Spillover Effects of Auditor Regulation on Corporate Tax Planning Effectiveness

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Data Availability: All data are publicly available from the sources cited in the text.

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SYNOPSIS: This study examines the spillover effects of auditors' exposure to PCAOB inspection on corporate tax planning effectiveness. We focus on tax planning effectiveness because taxes are material to most companies, the auditing of taxes is an area often scrutinized by the PCAOB, and auditors have opportunities to influence clients' tax planning decisions. We posit that auditors increased their focus on tax-related issues in response to the onset of this scrutiny and that this increased emphasis resulted in more tax-related knowledge diffusion to clients. Consistent with this notion, we provide evidence that clients' tax planning effectiveness increased significantly following their auditor's first year of exposure to PCAOB inspection. This study provides new evidence of an unintended real effect of changes to the audit regulatory regime. Our findings are timely given that recent legislative actions to dissolve the PCAOB into the SEC reflect the potential of future changes to auditor oversight.

Data Availability: All data are publicly available from the sources cited in the manuscript.

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I. SYNOPSIS AND INSIGHTS FOR REGULATORS

In response to the financial reporting scandals in the early 2000s, U.S. Congress established the Public Company Accounting Oversight Board (PCAOB) to oversee public company auditors as part of the Sarbanes-Oxley Act (SOX). Auditor inspections are the PCAOB's core function and are the regulator's fundamental tool to improve public confidence in audited financial reports (PCAOB 2005). Prior research on the PCAOB focuses primarily on whether PCAOB inspection initiation impacts audit quality and financial reporting credibility (Lamoreaux 2016; Fung et al. 2017; Krishnan et al. 2017; Gipper et al. 2020; Khurana et al. 2021). However, there is limited research on the spillover effects of such major changes to the audit regulatory regime. We seek to address this gap in the literature by investigating the unintended real effects of PCAOB inspections on audit clients' decision making. More specifically, given that PCAOB inspections commonly scrutinize the auditing of income taxes, we posit that auditors' exposure to PCAOB inspection increases their focus on tax-related issues, leading to increased tax-related knowledge diffusion to clients and thus more effective client tax planning. This research question is increasingly important given the uncertain future of the PCAOB. While the regulator survived elimination during the recent passage of the One Big Beautiful Bill Act (Strickland 2025), many still question its inherent value, including former chairwoman Erica Williams, who warns of the potential of budget slashing for the PCAOB (Maurer 2025). Our study speaks to the spillover effects of the PCAOB inspection program, including the potential of companies increasing their decision-relevant knowledge by way of enhanced information diffusion from auditors.

Recent studies show that exposure to PCAOB inspection improves audit quality (Khurana et al. 2021) and increases financial reporting credibility for U.S. audit clients (Gipper et al. 2020). These findings are consistent with other evidence suggesting that the implementation of PCAOB

inspections altered auditor behavior and the nature, extent, and timing of auditing procedures (Wagner and Dittmar 2006; EY 2017). Furthermore, anecdotal evidence supports the notion that auditors continuously adjust their procedures and learn from the PCAOB inspection process (Riley et al. 2008; Johnson et al. 2019), and our discussions with a former Big 4 partner reveal that the enhanced procedures, documentation, and training before and in response to PCAOB inspections likely explain the above findings and would have also potentially led to other spillover benefits. Said another way, auditors likely shifted their focus to areas of interest to the PCAOB, which could have resulted in externalities in areas not directly related to the audit (i.e., spillover effects).

We expect that the PCAOB inspection process impacts audit clients' tax planning effectiveness through the following chain of events. First, the PCAOB proposed applying substantial scrutiny and focus on the auditing of income taxes (Goelzer 2004), and the literature finds that the PCAOB delivered on its intentions (Drake et al. 2016; Acito et al. 2018; Westermann et al. 2019). This increased scrutiny likely left auditors doing substantially more work to prepare for PCAOB scrutiny over the auditing of income taxes. Because tax financial reporting and tax planning are often linked together (Frank et al. 2009; Balakrishnan et al. 2019), it is plausible that auditors acquired enhanced tax planning knowledge during this stage. Second, as auditors focus more on taxes and increase their tax knowledge, this knowledge diffuses to their clients through conversations and other interactions (Argote and Ingram 2000; Bae et al. 2017; Kleppe 2025). Prior literature suggests this diffusion is particularly prevalent among tax accounts (Lisowsky 2010; McGuire et al. 2012; Bianchi et al. 2019; Lim et al. 2025). Third, we expect clients to act on this information received from their auditor, resulting in more effective tax planning activities (Chyz et al. 2021). To the extent that clients incorporate this information into their tax planning decisions, we expect to observe an on-average increase in client tax planning effectiveness.

This prediction is not without tension. An auditor's primary duty is to provide assurance about whether the financial statements are free from material misstatement. While this responsibility involves examining detailed assumptions and inputs for tax positions, auditors do not need to judge the appropriateness of their clients' tax positions beyond whether they are properly reported in their financial statements (Goldman et al. 2022a). Relatedly, we base our expectation on the notion that auditors' tax teams must develop an in-depth understanding of the Internal Revenue Code to properly audit clients' tax accounts (Goldman et al. 2022a). It is possible that any increase in auditors' focus on client tax accounts only affects the financial reporting of taxes and thus is not beneficial to tax planning effectiveness. Finally, the PCAOB originally implemented (and continues to enforce) stringent rules to limit auditors' provision of non-audit services, particularly tax services (Lennox 2016). While knowledge diffusion may occur for areas like investment decisions and voluntary disclosures, it may occur less frequently for tax-related knowledge. Given these reasons, an increase in auditors' focus on tax issues due to PCAOB inspection exposure may not lead to more effective client tax planning.

To examine the impact of auditors' exposure to PCAOB inspection on clients' tax planning effectiveness, we use Schwab et al.'s (2022) measure of tax planning effectiveness.[1] Schwab et al. (2022) argue that this measure is an appealing proxy since it encapsulates the efficiency of converting tax inputs into after-tax returns. Thus, this measure captures the benefits of tax planning (e.g., reduced effective tax rates (ETRs)) along with the potential costs of tax planning (e.g., increased tax risk). Given our focus on the diffusion of tax-related knowledge through auditors, this measure is ideal since auditors are likely concerned about unexpected changes to clients' tax accounts. Additionally, this measure allows us to isolate changes in tax planning effectiveness

[1] We provide a detailed discussion of the Schwab et al. (2022) measure in Appendix A.

from changes in the financial reporting of taxes. This distinction is critical because PCAOB oversight could also plausibly affect the financial reporting of taxes (as discussed below).

We follow Khurana et al. (2021) and use the PCAOB's staggered inspection initiations in the U.S. to examine potential changes in clients' tax planning effectiveness following auditors' exposure to PCAOB inspection. This design facilitates empirical identification since the timing differences in the PCAOB's rollout were arguably exogenous to auditors and their clients (Gipper et al. 2020; Khurana et al. 2021). Our design also incorporates auditor fixed effects to control for systematic differences across auditors (e.g., auditor size or type) and time-varying controls relating to tax planning effectiveness. Our primary results are consistent with our hypothesis and suggest that clients' tax planning effectiveness increased significantly following their auditor's first year of exposure to PCAOB inspection. This finding suggests that PCAOB inspections have a significant spillover effect on clients' tax planning effectiveness, presumably because of auditors' increased emphasis on tax-related issues and knowledge diffusion from auditors to clients.

As noted above, we expect our main results to be the function of a chain of events that culminates in changes in clients' tax planning decisions. Accordingly, to strengthen our inferences, our next set of tests is designed to test the prior links in this chain. First, to test the initial link that increased auditor scrutiny over tax accounts leads to increased tax-related knowledge for auditors, we examine the relation between PCAOB inspection exposure and clients' tax accrual quality. The results reveal a positive association, consistent with inspection exposure leading to increased tax-related knowledge for auditors. We also note that, while we cannot directly observe auditors' knowledge specifically relating to tax planning, tax financial reporting knowledge and tax planning knowledge are often intertwined (Frank et al. 2009; Balakrishnan et al. 2019). To test the other intermediate link through which this increased knowledge diffuses to the auditors' clients, we

leverage data on clients' purchases of auditor-provided tax services (APTS). APTS has been shown to be a common channel through which auditors can share tax knowledge with audit clients (e.g., McGuire et al. 2012), and thus we expect that, if our main results are attributable to information diffusion through auditors, we would expect to observe a stronger relation between PCAOB inspection exposure and tax planning effectiveness for clients that increase their APTS purchases. The results of this cross-sectional analysis align with this expectation.

