What Does the Volatility of Tax Reserves Signal about Firms' Tax Strategies?

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Abstract: We examine whether a previously unexplored facet of firms' unrecognized tax benefits (UTBs)—their volatility—provides a relevant signal to external stakeholders about the risk underlying a firm's tax strategies. We posit that the volatility of UTB additions (UTB volatility) reflects managers' uncertainty about new and/or evolving tax strategies. As such, unlike the level of UTBs or ETR volatility, UTB volatility can provide an early signal of changes in tax activities that can result in increased risk. Consistent with UTB volatility capturing changing and/or unfamiliar tax positions, we find that higher UTB volatility is associated with more volatile R&D and tax planning expenditures and with geographic expansion. Moreover, firms with higher UTB volatility experience greater changes in the level and volatility of future ETRs, which suggests that UTB volatility indicates a change in tax strategies. Because evolving tax strategies could increase firm risk, we examine and find that UTB volatility is associated with external parties' perceptions of risk, including greater IRS scrutiny and future tax settlements, lower credit ratings and firm value, and greater future return volatility. UTB volatility is incrementally more informative about risk-related firm outcomes than ETR volatility, the level of UTBs, and other underlying firm activities. Overall, our results suggest that UTB volatility serves as a unique signal of managers' ex ante uncertainty about a firm's tax positions that is relevant for the risk assessment of various stakeholder groups.

Keywords: Unrecognized tax benefits, ASC 740, volatility, tax uncertainty, tax strategy, risk relevance, audit risk, compliance risk, credit risk, IRS scrutiny

JEL Codes: G10; M41; H26

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I.   INTRODUCTION

We examine whether the volatility of unrecognized tax benefits (UTBs) provides a signal to external stakeholders of managers' ex ante uncertainty about evolving tax positions and strategies. The FASB's objective when enacting FIN 48 was for firms to provide value-relevant information about the uncertainty and risk exposure of their tax positions through UTBs (FASB 2006). However, because of assumptions required by the standard (e.g., 100 percent probability of audit), many UTBs are not realized (Robinson et al. 2016). Although prior research has used the level of UTBs as a measure of tax-related risk and uncertainty (e.g., Lisowsky et al. 2013; Hanlon et al. 2017; Dyreng et al. 2019), the fact that UTBs are subject to unique recognition and measurement criteria could explain why the evidence thus far is inconsistent with the level of UTBs reflecting tax-related risk (Hutchens and Rego 2015; Guenther et al. 2017). We propose that the volatility of UTBs related to current tax positions (hereafter, UTB volatility) provides unique information about the riskiness of a firm's tax strategies. Volatile UTBs likely reflect new or different tax positions, whereas non-volatile UTBs likely reflect stable, persistent tax practices. New tax positions are likely less familiar (and, therefore, more uncertain) than existing tax positions, as managers may lack adequate information and expectations about the position's ultimate realization. As such, UTB volatility can provide an early signal of changing tax strategies and increased tax-related uncertainty that is informative to external stakeholders. In this study, we investigate whether external stakeholders perceive UTB volatility as a signal of the risk arising from a firm's changing tax strategies.

Understanding the implications of UTB volatility is important for evaluating the decision-usefulness of information required under FIN 48. Reflecting the prior literature's lack of consensus about the information conveyed by the level of UTBs, Blouin and Robinson (2014) state, in their

post-implementation review of FIN 48, that "it is not entirely clear how investors are using [UTB] information, and whether they correctly interpret the information that is being conveyed," in part because "similar uncertain tax positions may be recorded differently across firms" (p. 488).[1] That is, the same tax position can result in different levels of UTBs, and the same level of UTBs can represent tax positions with different levels of risk. We contend that, unlike the level of UTBs, the volatility of UTBs over time better captures the constant or evolving nature of a firm's tax practices, which could increase real or perceived risk related to a firm's tax positions and draw attention from tax authorities.[2] Additionally, unlike the volatility of effective tax rates (ETRs), which is less timely (ex post) and outcome-dependent, the volatility of UTBs provides an early signal of changes in managers' assessments of tax uncertainty based on their private information. Thus, to expand our understanding about the information provided under FIN 48, we examine whether UTB *volatility* serves as a relevant signal to external parties about a firm's tax strategies and the accompanying tax-related uncertainty.

UTB volatility can convey important information about the risk profile of firms' tax strategies. We expect the more volatile the firm's UTB additions, the more likely the additions are related to changes in tax strategy that result in new or different tax positions. Undertaking new and unfamiliar tax positions, or expanding or contracting existing tax positions, could increase

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[1] These differences in the recording of UTBs occur because, to improve consistency and comparability in reporting, the FASB requires firms to assume each tax position will be audited. Thus, tax positions that may never be audited generate liabilities that remain on firms' books until the position is audited or the statute of limitations expires. Moreover, the relative reporting conservatism of managers can contribute to some firms having higher UTB balances than others for the same position.

[2] We consider the volatility of UTB additions rather than alternative metrics (such as year-over-year changes in UTBs or UTB additions) because volatility over time better reflects the changing nature of a firm's tax strategies relative to singular events. For instance, decreases in UTB additions do not necessarily suggest reductions in tax uncertainty, only that fewer new positions are added in a given year. See Appendix B for a hypothetical example that compares inferences from different metrics based on UTBs. Additionally, we focus on UTB additions related to current year tax positions to better map changes in tax strategies to future outcomes. Nevertheless, in additional analyses in Sec. 5.4, we repeat the tests of our hypotheses using alternative metrics, including changes in UTB additions and the volatility of other components of UTBs (i.e., UTBs related to prior year positions and the UTB ending balance).

managers' uncertainty about the likelihood of successful challenge by tax authorities.[3] Changes in

tax law or other new information can also alter managers' judgement about existing tax positions,

leading to greater uncertainty. Greater managerial uncertainty could increase real or perceived risk

in the view of external parties if managers underestimate the risk exposure of new tax positions, if

managers fail to be fully compliant due to their unfamiliarity with a new or changing position, or

if evolving tax strategies attract greater tax authority scrutiny that leads to heightened audit risk.

On the other hand, UTB volatility may not provide useful information about the risk profile

of a firm's tax strategies if non-volatile UTBs also reflect equally risky tax positions, if firms

exercise greater caution when implementing new tax strategies, or if UTB volatility primarily

reflects financial reporting choices, such as incentives to manipulate the tax reserve to manage

earnings (e.g., Cazier et al. 2015). Finally, UTB volatility may not serve as a useful signal if

external parties do not utilize or respond to UTB volatility. Ultimately, if UTB volatility provides

a signal about managers' uncertainty arising from evolving tax strategies, then we expect it to be

associated with risk-related responses by external stakeholders.

To examine our question, we use a sample of U.S. public firm-year observations from

2011-2021 that report at least three years of UTB additions. Our main variable of interest, UTB

volatility, is measured as the coefficient of variation of UTB additions related to current year tax

positions over the period *t-4* to *t*. We first provide evidence to validate our assertion that UTB

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[3] For example, consider two firms, Firm A and Firm B, that have the same total balance of UTBs related to new tax positions over a given period. Firm A's tax strategy and tax positions are relatively consistent over time; thus, the same amount of UTB additions is recorded each year for current year tax positions, resulting in persistent UTB additions. In contrast, Firm B's tax planning is evolving, and its tax positions vary over time; thus, a different amount of UTB additions is recorded each year for current year tax positions, resulting in volatile UTB additions. Although these two firms have the same total UTB additions, the uncertainty and risk underlying their tax strategies differ due to the firms' familiarity with the tax positions they undertake. Given the evolving nature of Firm B's tax strategy, we expect Firm B to experience greater ex ante tax uncertainty than Firm A. See Appendix B for a detailed illustration and comparison of these situations. In addition, in Appendix C, we provide examples of firms from our sample that have high and low UTB volatility, as determined by their 10-K disclosures.

volatility represents evolving tax planning that could generate ex ante tax uncertainty. When investigating firm characteristics that contribute to UTB volatility, we find that firms with higher UTB volatility have more volatile research and development and tax planning expenditures, as well as more volatile pre-tax book income. Moreover, firms that are expanding geographically and that have more leverage and net operating losses are more likely to have volatile UTBs. These results are consistent with changes in business operations that would create a need to adapt tax strategies. Next, we find that UTB volatility is associated with changes in future ETR levels and volatility, which is consistent with UTB volatility serving as an early signal of evolving tax strategies. Specifically, we find that firms with volatile UTB additions experience, on average, greater changes in the level and volatility of future ETRs than firms with persistent UTB additions. Moreover, we find that volatile UTBs do not map into cash taxes paid for at least three years, providing additional evidence that UTB volatility signals evolving tax planning that requires time to be reflected in tax outcomes. In combination, our analyses suggest that UTB volatility is indicative of evolving tax strategies, which likely leads to increased tax-related uncertainty.

To examine whether external stakeholders utilize UTB volatility as an early signal of risk associated with firms' tax strategies, we investigate the association between UTB volatility and risk from the perspective of various stakeholders using tax authority audit and compliance risk, credit risk, and current and future firm risk. If UTB volatility reflects managers' private information about the risk underlying changing tax strategies, we expect it will be associated with increased risk as assessed by tax authorities, creditors, and investors.

Our results confirm our expectations. We find that firms with more volatile UTBs are more scrutinized by the IRS and pay out greater settlement amounts in future periods. Increasing UTB volatility by one standard deviation results in an increase in IRS scrutiny of 2.7% and an increase

in the amount of UTBs released through settlements of 58.5%. These results suggest that tax authorities are more likely to challenge the tax positions of firms with more volatile UTBs, consistent with UTB volatility signaling evolving tax planning that increases tax authority audit and compliance risk. We also find that firms with greater UTB volatility have lower credit ratings, suggesting creditors view these firms as relatively riskier. A one standard deviation increase in UTB volatility is associated with a 2.2% decline in long-term credit ratings. Finally, we find that firms with greater UTB volatility have lower firm value and higher one-year-ahead stock return volatility. A one standard deviation increase in UTB volatility is associated with a 3.2% decrease in firm value and an increase in stock return volatility of 1.3%, consistent with UTB volatility increasing investors' perceptions of firm risk and signaling increased future overall risk.

In contrast to our results using UTB volatility, we do not find a consistent relation between the *level* of UTBs and these risk-related outcomes, similar to conflicting evidence in prior work regarding the signal provided by the UTB balance about the uncertainty of firms' tax positions. Moreover, we control for ETR volatility in all models; thus, the information that UTB volatility provides about managers' private assessments of ex ante tax uncertainty is separate and distinct from the information conveyed by variation in ex post tax outcomes. We also find a robust association between UTB volatility and risk-related outcomes for firms with high and low levels of UTB additions. Lastly, the associations we document in our hypothesis tests only hold with the volatility of UTB additions related to *current year* positions, which suggests that current year UTBs uniquely reflect changes in tax strategies that potentially increase risk.[4] In combination, our results support the notion that the volatility of UTB additions reflects tax strategies that generate greater uncertainty, which increases external parties' perceptions of risk. Moreover, our findings

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[4] In additional analyses, we do not find significant associations between the risk-related outcomes in our hypothesis tests and the volatility of alternative UTB line items (i.e., UTB additions related to prior year positions or total UTBs).

for UTB volatility are consistent with the FASB's arguments that additional disclosure about uncertain tax positions would communicate new information to financial statement users.

In additional analyses, we address alternative explanations for our results and provide insight into whether UTB volatility reflects more aggressive tax reporting practices. Controlling for key determinants of UTB volatility, we continue to find that UTB volatility is associated with risk-related outcomes incremental to underlying firm activities, suggesting that it provides a distinct signal of managers' uncertainty arising from changing tax planning. We also do not find that our results are driven by firms likely to have engaged in earnings management through UTB reserves (e.g., Cazier et al. 2015). Finally, we do not find evidence that UTB volatility is associated with an increased likelihood of an unfavorable settlement (e.g., Finley 2019). The results indicate that firms with more volatile UTBs are more likely to be audited by the IRS and pay a settlement, but that these settlements do not exceed firms' UTB reserves, suggesting managers record conservative reserves for new tax positions that create UTB volatility.

