benefits come with potential costs, specifically impaired auditor independence (e.g., Beardsley, Imdieke, & Omer, 2021; Lassilla et al., 2010). The firms are aware of this potential, and one AI described additional precautions the firm takes when providing APTS to ensure independence and objectivity.

> "*We also typically for those engagements would have … another tax specialist come in and review the work papers. Basically, the quality control checks … against the tax team and audit team to make sure we've done the right things. Just to make sure that we're not doing anything where we have any kind of level of inherent bias or any type of disconfirming evidence we may be looking for as well."*

There may be situations that impede the ability to share knowledge and develop TSK. We asked the AIs whether there are instances in which they do not share information from one client to another. Auditors intentionally do not share relevant information or insight gained from another client when they are confidential or reveal a competitor's competitive advantage. For example, one AI stated,

> *"I think in certain industries where you have a very low concentration of competitors, there could be a high level of, I guess I would say not wanting to pierce the veil on between account teams on competitors."*

Thus, the greater exposure to and more clients with complex tax issues, the easier it is to share information without unintentionally identifying the origin of the information or knowledge.

After confirming that the structure of the teams involved in auditing the income tax accounts lends itself to developing TSK and is consistent with Figs. 1 and 2, we asked whether tax expertise, which is a function of TSK, develops at the individual or engagement team level. The majority (nine) of the responses acknowledge that tax expertise develops at the engagement level or based on individual expertise. Five of the AIs suggest it develops at an individual level.[26] Four AIs believe that expertise develops at both the individual and engagement levels. For example, one AI provided an answer illustrating the effect of developing individual expertise and its translation to office expertise.

> *"I think the knowledge would be gained both by an individual [and engagement]. So if you have individuals that are going and seeking other opportunities and working on different engagements. That would be one means of knowledge transfer. . . .The other means would be essentially cross pollinating those individuals on different teams and they would be able to transfer that knowledge to the teams."*

Five of the AIs indicated that the development of tax expertise develops at the team level. For example,

> *"Expertise one hundred percent grows by the team and the experience they get through the work on a daily basis, including audit and non-audit procedures and audit and non-audit projects or accounts. . . . Absolutely there are learnings and trainings and CPE, but again, I don't think that's the way that professionals in Big 4 get the bulk of their technical and/or skill set."*

Five AIs indicated that tax expertise is developed predominately at the individual level. However, one AI that stated tax expertise develops at the individual level also recognized that audit expertise (as opposed to tax expertise) develops more at the team level.

> *"I think from the tax specialist side it's by individual within the various engagements they're going to work on. So, as you know, tax specialist would work on multiple engagements throughout the year, which I believe further helps enhance their knowledge and understanding by seeing different provisions. . . . So depending on how involved, you are in oversight of the tax auditing will [influence] … how much knowledge you may gain or strive to gain outside of just a general overview and understandings of deferred tax assets and uncertain tax provisions. So probably more engagement specific beyond that."*

Lastly, we asked whether tax expertise is more industry or topic specific. Thirteen out of the 15 respondents stated that tax expertise develops from task-specific knowledge, predominantly or in conjunction with industry-specific knowledge. The majority (eight) of the AIs thought tax expertise was task or matter-specific, with little mention of industry expertise. For example, the tax expertise required for the financial services and utility sectors is more industry-specific than a task or matter specific. Furthermore, the two AIs identified as subject matter specialists thought tax expertise is predominantly task or matter specific. The two subject matter experts serve many clients across industries. These two AIs serve between four to six industries, including retail, automotive, technology, and life sciences.

[26] One AI responded to the question with details how expertise is developed as opposed to the level in which it is developed. Their response indicated the means of developing expertise were at an engagement or audit office level. *"I would say it's a combination of formal firm training and, I'll call it more informal on the job training. . . . I would say [knowledge is] absorbed and learned over time as you have more exposure to those technical topics. But a lot of it is also through formal training within the firm, which becomes more technical and rigorous the more experienced you become within the firm."*

"Can it be both? . . If I had to pick one of the two, I would say topic specific, and that topics can apply across, and issues can apply across multiple industries pretty easily. But there's always like some sort of industry twists to it. . . . There's … general broad based knowledge and topics across all industries."