This study provides new evidence on a notable unintended real effect of changes to the audit regulatory regime—changes in corporate tax planning effectiveness. While extant literature explores the impacts of PCAOB inspection initiation on audit quality (Lamoreaux 2016; Fung et al. 2017; Krishnan et al. 2017; Khurana et al. 2021), financial reporting credibility (Gipper et al. 2020), and capital market frictions (Lamoreaux et al. 2020; Shroff 2020), there is limited evidence on how PCAOB inspections affect tax outcomes. Two extant studies investigate the effects of specific PCAOB actions on clients' tax-related decisions. Drake et al. (2016) document changes in Deloitte clients' tax-related reporting following the release of Deloitte's PCAOB Part II inspection findings, but they note that their results are "not associated with a change in the underlying tax strategies, but rather a change in financial reporting" (p. 1436). Ahn et al. (2021) document that Deloitte's clients lower their APTS usage following the same Part II inspection finding release. In contrast to these studies, we examine the real spillover effects of PCAOB oversight by testing whether auditors' exposure to the initiation of the PCAOB inspection process affected their clients' tax planning effectiveness. Thus, we examine an outcome distinct from financial reporting conservatism, and we focus on the initiation of the inspection program (i.e., regulation) rather than how auditors and clients respond to a failed inspection (i.e., enforcement).[2]

[2] As discussed above and in section V, our main results are similar after controlling for tax-related financial reporting quality, which mitigates concerns that our results are attributable to changes in the financial reporting of taxes.

Our evidence is timely given that tax-related issues continue to be a priority of the PCAOB and a point of emphasis for many accounting firms (Cohn 2022). Furthermore, changes to tax planning effectiveness might obscure financial reporting quality (Frank et al. 2009; Balakrishnan et al. 2019). Thus, while the net impact of the PCAOB inspection program likely resulted in improved financial reporting quality, our study suggests an unintended consequence of inspections (i.e., increased client tax planning effectiveness) that might diminish the positive impact of inspections on financial reporting quality. As the PCAOB faces enhanced scrutiny and political pressure, it is important to understand the full effects of its actions, whether intended or unintended.

This study also adds to the broader literature examining auditors' impact on clients' tax planning strategies. As suggested by Donovan et al. (2014), it is inherently important that researchers better understand how external audits impact clients' real activities. Prior studies reach arguably different conclusions on the relationship between auditor characteristics and client tax avoidance (e.g., Lisowsky 2010; McGuire et al. 2012; Kanagaretnam et al. 2016; Klassen et al. 2016). Our tests differ from these studies across two key dimensions. First, we focus on tax planning effectiveness. While examining tax avoidance can be informative, tax planning effectiveness introduces a new dimension to the literature that helps connect clients' decisions to the Scholes-Wolfson framework. Second, our research design uses the staggered initiation of PCAOB inspections. This plausibly exogenous change to auditor oversight strengthens our inferences (Gipper et al. 2020; Khurana et al. 2021), thereby allowing us to extend the literature that examines the influence of auditors on clients' tax planning activities.[3]

[3] We acknowledge that it is difficult to uniquely attribute our results to audit regulation as the PCAOB inspection program went into effect as part of SOX and in response to several high-profile accounting scandals. While we take numerous steps to provide assurance that our findings are a function of the onset of the PCAOB inspection process, we nonetheless cannot completely rule out the possibility that our results are impacted by other aspects of SOX.

II. BACKGROUND AND HYPOTHESIS DEVELOPMENT

Auditing of Income Taxes

External auditors perform assurance services over the income tax accounts as they do with all other material accounts. However, the composition of the personnel conducting the audit of the income tax accounts often differs from the audits of other accounts. As demonstrated by Goldman et al. (2022a), income tax audits often involve a core team of tax personnel who specialize in auditing income taxes or specialize in a certain type of taxation (e.g., multinational taxation, state and local taxation, specific tax credits). A key attribute of this team is that they typically do not concentrate in a particular industry. Instead, they perform similar duties and responsibilities for numerous assurance clients within the same office without regard to industry, as tax issues and complexities tend to be industry-independent (Goldman et al. 2022a). This framework results in an audit team that differs substantially from teams that audit other accounts. Many offices employ in-house tax experts who affect reporting quality (Bauer et al. 2021), and prior work supports the notion that auditors use tax professionals to audit tax-related accounts (Gleason and Mills 2011; McGuire et al. 2012; Donohoe and Knechel 2014; Hux et al. 2023).

Auditing income taxes is not without its challenges. The corporate statutory tax rate in the United States is 35 percent during our sample period. Thus, absent any tax planning activities, for every $100 a company earns, it records $35 in tax expense and cash taxes paid, thereby making income taxes a quantitatively material account for most companies. However, the tax account's materiality often goes beyond quantitative thresholds. Tax accounts capture the accounting treatment from both backward-looking activities and forward-looking estimations (Bonner et al. 1992). For example, the valuation allowance requires companies to weigh their deferred tax assets in comparison to their earnings likelihood to enable the recognition of the corresponding tax

benefits (Miller and Skinner 1998; Goldman et al. 2022b). Thus, auditors must assess both the underlying tax positions that generated the deferred tax assets and their client's discounted future cash flows to audit the tax accounts effectively.

Other tax accounts require auditors to assess different aspects of the tax positions. For example, ASC 740-10 (also referred to as FIN 48 or the unrecognized tax benefit reserve) requires companies to assess each of their tax positions and determine the likelihood of these positions being overturned upon IRS audit (Robinson et al. 2016). The "more likely than not" threshold, as well as the individual percentages that clients set for each tax position, are highly subjective and variable (Graham et al. 2012; De Simone et al. 2014), which can lead to additional complexities that auditors face related to the income tax accounts (Erickson et al. 2016; Abernathy et al. 2021).

Finally, income tax accounts are a common area that companies use to engage in earnings management. The income tax accounts are among the last accounts to be finalized before the earnings release (Dhaliwal et al. 2004); thus, these accounts also tend to be qualitatively significant. The combination of quantitative and qualitative materiality likely contributes to income tax accounts being among the most common critical audit matters that auditors designate to their clients in their financial statements (Drake et al. 2024). In fact, a concurrent study finds that mentions of these concerns in the expanded audit report can lead to a significant decline in tax planning activities (Beuselinck et al. 2024), and other studies document that audit fees and expertise are associated with tax avoidance (McGuire et al. 2012; Donohoe and Knechel 2014).

PCAOB Inspections

The PCAOB was created by SOX and is charged with performing routine inspections of external auditors. The PCAOB inspects auditors either annually (if they audit 100 or more publicly listed clients) or triennially (if they audit fewer than 100 publicly listed clients). The regulator's

inspection process involves two components. First, the PCAOB uses a risk-based approach to select audits to inspect.[4] PCAOB inspectors review the work completed for each audit selected to determine whether the auditor's work complies with PCAOB standards, and any identified deficiencies are reported in Part I of the auditor's inspection report.

The second component examines the auditor's quality control. This part of the inspection involves the PCAOB examining the auditor's methodology and processes to ensure adequate policies and procedures and analyzing the causes of any Part I deficiencies. The PCAOB reports quality control deficiencies in Part II of the auditor's inspection report. The PCAOB publicly discloses an auditor's Part I findings on the PCAOB website, but an auditor has one year after the issuance of the inspection report to resolve any Part II deficiencies (which are generally more holistic and severe than Part I deficiencies). If, after one year, the PCAOB determines that the auditor adequately addressed the Part II deficiencies, then they remain private; if not, any remaining deficiencies are publicly disclosed.

Prior literature finds that the PCAOB inspection process enhances the reliability of the financial reporting process through improvements in audit quality (Carcello et al. 2011; Gunny and Zhang 2013; Lamoreaux 2016; Fung et al. 2017; Krishnan et al. 2017; Aobdia 2018) and in internal control quality (DeFond and Lennox 2017).[5] Some more recent studies focus on the initiation of PCAOB inspections in the U.S. Khurana et al. (2021) document that inspection exposure increases audit quality, especially for larger auditors. Gipper et al. (2020) document that the inspection process enhances financial reporting credibility.

[4] Beginning in 2016, the PCAOB started to incorporate randomization in selecting audits for inspection (in conjunction with the risk-based approach). However, our sample period ends prior to the PCAOB's incorporation of this approach.
[5] Other related literature examines the implications of PCAOB inspection findings. For example, these studies show that inspection deficiencies are associated with auditor reputational damage (Nagy 2014; Aobdia and Shroff 2017), diminished auditor-client relations (Acito et al. 2018), and changes in clients' financial reporting (Drake et al. 2016; Stuber and Hogan 2021).

Despite the large literature examining the PCAOB inspection process, most prior work focuses on the direct, financial reporting-related effects of PCAOB inspection access. However, there is a nascent literature that considers the real economic effects of PCAOB inspections. Kim et al. (2020) document that PCAOB inspections affect clients' M&A outcomes, while Shroff (2020) and Aobdia et al. (2021) find that PCAOB inspections can impact clients' financing and lending practices, respectively. Additionally, Lamoreaux et al. (2024) document that PCAOB inspection oversight is associated with greater real earnings management. We seek to further the literature's understanding of the real effects of PCAOB inspections by examining a material and consequential aspect of corporate operations—tax planning effectiveness.