Our study contributes to the literature and practice in several ways. First, we provide evidence that the *volatility* of UTBs is a more consistent signal of tax uncertainty and risk than the *level* of UTBs because it reflects new and unfamiliar tax positions; thus, our study helps explain the mixed findings in prior literature about the information conveyed by the level of UTBs. Our study is also potentially useful to researchers by providing an easily implementable measure that captures evolving tax planning. Second, our study answers the call in Blouin and Robinson (2014) to explore the decision relevance of UTB disclosures to various stakeholders. Our findings suggest that UTB volatility conveys a negative signal to investors and creditors about the risk underlying firms' tax strategies and, consistent with that signal, the IRS is successful in obtaining larger settlements. As such, our results should interest practitioners because they suggest that changing

tax positions increase the likelihood of successful challenge by the IRS. Finally, our results suggest that the FASB's intent to increase the "relevance and comparability in the financial reporting of income taxes" by implementing FIN 48 may not have been achieved (FASB 2006). Specifically, the same level of UTBs for different firms can reflect different levels of tax uncertainty, reducing the comparability of reporting for uncertain tax positions. However, the volatility of UTBs over time can provide useful information, enhancing transparency about firms' tax positions. Knowing whether FIN 48 improves transparency about tax uncertainty is especially timely because the FASB has recently enacted additional updates to the accounting for income taxes standard targeted at improving the transparency of tax disclosures (FASB 2023).

II. PRIOR LITERATURE AND HYPOTHESIS DEVELOPMENT

2.1 Prior Literature on Unrecognized Tax Benefits

Codified as ASC 740, FIN 48 standardized the measurement and reporting of income tax reserves in the financial statements. FIN 48 requires firms to book a tax reserve (i.e., an unrecognized tax benefit or UTB) for uncertain tax positions. Tax positions are considered uncertain when the firm is unsure whether the treatment of the tax position will be sustained on its merits by the relevant tax authority. Uncertain tax positions exist because the tax law must be general enough to apply to a wide range of situations, leading to differing interpretations by taxpayers and tax authorities that could result in disagreement about the treatment of a tax position.

Firms undertaking uncertain tax positions are potentially riskier, and thus, information about their underlying tax positions and strategies is valuable to financial statement users and other stakeholders. Information about uncertain tax positions can also help tax authorities identify tax positions that are more likely to be successfully challenged or overturned upon audit (e.g., Bozanic

et al. 2017). As such, understanding what UTBs reveal about managers' private information about firms' tax strategies is important to both financial statement users and regulators.

Despite concerns that UTB disclosures required under FIN 48 would provide a roadmap for revenue audits for the IRS (e.g., Blouin and Robinson 2014), prior research does not provide evidence consistent with that concern. Robinson et al. (2016) estimate that only $0.24 of every dollar of UTBs results in a tax settlement with revenue authorities, while Gleason et al. (2023) find that FIN 48 resulted in improvements in the mapping of income tax expense into future tax cash flows regardless of firms' level of IRS audit risk. In addition, prior studies find that firms exercise considerable discretion when applying FIN 48 (i.e., De Simone et al. 2014a; Cazier et al. 2015; Towery 2017), despite the FASB's goal of improving consistency, comparability, and transparency in reporting reserves for uncertain tax positions. The lack of UTB realization and the differences in recording UTBs arise because FIN 48 requires firms to assume each tax position will be audited. Thus, firms accrue a liability for tax positions that may never be audited, and those liabilities remain on the firm's books until the position is either audited or the statute of limitations expires. Moreover, given the discretion permitted by FIN 48, managerial conservatism can affect the amount of UTBs accrued. For example, firms with conservative managers may report higher UTB balances even if the firm's tax positions are not very uncertain, whereas firms with less conservative managers might report lower UTB balances for relatively uncertain tax positions. Thus, the same tax position can result in different levels of UTBs, and the same level of UTBs can represent tax positions with different levels of risk (De Simone et al. 2014). Therefore, the *level* of UTBs reported may not provide the tax authority or other users clear information about managers' assessment of the uncertainty or risk of the tax positions underlying firms' tax strategies.

Reflecting the lack of clarity regarding the information conveyed by UTB disclosures, prior work uses the level of UTBs or UTB additions as a proxy for tax aggressiveness, tax risk, and/or tax uncertainty (e.g., Rego and Wilson 2012; Lisowsky et al. 2013; Hutchens and Rego 2015; Hanlon et al. 2017; Dyreng et al. 2019), but finds mixed results about its implications for risk.[5] For instance, Lisowsky et al. (2013) find that the level of UTBs is associated with aggressive and risky tax positions (i.e., tax shelters), and Rego and Wilson (2012) find it is associated with managerial risk-taking. However, Guenther et al. (2017) do not find an association between the level of UTBs and future firm risk or future tax rate volatility, and Hutchens and Rego (2015) find either no association or a negative association between UTBs and firm risk. Similarly, Ciconte et al. (2024) and Gleason et al. (2023) find that UTBs are predictive of future tax cash outflows, while Koester et al. (2015) find that the level of UTBs is positively associated with firm value, which is inconsistent with UTBs being indicative of tax-related risk. Thus, the prior literature is inconclusive regarding what information the *level* of UTBs conveys, particularly about the risk or uncertainty of the tax positions that comprise firms' tax strategies.

2.2 Hypothesis Development

The inconclusive results of prior studies suggest that the *level* of UTBs does not provide adequate information to gauge the underlying risk or uncertainty of firms' tax practices. We propose that the volatility of UTBs provides unique information to external parties about the riskiness of firms' uncertain tax positions because it reflects changes in tax strategies and firms'

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[5] Similar to Dyreng et al. (2019), we refer to tax uncertainty as managers' uncertainty regarding the ultimate outcome of a tax position, resulting in a loss of tax benefits. Ex ante tax uncertainty may or may not result in greater tax-related risk. For instance, Neuman (2023) finds that some firms are able to engage in sustainable tax avoidance long term. Managers undertaking new and unfamiliar tax positions may face greater uncertainty and fully reserve for the tax position. In this case, UTBs should reflect the upper bound of potential losses from a tax position, and therefore, are not particularly risky for valuation purposes. On the other hand, managers taking unfamiliar tax positions may record no reserve (for instance, for neglecting to file a state tax return), in which case potential losses may be extensive, resulting in greater tax risk. Our hypothesis tests speak to these possibilities.

familiarity with the tax positions undertaken. Firms that undertake similar tax positions over time will likely have persistent UTBs, as the same or similar amounts of UTBs are added for the current year positions. Firms with evolving tax strategies are likely to record different amounts of UTB additions each year to reflect changing tax positions, resulting in increased UTB volatility. See Appendix B for a detailed example of these two types of firms.

UTBs related to tax positions a firm has successfully claimed in the past can be persistent for multiple reasons. First, because FIN 48 does not permit consideration of audit or detection risk, UTBs must still be recorded for uncertain tax positions that are unlikely to be audited. If an uncertain tax position is never audited, then a firm has no basis for updating the reserve related to the position. Second, firms may still record UTBs for uncertain tax positions that have previously been audited if the issue at hand is not considered "effectively settled" (ASC 750-10-25-10), for instance, if there is a possibility of a determination being reversed on appeal. Thus, although uncertain tax positions that are not challenged (or challenged unsuccessfully) on audit may be viewed as less uncertain in the future, firms may not update the UTB reserve. Finally, UTBs also reflect accounting choices, and conservative managers may choose to record a UTB for tax positions that the firm has successfully benefitted from over time (see Guenther et al. 2017).

UTB additions can be volatile for several reasons that increase tax-related uncertainty. First, firms' tax planning could be evolving, leading the firm to undertake new and unfamiliar positions. If these new positions are uncertain, then the firm will book a reserve for these tax positions that likely differs from reserves for existing positions, resulting in volatile UTB additions over time. Second, the firm might expand an existing activity or tax position; for example, the firm might experience growth in overseas earnings or research and development. The increased size and complexity associated with expanded positions could create added uncertainty for the firm,

resulting in increased tax-related risk and volatile UTB additions. Third, UTBs can be volatile if managers' judgment regarding the likely tax benefits from a tax position has changed (e.g., due to changing tax laws or new information revealed through a revenue audit). Different UTB additions (relative to prior years) for the same tax position can convey a change in the underlying risk of firms' tax strategies arising from managers' evolving understanding of the tax treatment of the position. These reasons for volatile UTB additions suggest that UTB volatility signals increased managerial uncertainty about the risk of firms' tax positions.

We anticipate that more volatile UTB additions are likely due to expanded, different, or unfamiliar tax positions, increasing managers' ex ante uncertainty about whether the treatment of those tax positions will be sustained upon tax authority audit. Managers' ex ante tax uncertainty could contribute to increased firm risk if managers underestimate the risk exposure of new tax positions, lack familiarity with the compliance requirements of the tax position, or if novel and diverse tax positions draw more attention from tax authorities (e.g., Watson 2013; Bozanic et al. 2017). If volatile UTBs signify more managerial uncertainty due to changing tax planning, then we expect it to be associated with actual or perceived risk.

Alternatively, UTB volatility may not provide a value-relevant signal about risk for several reasons. First, firms with non-volatile, consistent UTB additions can still have risky tax positions. We argue that firms accruing similar tax reserves each year face less uncertainty because they are likely more familiar with the underlying positions. However, even familiar tax positions can contain risk, particularly if the position has not been audited. If stakeholders perceive no difference in the risk or uncertainty of the tax strategies of firms with consistent or volatile UTBs, then UTB volatility will not be associated with increased risk-related responses. Second, it is possible that firms undertaking new and unfamiliar tax positions exercise greater caution and conservatism in

implementing and reporting the tax position. Firms could devote more attention and resources to the execution of new tax strategies to ensure they are compliant, which could result in less perceived or real risk. At the same time, firms may over-reserve for unfamiliar tax positions, contributing to UTB volatility. Thus, if the volatility of UTBs reflects new tax positions that are viewed as less risky, we would not expect to find a positive association with risk-related responses. Third, UTB volatility may not signal increased tax risk to external parties if it primarily reflects financial reporting choices. Prior literature finds evidence of earnings management through the tax reserve, which adds noise to the information conveyed by UTBs (e.g., Cazier et al. 2015; Gupta et al. 2016). If UTBs are volatile due to tax reserve manipulation, we would not expect UTB volatility to provide useful information about tax-related risk. Finally, UTB volatility will not be associated with risk-related outcomes if external parties do not use or respond to UTB volatility.

We examine how evolving tax strategies, as reflected through UTB volatility, affect risk-related responses for several sets of stakeholders: tax authorities, creditors, and investors. First, volatile UTBs could attract greater tax authority scrutiny if they signal to tax authorities that firms are undertaking new and unfamiliar positions, which could be audited and successfully challenged. Bozanic et al. (2017) find that IRS downloads of firms' 10-Ks increased following FIN 48, suggesting that the IRS utilizes tax-related financial statement disclosures. Additionally, if volatile UTBs reflect new and unfamiliar tax positions, managers face a higher likelihood of failing to comply with necessary tax requirements. This noncompliance can result in the tax positions being challenged on audit, which could lead to greater settlements with tax authorities (e.g., Christensen et al. 2019; Finley and Stekelberg 2022). In addition, Finley and Stekelberg (2022) show that UTBs released through settlements are associated with increased tax authority monitoring. Thus, if UTB volatility draws tax authority scrutiny or poses a compliance risk, we expect it to be positively

associated with IRS 10-K downloads and future UTBs released through settlements. We state our first set of hypotheses as follows:

H1a: The volatility of UTBs is positively associated with IRS 10-K downloads.