The AIs mentioned foreign operations, transfer pricing, valuation allowance, R&D credits, and fixed assets as complex tax issues requiring specialized knowledge. When asked about the expertise of those involved in the audit, one AI responded,

"And finally, depending on the nature of the client, there would be specialists involved. So for example, if the company had extensive international operations, we would have international tax partners."

Five of the AIs believe the expertise is a joint function of topic and industry knowledge. Although one AI suggested, it was both they also acknowledged applying tax knowledge across industries.

"It's probably a little bit of both. Topic-specific because a lot of things will apply to all clients; however, there are some special provisions that will apply to [specific] industr[ies] …. "

However, two audit AIs believe tax expertise is predominately industry-driven.

"I think it is both. . . . So there's crossover between industries. But generally, people from a tax specialty are assigned due to their industry expertise. . . . Same thing goes on the audit side. . . . You develop a level of expertise if you continuously work in that industry."

The AI responses suggest that tax expertise develops at the engagement level, with the engagement team including individuals with expertise. This response is consistent with GIP where the audit of the income tax accounts leverages individuals' TSK. Tax expertise is more topic or matter-specific but requires industry-specific knowledge in some situations. Thus, our interviews provide evidence of TSK developing at the office level.

5. Additional analyses

5.1. TSK, learning, and the contagion effect

Although none of the AIs had firsthand experience with prior year restatements, hypothetical responses indicate that knowledge gained through the restatement process would be disseminated and reflected in the future audit processes. Francis and Michas (2013) and Swanquist and Whited (2015) suggest that when audit offices have clients with misstatements, the audit failure results from a systematic quality issue specific to that audit office. However, they find that larger audit offices and industry experts can mitigate this systematic problem. Tax TSK might also mitigate systematic audit quality issues associated with tax-related misstatements because a tax restatement announcement provides feedback to the audit office. Audit offices with more tax TSK might benefit more from the audit failure's internal analysis because they have a heightened ability to implement changes to audit procedures for auditing the income tax accounts. If tax misstatements occur while acquiring tax TSK, audit offices that continuously adapt and respond to the feedback can alter the audit process and increase the audit quality of income tax accounts. The ability to respond and adapt to prior year errors can also develop a level of expertise, reducing the occurrence of future misstatements by enhancing the ability to identify errors (Hammersley, 2006).

To test the tax TSK learning effect on tax misstatements in Table 8, we create an indicator variable for client years when a tax restatement occurs. *PriorTR* is an indicator that is one when an audit office has a client with a tax restatement disclosed in year t-2, and zero otherwise.,[27][28] We estimate Model (1) using the entropy balanced samples including *PriorTR* and the interaction term between *PriorTR* and proxies for tax TSK (*TaxScore* and *UTB).*

Table 8 indicates a positive *PriorTR* coefficient (p-value < 0.01) consistent with a possible contagion effect of low-quality audits (i.e., Francis & Michas, 2013; Swanquist & Whited, 2015). The negative and significant *TaxScore * PriorTR* (p-value < 0.01) and *UTB * PriorTR* (p-value < 0.01) coefficients suggest those audit offices with prior tax-related restatements but with more tax TSK have a lower likelihood of future tax-related misstatements. Overall, these results suggest more improvement in audit offices' audit processes with more tax TSK.

5.2. Auditor-provided tax services, tax TSK, and the audit quality of the income tax accounts

APTS benefits the office monetarily and through the potential for tax professionals sharing knowledge generated from providing APTS to audit teams (Kinney et al., 2004; Simunic, 1984). This knowledge sharing is not restricted to specific clients but provides additional insight and experiences that create knowledge sharing and increase audit quality by reducing misstatements. However, providing APTS to an audit client could also give the appearance of impaired independence concerns, and thus audit offices and clients could forego these services (Beardsley et al., 2020; Lassila, Omer, Shelley, & Smith, 2010). If audit offices provide lower APTS levels and acquire limited knowledge of the income tax accounts, they may rely more on tax TSK in audits of the income tax accounts. Because APTS knowledge spillover improves audit quality (Kinney et al., 2004; Seetheraman et al., 2011),[29] audit offices providing high APTS levels may rely on tax TSK, regardless of APTS provision.