Hypothesis Development

From its inception, the PCAOB's inspection program changed auditor behavior (e.g., Khurana et al. 2021). One likely explanation for these results is that auditors enhanced their audit preparation and shifted their focus to high-risk accounts to minimize the likelihood of audit failures and inspection deficiencies. Consistent with this, a former Big 4 audit partner confirmed that auditors were forced to dramatically change their audits after Enron, SOX, and the creation of the PCAOB. In particular, this former practitioner noted that every firm had just witnessed Arthur Andersen's collapse and that there was credible fear that any firm could be the next to follow suit. Other practitioner-based anecdotes highlight how PCAOB inspections led to audit firms altering the nature, extent, and timing of their auditing procedures (Wagner and Dittmar 2006; EY 2017).

These changes in auditor behavior were also likely persistent. For example, the PCAOB's 2004-2007 inspection review states that many auditors "created subject matter networks or groups for areas of accounting and auditing where there have been deficiencies" (PCAOB 2008, p. 27). In addition, Johnson et al. (2019) survey auditors and find that "auditors and firm leaders design

additional procedures based on the verbal comments and preliminary reports received from the inspectors" (p. 1556) and "participants frequently participate in firm training or debriefing sessions to learn about issues of recent concern to the PCAOB" (p. 1554).[6] They conclude by stating, "overall, participants described substantial modifications in their audit approach in response to inspection findings and the anticipation of inspections" (p. 1557). These anecdotes collectively suggest that PCAOB inspection exposure likely results in auditors changing their policies and procedures and applying these changes to audits.

In this study, we propose that the initiation of the PCAOB inspection program has a spillover effect on audit clients' tax planning effectiveness through the following chain of events. First, we expect that auditors significantly increased their knowledge and understanding of their clients' income tax accounts in response to PCAOB inspection exposure. While the impact of the PCAOB was likely widespread across the entire portfolio of accounts, we expect the impact of PCAOB inspection exposure to be particularly salient to the auditing of income taxes for two key reasons. First, taxes are material and complex for most companies, evidenced by tax accounts being commonly misstated (Audit Analytics 2021) and a common critical audit matter (Drake et al. 2024). Second, the PCAOB pledged a significant focus on the policies and procedures related to auditing income taxes (Goelzer 2004). Importantly, the PCAOB seemed to deliver on this pledge, as the regulator generally assigns a tax specialist to each inspection team (Westermann et al. 2019), and tax account issues are among the most common inspection deficiencies (Acito et al. 2018). This enhanced scrutiny likely led auditors to increase their focus on and knowledge of income tax issues. Moreover, prior research suggests that understanding the financial reporting

[6] This point is echoed by Riley et al. (2008), who summarize commentary from practitioners about the changes their firms made in response to the PCAOB's establishment. They state "the panelists noted that consistent audit quality requires a commitment to continuous auditor training" and "the increased field work involvement of partners and managers has worked out very well for the firms" (p. A22).

and auditing procedures of the income tax accounts requires an understanding of the tax rules governing the underlying positions (Dhaliwal et al. 2004; Graham et al. 2012; McGuire et al. 2012; Goldman et al. 2022a), which supports our expectation that auditors could gain increased knowledge of client tax planning opportunities in response to PCAOB inspection exposure.

Second, we expect this increased tax knowledge acquired by the auditors in response to PCAOB inspections to diffuse to their clients. We form this expectation based primarily on a deep literature that suggests auditors can share information and knowledge across engagements and with clients. Argote and Ingram (2000) provide a framework for auditors to transfer this knowledge. They posit that organizations will diffuse knowledge when it is conducive to doing so.[7] This notion is enhanced when considering auditors' knowledge sharing related to income tax accounts. Unlike the audits of most other accounts, the income tax portion of the financial statement audit tends to be performed by a small number of centralized teams within the audit firm (Goldman et al. 2022a; Hux et al. 2023). While auditors are not permitted to perform certain tax services for their clients, there are still ample opportunities for auditors to share tax-related knowledge with their clients. For example, the SEC permits auditors to converse with management and informally discuss and share ideas (SEC 2005). Prior academic research provides evidence supporting the idea that auditors share information with their clients (e.g., Bae et al. 2017; Axelton et al. 2021; Kleppe 2025). Specific to taxes, Goldman et al. (2022a) and Lim et al. (2025) provide evidence suggesting that tax planning knowledge is diffused through shared audit offices and audit partners, respectively. Further, Lisowsky (2010) documents an association between having a larger auditor and tax shelter usage, and McGuire et al. (2012) show that clients that purchase tax services from

[7] A survey response in Johnson et al. (2019) substantiates this point for auditors' PCAOB-related knowledge sharing and diffusion: "If I learned something, then I'll tell my colleague, so then that [issue is] on his list when he gets to reviewing his engagement, and vice versa, and . . . a partner on one of my jobs is from another city, so he talks to people there and they may say . . . PCAOB really hit this area hard. Make sure you look at that closely" (p. 1556).

a tax-expert auditor have lower effective tax rates on average.

Third, we expect that clients will incorporate any tax-related knowledge received from their auditor into their tax planning decisions. This expectation is motivated by prior work that documents that auditor-derived knowledge from providing APTS can impact clients' tax planning activities (Chyz et al. 2021). To the extent that auditors increase their emphasis on taxes following exposure to PCAOB inspection, and this leads to more diffusion of tax-related knowledge to clients, we expect to observe more effective tax planning strategies for these auditors' clients. We specifically focus on clients' tax planning effectiveness—which involves weighing the costs and benefits of tax risks to maximize after-tax returns—because this construct helps capture tax avoidance and tax uncertainty paradigms (Schwab et al. 2022).[8] Given these expectations, we state our formal hypothesis as follows:

> *Hypothesis: Following an auditor's exposure to PCAOB inspection, clients of these auditors significantly increase their tax planning effectiveness, relative to clients of auditors not yet exposed to PCAOB inspection.*

We reemphasize that our hypothesis is multifaceted. In other words, observing an increase in clients' tax planning effectiveness after their auditor's exposure to PCAOB inspection relies on (i) auditors increasing their focus on tax-related issues and (ii) the diffusion of (at least some) of auditors' tax-related knowledge to clients. Thus, if either component is unmet, we will likely fail to observe the predicted association.

While our hypothesis is formed based on considerable evidence from prior work and

[8] In Figure 1a, we provide a timeline that illustrates how the initiation of PCAOB inspections likely led to persistent tax effects not only in the year the PCAOB inspection process began but for years after. In this example, the audit firm becomes exposed to an annual PCAOB inspection starting in year 20X1. Anecdotal evidence suggests that auditors began preparing for inspection in the first year (or even in advance of the first year) they are subject to inspection. However, audit firms continue to be inspected regularly (annually for larger audit firms, as depicted, and triennially for smaller audit firms). Thus, we expect auditors to continue refining and increasing their tax knowledge as part of continuing education and in response to periodic PCAOB inspection report outcomes. Importantly, this tax knowledge involves understanding the underlying tax positions to assess the appropriateness of their financial reporting treatment (Goldman et al. 2022a). Finally, auditors' increased tax knowledge likely diffuses from the auditor to the client.

practitioner sources, there are reasons why we may not observe this relation. First, a central tension to our hypothesis is that auditors are charged with providing assurance over clients' financial statements. An auditor's opinion regarding whether the client's financial statements are fairly presented is theoretically formulated with little regard for whether the client is operating optimally. Thus, even if auditors increased their focus on income taxes following exposure to PCAOB inspection, it is not obvious that this would necessarily result in their clients having more effective tax planning. Additionally, auditors are not permitted to perform certain tax services for their clients (Lennox 2016). Thus, auditors may be reluctant to share tax information and tax-related knowledge relative to other information. Finally, even though Lisowsky (2010), McGuire et al. (2012), and Lim et al. (2025) find an association between auditors and their clients' tax planning activities, these studies speak primarily to clients' tax planning activity levels. Tax planning activities range from certain to risky (Hanlon and Heitzman 2010), where lowering tax liabilities in a risky manner may not necessarily increase tax planning effectiveness due to the increased risk of such positions (Beasley et al. 2021). Should auditor knowledge diffusion enhance clients' tax planning through risky tax positions, we would not expect to find a relation between PCAOB inspection exposure and tax planning effectiveness. While each of these explanations may lead to a null result, it seems unlikely that PCAOB inspection exposure would result in a decline in tax planning effectiveness. Thus, we continue to state our hypothesis in the alternative form.