H1b: The volatility of UTBs is positively associated with future tax settlements.

Second, we examine whether UTB volatility increases perceived risk by creditors by examining its association with credit risk. Using non-UTB-based measures, Hasan et al. (2014) and Shevlin et al. (2020) find that aggressive tax avoidance is associated with increased bank loan spreads, which suggests that creditors price protect in the presence of risky tax avoidance. However, Bonsall et al. (2017) find that credit ratings agencies disagree in their interpretation of how tax avoidance (and the level of UTBs) influences credit risk. Their findings suggest that the level of UTBs does not unambiguously represent greater risk related to the cash flow realizations of uncertain tax positions. In contrast to the level of UTBs, if *volatility* in UTBs reflects new and unfamiliar tax positions that potentially increase credit risk, then we expect creditors to incorporate that information into their credit ratings. We state our next hypothesis as follows:

H2: The volatility of UTBs is negatively associated with credit ratings.

Next, we consider whether volatile UTB additions convey information about the overall risk profile of a firm's existing tax planning by examining whether UTB volatility is associated with firm value. Prior studies find that investors positively value tax avoidance but negatively perceive tax-related risk (e.g., Goh et al. 2016; Drake et al. 2019). If UTB volatility signals greater tax uncertainty that increases tax-related risk, then we expect it to be negatively associated with firm value, leading to our third hypothesis.

H3: The volatility of UTBs is negatively associated with firm value.

Finally, we examine whether the volatility of UTBs is associated with investor expectations about *future* firm risk. Guenther et al. (2017) do not find an association between the *level* of UTBs and future firm risk, as measured by future return volatility. However, if the *volatility* of UTB additions signals greater overall risk due to ex ante tax uncertainty, then we expect it will be reflected in the market's assessment. We state our final hypothesis in the alternative form.

H4: The volatility of UTBs is positively associated with future firm risk.

III.   RESEARCH DESIGN AND METHODOLOGY

3.1 Measuring UTB Volatility

We measure UTB volatility as the coefficient of variation of UTB additions related to current year tax positions (*CV_UTB*). We compute this variable as the standard deviation of current year UTB additions over the period *t-4* to *t*, scaled by the absolute value of mean current year UTB additions over the same period.[6] We focus on UTB additions related to current year positions to identify new changes in tax strategy that may influence the risk exposure of the firm (e.g., Dyreng et al. 2019). Using the coefficient of variation effectively controls for firm size and provides a sense of relative magnitude, which permits us to meaningfully compare the volatility of UTBs across firms (e.g., Minton et al. 2002; McGuire et al. 2013; Neuman 2023). An additional benefit of using the coefficient of variation is that it holds constant the level of conservatism in accounting for UTBs. In other words, although some firms might book larger, more conservative UTBs than others, the volatility of UTBs relative to the mean level of UTBs will capture changes in tax strategy, regardless of the typical level of conservatism with which firms report UTBs.

Moreover, we examine the volatility of UTBs over time rather than a year-over-year change in UTBs because we seek to measure the ongoing risk and uncertainty of tax positions that

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[6] The results of our hypothesis tests are robust to measuring *CV_UTB* over three rather than five years, and to scaling UTB additions by total sales, total assets, or the beginning balance of UTBs (e.g., Dyreng et al. 2019).

comprise a firm's tax strategy rather than singular events that may not represent a change in risk. For instance, a year-over-year decrease in UTB additions does not necessarily suggest a *reduction* in risk; it simply means that no additional uncertain positions were undertaken in the current year. We require firms to have UTB additions in at least three of the five years used to measure UTB volatility because, to examine whether the pattern of UTB additions is informative of firms' tax planning, firms must regularly record reserves for uncertain tax positions. A *CV_UTB* value greater than one indicates that the volatility of UTB additions exceeds the average UTB addition over the timeframe. See Appendix C for examples of firms with high and low UTB volatility in our sample.

In Appendix B, we use a stylized example to illustrate differences in the inferences obtained using *CV_UTB* and alternative metrics used to measure tax uncertainty in prior literature. Specifically, we compare the value of tax uncertainty over time for two firms—one with constant UTB additions (Firm A) and one with volatile UTB additions (Firm B)—when we measure tax uncertainty using (1) the level of UTBs (e.g., Guenther et al. 2017), (2) the level of current year UTB additions (e.g., Dyreng et al. 2019), (3) changes in UTB additions, and (4) UTB volatility (*CV_UTB*). We argue that firms with more volatile UTBs likely exhibit greater tax uncertainty, so an appropriate metric for tax uncertainty should yield a higher value for Firm B than for Firm A. Over ten years, only UTB volatility always returns a higher value for Firm B than for Firm A, consistent with UTB volatility reflecting tax uncertainty more reliably than alternative measures.

3.2 Validation of UTB Volatility

Before conducting tests of our hypotheses, we first provide evidence to validate our conjecture that the volatility of UTBs likely reflects changes in tax positions and evolving tax strategies by examining (1) factors that contribute to UTB volatility and (2) its relation to the level and volatility of future ETRs. If UTB volatility reflects changing tax strategies that give rise to tax

uncertainty, we expect it to be associated with firm activities that have a tax effect or changes in business operations that would create the need to adapt tax strategy. Similarly, we expect evolving tax strategies to result in a change in the level of future cash taxes paid, as well as the variation in future cash taxes paid, as the outcomes of these new tax strategies are realized.

A firm can reassess and alter its tax strategies or undertake new tax planning opportunities if it undergoes a change in organizational structure, engages in acquisitions or divestitures, or enters a new jurisdiction. For instance, expanding into a new jurisdiction can provide firms with greater income mobility and facilitate income shifting (e.g., De Simone et al. 2014b; Klassen and Laplante 2012). A change in tax strategy can result in ex ante uncertainty about whether a tax position will be sustained, manifesting as volatile UTBs. Thus, in our first validation test, we investigate the factors that contribute to UTB volatility and examine whether UTB volatility is consistent with evolving tax planning by estimating the following model:

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\begin{aligned}
CV\_UTB_{i,t} = {} & \beta_0 + \beta_1 CV\_R\&D_{i,t} + \beta_2 CV\_APTS_{i,t} + \beta_3 CV\_FI_{i,t} + \beta_4 ChgGeoSeg_{i,t} \\
& + \beta_5\, Five\ Year\ ETR_{i,t} + \beta_6\, Count\_AQC_{i,t} + \beta_7 Intro\_Firm_{i,t} + \beta_8 Decline\_Firm_{i,t} \\
& + \beta_9 CV\_PTBI_{i,t} + \beta_{10} Five\ Year\ UTBs_{i,t} + \beta_{11} NOL\_Indicator_{i,t} + \beta_{12} Delta\_NOL_{i,t} \\
& + \beta_{13} AvLeverage_{i,t} + \beta_{14} AvSize + Industry\ FE + Year\ FE + \varepsilon_{i,t}. \quad\quad (1)
\end{aligned}
$$

CV_UTB is defined as above. Because the research and development (R&D) tax credit is a common source of tax uncertainty (Nesbitt 2014; Laplante et al. 2019), we expect UTB volatility to vary positively with volatility in R&D activity ($CV\_R\&D$). CV_APTS is the volatility of payments to the auditor for tax services (APTS), which are likely to vary over time if firms engage tax service providers to implement new or expanded tax strategies rather than administer existing strategies. As such, we expect CV_UTB to be positively associated with CV_APTS. We include CV_FI, the volatility of pre-tax foreign income scaled by total pre-tax income, which captures the volatility of firms' foreign activity and likely affects the uncertainty related to firms' foreign tax

positions. Like *CV_UTB,* the variables *CV_R&D, CV_APTS,* and *CV_FI* are computed as the coefficient of variation of R&D, APTS, and foreign income, respectively, over the period *t-4* to *t*.

We further expect firms likely undertake new uncertain tax positions when they expand into additional tax jurisdictions. Therefore, we expect *CV_UTB* to vary positively with the change in a firm's number of geographic segments (*ChgGeoSeg*). Moreover, because merger and acquisition (M&A) activity often gives rise to UTBs (Savoy 2017) and changes in tax planning, we expect UTB volatility to be positively associated with the number of years from *t-4* to *t* in which a firm engages in M&A activity (*Count_AQC*).

We also control for additional firm characteristics that likely affect the volatility of UTBs, including the long-term cash ETR (*Five Year ETR*), the sum of UTB additions over the five-year period (*Five Year UTBs*) (Dyreng et al. 2019), the volatility of pre-tax income (*CV_PTBI*), and the life cycle stage of the firm (*Intro_Firm* and *Decline_Firm*). In addition, we include controls for loss firms (*NOL_Indicator*), loss utilization (*Delta_NOL*), average leverage (*AvLeverage*), and average firm size (*AvSize*). Finally, we include industry (2-digit SIC) and year fixed effects and cluster standard errors by firm. See Appendix A for detailed variable descriptions.

In Table 3, Panel A, we present the results of estimating Eqn. (1). As expected, *CV_UTB* is positively associated with *CV_R&D* and *CV_APTS* and with increases in geographic segments (*ChgGeoSeg*), consistent with UTB volatility (and ex ante tax uncertainty) arising from firm expansions in innovation, operating jurisdictions, and tax planning. We also find that operating volatility (*CV_PTBI*), the presence of NOLs (*NOL_Indicator*), and leverage (*AvLeverage*) contribute to UTB volatility. Finally, we find that larger firms (*AvSize*) and firms that are earlier in their life cycle (*Intro_Firm*), which are likely to have more consistent tax planning or to be less focused on tax planning, respectively, are less likely to have volatile UTBs.

In our second validation test, we investigate whether UTB volatility is associated with future changes in the level of cash ETRs and cash ETR volatility.[7] If UTB volatility captures more uncertain tax strategies, we expect it to be associated with a change in future tax outcomes. To test the association between UTB volatility and future changes in the level of cash ETRs and cash ETR volatility, we estimate the following model:

$$ETR\ Change_{i,t+5}/Volatility\ Change_{i,t+5} = \beta_0 + \beta_1 CV\_UTB_{i,t} + \beta_2 CV\_R\&D_{i,t} + \beta_3 CV\_APTS_{i,t}$$
$$+ \beta_4 CV\_FI_{i,t} + \beta_5 ChgGeoSeg_{i,t} + \beta_6 Five\ Year\ ETR_{i,t} + \beta_7 Count\_AQC_{i,t} + \beta_8 Intro\_Firm_{i,t5}$$
$$+ \beta_9 Decline\_Firm_{i,t} + \beta_{10} CV\_PTBI_{i,t} + \beta_{11} Five\ Year\ UTBs_{i,t} + \beta_{12} NOL\_Indicator_{i,t}$$
$$+ \beta_{13} Delta\_NOL_{i,t}\ \beta_{14} AvLeverage_{i,t} + \beta_{15} AvSize + Industry\ FE + Year\ FE + \varepsilon_{i,t}. \qquad (2)$$

Specifically, we regress the quintile-ranked absolute change in cash ETR (*ETR Change*) or ETR volatility (*Volatility Change*) from the four years preceding the current year (*t-4* to *t*) to the four years following the current year (*t+1* to *t+5*) on *CV_UTB* and the same control variables as in Eqn. (1). We expect a positive association between *CV_UTB* and *ETR Change/Volatility Change* (β_1) because it indicates that firms with higher current UTB volatility are associated with greater changes in the level and volatility of future cash ETRs. Such results are consistent with the current period's evolution in tax planning changing the future realization of firms' tax outcomes.

Table 3, Panel B reports the associations between *CV_UTB* and *ETR Change* (*Volatility Change)*. We find that UTB volatility is positively associated with changes in the level and volatility of future cash ETRs, suggesting that the changing tax strategies represented by volatile UTBs are eventually realized through taxes paid and affect the variation in future tax outcomes.