To examine the extent to which these different knowledge types affect audit quality, we split our sample on whether the audit office provides high APTS levels. In untabulated analyses, the *TaxScore* and *UTB* coefficients are negative and significant when the audit office has low APTS levels. Furthermore, the difference in *TaxScore (UTB)* coefficients for offices with high and low levels of APTS is significant (p-value < 0.05). These results support the notion that the audit office's reliance on tax TSK is not dependent on APTS provision.

[27] *PriorTR* represents the restatement disclosure year rather than the year when the misstatement occurred. We consider 2 years as a reasonable amount of time for an audit office to respond to prior tax issues.

[28] We expect that the year of the restatement announcement (year t) and the year following the restatement announcement (year t+1), the audit office will partially or fully resolve the concerns noted in the restatement. However, some misstatements can be indicative of widespread audit issues where a full cycle of auditing is necessary to understand and respond to the concerns that led to the misstatement. As a result, we set the timeline for year t+2 to allow us to examine the audit quality when the audit office has had ample time to respond to the restatement announcement.

[29] Other studies examine how APTS provides knowledge spillover benefits to tax planning activities (Gleason & Mills, 2011; Gleason, Mills, & Nessa, 2017; Klassen, Lisowsky, & Mescall, 2016; McGuire et al., 2012). Because our study examines the audit quality effect, we focus on how audit office exposure to complex tax accounts affects audit quality.

Table 8
Tax Misstatement as a function of prior office tax restatements.

VARIABLES	(1)	(2)
	TaxMisstatement	TaxMisstatement
$TaxScore_{f,t}$	0.001	
	(0.37)	
$UTB_{f,t}$		−0.031
		(-0.97)
$PriorTR_{f,t}$	1.242***	1.241***
	(12.76)	(6.42)
$TaxScore_{f,t} \times PriorTR_{f,t}$	−0.005***	
	(-3.09)	
$TaxScore_{f,t} \times UTB_{f,t}$		−0.039***
		(-3.22)
$LocalTaxExp_{f,t}$	0.146	0.152
	(1.54)	(0.93)
$Size_{i,t}$	−0.030	0.031
	(-0.73)	(0.43)
$Office_{f,t}$	−0.253*	0.067
	(-1.77)	(0.44)
$OfficeFees_{f,t}$	0.165	0.206
	(1.59)	(1.61)
$Loss_{i,t}$	0.068	−0.106
	(0.86)	(-0.70)
$AuditorChange_{i,t}$	−0.455***	−0.242
	(-2.77)	(-0.69)
$Influence_{f,t}$	0.134	0.515*
	(0.63)	(1.75)
$NonAudit_{i,t}$	−0.010	−0.002
	(-0.63)	(-0.09)
$Audit_{i,t}$	0.069	−0.126
	(0.97)	(-1.09)
$LocalAudExp_{f,t}$	0.011	−0.015
	(0.10)	(-0.09)
$NatAudExp_{f,t}$	0.052	−0.130
	(0.65)	(-1.06)
$AbsDA_{i,t}$	0.188	0.330
	(0.92)	(1.14)
$\Delta receivables_{i,t}$	−0.309***	−0.239
	(-2.78)	(-1.16)
$\Delta inventory_{i,t}$	0.169	0.339**
	(1.53)	(2.04)
$\Delta cashSales_{i,t}$	0.256	0.076
	(1.53)	(0.23)
$\Delta earnings_{i,t}$	−0.005	−0.001
	(-0.44)	(-0.08)
$ActualIssuance_{i,t}$	0.089	−0.082
	(1.04)	(-0.64)
$MB_{i,t}$	−0.079**	−0.030
	(-2.24)	(-0.59)
$LogTenure_{i,t}$	−0.013	−0.022
	(-0.27)	(-0.27)
$BigN_{f,t}$	−0.165	0.380
	(-0.70)	(1.28)
$APTS_{i,t}$	0.070	0.144
	(0.79)	(0.97)
Constant	−8.415***	−4.910**
	(-6.16)	(-2.40)
Pseudo R-Square	0.211	0.243
ROC Curve	0.818	0.845
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
MSA Fixed Effects	Yes	Yes
Observations	13,698	4313