III. SAMPLE AND EMPIRICAL DESIGN

Sample Selection

Table 1 outlines our sample selection procedure, which generally follows Khurana et al. (2021). Our sample starts in 2001 to ensure that we include at least two pre-PCAOB years for each auditor and ends in 2010 since virtually all U.S. auditors had been inspected at least once by 2010.

We begin with the intersection of Compustat and Audit Analytics for all U.S.-incorporated clients with a U.S. auditor. Next, we exclude clients in regulated industries (SICs 4300-4999 and 6000-6999) due to inherent differences in regulatory oversight, and we remove observations without adequate data to construct our control variables. We also exclude clients who enter (leave) the sample after (before) their auditor's first inspection year to ensure a given client is in the pre- and post-PCAOB samples. Finally, we remove observations without the data needed to construct our dependent variable and clients with negative pre-tax income, and we exclude clients that change auditors in the current or subsequent year so that our sample consists of "constant auditor" clients.[9] This procedure leads to a final sample of 11,154 client-year observations.

In addition to this sample, we also perform tests using a reduced sample limited to observations where the measure of client tax planning effectiveness is based on data entirely in the pre- or post-inspection period. As discussed in more detail in the following section, the measure (following Schwab et al. 2022) estimates tax planning effectiveness in the current year based on tax-related inputs from the current year and the four previous years. In short, the reduced sample removes post-inspection period observations where the inputs in constructing the tax planning effectiveness measure could potentially be influenced by PCAOB inspection exposure. After dropping these observations, the reduced sample is limited to 6,024 client-year observations.

Research Design

We test our hypothesis by estimating the following equation using ordinary least squares (OLS) regression with standard errors clustered by auditor:[10]

[9] We impose this restriction to avoid the possibility that our results are unduly influenced by auditor changes. However, we note that our inferences are unchanged if we do not impose this restriction.

[10] We cluster standard errors by auditor since this is consistent with clustering "one level higher" than the treatment, which varies based on auditor-year (Angrist and Pischke 2009). However, we note that our primary inferences are unchanged if we instead cluster by client.

$$TaxPlanningEffectiveness = \beta_0 + \beta_1 PostInspection + \beta_n Controls + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + Auditor\ Fixed\ Effects + \varepsilon. \quad (1)$$

The dependent variable in Equation (1) is the client's tax planning effectiveness (*TaxPlanningEffectiveness*) from Schwab et al. (2022). *TaxPlanningEffectiveness* is a "measure of effective tax planning that is theoretically aligned with the Scholes-Wolfson paradigm," which focuses on "maximizing after-tax returns while considering all taxes, all parties, and all costs" (p. 432). Schwab et al. (2022) create this measure by performing a data envelopment analysis on how efficiently a company converts tax-related inputs into after-tax returns. They argue that this measure more effectively encapsulates tax planning than traditional tax planning measures (e.g., cash or GAAP ETRs) that focus on the benefits of tax planning (i.e., lower ETRs) while ignoring the potential costs (i.e., increased tax risk). Given our focus on tax-related knowledge diffusion through auditors, this measure is ideal since auditors are likely concerned about unexpected changes to clients' tax accounts, especially such changes that result from risky tax strategies. In addition, *TaxPlanningEffectiveness* is especially suited for our study's focus on tax planning activities because the measure does not capture changes related to the financial reporting of taxes. We discuss the construction of *TaxPlanningEffectiveness* in detail in Appendix A.

The variable of interest in Equation (1) is *PostInspection*, an indicator equal to one for the year of and the years after the first PCAOB inspection of the client's auditor, and zero otherwise (Khurana et al. 2021). We include the first inspection year because some auditors likely began preparing in advance of their first inspection, and clients can swiftly implement new tax strategies (Hoopes et al. 2012; Kim et al. 2019); thus, it is plausible that changes in clients' tax planning effectiveness could materialize quickly. We obtain data for PCAOB inspection timing from Audit Analytics. Figure 1b provides a visual depiction of the staggered onset of PCAOB inspections beginning in 2003 with the Big 4 accounting firms and continuing in 2004 and onward with several

of the most prominent non-Big 4 firms newly subject to the inspection process. Our hypothesis predicts that the coefficient on *PostInspection* (β_1) will be positive, consistent with clients increasing their tax planning effectiveness following their auditor's first year of PCAOB inspection exposure. We include auditor fixed effects to ensure that within-auditor variation in PCAOB inspection timing drives any observed *PostInspection* effect as opposed to cross-sectional variation across auditors. We also include industry (Fama-French 48) and year fixed effects.[11]

To ensure that certain observable factors do not impact the relation of interest, we include a vector of control variables following prior literature on corporate tax planning (Kubick et al. 2015). Specifically, we include controls for a client's financial position and performance, as well as controls that capture differences in tax planning opportunities. For brevity, we describe these variables in Appendix B. We winsorize all continuous variables at the 1st and 99th percentiles.

As noted above, because *TaxPlanningEffectiveness* estimates tax planning effectiveness in the current year based on tax-related inputs from the current year and the four previous years, we also perform estimations of Equation (1) after excluding observations in the first, second, third, or fourth post-inspection year to ensure that all tax planning inputs and outputs are from the post-inspection period for the post-inspection observations. This reduced sample does not omit the years just after the onset of the inspection process; *TaxPlanningEffectiveness* is a five-year aggregation. Instead, this reduced sample *only* considers observations where *TaxPlanningEffectiveness* is entirely calculated using post-inspection data. We use this reduced sample to ensure that our results are not impacted in certain post-inspection years by the presence of pre-inspection inputs that theoretically should not have been impacted by PCAOB inspection exposure.

[11] Our results are robust if we instead include client or Fama-French 30 industry fixed effects (untabulated).

IV. EMPIRICAL RESULTS

Descriptive Statistics

Table 2 presents descriptive statistics for the full sample. The distribution of *TaxPlanningEffectiveness* is similar to that of the measure in Schwab et al. (2022). As shown, this variable's mean value is 0.708, which indicates that clients are 70.8 percent as effective at tax planning as the most tax effective clients in their industry-year, on average. The mean value of *PostInspection* is 0.803, which shows that just over three-quarters of client-year observations engage an auditor exposed to PCAOB inspection. The remaining variables' distributions align with prior tax planning literature (e.g., McGuire et al. 2012; Ayers et al. 2018; Chen et al. 2018).

Hypothesis Tests

Table 3 presents the results of our hypothesis tests. Column (1) tabulates the estimation of Equation (1) with all sample observations, and column (2) tabulates the estimation with the reduced sample. Consistent with our hypothesis, the coefficients on *PostInspection* are positive and significant in both columns ($p < 0.01$ in each column). These results indicate that clients' tax planning effectiveness increases in response to their auditor's exposure to PCAOB inspection.[12] The estimates are also economically significant; the coefficient in column (1) (column (2)) indicates that clients, on average, increased their tax planning effectiveness by 6.1 (14.7) percent

[12] We expect that some auditors began preparing for inspections before the first inspection year. However, audit firm-level policies take time to adjust, and clients may take years to unwind and invest in new tax planning activities; thus, we still expect to primarily observe changes in tax planning effectiveness *after* the auditor's initial inspection. Consistent with this, an untabulated dynamic (i.e., year-by-year) analysis reveals that our main result manifests immediately after an initial inspection, but we fail to find evidence of an effect prior to the auditor's first inspection exposure. The relative immediacy of this result is consistent with auditors taking anticipatory actions, but it is also consistent with clients being able to implement new tax strategies quickly (Hoopes et al. 2012; Kim et al. 2019). It is inherently difficult to disentangle these explanations because we are unable to identify precisely when each audit firm became aware of its initial inspection. The dynamic analysis also reveals that the effects are most significant in earlier post-inspection years. The effects are generally statistically similar in later years, which is consistent with somewhat persistent effects, but we acknowledge that the effect does appear to taper off in later years. This could be due to other factors influencing the effects after the treatment, the relative benefits from initial increased tax knowledge diminishing due to broader PCAOB exposure, or some combination of both.

following their auditor's exposure to PCAOB inspection relative to the sample mean of *TaxPlanningEffectiveness*.[13] Unsurprisingly, the effect size is smaller in the full sample estimation because *TaxPlanningEffectiveness* is formulated based on tax-related inputs from both the current and preceding years. Thus, the full-sample estimation is likely biased downward because, for some post-inspection observations, the measure may be influenced by pre-inspection tax planning activities.[14] Together, the results in Table 3 support our hypothesis and are consistent with PCAOB inspections having a significant spillover effect on corporate tax planning effectiveness.