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[7] In untabulated tests, we also explore how UTB volatility affects the mapping of UTBs into future cash taxes paid. Specifically, for firms with high and low UTB volatility, we examine how total UTBs unwind into future cash taxes paid over the next three years, following Ciconte et al. (2024). We select a three-year horizon to correspond to the statute of limitations (Lisowsky et al. 2013) and to reflect the fact that most IRS audits conclude within three years (Finley and Stekelberg 2022). Consistent with Ciconte et al. (2024), we find that UTBs are strongly associated with future one- to three-year cash taxes paid for firms with low UTB volatility. In contrast, UTBs are not associated with future one- to three-year cash taxes paid for firms with high UTB volatility. The reduced mapping for high UTB volatility firms is consistent with *CV_UTB* being associated with future changes in ETRs and the volatility of ETRs and with the UTBs of these firms being unpredictable because they capture novel and unfamiliar tax positions.

We also graphically examine changes in the cash ETR over time for firms with different levels of UTB volatility. Specifically, we graph the absolute change in the mean cash ETR (ETR volatility) for firms in the highest and lowest quintiles of *CV_UTB* during the four years preceding the current year (over which UTB volatility is measured) and the four years following the current year (Figure 1). Consistent with UTB volatility reflecting evolving tax strategies that eventually affect cash taxes paid, we find that mean future cash ETRs and ETR volatility changed more for firms with high UTB volatility than for firms with low UTB volatility (*t*-stat for difference between groups = 7.623 and 8.521, respectively).

Collectively, these results suggest that expanding existing tax positions or undertaking new tax positions, as evidenced through investments in innovation, changes in tax services, or growth in foreign jurisdictions, contribute to more volatile UTBs. Moreover, firms with volatile UTBs tend to have greater changes in the level and volatility of *future* cash ETRs, which suggests that evolving tax strategies are realized in future tax outcomes. The evolving nature of tax planning in these firms with more UTB volatility will result in tax positions with which firms are less familiar. Thus, overall, the results of our validation tests suggest that the volatility of UTBs is indicative of evolving tax strategies which increase ex ante tax-related uncertainty.

3.3 Hypothesis Tests – Empirical Design

To test our hypotheses, we investigate the association between the volatility of UTBs and tax authority and compliance risk, credit risk, and current and future firm risk, respectively. We estimate the following OLS model using panel data:

$$\textit{Firm Outcomes}_{it} = \beta_0 + \beta_1 \, CV\_UTB_{it} + \sum \beta_m Controls_{mit} + \textit{Industry FE} + \textit{Year FE} + \varepsilon_{it}. \quad (3)$$

Firm Outcomes is one of the following variables: (1) IRS 10-K downloads (*TotalIRSDownloads*), (2) future tax settlements (*Three Year Settlements*), (3) long-term credit rating (*Long Term Credit*

Rating), (4) firm value (*Q*), and (5) future firm risk (*Return Volatility*). Following Bozanic et al.

(2017), we use the IRS's downloads of firms' 10-K filings from SEC Edgar as a proxy for IRS

attention and scrutiny.[8] We scale total IRS downloads for the period $t - 4$ to t by total assets in

year t to control for firm size and quartile-rank the measure (*TotalIRSDownloads)*. *Three Year*

Settlements is defined as the sum of UTB settlements over the period $t+1$ to $t+3$ scaled by the sum

of UTB additions over the same period. We measure firms' credit ratings using the S&P long-term

issuer credit rating in the current year (*Long Term Credit Rating*). Firm value is measured as

Tobin's Q (Drake et al. 2019), and future firm risk is measured as future stock return volatility

(i.e., the standard deviation of monthly stock returns during year $t+1$) (Guenther et al. 2017).

The variable of interest, *CV_UTB*, is defined as above. If *CV_UTB* reflects changes in tax

strategy that attract tax authority attention (H1a and H1b), we expect that it will be positively

associated with IRS scrutiny and future tax settlements. If *CV_UTB* increases perceptions of firms'

risk profiles and exposure (H2), then we expect it to be negatively associated with credit

worthiness. Finally, if UTB volatility reduces the benefits of expected tax savings by increasing

tax-related risk (e.g., Drake et al. 2019), we expect *CV_UTB* to be negatively associated with firm

value (H3) and positively associated with future firm risk (H4).[9]

To isolate the effect of *CV_UTB*, we control for other indicators of tax-related risk, such

as five-year cash ETR (*Five Year ETR*) and total five-year UTB additions (*Five Year UTBs*).[10] We

include the volatility of UTB additions related to prior year tax positions (*CV_PYUTB*) to account

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[8] We thank Jeff Hoopes for making IRS 10-K download data available on his website:
http://www.jeffreyhoopes.com/data/irsattentiondata.html.
[9] Guenther et al. (2017) do not find an association between the *level* of UTBs and future firm risk as measured by stock return volatility, but, if the *volatility* of UTBs more consistently signals the risk inherent in firms' tax strategies, then we expect a positive association with future return volatility.
[10] Our results remain unchanged (i.e., the coefficient on the variable of interest maintains the same sign and level of significance) when we remove the control for the level of UTBs (*Five Year UTBs*), which suggests the effect of the volatility of UTBs on firm outcomes is both incremental to, and not dependent upon controlling for, the level of UTBs.

for changes in managers' assessment of existing tax positions. We also control for ETR volatility

(*CV_ETR*) in all models to ensure that the effect of *CV_UTB* is distinct from, and incremental to,

ex post tax rate volatility.[11] We also control for firm characteristics associated with operating risk

and financial distress, including earnings volatility (*CV_PTBI*), tax loss carryforwards (*NOL*),

operating losses (*Loss*), R&D intensity (*R&D*),[12] intangible intensity (*Intangibles*), foreign activity

(*Foreign Income*), cash holdings (*Cash*), and financial distress (*Altman Z Score*) (Altman 1968).

We include discretionary accruals (*Discretionary Accruals*) to control for financial reporting

practices. Finally, we control for firm performance and other activities, including pretax return-

on-assets (*PTROA*), sales (*Sales*), sales growth (*Sales Growth*), leverage (*Leverage*), capital

expenditures (*CAPEX*), advertising expenses (*Advertising*), and depreciation expenses

(*Depreciation*) (e.g., Drake et al., 2019). We include fixed effects for industry (2-digit SIC) and

year and cluster standard errors by firm. To reduce the effect of outliers, we winsorize all

continuous variables at the 1st and 99th percentiles. All variables are described in Appendix A.

IV. DATA AND EMPIRICAL RESULTS

4.1 Data and Sample

     We obtain financial statement data from Compustat's North America Annual database,

monthly stock returns from CRSP, and credit ratings from the S&P Ratings database. We begin

with all U.S. firm-year observations from 2007 to 2021 that are not in the financial services (SIC

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[11] We argue UTB volatility represents managers' *ex ante* uncertainty about whether a tax position will be challenged by relevant tax authorities, which is conceptually different than what ETR volatility represents, i.e., *ex post* variation in tax outcomes. In addition to controlling for *CV_ETR*, we also provide empirical support that UTB volatility is a unique construct relative to ETR volatility. In untabulated tests, we regress future ETR volatility, measured from *t+1* to *t+5*, on current UTB volatility and do not find a significant association between the variables. Thus, the volatility of UTBs does not predict the future volatility of ETRs, indicating that it is not another proxy for ex post tax outcomes.
[12] The R&D tax credit is a common source of UTBs (e.g., Towery 2017; Goldman et al. 2024), and thus, changes in R&D can contribute to UTB volatility as well as to firm risk. While we control for R&D intensity in our main analyses, we remove all firms with R&D expense in additional tests and all inferences hold, indicating that UTB volatility related to changes in R&D does not explain our findings.

6000-6999) or utilities (SIC 4900-4999) industries, since those firms are subject to unique regulatory requirements. We remove observations with missing UTB additions because it is unclear whether missing values are truly zero (Lisowsky et al. 2013). We also delete observations with insufficient data to compute control variables for our hypothesis tests, leaving 49,810 firm-year observations. UTB volatility is computed over a five-year period, so we also require at least three non-missing, non-zero values for UTB additions for years *t-4* to *t*.[13] Our final sample consists of 9,984 firm-year observations from 2011-2021. Table 1 details the sample selection procedure.

4.2 Descriptive Statistics

Table 2, Panel A reports descriptive statistics for the sample. Mean (median) *CV_UTB* is 0.772 (0.674), which is slightly more volatile than ETRs and more volatile than pretax book income. *CV_ETR* has a mean (median) value of 0.672 (0.499) and *CV_PTBI* has a mean (median) value of 0.460 (0.355), similar to amounts documented in prior work (e.g., Neuman 2023). The mean (median) five-year cash ETR is 16.7% (21.6%), which suggests firms maintain a relatively low ETR, on average. Consistent with Dyreng et al. (2019), mean (median) five-year UTB additions are 0.3% (0.1%) of total sales over the period, which suggests that UTB additions are a relatively small portion of firm activity. The average firm in the sample has a Tobin's Q of 2.182 (median of 1.718) and a long-term credit rating of BBB- (mean of -10.469, median of -10), similar to prior literature (Edwards 2018; Drake et al. 2019). Finally, the mean (median) one-year-ahead stock return volatility is 10.0% (8.6%), which is comparable to Guenther et al. (2017).

Table 2, Panel B displays the Pearson correlations for key variables used in the main hypothesis tests. In univariate analyses, *CV_UTB* is positively associated with IRS scrutiny, future

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[13] We restrict our sample to firms that have at least three years of non-zero UTB additions because we are interested in studying the difference between volatile and persistent UTB additions, and the underlying assumption is that, in both cases, firms are booking new UTBs. However, the results of our hypotheses tests hold when we include all firms with non-missing UTB balances.

tax settlements, and return volatility at the five percent significance level. Moreover, *CV_UTB* is positively associated with *CV_ETR* and *CV_PTBI*, but not significantly associated with either the five-year level of UTBs or five-year cash ETR. These univariate correlations are consistent with our predictions and suggest UTB volatility reflects uncertain tax positions related to evolving tax planning and firm operations rather than the level of tax avoidance.

4.3 Results—UTB Volatility and Tax Authority Audit and Compliance Risk

In H1a and H1b, we argue that UTB volatility can increase tax authority audit risk and/or compliance risk, resulting in greater tax authority scrutiny and potential settlements. Column (1) of Table 4 presents the results of the test of H1a, in which we estimate Eqn. (3) with *TotalIRSDownloads* as the dependent variable. We find a positive and significant association between *CV_UTB* and *TotalIRSDownloads*, which suggests that UTB volatility attracts greater IRS scrutiny (Bozanic et al. 2017). In economic terms, a one standard deviation increase in UTB volatility is associated with a 2.7% increase in IRS 10-K downloads.[14] In contrast, neither ETR volatility (*CV_ETR*) nor the level of UTBs (*Five Year UTBs*) are associated with IRS downloads, suggesting that UTB volatility uniquely piques the attention of the IRS, increasing audit risk.

Table 4, Column (2) presents the results of our test of H1b, estimating Eqn. (3) with *Three Year Settlements* as the dependent variable. Consistent with expectations, we find that *CV_UTB* is positively associated with the amount of UTBs (as a percentage of UTB additions) released through settlements with tax authorities in years *t+1* to *t+3* (e.g., Dyreng et al. 2019).[15] A one standard deviation increase in UTB volatility is associated with a 58.5% increase in scaled UTBs paid out in settlements. In contrast, the level of UTBs (*Five Year UTBs*) is significantly negatively

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[14] Economic significance is computed as the coefficient of interest (0.0850) times the standard deviation of *CV_UTB* (0.469) divided by the absolute value of the mean of the dependent variable (1.450).
[15] Results are unchanged if we scale three-year UTB settlements by the ending balance of UTBs in year *t*.

associated with future settlements, suggesting the level of UTBs does not represent tax positions that are likely to be successfully challenged. Instead, the findings indicate firms with more volatile UTBs are more likely to experience tax authority monitoring (Finley and Stekelberg 2022) and face challenges to their tax positions.[16] Collectively, our results suggest that UTB volatility increases audit and compliance risk, resulting in greater settlement payouts in future periods.