Results in columns (1) and (2) are from the Probit estimation of Model (1) augmented with *PriorTR* and the interaction *TaxScore* × *PriorTR (UTB* × *PriorTR)*. The dependent variable is *TaxMisstatement*, and the variables of interest are *TaxScore, UTB, PriorTR, TaxScore* × *PriorTR*, and *UTB* × *PriorTR*. We cluster standard errors by client. We describe all variables in Appendix B.
***, **, and * denote significance levels at the 0.01 [or 1 percent], 0.05 [or 5 percent], and 0.10 [or 10 percent] (one-tailed for the variable of interests and two-tailed for all other variables), respectively. *t*-values/*z*-values are in parentheses. We cluster standard errors by client. We describe all variables in Appendix B.

5.3. First changes analysis

Clients with complex tax issues could select audit offices with industry tax expertise to help substantiate tax positions before an IRS audit. Our results could proxy for this decision rather than tax TSK. We examine how tax TSK changes affect the quality of the income tax accounts' audits to address this issue. Each auditor change likely influences the new audit office's tax TSK because of the new client's existing audit and tax issues. Consistent with the argument that more exposure to audit-related issues improves audit quality, increased tax TSK should also increase the audit quality of income tax accounts. We create two new variables to examine the association between tax misstatements and an increase in tax TSK. First, we create an indicator variable equal to one if an audit office's change in *TaxScore* from t-1 to t is in the top quartile of all observations and zero otherwise (*ΔTaxScore)*. We also create an indicator variable equal to one if an audit office's change in clients with high *UTBs* from t-1 to t is in the top quartile of all observations and zero otherwise *(ΔUTB)*.

The dependent variable, *TaxMisstatement,* is an indicator variable equal to one in the year the misstatement occurred if the misstatement relates to a tax issue and zero otherwise. All control variables are consistent with Model (1); however, we convert them to change variables (from the prior year to the current year). We include Fama-French 48 industry, year, and MSA fixed effects and cluster standard errors by client.

In untabulated analyses, the *ΔTaxScore* and *ΔUTB* coefficients are negative and significant (p-value < 0.05). These results support the notion that when an audit office increases tax TSK, there is a lower probability of a tax-related misstatement. These results provide additional support for Hypothesis 1, suggesting a positive association between tax TSK and the quality of the income tax accounts' audit.

5.4. Analysis of clients' specific complex tax issues

Clients with more complex tax issues, such as multinational corporations (MNC), could benefit more from tax TSK. Thus, we examine whether tax TSK benefits differ between MNCs and domestic corporations. We create an indicator variable, *MNC,* equal to one (zero otherwise) for a multinational client. We then estimate Model (1) augmented with *MNC* and the interactions between *TaxScore* and *MNC* and *UTB and MNC.*

In untabulated results, the *TaxScore* coefficient is insignificant, and the *MNC* coefficient is positive and significant in both columns (p-value < 0.05). The *TaxScore*MNC* coefficient is negative and significant (p-value < 0.05) as well as the *UTB*MNC* coefficient (p-value < 0.10). These results support greater tax TSK benefits for clients with greater complex tax issues, MNCs, which further validates our measure.

While the exposure to complex tax issues improves tax accounts' audit quality only for firms exposed to these complex tax issues, we consider whether other tax complexities (R&D and tax loss carryforwards) influence audit quality. In addition to considering MNCs, we perform two additional analyses. First, we re-estimate Model (1) augmented with *R&D*, an indicator variable equal to one when the client has R&D expenditures, and the interaction *R&D* and *TaxScore (UTB).* Second, we re-estimate Model (1) augmented with *Loss*, an indicator variable equal to one when the client has tax-loss carryforwards, and the interaction *Loss* and *TaxScore (UTB).* For the first analysis, the *R&D*TaxScore* and *R&D*UTB* coefficients are all negative and significant (p-value < 0.01, p-value < 0.10, respectively). When augmenting Model (1) with *Loss,* the *Loss*TaxScore* coefficient is negative and significant (p-value < 0.10). However, we fail to find a significant *Loss*UTB*

coefficient. These findings provide evidence that while prior exposure to complex tax issues improves the audit quality of the tax accounts, our results are not specific to one complex issue. Thus, individual complexities do not underlie our overall results.