Changes in Tax Accruals Quality

While the results in Table 3 are consistent with our hypothesis, the observed relation between PCAOB inspection exposure and clients' tax planning effectiveness relies on two intermediate links. First, as outlined above, we expect that auditors significantly increased their knowledge and understanding of their clients' income tax accounts in response to PCAOB inspection exposure. If this is the case, we should observe that auditors improved their auditing of income taxes following exposure to PCAOB inspection. To test this conjecture, we follow Choudhary et al. (2016) and examine how clients' tax accruals quality differs before and after their auditor is exposed to PCAOB inspection. We expect that any improvement in tax accruals quality is attributable (at least in part) to improved audit quality related to the tax accounts. We estimate a modified version of Equation (1) with *TaxAQ* as the dependent variable; similar to the reduced sample in our main analysis, we exclude post-inspection observations where pre-inspection inputs are needed to construct *TaxAQ*. The results of this analysis are reported in Table 4. The coefficient

[13] By design, *TaxPlanningEffectiveness* captures differences in companies' tax planning effectiveness relative to the most efficient tax planning company in an industry-year. One potential limitation of this measure is that variation in *TaxPlanningEffectiveness* can capture either an increase in a company's tax planning effectiveness (which we hypothesize) or a decline in the industry-leader's tax planning effectiveness. To mitigate any concerns related to the latter, we separately examine companies' tax planning levels. See section V.

[14] This is our impetus for estimating our tests using the reduced sample, which ensures that all tax planning inputs and outputs for the post-inspection observations correspond only to the post-inspection period.

on *PostInspection* is positive and significant ($p < 0.01$), suggesting that clients' tax accruals quality increased on average following their auditor's exposure to PCAOB inspection. This result is consistent with increased auditor focus on and knowledge of income taxes following PCAOB inspection exposure. We also note that, while not directly testable, we expect auditors' tax planning knowledge to be bolstered following PCAOB inspection exposure, as prior literature links financial reporting and tax planning (Frank et al. 2009; Balakrishnan et al. 2019).

APTS Cross-Sectional Analysis

For our second intermediate chain link, we expect auditors' newly acquired tax-related knowledge to diffuse to their clients. We form this expectation based on literature suggesting that auditors share information and knowledge across clients (Argote and Ingram 2000; Bae et al. 2017; Axelton et al. 2021; Kleppe 2025). While it is difficult to observe the transfer of information from auditors to clients, prior literature suggests that auditors are likely to diffuse tax-related knowledge to clients through auditor-provided tax services (APTS) (Gleason and Mills 2011; McGuire et al. 2012; De Simone et al. 2015; Filosa et al. 2025). Because this type of knowledge is more likely to be transferred when the auditor also provides tax-related services, this second link predicts that the main relation will be strongest when the client purchases APTS.

To test this, we re-estimate Equation (1) separately for observations where the client purchases APTS from its auditor and observations where the client does not purchase APTS from its auditor. The results are reported in Table 5. As shown, in both the full and reduced samples, the coefficient on *PostInspection* is only significant among observations where the client purchases APTS ($p < 0.01$ in columns (1) and (3); insignificant in columns (2) and (4)). These results suggest that the primary relation is only present when there are more opportunities for tax-related knowledge diffusion from auditors to clients.

V. ADDITIONAL ANALYSES

Additional Knowledge Diffusion Tests

While prior literature supports APTS as a common mechanism for knowledge diffusion from auditors to clients, we nonetheless acknowledge that our evidence in Table 5 is indirect since direct interactions between auditors and clients are unobservable. To provide additional supporting evidence, we next examine two other potential mechanisms for auditor-client knowledge diffusion. First, we consider whether the main relation is strongest when clients are more likely to benefit from auditors' tax-related knowledge. Specifically, we expect that clients engaging in more tax-advantaged activities (e.g., clients with more R&D expenditures and intangible assets) are more likely to benefit from auditors' tax-related insights (Demeré et al. 2020; Cheng et al. 2021). To test this, similar to our APTS analysis, we re-estimate Equation (1) separately for clients with above-the-median R&D expenditures (intangible assets) and clients with R&D expenditures (intangible assets) equal to or below the sample median. The results are reported in Panels A and B of Table 6. Consistent with expectations, the magnitude of the *PostInspection* effect is consistently largest for clients with higher levels of R&D expenditures and for clients with higher levels of intangible assets.

Second, we consider whether the main results are strongest when the auditor is more likely to be a tax-specific industry expert. We expect that beneficial tax-related knowledge diffusion is more likely to occur among tax-expert auditors. To test this, we first follow the approach in McGuire et al. (2012) to identify tax-specific industry expert auditors. We then re-estimate Equation (1) separately for observations where the auditor is and is not a tax expert. The results are reported in Panel C of Table 6. Consistent with expectations, the magnitude of the *PostInspection* effect is largest when the auditor likely has superior tax expertise. Collectively, the

results in Table 6 provide further indirect evidence supporting our inferences.

Time Trends

Next, we perform two falsification tests designed to provide comfort that our main result reflects an increase in clients' tax planning effectiveness attributable to their auditor's PCAOB inspection exposure rather than a general increase in tax planning effectiveness over time. While this alternative explanation is unlikely since we include year fixed effects in our primary estimations, we attempt to rule out this explanation more directly using placebo event dates. First, we create a "false" post-inspection indicator (*FalsePostInspection1*) that equals one for the year of and the years after a "false" initial PCAOB inspection of the client's auditor. This false date is a randomly generated year between 2003 and 2010 (inclusive) for each auditor, and this date range mirrors the range of treatment dates in the primary sample. We then modify Equation (1) by replacing *PostInspection* with *FalsePostInspection1*. Second, we create another "false" post-inspection indicator (*FalsePostInspection2*) that equals one for client-years that occur 10 or more years after the client was originally "treated" (i.e., after *PostInspection*=1 for the client for the first time). We then modify Equation (1) by replacing *PostInspection* with *FalsePostInspection2* and use sample years 2011 through 2019 since the Schwab et al. (2022) measure is only available through 2019. If, as we have inferred, our primary result is attributable to PCAOB inspection exposure (as opposed to a general increase in tax planning effectiveness over time or some other explanation), we would expect neither *FalsePostInspection1* nor *FalsePostInspection2* to be associated with *TaxPlanningEffectiveness*. As shown in columns (1) and (2) of Table 7, the coefficients on *FalsePostInspection1* and *FalsePostInspection2* are both insignificant, which supports our interpretation of the main result.

Alternative Tax-Related Outcomes

To provide additional support for our interpretation of the main results, we consider several alternative tax-related outcomes that could plausibly be impacted by auditors' exposure to PCAOB inspection. First, we consider whether the provision of APTS changed in the post-inspection period. If PCAOB inspection exposure prompted auditors to develop more tax-related knowledge, then it is plausible that auditors developing such knowledge would be able to leverage this knowledge to generate increased sales of APTS to audit clients. To test this, we estimate a modified form of Equation (1) with the level of APTS (scaled by audit fees) as the dependent variable. As shown in Panel A of Table 8, the provision of APTS is relatively greater following auditors' exposure to PCAOB inspection.

Second, we consider alternative tax planning proxies. Our primary measure of tax planning effectiveness is appealing because it incorporates the benefits of tax planning and the costs of tax planning by focusing on the efficiency of converting tax inputs into after-tax returns. However, unlike more traditional tax planning measures, *TaxPlanningEffectiveness* is a relative measure (i.e., a company's score is relative to its industry-year peers). Accordingly, for robustness, we separately estimate modified forms of Equation (1) using three alternative tax planning proxies as the dependent variable: cash ETRs, GAAP ETRs, and book-tax differences. As shown in Panel B of Table 8, the results provide evidence of increased client tax planning following auditor exposure to PCAOB inspection (specifically, reduced cash ETRs and increased book-tax differences).

Other Additional Analyses

We conclude by exploring several additional specifications. First, given that prior research shows that PCAOB inspections improve clients' reporting quality (e.g., Khurana et al. 2021) and that clients' internal information quality (IIQ) is associated with tax avoidance (Gallemore and

Labro 2015), we re-estimate our main test after controlling for clients' IIQ using the composite measure from McGuire et al. (2018). Relatedly, to ensure that our results are not attributable to any impact of PCAOB inspection exposure on tax-related financial reporting quality (Drake et al. 2016; Ahn et al. 2021), we re-estimate our main test after controlling for tax accruals quality and tax-related restatements. Finally, to provide comfort that our results are not driven by auditors' impact on their clients' investment practices (Bae et al. 2017), we re-estimate our main test after controlling for client investment efficiency using the measure from McNichols and Stubben (2008). In all three tests (untabulated), our inferences are unchanged.[15]

VI. CONCLUSION

This study examines a previously unexplored spillover effect of PCAOB inspection exposure. More specifically, we examine clients' tax planning effectiveness because of the prominence of the tax accounts from a materiality and complexity perspective and the substantial attention the PCAOB gives to the auditing of income tax accounts. We posit that auditors increased their emphasis on tax-related issues due to PCAOB inspection exposure, and we expect that this increased emphasis results in more tax-related knowledge diffusion to clients. Consistent with this expectation, we find that clients' tax planning effectiveness increased significantly following their auditor's exposure to PCAOB inspection.