4.4 Results—UTB Volatility and Credit Risk

Table 5 presents the results of our tests of H2, where we estimate Eqn. (3) to examine the association between *CV_UTB* and long-term credit ratings (*Long Term Credit Rating*). If creditors perceive *CV_UTB* as a signal of reduced creditworthiness, then we expect firms with more volatile UTBs will have lower credit ratings. Indeed, we find a negative association between *CV_UTB* and *Long Term Credit Rating*, controlling for other variables that influence credit ratings (e.g., Altman 1968; Ayers et al. 2010; Edwards 2018), that is economically significant – a one standard deviation increase in UTB volatility is associated with a 2.2% decrease in the long-term credit rating. We also find that the level of UTBs (*Five Year UTBs*) is positively associated with credit ratings, inconsistent with the level of UTBs indicating higher credit risk. The results suggest that creditors perceive firms with more volatile UTBs as a greater credit risk, potentially because UTB volatility signals greater risk and uncertainty about the future outcomes of new and evolving tax strategies.

4.5 Results—UTB Volatility and Firm Value

Table 6 presents the results of our test of H3, in which we examine whether UTB volatility is associated with firm value using Eqn. (3). As expected, *CV_UTB* is significantly negatively

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[16] In untabulated tests, we replace *Three Year Settlements* with future statute of limitations lapses, measured following Holt et al. (2022). If *CV_UTB* represents evolving tax positions that are more uncertain, we expect it to be associated with fewer UTB releases through lapses because the underlying tax positions are more likely to be scrutinized by tax authorities and challenged or settled. Consistent with expectations, *CV_UTB* is negatively associated with the likelihood and magnitude of future statute of limitations lapses, suggesting volatile UTBs draw greater audit scrutiny.

associated with firm value as measured by Tobin's Q, after controlling for other determinants (e.g., Drake et al. 2019). In terms of economic magnitude, a one standard deviation increase in *CV_UTB* is associated with a 3.2% decrease in *Q*. Like Drake et al. (2019), we also find that *CV_ETR* is negatively associated with *Q*, consistent with investors discounting risk associated with volatile tax outcomes. The incremental negative association we document between *Q* and *CV_UTB* suggests that, not only do investors negatively value realized tax volatility (i.e., as measured by *CV_ETR*), they also negatively perceive *expected* volatility related to uncertain tax positions. Confirming the puzzling evidence in prior literature, we also document a highly positive association between the level of UTBs (*Five Year UTB*) and *Q* (Koester 2012; Koester et al. 2015), which suggests that investors view the level of UTBs as a positive signal of savings through tax avoidance. Taken together, these results suggest that investors negatively value UTB volatility and highlight the inadequacy of the level of UTBs as a proxy for tax-related uncertainty and risk.

4.6 Results—UTB Volatility and Future Firm Risk

Finally, to test H4 and directly examine whether UTB volatility is associated with future firm risk, we estimate Eqn. (3) with future return volatility (*Return Volatility*) as the dependent variable. Table 7 presents the results. We find a significant, positive association between *CV_UTB* and one year-ahead return volatility, after controlling for ETR volatility and other firm characteristics related to future firm risk (e.g., Guenther et al. 2017). Economically speaking, a one standard deviation increase in *CV_UTB* is associated with an increase in return volatility of 1.3%. This result suggests the volatility of UTB additions signals tax positions with greater risk or uncertainty for the firm. Consistent with Guenther et al. (2017), we do not observe a significant association between the level of UTBs (*Five Year UTB*s) and future return volatility. Moreover, the coefficient estimate on *CV_ETR* is insignificant, suggesting that the volatility of ETRs is not a

significant predictor of future firm risk incremental to UTB volatility. These results imply that investors perceive *CV_UTB*, and not the level of UTBs or ETR volatility, as increasing firm risk.

V.   ADDITIONAL ANALYSES

5.1 Addressing Alternative Explanations

In this section, we conduct additional tests to rule out two potential alternative explanations for our results. First, in our validation tests, we find that UTB volatility is associated with several firm characteristics indicative of changes in tax strategy, including the volatility of R&D expense, the volatility of APTS fees, and changes in geographic operations. Here, we explore whether those underlying firm characteristics potentially account for the associations we document between UTB volatility and our proxies for perceptions of risk.

Specifically, we re-estimate Eqn. (3) for each risk-related response (i.e., IRS scrutiny, future tax settlements, credit ratings, firm value, and future firm risk) including three key determinants from Eqn. (1) – *CV_R&D*, *CV_APTS*, and *ChgGeoSegs*. Table 8, Panel A presents the results. The results confirm our primary analyses for firm value, future tax settlements, and future firm risk (all $p < 0.05$, at least), but we find that the coefficient estimates for *CV_UTB* when examining IRS scrutiny and credit ratings are no longer statistically significant. However, the loss of significance is likely due to a substantial reduction in sample size (approximately 30 percent) upon the inclusion of these variables.[17] Overall, we conclude that our inferences are robust to controlling for these key determinants and that managers' private assessment of tax uncertainty,

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[17] We also use a path analysis model to test whether *CV_UTB* mediates the association between *CV_R&D* (and *CV_APTS* and *ChgGeoSegs*, respectively) and each of the dependent variables in our hypothesis tests. We do not find that *CV_UTB* mediates the association between each characteristic and any of the risk-related responses. Moreover, while we find a strong direct effect of *CV_UTB* on each of our outcome variables, we do not observe a significant direct effect of any of the factors contributing to UTB volatility on the outcome variables. In other words, *CV_UTB* is not the mechanism through which underlying firm characteristics affect assessments of risk. The results of this analysis suggest *CV_UTB* represents a distinct construct (i.e., new and evolving tax strategies that generate tax uncertainty) and is not merely a summary of underlying firm activities or characteristics.

reflected by UTB volatility, is associated with risk-related firm outcomes incremental to, and independent of, the effect of underlying firm characteristics.

Second, because prior research finds evidence of earnings management through the tax reserve (e.g., Cazier et al. 2015; Gupta et al. 2016), we also investigate whether our results are driven by firms with a higher likelihood of having managed earnings. Specifically, we re-estimate Eqn. (3) separately for firms whose reported earnings are within $0.01 of analysts' consensus earnings forecasts (earnings management sample) and firms whose reported earnings are not within $0.01 of analysts' consensus earnings forecasts (e.g., Degeorge et al. 1999). Table 8, Panel B reports the results. We do not find evidence that our results are stronger among firms more likely to have managed earnings.[18] In fact, our results are concentrated among firms that are unlikely to have managed earnings. Thus, these findings indicate that earnings management through the tax reserve does not explain our main results.

5.2 Settlement Favorability

To complement our H1b analysis, we consider the favorability of settlements associated with UTB volatility to examine management's abilities to adequately reserve for evolving tax positions. A settlement is considered favorable (unfavorable) if the firm retains more (less) tax benefits than it expects as reported on the financial statements (Finley 2019). If managers underestimate the firm's exposure to new and unfamiliar tax positions that give rise to volatile UTBs, we may observe a positive association between UTB volatility and unfavorable settlements. We test this association by re-estimating Eqn. (3) using unfavorable settlements as the dependent variable, where a settlement is considered unfavorable when the residual from a regression of

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[18] The earnings management subsample is small due to sample restrictions required to compute *CV_UTB*; thus, we also conduct this test expanding the subsample of earnings management firms to include firms that are within $0.05 of analysts' consensus earnings forecast (e.g., Yu 2008). Our results are unchanged using this alternative specification (i.e., our results remain concentrated among firms that are unlikely to have managed earnings).

interest and penalties related to UTBs on factors unrelated to tax settlements is positive (Finley 2019). We find that *CV_UTB* is negatively associated with unfavorable settlements, suggesting managers estimate and report adequate tax reserves when the firm's UTBs are more volatile.

5.3 Level of Unrecognized Tax Benefits

Throughout our analyses, we control for firms' level of UTBs to ensure that our results for UTB volatility are incremental to the effect of the level of UTBs on firm outcomes. Including this control also provides us with an opportunity to compare our results to those of prior work and confirm the inconsistent association between negative firm outcomes and the level of UTBs documented by prior studies within our sample and period. To examine whether our results are driven by firms with high or low levels of UTBs, we conduct an additional analysis (untabulated) accounting for the level of UTBs. Specifically, we re-estimate Eqn. (3) separately for firms with above and below median level of UTBs, resulting in ten model specifications. Consistent with our primary tests, we find significant coefficient estimates on *CV_UTB* (in the expected direction) in eight of the ten models. These results confirm our previous conclusion that the level of UTBs does not impact the association between the volatility of UTBs and the firm outcomes we examine.

5.4 Alternative Measures of Evolving Tax Strategies

In our hypothesis tests, we operationalize evolving tax strategies using the coefficient of variation of UTB additions related to current year tax positions. We focus on UTB additions related to current year positions to identify changes in tax strategy that may influence the risk exposure of the firm (e.g., Dyreng et al. 2019). Moreover, we expect external stakeholders to be most interested in the pattern of UTB additions related to new tax positions as an early signal of uncertainty in firms' tax practices. However, it is possible that alternative UTB measures will provide insight into evolving tax planning. Therefore, in supplemental tests, we replace *CV_UTB* with, alternately,

changes in current year UTB additions, the volatility of UTB additions related to prior year positions, and the volatility of the ending UTB balance.

When we re-estimate our hypothesis tests using these alternative UTB measures (untabulated), we do not find evidence of a significant association for any of the three alternative measures for any of the firm outcomes we examine. That is, unlike the volatility of current year UTB additions, neither changes in UTB additions nor volatility in other UTB components are associated with risk-related outcomes. Our results are consistent with the volatility of current year additions to UTBs being indicative of managers' ex ante uncertainty from the perspective of external stakeholders because volatile current year UTB additions likely reflect changes in a firm's existing tax strategy that are relevant to risk assessment.

VI.   CONCLUSION

Given the objectives of FIN 48, prior research has frequently focused on the balance of the UTB account to proxy for the uncertainty of a firm's tax positions (e.g., Hutchens and Rego 2015; Hanlon et al. 2017; Dyreng et al. 2019), but draws inconsistent conclusions regarding the information conveyed by the level of UTBs. We contend that, due to assumptions required by FIN 48, not all uncertain tax positions are equally uncertain; therefore, we examine an alternative attribute of firms' UTBs – their volatility – and argue that UTB volatility is more informative about managers' tax uncertainty because it reflects evolving tax strategies, and thus, managers' familiarity with the tax positions undertaken.

We find evidence consistent with UTB volatility representing changes in tax planning that reflect managers' ex ante tax uncertainty. We find that higher UTB volatility is associated with more volatile business operations, research and development, and tax planning expenditures, and that firms with high UTB volatility experience greater changes in the level and volatility of future

cash ETRs. These findings are consistent with UTB volatility representing evolving tax planning that is eventually realized in tax outcomes. As evidence that UTB volatility is informative about managers' uncertainty about evolving tax strategies, we find that UTB volatility is associated with perceptions of increased tax audit and compliance risk, credit risk, and overall firm risk by external stakeholders, after controlling for the level of UTBs, the volatility of ETRs, and underlying firm characteristics. In combination, our results support the notion that the UTB volatility serves as an early signal of changes in firms' tax positions that contribute to actual and perceived risk.