5.5. Time to develop TSK

TSK could take some time to accumulate at the audit office level because of the different mediums for transferring information within an organization. Thus, we consider whether the TSK benefits are enhanced if the audit office experiences high tax TSK for longer than that year. Consistent with Gaver and Utke (2018), that industry expertise takes three years to develop, we performed an additional analysis considering a similar period. First, we create two indicator variables equal to one when the audit office has high tax TSK for at least three consecutive years. We create indicators *TaxScore3* and *UTB3* when *TaxScore* and *UTB* are greater than their respective medians for three consecutive years and zero otherwise. Next, we estimate Model (1) with *TaxScore3* replacing *TaxScore* and replace *UTB* with *UTB3.*

In untabulated results we find the *TaxScore* and *UTB* coefficients remain negative and significant (p-value < 0.10 and p-value < 0.05, respectively) and the *TaxScore3*TaxScore* and *UTB3*UTB* coefficients are negative and significant (p-value < 0.10) in each regression. The *TaxScore3* and *UTB3* coefficients are insignificant. These findings suggest that tax TSK reduces the likelihood of a tax misstatement even when the audit office does not have at least three consecutive years of high tax TSK. However, if the audit office has high tax TSK for at least three consecutive years, their clients are incrementally less likely to experience a tax misstatement. These findings support some immediate tax TSK benefits, but tax TSK benefits also increase over time.

6. Conclusion

This study considers whether audit offices develop task-specific knowledge based on the office's experiences with specific tasks. We leverage the audits of income tax accounts to investigate whether TSK develops at the office level because these accounts are difficult to audit and their susceptibility to misstatements (Christensen, Olson, & Omer, 2015; Cook, Huston, & Omer, 2008; Dhaliwal et al., 2004). Although auditing other accounts such as fair value estimates, going concern opinions, goodwill impairments are also complex and rely on forward-looking information, focusing on the income tax accounts provides a unique setting to test the development of office-level TSK while reducing confounding influences. Enhanced knowledge and experience help develop task-specific knowledge, increasing the task's performance quality, especially for complex tasks (Abdolmohammadi & Wright, 1987; Bonner et al., 1992).

We combine two research methods to examine whether tax TSK aggregates at the office level and influences the audit quality of income tax accounts. Using semi-structured interviews, we verify that group information processing explains the results of our archival finding of an association between an audit office's exposure to complex tax issues and the audit quality of the income tax accounts.

Using a post-Sarbanes-Oxley sample of Big 4 and second-tier audit offices, we find a negative association between tax TSK and client tax-related misstatements, which translates to a positive association between audit quality and tax TSK. This result suggests that tax TSK accumulates at the audit office level and improves the income tax accounts' audit quality. Our results are robust to controlling for covariate imbalance, design specifications, and alternative measures of TSK. Further, when an audit office has a client with a tax-related restatement in a prior year but more tax task-specific knowledge, there is a lower likelihood of future tax-related misstatements. This result suggests an improved audit office response in evaluating their audit plan and adjusting their future audit procedures. We also consider the role of APTS on the benefits of tax task-specific knowledge. Our results indicate that the benefits of tax task-specific knowledge do not depend on APTS provision to clients.

The semi-structured interviews of 15 senior managers/partners of Big 4 audit firms support group information processing as an explanation for TSK accumulation at the office level that benefits tax audit quality. In general, the interviewees confirm that the income tax accounts' audits deploy a task-specific approach, and personal tax knowledge contributes to engagement team expertise.