This study provides new evidence of a significant unintended real effect of the dramatic change in U.S. auditor regulation that occurred with the initiation of the PCAOB inspection regime. While prior research examines the impacts of PCAOB inspections on audit/financial reporting quality and capital market frictions, we provide new evidence on the spillover effect of

[15] Additionally, recent work suggests that auditors can impact their clients' operational performance (Kleppe 2025). However, it is unlikely that our results are driven by client performance because we control for several aspects of performance in our regressions (including *FreeCashFlows*, *ROA*, *SalesGrowth*, and *1/PretaxIncome*). We also note that our primary results are consistent if we include a proxy for pre-tax effectiveness created with DEA (untabulated).

PCAOB oversight on corporate decision making related to tax planning. Furthermore, while prior studies have focused on how the PCAOB inspection process affects clients via the enforcement of the rules (e.g., Drake et al. 2016; Ahn et al. 2021), we demonstrate that the regulation itself had sweeping effects on real client decisions, evidenced by the onset of the inspection process impacting clients' tax planning effectiveness. Even though other significant events occurred in a similar timeframe to the onset of the PCAOB inspection process (e.g., Enron and Arthur Andersen's demise, SOX), we do not believe these events impair our inferences given our focus on the staggered implementation of the inspection cycle. That said, we acknowledge a limitation of our study is that the evidence we provide is indirect and that we are unable to directly observe the diffusion of tax-related information from auditors to clients.

Because our paper explores the intersection of audit regulation and corporate tax decisions, our findings should be of interest to auditing and tax practitioners and regulators charged with overseeing auditing and tax markets. More broadly, although our results suggest that the implementation of the PCAOB's inspection program likely benefited corporations through improved tax planning opportunities, these results conversely suggest that this shift in auditor oversight may have unintentionally led to decreased tax revenues for the U.S. government, which potentially has implications for U.S. lawmakers and policymakers. This concern is particularly relevant given uncertainty about the PCAOB's future. Finally, our findings add to the broader literature on auditors' impact on clients' tax-related decisions. While the PCAOB continues to enforce restrictions on the tax-related services that auditors can provide to their clients, we add to the limited evidence on the existence or consequences of tax-related knowledge diffusion between auditors and their clients beyond the financial reporting of taxes.

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APPENDIX A: Measurement of *TaxPlanningEffectiveness*

We obtain the tax effectiveness scores (i.e., the values for *TaxPlanningEffectiveness* in our study) from the authors of Schwab et al. (2022) (https://sites.google.com/view/brianmwilliams/tax-effectiveness-scores). While their study details the construction of these tax effectiveness scores, below we provide more background on this variable's construction and measurement.

Schwab et al. (2022) create the tax effectiveness scores using a data envelopment analysis (DEA) estimation. DEA is a nonparametric method of evaluating how efficiently a unit or entity converts inputs into outputs. The output and inputs for this estimation are as follows (as discussed by Schwab et al. (2022, p. 417-418)). Consistent with the Scholes-Wolfson framework, the single output for this estimation is *After-tax Return*, which equals the sum of pre-tax income less cash taxes paid from *t*-4 to *t* scaled by the sum of book value of equity from *t*-5 to *t*-1. The first input is *R&D*, which equals the sum of R&D expense from *t*-4 through *t* scaled by the sum of book value of equity from *t*-5 to *t*-1. The second input is *PP&E*, which equals gross PP&E summed from *t*-4 through *t* and scaled by the sum of book value of equity from *t*-5 through *t*-1. The third input is *Tax Havens*, which equals the natural log of 1 plus the sum of the number of countries with disclosed subsidiaries in tax havens from *t*-4 through *t*. The fourth input is *Intangible Assets*, which equals intangible assets summed from *t*-4 through *t* and scaled by the sum of book value of equity from *t*-5 through *t*-1. The fifth input is *Inventory*, which equals inventory summed from *t*-4 through *t* scaled by the sum of book value of equity from *t*-5 through *t*-1. The sixth and final input is *Total Debt*, which equals total debt summed from *t*-4 through *t* and scaled by the sum of book value of equity from *t*-5 through *t*-1. These inputs represent the level, type, and location of firms' investments and the associated financing decisions. Schwab et al. (2022) use DEA to solve the following optimization problem:

$$\max_{v} \theta = (\textit{After-tax Return}_{t\text{-}4,t}) \cdot (v_1 R\&D_{t\text{-}4,t} + v_2 PP\&E_{t\text{-}4,t} + v_3 \textit{TaxHaven}_{t\text{-}4,t} + v_4 \textit{Intangible Assets}_{t\text{-}4,t} + v_5 \textit{Inventory}_{t\text{-}4,t} + v_6 \textit{Total Debt}_{t\text{-}4,t})^{-1}$$

As outlined in Schwab et al. (2022, p. 437), these are the specific steps in this DEA:

1. For each fiscal year, firms are sorted into modified Fama-French 30 industries to enable relative comparison. The modified Fama-French 30 industries follow the traditional industry definitions other than the consolidation of six small industries into three larger industries (see their footnote 11).
2. Each of the input and output variables are ranked within industry-year. This means that this analysis technically estimates a firm's efficiency in generating ranked outputs given its ranked inputs relative to its industry-year peers.
3. DEA identifies the input and output weights that maximize tax planning efficiency for each firm relative to its peers. This analysis generates firm-specific optimal weights.
4. The firm-specific optimal weights are then multiplied by the firm's output and input quantities and summed across the output and inputs. The resulting ratio is the tax effectiveness score.

Put simply, the estimated tax effectiveness score represents "a proportion of the specified firm's effectiveness at using its inputs to generate after-tax return compared to effectiveness of the "best" possible tax planners in its estimation group" (Schwab et al. 2022, p. 416). These scores range from 0 to 1, with a value of 0 reflecting minimal tax effectiveness relative to peers and a value of 1 reflecting the highest tax effectiveness within the industry-year group. Moreover, an observation with a score of 0.8 could reach maximum tax effectiveness (at least relative to its most effective peer) by increasing output (i.e., after-tax returns) by 25 percent or achieving the same output through a 20 percent decrease in inputs (Schwab et al. 2022).

Schwab et al. (2022, p. 414) outline several reasons why using DEA to estimate the tax effectiveness score is an appealing way to proxy for tax planning effectiveness:

1. DEA estimates how efficiently inputs are converted into outputs. In the tax setting, this "accounts for the fact that tax planners must maximize after-tax returns subject to the operating, financing, and investing decisions made by the firm" (p. 414). Therefore, this research design aligns with the Scholes-Wolfson paradigm. Further, this focus on efficiency captures tax planning more completely than most measures since it captures the potential benefits of tax planning (i.e., reduced ETRs) and the potential costs of tax planning (i.e., increased tax risk).
2. DEA allows for each firm's optimal input weights to differ. In other words, it allows for a firm to weigh a certain input (e.g., R&D) more than another input (e.g., PP&E) for tax planning. This feature mirrors reality, as firms differ in the amount of tax benefits obtainable from different operating, investing, and financing decisions.
3. This proxy is estimable for a sample of firms that includes profit and loss firms, which increases the generalizability of any inferences across a larger sample of firms.

In addition to the theoretical and methodological arguments for the tax effectiveness scores, Schwab et al. (2022) perform the following analyses to show that these scores measure effective tax planning (in a way that is distinct from other measures):

1. They provide evidence that the tax effectiveness scores are positively associated with after-tax returns, consistent with the theoretical goal of tax planning.
2. They provide evidence that the scores are distinct from five-year cash ETRs.
3. They provide evidence that the scores are negatively associated with tax and non-tax costs of tax planning.
4. They provide evidence that the scores do not merely capture overall firm effectiveness or profitability.