Our study contributes to the literature and practice by providing evidence that UTB volatility conveys a unique early signal about the uncertainty and risk of the tax positions underlying firms' tax strategies and by exploring the decision relevance of UTBs to various stakeholders (Blouin and Robinson 2014). We find that UTB volatility conveys a negative signal to investors and creditors and, consistent with that signal, the IRS can extract larger settlements from firms with greater UTB volatility. Our work helps to explain the mixed findings in prior literature about the information contained in the level of UTBs by demonstrating that the volatility of UTBs is a more consistent indicator of evolving tax planning and risk underlying tax positions. In addition, our work is of interest to researchers because it offers a readily implementable measure of managers' ex ante uncertainty about changing tax strategies. Our results may also interest practitioners and regulators because they demonstrate that changing tax positions increases the likelihood of successful challenge by the IRS. Finally, our research sheds light on the information about tax uncertainty that is conveyed by FIN 48 disclosures, which is timely because the FASB has recently enacted additional updates to the accounting for income taxes standard targeted at improving the transparency of tax disclosures (FASB 2023).

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Dependent Variables – Main Analyses	
Total IRS Downloads	Sum of IRS downloads over the period t – 4 to t scaled by total assets and ranked into quartiles by year; IRS downloads are obtained from Bozanic et al. (2017)
Three Year Settlements	Sum of UTB settlements (txtubsettle) over the period t + 1 to t + 3 scaled by UTB additions (txtubposinc) over the period t – 2 to t
Long Term Credit Rating	S&P long-term issuer credit rating in year t. The variable is constructed by converting the rating (splticrm) to a numerical value such that AAA = -1, AA+ = -2, and so on such that the ratings are increasing with the value of the numbers.
Q	Market value of equity (csho * prcc_f) plus total assets (at) less common equity (ceq) divided by total assets (at)
Return Volatility	The standard deviation of monthly stock returns over year t + 1
Dependent Variables – Additional Analyses	
UnfavSettlements	Indicator variable equal to one if a firm has at least one unfavorable settlement in the period t + 1 to t + 3. We consider an unfavorable settlement an instance where total settlements are greater than UTB settlements (txtubsettle), where total settlements = UTB settlements (txtubsettle) + prior year UTB increases (txtubposinc) – prior year UTB decreases (txtubposdec)
UnfavSettlementsFinley	Indicator variable equal to one if a firm has at least one unfavorable settlement in the period t + 1 to t + 3. We measure the favorability of settlements following Finley (2019)
ETR Change	The quintile rank of the absolute value of *Five Year ETR* for the period t – 4 to t less *Five Year ETR* for the period t + 1 to t + 5
Volatility Change	The quintile rank of the absolute value of *CV_ETR* for the period t – 4 to t less *CV_ETR* for the period t + 1 to t + 5
Independent Variables – Determinants Analysis	
CV_UTB	The standard deviation of UTB additions (txtubposinc) over the period t - 4 to t scaled by the average UTB additions (txtubposinc) over the same period
CV_ETR	The standard deviation of *Cash ETR* over the period t - 4 to t scaled by average *Cash ETR* over the same period
CV_PYUTB	The standard deviation of UTB additions for prior positions (txtubpospinc) over the period t - 4 to t scaled by the average UTB additions for prior positions (txtubpospinc) over the same period
Five Year ETR	Sum of cash taxes paid (txpd) over the period t - 4 to t scaled by the sum of pre-tax income (pi) adjusted for special items (spi) over the same period
Five Year UTBs	Sum of UTB additions (txtubposinc) over the period t - 4 to t scaled by the sum of sales (sale) over the same period
CV_PTBI	The standard deviation of pre-tax income (pi) less special items (spi) over the period t - 4 to t scaled by the average of pre-tax icome (pi) less special items (spi) over the same period
CV_R&D	The standard deviation of research and development expense (xrd) scaled by total assets (at) over the period t - 4 to t scaled by the average research and development expense (xrd) scaled by total assets (at) over the same period

CV_FI	The standard deviation of pre-tax foreign income (pifo) scaled by total pre-tax income (pi) over the period t - 4 to t scaled by the average pre-tax foreign income (pifo) scaled by total pre-tax income (pi) over the same period
CV_APTS	The standard deviation of auditor provided tax fees (tax_fees) over the period t - 4 to t scaled by the average auditor provided tax fees (tax_fees) over the same period
Count_AQC	A count variable equal to the number of years the firm reports a nonzero value for acquisitions (aqc) over the period t - 4 to t
Intro_Firm	An indicator variable equal to one for firms with negative values for operating cash flows (oancf) and investing cash flows (invcf) and a positive value for financing cash flows (fincf) following Dickenson (2011)
Decline_Firm	An indicator variable equal to one for firms with negative operating cash flows (oancf), positive investing cash flows (invcf), and either positive or negative financing cash flows (fincf) following Dickenson (2011)
ChgGeoSeg	Number of geographic segments in year t less number of geographic segments in year t - 4
NOL_Indicator	An indicator variable equal to one for firms with a greater than zero value for tax loss carryforwards (tlcf) in year t
Delta_NOL	Tax loss carryforwards (tlcf) in year t less tax loss carryforwards in year t – 4 scaled by total assets in year t
AvLeverage	Average of the sum of short-term debt (dlc) and long-term debt (dtlt) scaled by total assets (at) over the period t - 4 to t
AvSize	Average of natural log of total assets (at) over the period t - 4 to t

Independent Variables – Hypotheses Tests

PTROA	Pre-tax income (pi) scaled by total assets (at)
NOL	Tax loss carryforwards (tlcf) scaled by total assets (at)
Loss	Indicator variable equal to one if pre-tax income (pi) is less than zero
Sales	Natural log of sales (sale)
Leverage	Sum of long term debt (dltt) and short term debt (dlc) scaled by total assets (at)
Foreign Income	Pre-tax foreign income (pifo) scaled by total pre-tax income (pi)
Sales Growth	Sales (sale) in year t less sales in year t - 3 scaled by sales in year t - 3
CAPEX	Capital expenditures (capx) scaled by pre-tax income (pi)
R&D	Research and development expense (xrd) scaled by pre-tax income (pi)
Discretionary Accruals	Performance adjusted discretionary accruals computed as the signed value of the error term from the regression of total accruals $((ib_t - oancf_t)/at_{t-1})$ on the inverse of assets at the beginning of the year $(1/at_{t-1})$, the change in sales adjusted for the change in receivables $(((sale_t - sale_{t-1}) - (rect_t - rect_{t-1}))/at_{t-1})$, PPE, and prior year return on assets, all scaled by total assets at the beginning of the year $((ni_{t-1}/at_{t-2})/at_{t-1})$ following Kothari (2005)
Advertising	Advertising expense (xad) scaled by pre-tax income (pi)
Intangibles	Intangibles (intan) scaled by total assets (at)
Depreciation	Depreciation expense (dep) scaled by pre-tax income (pi)
Cash	Cash (ch) scaled by total assets (at)
Altman Z Score	Altman (1968) Z Score calculated as 3.3*(ebit/at) + 0.99*(sale/at) + 0.6(me/lt) + 1.2(act/at) + 1.4(re/at)

APPENDIX B. Stylized Example of UTB Volatility

We contend that the volatility of UTB current year additions reflects evolving tax practices that increase ex ante tax uncertainty, or managers' ex ante uncertainty about the ultimate realization of uncertain tax positions. Consider two firms, Firm A and Firm B, which have the same total level of UTBs and UTB additions, but are exposed to different degrees of uncertainty arising from their tax positions.

Firm A undertakes the same tax positions each year and records the same amount of UTBs each year related to current year positions.[19] Even though Firm A must record a UTB for the tax position pursuant to the requirements of ASC 740, Firm A faces relatively low tax uncertainty because the firm is familiar with the tax position and its potential realizations.

Firm A: Low ex ante tax uncertainty (same tax position each year)

Year	1	2	3	4	5	6	7	8	9	10
Beg. UTB balance	0	5	10	15	20	25	30	35	40	45
UTB Additions (CY pos.)	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
End. UTB balance	5	10	15	20	25	30	35	40	45	50
ΔUTBAdditions		0	0	0	0	0	0	0	0	0
CV_UTB					**0**	**0**	**0**	**0**	**0**	**0**

Firm B undertakes different tax positions each year and records a different amount of UTBs each year related to current year positions. We implicitly assume that undertaking a different position from the previous year increases tax uncertainty because the firm is likely unfamiliar with the tax position and its potential realizations.

Firm B: High ex ante tax uncertainty (different tax position each year)

Year	1	2	3	4	5	6	7	8	9	10
Beg. UTB balance	0	6	9	17	21	22	30	31	43	46
UTB Additions (CY pos.)	*6*	*3*	*8*	*4*	*1*	*8*	*1*	*12*	*3*	*4*
End. UTB balance	6	9	17	21	22	30	31	43	46	50
ΔUTBAdditions		-0.50	1.67	-0.50	-0.75	7.00	-0.88	11.00	-0.75	0.33
CV_UTB					**0.61**	**0.65**	**0.80**	**0.92**	**0.97**	**0.78**

Because Firm B undertakes new and unfamiliar tax positions, Firm B experiences a higher degree of ex ante tax uncertainty than Firm A each year, even though the total amount each firm reserved for uncertain tax positions is the same over time (i.e., both firms have an ending UTB balance of

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[19] As discussed in the manuscript, there are several reasons why firms may record UTBs for persistent tax positions that may not be uncertain. For instance, due to the requirement of the standard that firms not consider audit and detection risk, firms may record a UTB for an uncertain tax position that has never been audited.

50 at the end of the ten-year period). Thus, an appropriate metric for tax uncertainty would show a higher value for Firm B than Firm A each year.

Our measure of the volatility of UTBs (*CV_UTB*) reflects the fact that Firm B consistently experiences greater tax uncertainty than Firm A. Potential alternative metrics of tax uncertainty (shown below) show a higher value for Firm A than Firm B in some years.

Level of UTB end. balance

Level of UTB Additions
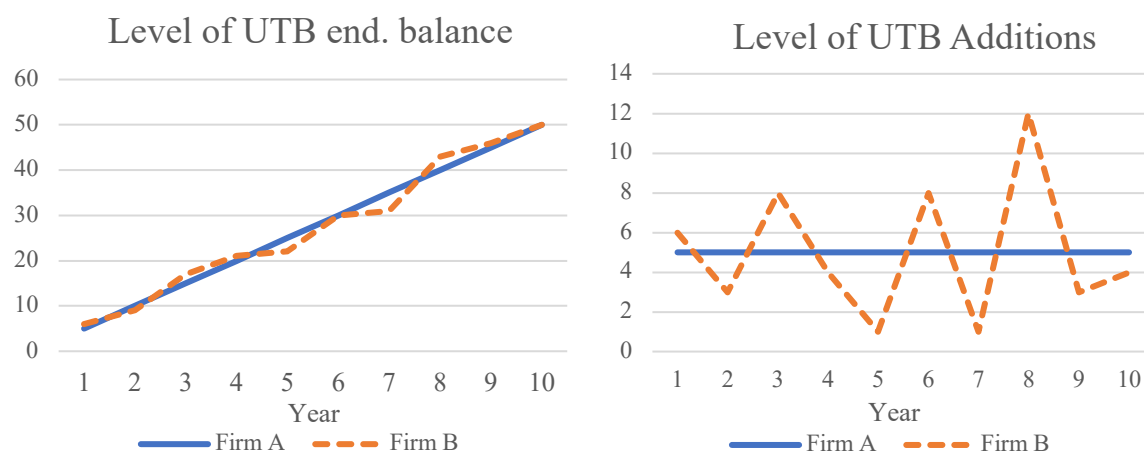
For instance, the graph of the level of the UTB ending balance shows that Firm A has a constant increase in current UTB additions each year while Firm B does not. However, it also incorrectly suggests that tax uncertainty increases monotonically and does not reflect the fact that Firm B should always have a higher value for tax uncertainty than Firm A.