This study makes several contributions to the literature. First, we contribute to the audit literature by identifying an archival setting to examine the effect of task-specific knowledge on auditor performance. Prior research examines this association in an experimental environment (Bonner, 1990; Bonner & Lewis, 1990; Libby & Frederick, 1990). We also support group information processing as an explanation of the accumulation of TSK at the office level.

We contribute to the audit and tax literature by providing archival evidence of a positive association between tax task-specific knowledge and the income tax accounts' audit quality, extending the prior literature, focusing on the effects of audit industry expertise and audit quality. In doing so, we provide evidence of an association between auditor competency and performance through audit offices' tax task-specific knowledge and tax-related misstatements, providing insight into the tax audit process. We also contribute to an ongoing discussion of expertise in the tax setting by suggesting that income tax account audits benefit less from industry expertise and more from task-specific knowledge. Our findings emphasize the importance of considering the effect and relevance of different forms of expertise on audit quality.

Finally, our study contributes to the audit literature that considers knowledge spillover and APTS. Our results indicate that audit offices' task-specific tax knowledge (inter-client knowledge spillover) is a separate construct from knowledge obtained from APTS (intra-client knowledge spillover).

Data availability

All archival data are publicly available. All interview data complies with IRB requirements.

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Appendix C. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.aos.2021.101320.

Appendix A. Interview script

1) Have you been involved in the process, at any level, providing attestation for financial statement accounts? If so, can you provide an example?
2) Has there been a time in which you were engaged in auditing the income tax provision, but did not have prior knowledge in how to complete this task or a portion of the task? If so, how did you go about gaining that knowledge?
3) What individuals are involved in auditing the income tax provision? What is their level within the audit firm?
4) Who, either in your office or from some other office, reviews the tax accrual work papers for your office's audit clients?
5) How/why do you split responsibility for auditing the tax provision between the audit team and tax specialists?
6) How often would you say that your office outsources the preparation and/or the review of tax accrual work papers to someone outside your local office as opposed to staying in-house?
7) How do engagement teams take information learned from one engagement and apply that information to another engagement?