APPENDIX B: Variable Definitions

Variable	Definition
Age	The client's age (calculated as the number of years since the client first appeared in Compustat).
APTS/AuditFees	The client's auditor-provided tax service fees divided by audit fees.
Assets	The natural logarithm of the client's total assets.
BTDs	The client's total book tax differences divided by the client's total assets.
CashETR	The client's cash ETR, calculated as cash taxes paid divided by pre-tax income less special items.
DiscAcc	The absolute value of the client's performance-matched discretionary accruals.
EquityIncome	The client's equity earnings divided by the client's total assets.
FalsePostInspection1	Indicator variable equal to one for the year of and the years after the random "false" first PCAOB inspection of the client's auditor, and zero otherwise.
FalsePostInspection2	Indicator variable equal to one if a fiscal year is 10 or more years after the client was originally "treated" (i.e., *PostInspection*=1), and zero otherwise
Foreign	The client's pre-tax foreign income divided by the client's total assets.
FreeCashFlows	The client's operating cash flows (less capital expenditures) divided by the client's total assets.
GAAPETR	The client's GAAP ETR, calculated as tax expense divided by pre-tax income less special items.
Intangibles	The client's intangible assets divided by the client's total assets.
Leverage	The client's total debt divided by the client's total assets.
MarketToBook	The client's market value of equity divided by the client's book value of equity.
NOLIndicator	Indicator variable equal to one if the client reports a positive tax loss carryforward in the current year or the prior year, and zero otherwise.
PostInspection	Indicator variable equal to one for the year of and the years after the first PCAOB inspection of the client's auditor, and zero otherwise.
PP&E	The client's net property, plant, and equipment assets divided by the client's total assets.
1/PretaxIncome	One divided by the client's pre-tax income (Edwards et al. 2021).
R&D	The client's R&D expense divided by the client's total assets.
ROA	The client's income before extraordinary items divided by the client's total assets.
SalesGrowth	The percentage change in the client's sales.
SpecialItems	The client's special items divided by the client's total assets.
TaxAQ	The client's tax accrual quality, following Choudhary et al. (2016). This variable equals negative one times the standard deviation of the residuals from client-specific estimations of tax accruals being regressed on prior, current, and future cash taxes paid and contemporaneous changes in long-term deferred tax assets and liabilities. These estimations are by Fama-French 48 industry-year for industry-years with at least 20 observations. *TaxAQ* is calculated as the standard deviation of the residuals from *t*-4 to *t*.
TaxPlanningEffectiveness	The client's tax effectiveness score, computed by Schwab et al. (2022) using data envelopment analysis. See Appendix A.
ZScore	The client's Altman Z-score. Calculated according to Altman (1968).
ΔNOL	The change in the client's tax loss carryforward divided by the client's total assets.

FIGURE 1: PCAOB Inspection Timeline and the Onset of PCAOB Inspections by Year

Figure 1a visually presents the timeline for the onset of PCAOB inspection and when and how it might influence audit clients' tax planning effectiveness. Figure 1b visually presents the staggered onset of PCAOB inspections beginning in 2003 with the Big 4 accounting firms and continuing in 2004 and onward with several of the most prominent non-Big 4 firms newly subject to the inspection process.

Figure 1a: Timeline for Effects of the Onset of PCAOB Inspection

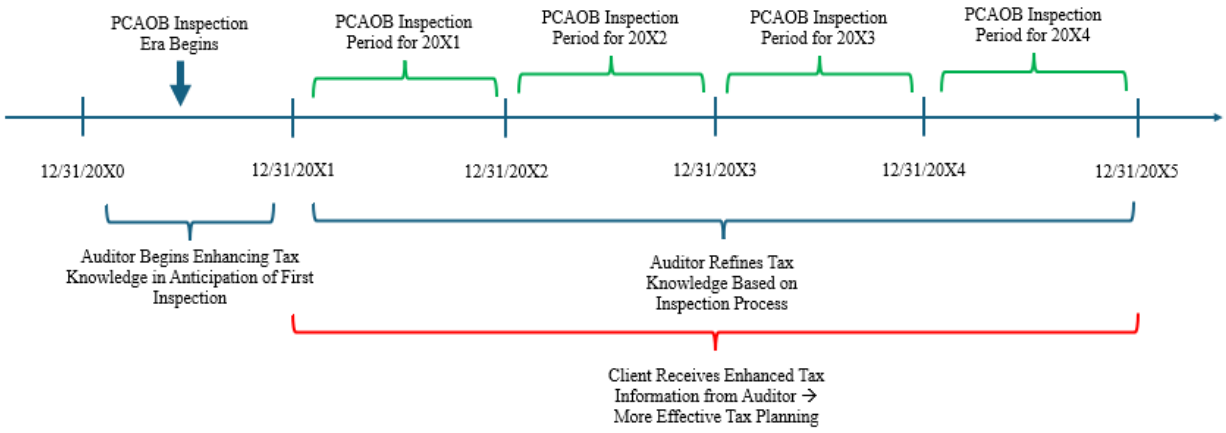

Figure 1b: PCAOB Inspection Onset by Year

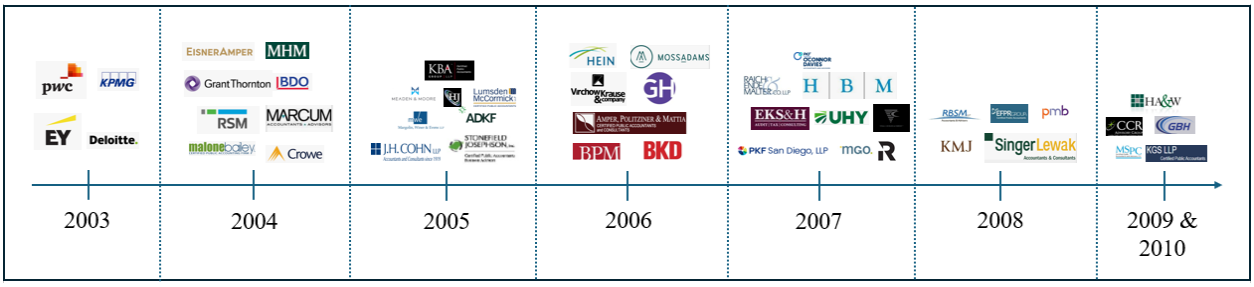

TABLE 1: Sample Selection

Table 1 outlines the sample selection process for this study.

	Observations
U.S.-incorporated clients of U.S. auditors at the intersection of Audit Analytics and Compustat for fiscal years 2001-2010	61,647
Less: Clients in regulated industries (SICs 4300-4999, 6000-6999)	-18,244
Less: Observations missing data for control variables	-10,784
Less: Clients that enter (leave) the sample after (before) their auditor's first inspection year	-4,666
Less: Observations without *TaxPlanningEffectiveness* data	-9,243
Less: Clients that change auditors in the current year or subsequent year	-3,813
Less: Clients with negative pre-tax income	-3,718
Less: Singleton observations	-25
***Full* sample of observations for tests of Equation (1)**	**11,154**
Less: Observations where *TaxPlanningEffectiveness* straddles the pre- and post-inspection era	-5,130
***Reduced* sample of observations for tests of Equation (1)**	**6,024**

TABLE 2: Full Sample Descriptive Statistics

Table 2 presents descriptive statistics for the full sample used in the primary analyses. All variables are formally defined in Appendix B.

Variable	N	Mean	Std. Dev.	p(25)	Median	p(75)
TaxPlanningEffectiveness	11,154	0.708	0.265	0.518	0.761	0.959
PostInspection	11,154	0.803	0.398	1.000	1.000	1.000
Age	11,154	24.156	14.989	12.000	19.000	35.000
Assets	11,154	6.391	1.892	5.116	6.453	7.646
DiscAcc	11,154	0.348	1.038	0.038	0.089	0.209
EquityIncome	11,154	0.001	0.004	0.000	0.000	0.000
Foreign	11,154	0.019	0.033	0.000	0.000	0.027
FreeCashFlows	11,154	0.065	0.080	0.023	0.066	0.110
Intangibles	11,154	0.174	0.178	0.021	0.117	0.280
Leverage	11,154	0.445	0.198	0.288	0.445	0.589
MarketToBook	11,154	2.794	2.306	1.427	2.140	3.355
NOLIndicator	11,154	0.722	0.448	0.000	1.000	1.000
ΔNOL	11,154	-0.001	0.053	0.000	0.000	0.000
PP&E	11,154	0.245	0.205	0.093	0.184	0.334
1/PretaxIncome	11,154	0.173	0.502	0.005	0.020	0.093
R&D	11,154	0.028	0.047	0.000	0.002	0.039
ROA	11,154	0.070	0.050	0.034	0.061	0.096
SalesGrowth	11,154	0.117	0.212	0.008	0.085	0.185
SpecialItems	11,154	-0.004	0.017	-0.006	0.000	0.000
ZScore	11,154	2.851	1.444	1.943	2.648	3.604

TABLE 3: PCAOB Inspection Exposure and Tax Planning Effectiveness

Table 3 presents the results of OLS estimations of Equation (1). Column (1) utilizes the full sample, while column (2) utilizes the reduced sample. Dependent variables are listed above their respective columns. Auditor (A), industry (I), and year (Y) fixed effects are excluded for brevity. Cluster (auditor) robust *t*-statistics are presented in parentheses below the corresponding coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed (one-tailed) tests for variables without (with) a prediction. All variables are formally defined in Appendix B.