ΔUTB Additions

UTB volatility (*CV_UTB*)
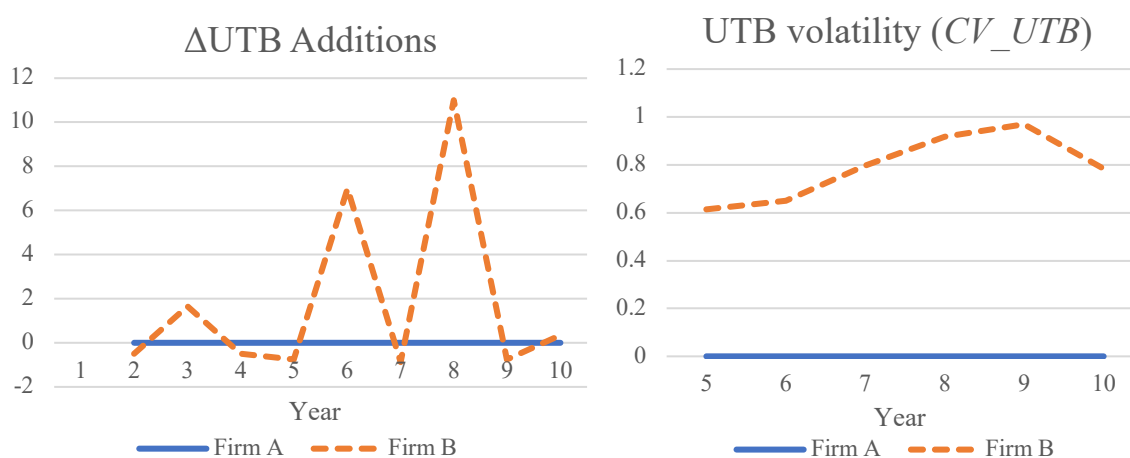
The level of UTB additions and year-over-year changes in UTB additions better capture the constant level of tax uncertainty faced by Firm A, but again, do not show higher uncertainty for Firm B in all instances. Only *CV_UTB* appropriately reflects the fact that Firm A has low tax uncertainty and Firm B always experiences a higher level of tax uncertainty than Firm A.

APPENDIX C. 10-K Examples of UTB Volatility

This appendix provides examples of firm-year observations from our sample with some of the highest and lowest values of UTB volatility (CV_UTB). Below are excerpts from the reconciliation of unrecognized tax benefits disclosed on each company's Form 10-K and the corresponding value for CV_UTB for the fiscal year. We expect firms with higher values of CV_UTB to possess a higher degree of uncertainty about current year tax positions than firms with lower values of CV_UTB.

High UTB volatility:

The Scotts Miracle-Gro Company (CIK: 0000825542) 10-K, Sep. 30, 2019

CV_UTB: 1.7706 (FY 2015 - FY 2019)

		Year Ended September 30,				
		2019		2018		2017
		(In millions)				
Balance at beginning of year	$	13.9	$	10.2	$	5.1
Additions for tax positions of the current year		13.8		0.9		1.4
Additions for tax positions of prior years		4.4		6.1		3.9
Reductions for tax positions of prior years		(1.7)		(0.8)		(0.2)
Settlements with tax authorities		(0.7)		(1.9)		0.9
Expiration of statutes of limitation		(0.2)		(0.6)		(0.9)
Balance at end of year	$	29.5	$	13.9	$	10.2

Additions for current year tax positions on prior year 10-Ks: FY 2016 = 0.3, FY 2015 = 0.2

Low UTB volatility:

Altria Group, Inc. (CIK: 0000764180) 10-K, Dec. 31, 2016

CV_UTB: 0 (FY 2012 – FY 2016)

(in millions)		2016		2015		2014
Balance at beginning of year	$	158	$	258	$	227
Additions based on tax positions related to the current year		15		15		15
Additions for tax positions of prior years		29		57		29
Reductions for tax positions due to lapse of statutes of limitations		(4)		(4)		(2)
Reductions for tax positions of prior years		(28)		(86)		—
Settlements		(1)		(82)		(11)
Balance at end of year	$	169	$	158	$	258

Additions for current year tax positions on prior year 10-Ks: FY 2013 = 15, FY 2012 = 15

Based on the values of CV_UTB, we expect Scotts Miracle-Gro to experience greater tax uncertainty in FY 2019 (i.e., CV_UTB = 1.7706) than Altria Group in FY 2016 (i.e., CV_UTB =

0). Over the previous four years, Scotts Miracle-Gro reported different values for UTB additions related to current tax positions, suggesting that its tax strategy is evolving, which could lead to increased uncertainty and risk. In contrast, Altria reported the same value for current year UTB additions over the same period, which suggests its tax strategy is stable, resulting in less tax uncertainty.

Using alternative proxies for tax uncertainty would not necessarily lead to the same inference. For instance, when comparing the ending balance of UTBs, Altria Group would appear to experience greater tax uncertainty than Scotts Miracle-Gro (i.e., 258m > 10.2m). Similarly, if comparing the amount of current year UTB additions, Altria Group would appear to have higher tax uncertainty as well (i.e., 15m > 13.8m). Thus, the volatility of UTB additions (*CV_UTB*) provides a consistent signal of the relative tax uncertainty faced by both companies.

Figure 1. Change in Cash ETR and ETR Volatility for High vs. Low UTB Volatility
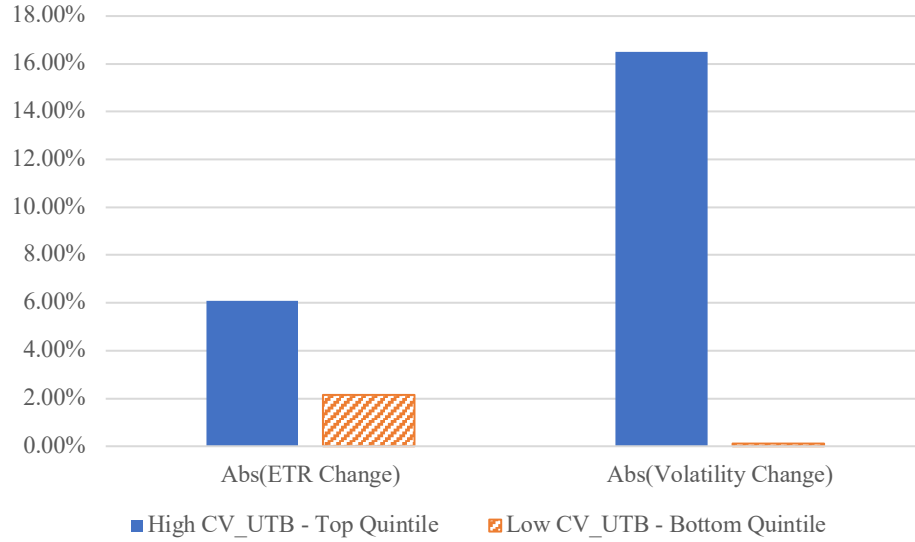
This figure displays the absolute change in mean cash ETR (*ETR Change*) and in mean cash ETR volatility (*Volatility Change*) for firm-years in the top and bottom quintiles of *CV_UTB* from the four years preceding the current fiscal year (*t-4* to *t*) to the four years following the current fiscal year (*t+1* to *t+5*). All variables are defined in Appendix A.

Table 1. Sample Construction

Sample Selection Criteria	Observations
All U.S. incorporated nonfinancial (SIC 6000-6999), non-utilities (SIC 4900-4999) Compustat firm-year observations between 2007-2021	102,425
Requiring non-missing observations for all control variables	69,300
Requiring non-missing observations for UTB additions	49,810
Requiring at least three non-missing values for UTB additions over the period t-4 to t	16,830
Requiring at least three non-zero values for UTB additions over the period t-4 to t	9,984

This table presents the sample construction for the full sample. The variables are constructed using data from the Compustat North America Annual, Audit Analytics, and CRSP databases from 2007 – 2021. Our final sample period spans 2011 – 2021 to accommodate the measurement of UTB volatility over the period t-4 to t.

Table 2. Descriptive Statistics and Correlations

Panel A. Descriptive Statistics

Variable	N	Mean	Std Dev	25%	Median	75%
Dependent Variables						
TotalIRSDownloads	3,554	1.450	1.110	0.000	1.000	2.000
Three Year Settlements	6,691	1.101	8.864	0.000	0.167	0.733
Long Term Credit Rating	2,141	-10.469	3.195	-13.000	-10.000	-9.000
Q	9,984	2.182	1.551	1.276	1.718	2.491
Return Volatility	7,235	0.100	0.057	0.062	0.086	0.120
ETR Change	8,660	0.123	0.178	0.022	0.069	0.149
Volatility Change	8,647	0.361	0.342	0.106	0.254	0.516
Volatility and UTB Variables						
CV_UTB	9,984	0.772	0.469	0.401	0.674	1.054
CV_ETR	9,984	0.672	0.559	0.240	0.499	0.956
CV_PYUTB	9,984	1.262	0.554	0.848	1.203	1.633
Five Year ETR	9,984	0.167	2.379	0.102	0.216	0.296
CV_PTBI	9,984	0.460	0.321	0.183	0.355	0.789
Five Year UTBs	9,984	0.003	0.004	0.000	0.001	0.003
Performance Metrics						
PTROA	9,984	0.044	0.140	0.008	0.059	0.108
NOL	9,984	0.297	1.178	0.000	0.036	0.162
Loss	9,984	0.143	0.350	0.000	0.000	0.000
Sales	9,984	7.619	1.739	6.529	7.701	8.752
Leverage	9,984	0.276	0.229	0.107	0.251	0.392
Foreign Income	9,984	0.334	0.915	0.000	0.164	0.630
Sales Growth	9,984	0.254	0.612	-0.033	0.145	0.382
Other Firm Characteristics						
CAPEX	9,984	0.445	2.400	0.054	0.258	0.625
R&D	9,984	0.188	2.071	0.000	0.000	0.379
Discretionary Accruals	9,984	0.108	0.693	0.000	0.000	0.084
Advertising	9,984	0.223	0.820	-0.028	0.034	0.227
Intangibles	9,984	0.265	0.219	0.069	0.223	0.424
Depreciation	9,984	0.439	2.872	0.084	0.300	0.668
Cash	9,984	0.127	0.117	0.042	0.095	0.174
Altman Z Score	9,984	4.351	5.278	2.259	3.511	5.237

This table presents descriptive statistics and correlations for the full sample regressions. All continuous measures are winsorized at the 1st and 99th percentile, and all variables are defined in Appendix A.

Table 2. Continued

Panel B. Univariate Correlations

	Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	*TotalIRSDownloads*	1.00										
(2)	*Three Year Settlements*	**-0.07**	1.00									
(3)	*Long Term Credit Rating*	**-0.29**	0.01	1.00								
(4)	*Q*	**0.05**	**-0.04**	**0.37**	1.00							
(5)	*Return Volatility*	**0.24**	-0.03	**-0.56**	**-0.10**	1.00						
(6)	*CV_UTB*	**0.10**	**0.07**	**-0.36**	**-0.10**	**0.11**	1.00					
(7)	*CV_ETR*	**0.20**	-0.02	**-0.51**	-0.14	**0.29**	**0.17**	1 .00				
(8)	*CV_PYUTB*	0.03	-0.08	**-0.31**	0.03	0.17	0.15	0.17	1.00			
(9)	*Five Year ETR*	0.00	0.00	-0.03	**-0.02**	-0.01	-0.01	**-0.04**	-0.01	1.00		
(10)	*CV_PTBI*	**0.26**	-0.02	**-0.56**	**-0.12**	0.37	0.22	0.68	0.19	**-0.03**	1.00	
(11)	*Five Year UTBs*	0.02	**-0.04**	**0.22**	**0.19**	**0.06**	0.01	**0.06**	0.03	-0.01	**0.10**	1.00

This table presents Pearson correlations for variables in the main regression analysis. Correlations with *p*-values <0.05 are in bold.