Dependent and Independent Variables	
$TaxMisstatement_{i,t}$	An indicator that is one, when the client subsequently restates the financial statements in year *t* for a tax-related misstatement; zero otherwise (Audit Analytics).
$TaxScore_{f,t}$	For each company, we sum the number of different activities: R&D, foreign operations, or tax-loss carryforwards. We then take this sum (a score between 0 and 3 for each company) and aggregate the audit office's score across all clients (Compustat).
$HighTS_{f,t}$	An indicator that is one, when the audit office's TaxScore is greater than or equal to 0.50; zero otherwise (Compustat).
$TaxScoreAlt_{f,t}$	Equal to *TaxScore* divided by the audit office's total number of clients (Compustat).
$UTB_{f,t}$	The number of clients the audit office audits with a UTB balance that is more than 2.0% of total assets. We aggregate the audit office's score across all clients (Compustat).
$HighUTB_{f,t}$	An indicator that is one, when the audit office's *UTB* is higher than the median; zero otherwise (Compustat).
$UTBAlt_{f,t}$	Equal to *UTB* divided by the audit office's total number of clients (Compustat).
$LaggedTaxScore_{f,t}$	Equal to the lagged (one, two, three, or four years) *TaxScore.*
$LaggedUTB_{f,t}$	Equal to the lagged (one, two, three, or four years) *UTB.*
$AlwaysHighScore_{f,t}$	Indicator that is one, if the audit office has $HighTS_{f,t}$ for the entire sample period.
$NeverHighScore_{f,t}$	An indicator that is one, when the audit office never has $HighTS_{f,t}$ during the sample period.
$AlwaysHighUTB_{f,t}$	An indicator that is one, when the audit office has $HighUTB_{f,t}$ for the entire sample period.
$NeverHighUTB_{f,t}$	An indicator that is one, when the audit office never has $HighUTB_{f,t}$ during the sample period.
$APTS_{i,t}$	Equal to the percent of tax fees to total fees paid to the auditor (Audit Analytics).
$Misstatement_{i,t}$	An indicator that is one, when the client subsequently has a non-tax related restatement for year *t*; zero otherwise (Audit Analytics).
$FRScore_{f,t}$	An aggregate of four variables indicating tax financial reporting activities from Bratten et al. (2017): change in GAAP ETRs from Q3 to Q4, permanent differences in GAAP ETRs, the volatility of quarterly GAAP ETRs, and whether the firm operates at a loss. The variable is calculated by adding 1 to the client score if there is a decrease in GAAP ETRs from Q3 to Q4, a GAAP ETR that is more than 10% lower than the statutory rate, above-median quarterly GAAP ETR volatility, or operating in a loss position, generating a score between 0 and 4 for each client. Next, the aggregate client scores for each audit office (Compustat).
$PriorTR_{f,t}$	Indicator variable equal to one when the audit office had a tax-related restatement among any of its clients in year *t-1 (*excluding consecutive year restatements); zero otherwise (Audit Analytics).
Independent Control Variables	
$Size_{i,t}$	Natural log of a client's total assets (Compustat).
$Office_{f,t}$	Natural log of the number of clients audited by the audit office (Audit Analytics).
$OfficeFees_{f,t}$	Natural log of total audit fees collected by the audit office (Audit Analytics).
$Loss_{i,t}$	An indicator that is one, when the net income is negative; zero otherwise (Compustat).
$AuditorChange_{i,t}$	An indicator that is one, when a client changes its auditor in year *t*, and zero otherwise (Audit Analytics).
$Influence_{f,t}$	The ratio of the client's total fees relative to annual fees of SEC registrants generated by the office for the year (Audit Analytics).
$NonAudit_{i,t}$	The ratio of non-audit fees over total fees paid by the client (Audit Analytics).
$Audit_{i,t}$	Natural log of audit fees (Audit Analytics).
$LocalAudExp_{f,t}$	An indicator that is one, when the audit office is a local industry-expert, as defined by Reichelt and Wang (2010); zero otherwise (Audit Analytics).
$LocalTaxExp_{f,t}$	An indicator that is one, when the audit office is a tax industry expert, as defined by McGuire et al. (2012); zero otherwise (Audit Analytics).
$MNC_{i,t}$	An indicator that is one, when the client is multinational; zero otherwise (Compustat).
$NatAudExp_{f,t}$	An indicator that is one, when the audit office is a national industry-expert, as defined by Reichelt and Wang (2010); zero otherwise (Audit Analytics).
$AbsDA_{i,t}$	The absolute value of discretionary accruals, where discretionary accruals are calculated using the modified Jones model with an intercept and scaling variables by assets (Dechow, Sloan, & Sweeney, 1995).
$\Delta Receivables_{i,t}$	The percentage change in accounts receivable from year *t-1* to year *t* (Compustat).
$\Delta Inventory_{i,t}$	The percentage change in inventory from year *t-1* to year *t* (Compustat).
$\Delta CashSales_{i,t}$	The percentage change in cash sales from year *t-1* to year *t* (Compustat).
$\Delta Earnings_{i,t}$	The percentage change in earnings from year *t-1* to year *t* (Compustat).
$ActualIssuance_{i,t}$	An indicator that is one, when the client issued new debt or equity during year *t;* zero otherwise (Compustat).
$MB_{i,t}$	The ratio of the market value of equity to the book value of equity (Compustat).
$LogTenure_{i,t}$	Natural log of the audit office's tenure with the client (Audit Analytics) (Compustat).
$BigN_{f,t}$	An indicator that is one, when the audit office is Price Waterhouse Coopers, Ernst & Young, Deloitte & Touche, or KPMG; zero otherwise (Audit Analytics).

8) How does experience with a prior tax provision related restatement affect the audit procedures in the following year?
9) Is there an advantage from providing tax services to an audit client or to the audit office when auditing the tax provision?
10) In what situation would relevant tax knowledge from one engagement not be shared with another engagement?
11) How does tax expertise develop in an audit office? Is it by individual or by engagement team?
12) Would you say tax expertise is more industry specific or topic specific?
13) What is the role of audit partner turnover/retirement on the audit office's tax related audit processes?

Appendix B. Variable definitions and data sources

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