	Pred.	(1)	(2)
		DV = TaxPlanningEffectiveness	
PostInspection	+	***0.043****	***0.104****
		(2.829)	***(2.808)***
Age		-0.000	-0.000
		(-1.176)	(-1.058)
Assets		0.031***	0.031***
		(7.993)	(6.544)
DiscAcc		-0.004***	-0.004**
		(-2.796)	(-2.046)
EquityIncome		0.680	0.748
		(1.230)	(1.389)
Foreign		0.054	0.033
		(0.487)	(0.280)
FreeCashFlows		0.030	0.018
		(0.608)	(0.208)
Intangibles		0.121***	0.084***
		(7.776)	(5.583)
Leverage		-0.136***	-0.158***
		(-5.246)	(-7.240)
MarketToBook		0.018***	0.021***
		(13.955)	(9.968)
NOLIndicator		-0.087***	-0.084***
		(-10.311)	(-6.826)
ΔNOL		-0.004	-0.058
		(-0.052)	(-0.564)
PP&E		0.074***	0.065*
		(3.523)	(1.733)
1/PretaxIncome		-0.017***	-0.019**
		(-3.662)	(-2.206)
R&D		-0.852***	-0.786***
		(-13.392)	(-6.851)
ROA		1.213***	1.144***
		(8.691)	(5.700)
SalesGrowth		-0.011	-0.015*
		(-0.947)	(-1.713)
SpecialItems		-0.260	-0.280
		(-1.398)	(-1.227)
ZScore		0.037***	0.032***
		(12.596)	(8.919)
Observations		11,154	6,024
Adjusted R-squared		0.339	0.342
Fixed Effects		A, I, Y	A, I, Y
Constant		Yes	Yes

TABLE 4: Changes in Tax Accruals Quality

Table 4 presents the results of an OLS estimation of a modified form of Equation (1). *TaxAQ* is the dependent variable in column (1). Auditor (A), industry (I), and year (Y) fixed effects are excluded for brevity. Cluster (auditor) robust *t*-statistics are presented in parentheses below the corresponding coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed (one-tailed) tests for variables without (with) a prediction. All variables are formally defined in Appendix B.

	Pred.	(1)
		DV = TaxAQ
PostInspection	+	***0.010******
		(2.462)
Observations		5,188
Adjusted R-squared		0.121
Controls		Yes
Fixed Effects		A, I, Y
Constant		Yes

TABLE 5: APTS Cross-Sectional Analysis

Table 5 presents the results of OLS estimations of Equation (1) with sample partitions. Columns (1) and (3) only include client-years with APTS purchases, and columns (2) and (4) only include client-years without APTS purchases. Columns (1) and (2) utilize the full sample, while columns (3) and (4) utilize the reduced sample. Dependent variables are listed above their respective columns. Auditor (A), industry (I), and year (Y) fixed effects are excluded for brevity. Cluster (auditor) robust *t*-statistics are presented in parentheses below the corresponding coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed (one-tailed) tests for variables without (with) a prediction. All variables are formally defined in Appendix B.

	Pred.	(1)	(2)	(3)	(4)
		DV = TaxPlanningEffectiveness			
APTS		Yes	No	Yes	No
PostInspection	+	***0.047******	***0.045***	***0.151******	***0.083***
		(2.852)	***(1.246)***	***(3.172)***	***(1.125)***
Observations		8,229	2,846	3,998	1,966
Adjusted R-squared		0.345	0.358	0.349	0.353
Controls		Yes	Yes	Yes	Yes
Fixed Effects		A, I, Y	A, I, Y	A, I, Y	A, I, Y
Constant		Yes	Yes	Yes	Yes

TABLE 6: Additional Knowledge Diffusion Tests

Table 6 presents the results of OLS estimations of Equation (1) with sample partitions. In Panel A, columns (1) and (3) only include client-years with above-median R&D (scaled by assets), and columns (2) and (4) only include client-years with below-median R&D (scaled by assets). In Panel B, columns (1) and (3) only include client-years with above-median intangible assets (scaled by assets), and columns (2) and (4) only include client-years with below-median intangible assets (scaled by assets). In Panel C, columns (1) and (3) only include client-years audited by an MSA tax expert, and columns (2) and (4) only include client-years not audited by an MSA tax expert. In each panel, columns (1) and (2) utilize the full sample, while columns (3) and (4) utilize the reduced sample. Dependent variables are listed above their respective columns. Auditor (A), industry (I), and year (Y) fixed effects are excluded for brevity. Cluster (auditor) robust *t*-statistics are presented in parentheses below the corresponding coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed (one-tailed) tests for variables without (with) a prediction. All variables are formally defined in Appendix B.

Panel A: R&D Cross-Sectional Analysis

	Pred.	(1)	(2)	(3)	(4)
		DV = TaxPlanningEffectiveness			
R&D		High	Low	High	Low
PostInspection	+	***0.051******	***0.014***	***0.126******	***0.080***
		(2.613)	***(0.658)***	***(2.785)***	***(1.234)***
Observations		5,570	5,560	3,004	2,997
Adjusted R-squared		0.371	0.345	0.388	0.334
Controls		Yes	Yes	Yes	Yes
Fixed Effects		A, I, Y	A, I, Y	A, I, Y	A, I, Y
Constant		Yes	Yes	Yes	Yes

Panel B: Intangibles Cross-Sectional Analysis

	Pred.	(1)	(2)	(3)	(4)
		DV = TaxPlanningEffectiveness			
Intangibles		High	Low	High	Low
PostInspection	+	***0.065******	***0.040****	***0.164****	***0.082***
		(3.401)	***(1.507)***	***(1.900)***	***(1.138)***
Observations		5,565	5,561	3,006	2,998
Adjusted R-squared		0.364	0.355	0.370	0.353
Controls		Yes	Yes	Yes	Yes
Fixed Effects		A, I, Y	A, I, Y	A, I, Y	A, I, Y
Constant		Yes	Yes	Yes	Yes

Panel C: MSA Tax Expert Auditor Cross-Sectional Analysis

	Pred.	(1)	(2)	(3)	(4)
		DV = TaxPlanningEffectiveness			
MSA Tax Expert		Yes	No	Yes	No
PostInspection	+	***0.066****	***0.047*****	***0.290*****	***0.128*****
		(1.724)	***(3.319)***	***(4.161)***	***(2.681)***
Observations		3,865	6,676	2,037	3,628
Adjusted R-squared		0.345	0.370	0.328	0.388
Controls		Yes	Yes	Yes	Yes
Fixed Effects		A, I, Y	A, I, Y	A, I, Y	A, I, Y
Constant		Yes	Yes	Yes	Yes

TABLE 7: Time Trends

Table 7 presents the results of OLS estimations of modified forms of Equation (1). *PostInspection* is replaced by *FalsePostInspection1* in column (1), and *FalsePostInspection2* in column (2). The sample years for the test in column (2) are 2011 through 2019. Dependent variables are listed above their respective columns. Auditor (A), industry (I), and year (Y) fixed effects are excluded for brevity. Cluster (auditor) robust *t*-statistics are presented in parentheses below the corresponding coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed (one-tailed) tests for variables without (with) a prediction. All variables are formally defined in Appendix B.

	Pred.	(1)	(2)
		DV = TaxPlanningEffectiveness	
FalsePostInspection1	+/-	***0.010***	
		(0.883)	
FalsePostInspection2	+/-		***0.002***
			(0.068)
Observations		11,154	6,972
Adjusted R-squared		0.339	0.362
Controls		Yes	Yes
Fixed Effects		A, I, Y	A, I, Y
Constant		Yes	Yes

TABLE 8: Alternative Tax-Related Outcomes

Table 8 presents the results of OLS estimations of modified forms of Equation (1). In Panel A, *APTS/AuditFees* is the dependent variable in column (1). In Panel B, *CashETR*, *GAAPETR*, and *BTDs* are the dependent variables in columns (1), (2), and (3), respectively. Auditor (A), industry (I), and year (Y) fixed effects are excluded for brevity. Cluster (auditor) robust *t*-statistics are presented in parentheses below the corresponding coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively, based on two-tailed (one-tailed) tests for variables without (with) a prediction. All variables are formally defined in Appendix B.

Panel A: Levels of APTS

	Pred.	(1)
		DV = APTS/AuditFees
PostInspection	+	***0.053****
		(1.904)
Observations		11,108
Adjusted R-squared		0.134
Controls		Yes
Fixed Effects		A, I, Y
Constant		Yes

Panel B: Effective Tax Rates and Book-Tax Differences

	Pred.	(1)	(2)	(3)
Dependent Variable		*CashETR*	*GAAPETR*	*BTDs*
PostInspection	-/-/+	***-0.017****	***-0.002***	***0.009****
		(-1.451)	***(-0.192)***	***(2.238)***
Observations		10,983	11,046	6,598
Adjusted R-squared		0.156	0.261	0.577
Controls		Yes	Yes	Yes
Fixed Effects		A, I, Y	A, I, Y	A, I, Y
Constant		Yes	Yes	Yes