Table 3. Validation of UTB Volatility

Panel A. Determinants of UTB Volatility

Variables	CV_UTB
CV_R&D	0.1031***
	(3.14)
CV_APTS	0.0302**
	(2.07)
CV_FI	0.0015
	(1.46)
ChgGeoSegs	0.1439*
	(2.33)
Five Year ETR	-0.002
	(-0.82)
Count_AQC	-0.0697**
	(-2.34)
Intro_Firm	-0.0031
	(-0.07)
Decline_Firm	0.0060**
	(2.33)
CV_PTBI	0.2861***
	(8.40)
Five Year UTBs	3.2525
	(1.11)
NOL_Indicator	0.1385***
	(4.00)
Delta_NOL	0.0028
	(0.59)
AvLeverage	0.1603***
	(2.91)
AvSize	-0.0185**
	(-2.22)
INTERCEPT	0.5592***
	(8.18)
Observations	7,001
Adjusted R^2	0.098

Table 3. Continued

Panel B. Change in Long-Run ETR and ETR Volatility

Variables	ETR Change	Volatility Change
CV_UTB	0.1248**	0.0971*
	(2.32)	(1.75)
CV_R&D	0.0503	0.1778*
	(0.51)	(1.93)
CV_APTS	-0.055	0.0007
	(-1.22)	(0.02)
CV_FI	0.0004	-0.0006
	(0.13)	(-0.20)
ChgGeoSegs	-0.0137	0.0007
	(-1.63)	(0.08)
Five Year ETR	1.4379***	-1.1029***
	(5.45)	(-4.30)
Count_AQC	-0.0121	-0.0024
	(-0.74)	(-0.14)
Intro_Firm	0.7415***	0.5601***
	(5.20)	(2.94)
Decline_Firm	0.1627	0.1488
	(0.63)	(0.73)
CV_PTBI	1.0899***	1.2221***
	(10.84)	(11.87)
Five Year UTBs	11.2	4.4146
	(1.40)	(0.65)
NOL_Indicator	0.1632**	0.1305
	(2.10)	(1.38)
Delta_NOL	-0.043	0.0112
	(-1.15)	(0.36)
AvLeverage	-0.0713	0.0665
	(-0.61)	(0.45)
AvSize	-0.0728***	-0.0277
	(-3.43)	(-1.34)
INTERCEPT	1.6651***	1.7548***
	(8.66)	(9.25)
Observations	5,493	5,484
Adjusted R^2	0.122	0.131

This panel presents results for the regression of *ETR Change* and *Volatility Change* on *CV_UTB*. The model includes industry (2-digit SIC code) and year fixed effects, and standard errors are clustered by firm. T-statistics are reported in parentheses, and ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. All continuous measures are winsorized at the 1st and 99th percentile, and all variables are defined in Appendix A.

Table 4. UTB Volatility and Tax Audit and Compliance Risk

Variables	TotalIRSDownloads	Three Year Settlements
CV_UTB	0.0850*	1.3730***
	(1.83)	(4.88)
CV_ETR	0.0069	-0.1546
	(0.14)	(-1.53)
CV_PYUTB	-0.0504	-0.0152
	(-1.20)	(-0.07)
Five Year ETR	0.0002	-0.0027
	(0.85)	(-1.24)
Five Year UTB	-7.9985	-0.7620
	(0.39)	(-1.16)
CV_PTBI	0.0254	-69.8407***
	(-0.94)	(-4.60)
PTROA	0.2075	-0.7190
	(1.01)	(-1.37)
NOL	-0.0110	-0.0027
	(-0.69)	(-0.15)
Loss	0.0129	-0.4638
	(0.40)	(-1.40)
Sales	-0.4084***	0.1093*
	(-24.70)	(1.86)
Leverage	-0.8091***	-0.3237
	(-4.93)	(-1.30)
Foreign Income	-0.0502**	0.0260
	(-2.08)	(1.07)
Sales Growth	-0.1678***	-0.0424
	(-4.10)	(-0.04)
CAPEX	0.0004	-0.0316
	(-0.20)	(-0.66)
R&D	0.0187**	-0.0153
	(2.10)	(-0.95)
Discretionary Accruals	-0.0150	-0.0348
	(-0.68)	(-0.26)
Advertising	0.0033	0.0197
	(0.36)	(0.37)
Intangibles	-0.4397***	0.0547
	(-2.98)	(0.52)
Depreciation	-0.0116	0.0318
	(-0.70)	(0.83)
Cash	-0.0936	0.9007
	(-0.07)	(1.56)
Altman Z Score	0.0020	-0.0127
	(0.36)	(-1.31)
INTERCEPT	4.8125***	-0.3488
	(25.17)	(-0.08)
Observations	3,354	6,691
Adjusted R^2	0.513	0.025

This table presents results for the regression of *TotalIRSDownloads* and *Three Year Settlements* on *CV_UTB*. The model includes industry (2-digit SIC code) and year fixed effects, and standard errors are clustered by firm. All continuous measures are winsorized at the 1st and 99th percentile. T-statistics are reported in parentheses, and ***, **, and * denote significance at the 1, 5, and 10% level, respectively. Variables are defined in Appendix A.

Table 5. UTB Volatility and Credit Risk

Variables	Long Term Credit Rating
CV_UTB	-0.4963***
	(-3.68)
CV_ETR	-0.4630***
	(-2.68)
CV_PYUTB	0.0019
	(0.02)
Five Year ETR	-0.0117
	(-0.69)
CV_PTBI	-2.1018***
	(-7.75)
Five Year UTB	67.4323***
	(3.21)
PTROA	2.1357**
	(2.45)
NOL	0.0541
	(0.56)
Loss	-0.6749***
	(-2.72)
Sales	1.1141***
	(15.77)
Leverage	-2.5154***
	(-4.67)
Foreign Income	-0.1451**
	(-2.27)
Sales Growth	-0.1768*
	(-1.83)
CAPEX	0.0311
	(0.68)
R&D	0.0460
	(1.38)
Discretionary Accruals	-0.0524
	(-1.48)
Advertising	-0.0818
	(-1.25)
Intangibles	0.9073**
	(2.04)
Depreciation	0.0053
	(0.14)
Cash	-0.4794
	(-0.36)
Altman Z Score	0.3601***
	(6.09)
INTERCEPT	-19.0335***
	(-24.05)
Observations	1,973
Adjusted R^2	0.751

This table presents results for the regression of *Long Term Credit Rating* on *CV_UTB*. The model includes industry (2-digit SIC code) and year fixed effects, and standard errors are clustered by firm. T-statistics are reported in parentheses, and ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. All continuous measures are winsorized at the 1st and 99th percentile. Variables are defined in Appendix A.

Table 6. UTB Volatility and Firm Value

Variables	Q
CV_UTB	-0.1490***
	(-3.83)
CV_ETR	-0.1556***
	(-2.98)
CV_PYUTB	0.0151
	(0.46)
Five Year ETR	-0.0048
	(-0.25)
CV_PTBI	-0.2284***
	(-2.90)
Five Year UTB	21.3327***
	(3.14)
PTROA	2.4426***
	(6.66)
NOL	0.3566***
	(4.62)
Loss	0.5523***
	(5.89)
Sales	0.0271
	(1.42)
Leverage	1.2109***
	(6.64)
Foreign Income	-0.0065
	(-0.52)
Sales Growth	0.3961***
	(7.39)
CAPEX	-0.0298***
	(-2.63)
R&D	-0.0143
	(-1.59)
Discretionary Accruals	-0.0405**
	(-2.34)
Advertising	0.0309
	(1.49)
Intangibles	-0.3051**
	(-2.51)
Depreciation	0.0186
	(1.51)
Cash	1.4987***
	(5.09)
Altman Z Score	0.1480***
	(8.63)
INTERCEPT	0.7474***
	(3.61)
Observations	9,984
Adjusted R^2	0.513

This table presents results for the regression of *Q* on *CV_UTB*. The model includes industry (2-digit SIC code) and year fixed effects, and standard errors are clustered by firm. T-statistics are reported in parentheses, and ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. All continuous measures are winsorized at the 1st and 99th percentile. Variables are defined in Appendix A.

Table 7. UTB Volatility and Firm Risk

Variables	Return Volatility
CV_UTB	0.0027**
	(2.56)
CV_ETR	-0.0005
	(-0.32)
CV_PYUTB	0.0009
	(0.73)
Five Year ETR	0.0007
	(0.56)
CV_PTBI	0.0340***
	(9.09)
Five Year UTB	-0.1874
	(-0.77)
PTROA	-0.1005***
	(-10.73)
NOL	0.0007
	(0.73)
Loss	0.0075*
	(1.76)
Sales	-0.0066***
	(-10.74)
Leverage	0.0406***
	(7.50)
Foreign Income	-0.0013*
	(-1.69)
Sales Growth	0.0037***
	(2.85)
CAPEX	0.0005
	(1.00)
R&D	0.0004
	(0.92)
Discretionary Accruals	-0.0001
	(-0.35)
Advertising	0.0017
	(1.36)
Intangibles	-0.0209***
	(-4.34)
Depreciation	-0.0005
	(-0.91)
Cash	-0.0151*
	(-1.93)
Altman Z Score	0.0002
	(1.48)
INTERCEPT	0.1330***
	(20.43)
Observations	7,235
Adjusted R^2	0.408

This table presents results for the regression of *Return Volatility* on *CV_UTB*. The model includes industry (2-digit SIC code) and year fixed effects, and standard errors are clustered by firm. T-statistics are reported in parentheses, and ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. All continuous measures are winsorized at the 1st and 99th percentile. Variables are defined in Appendix A.

Table 8. Addressing Alternative Explanations

Panel A. The Effect of Key Underlying Firm Characteristics

Variables	TotalIRS Downloads	Three Year Settlements	Long Term Credit Rating	Q	Return Volatility
CV_UTB	-0.004	1.242***	-0.180	-0.186***	0.004**
	(-0.08)	(3.44)	(-1.29)	(-4.15)	(2.41)
CV_R&D	-0.102	-0.007	0.222	-0.052	-0.005
	(-0.91)	(-0.03)	(1.16)	(-0.64)	(-1.62)
CV_APTS	0.0411	-0.104	-0.049	-0.050	0.001
	(1.08)	(0.79)	(-0.38)	(-1.47)	(0.79)
ChgGeoSegs	0.004	-0.069	-001	-0.002	-0.001
	(0.45)	(-1.36)	(-0.53)	(-0.34)	(-0.88)
Controls from Eqn. (3)	YES	YES	YES	YES	YES
Observations	2,316	4,972	1,365	6,649	5,283
Adjusted R^2	0.575	0.041	0.774	0.413	0.420

Panel B. The Effect of Earnings Management Incentives

Variables	TotalIRS Downloads	Three Year Settlements	Long Term Credit Rating	Q	Return Volatility
Firms with Earnings Management Incentives					
CV_UTB	-0.482***	0.363	-0.258	0.264	0.031
	(-2.43)	(0.13)	(-0.67)	(0.62)	(1.03)
Controls from Eqn. (3)	YES	YES	YES	YES	YES
Observations	161	64	92	78	68
Adjusted R^2	0.470	0.922	0.912	0.625	0.133
Firms without Earnings Management Incentives					
CV_UTB	0.134***	1.297***	-0.638***	-0.097***	0.002
	(2.54)	(2.43)	(-4.82)	(-2.81)	(1.38)
Controls from Eqn. (3)	YES	YES	YES	YES	YES
Observations	1,563	2,719	863	4,142	3,358
Adjusted R^2	0.426	0.101	0.777	0.519	0.408

This table presents results for additional analyses examining alternative explanations for the main findings. Panel A reports the regression results including key determinants from Eqn. (1). Panel B reports the results of an additional analysis separately examining firms with earnings management incentives (i.e., firms reporting earnings within $0.01 of analysts' consensus earnings forecast) and firms without earnings management incentives (i.e., firms reporting earnings more or less than $0.01 away from analysts' consensus earnings forecast). Each model includes control variables from Eqn. (3) and industry (2-digit SIC code) and year fixed effects. Standard errors are clustered by firm. T-statistics are reported in parentheses, and ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. All continuous measures are winsorized at the 1st and 99th percentile. Variables are defined in Appendix A.