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Do Publicly Disclosed Tax Reserves Tell Us About Privately Disclosed Tax Shelter Activity?

PETRO LISOWSKY,* LESLIE ROBINSON,† AND ANDREW SCHMIDT‡

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ABSTRACT

We examine whether public disclosures of tax reserves recently made available through *Financial Interpretation No. 48* (FIN 48) reflect corporate tax shelter activities. Understanding this relation is important to corporate stakeholders and researchers keen to infer the aggressive nature of a firm's tax

*University of Illinois at Urbana-Champaign; †Tuck School of Business at Dartmouth; ‡North Carolina State University.

Accepted by Merle Erickson. We obtain tax return data from the Internal Revenue Service's (IRS) Large Business & International Division (LB&I) and the Office of Tax Shelter Analysis (OTSA). As IRS data are not publicly available and are protected by nondisclosure agreements under the Internal Revenue Code, all statistics are presented in the aggregate. Firm-specific details disclosed in this manuscript are wholly derived from publicly available sources. Any opinions are those of the authors and do not necessarily reflect the views of the IRS. For their helpful comments, the authors thank Paul Beck, Jennifer Blouin, Charles Boynton, Michael Donohoe, Scott Dyreng, Michelle Hanlon, Brian Holt, David Cay Johnston (discussant), Rick Laux, Andrew Lyon (discussant), Devan Mescall, Lillian Mills, Tom Omer (discussant), Mark Peecher, Jeff Pittman, Richard Sansing, Jeri Seidman, Doug Shackelford, Jake Thornock, Ryan Wilson, and two anonymous reviewers; participants at the 2010 University of North Carolina-KPMG Tax Symposium, the 2010 IRS Research Conference, and the 2010 American Accounting Association annual meeting; workshop participants at the University of Illinois at Urbana-Champaign, Michigan State University, University of Hawaii, North Carolina State University, and University of Connecticut; and members of the Texas Tax Readings group. The authors also thank Monika Dubiel, Thomas Pan, Victoria Ruppert, and Jennifer Wu for excellent research assistance. Finally, Petro Lisowsky appreciates generous support from the PricewaterhouseCoopers Faculty Fellowship at the University of Illinois. This manuscript was formerly titled, "An Examination of FIN 48: Tax Shelters, Auditor Independence, and Corporate Governance."

positions from its tax reserve accrual. Our study links public disclosures of tax reserves with mandatory private disclosures of tax shelter participation as made to the Internal Revenue Service's Office of Tax Shelter Analysis. We find strong, robust evidence that the tax reserve is positively associated with tax shelters, while other commonly used measures of tax avoidance are not. Based on out-of-sample tests, we also show that the reserve is a suitable summary measure for predicting tax shelters. The tax benefits of tax shelters are economically significant, accounting for up to 48% of the aggregate FIN 48 tax reserves in our sample.

1. Introduction and Motivation

Recent accounting guidance under Financial Interpretation No. 48 (FIN 48) standardizes the public disclosure and measurement of income tax reserves in financial statements.[1] A reserve may be required when a firm is uncertain whether its tax positions, or transactions reported on a tax return, will result in an additional payment pursuant to a future tax audit, settlement, or lawsuit because tax authorities disallow the tax benefits originally claimed. Many researchers consider tax positions supported by relatively weak facts and greater uncertainty as aggressive (e.g., Mills, Robinson, and Sansing [2010]), and recent research claims that the FIN 48 reserve in particular is "theoretically most similar to the underlying construct of [tax aggressiveness]" relative to other publicly available data (Rego and Wilson [2012, p. 785]). Thus, it is possible that FIN 48 disclosures can help interested parties discern the aggressive nature of firms' tax positions from public data. However, financial reporting incentives also affect FIN 48 reserves, potentially rendering them uninformative for tax aggressiveness (Hanlon and Heitzman [2010], hereafter HH [2010]). We seek to resolve this issue and contribute to the academic literature by validating whether FIN 48 tax reserves reflect aggressive tax positions, namely, tax shelters.

HH [2010, p. 137] note that "clearly, most interest, both for researchers and for tax policy, is in actions at the aggressive end of the [tax avoidance] continuum."[2] Conceptually, a tax shelter is the most aggressive type of tax position because it serves little or no business purpose (Treasury [1999]),

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[1] An income tax reserve is a contingent liability. FIN 48, effective for fiscal years beginning after December 15, 2006, is classified as Accounting Standards Codification (ASC) 740-10-25 under the Financial Accounting Standards Board's (FASB) new codification for U.S. Generally Accepted Accounting Principles (GAAP).

[2] Consistent with HH [2010], in Section 2, we conceptualize tax positions as falling along a continuum from highly certain (least aggressive) to highly uncertain (most aggressive). Tax avoidance encompasses all tax positions (with strong and weak facts, i.e., certain and uncertain positions); tax aggressiveness encompasses tax positions with relatively weaker facts (i.e., greater uncertainty); and tax sheltering encompasses tax positions with the weakest facts (i.e., greatest amount of uncertainty). Tax uncertainty arises because of the difficulty in applying ambiguous tax laws and anticipating the consequences of a future audit (see Mills, Robinson, and Sansing [2010]).

while generating tax benefits that the tax authority will most likely disallow (see section 2). Successfully identifying tax aggressiveness represents an important potential source of revenue for tax regulators. For example, the Internal Revenue Service (IRS) combats tax shelter use through mandatory tax return disclosure of "reportable transactions."[3] Boynton et al. [2011] find that the reportable transactions of 250 firms reduced reported taxable income in 2007 by $21.4 billion, or 2.1%. This translates into lost revenue of $7.5 billion (21.4 × 35% tax rate), or 2.8% of the $266.1 billion in corporate tax revenue collected in 2007. In our sample alone, the reportable transactions of 48 firms reduce taxable income in 2007 by $10.7 billion, or 7.5%, representing tax savings of $3.7 billion, or 1.4% of corporate tax revenue.

Research examining the causes and consequences of tax avoidance recognizes that tax shelters can generate either net benefits or costs to shareholders. Hanlon and Slemrod [2009] find little negative stock price reaction to firms accused of tax sheltering, suggesting that, despite their risk, some investors seek greater after-tax returns from tax shelters' substantial tax savings. Yet, other evidence suggests that tax shelters can facilitate rent extraction by using complicated business structures (Desai, Dyck, and Zingales [2007]) or can indicate aggressive financial reporting practices (Frank, Lynch, and Rego [2009]). The possibility that tax reserves can help further our understanding of these issues by offering a publicly available and reliable proxy for tax sheltering motivates our study.

Anecdotal evidence suggests that interested parties might be able to use tax reserves to infer tax shelter use. To illustrate, we analyze the public disclosures in Securities and Exchange Commission (SEC) 10-K filings of Wells Fargo (Wells) and Consolidated Edison (Con Ed). According to the annual reports of Wells and Con Ed, the IRS considered certain leveraged leases of Wells and Con Ed to be abusive Sale-In Lease-Out (SILO) and Lease-In Lease-Out (LILO) transactions, respectively, and disallowed the deductions.[4] In 2008, the IRS launched a settlement initiative providing an opportunity to settle some of these disputes out of court. According to

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[3] The amount of revenue ultimately collected is uncertain because the IRS must undergo costly audits and/or lawsuits to fully examine and adjudicate reportable transactions. Although the data are not public, Lisowsky [2010], which uses IRS data, demonstrates that reportable transactions are a valid empirical proxy for publicly disclosed (litigated) tax shelters as reported in Graham and Tucker [2006].

[4] SILOs/LILOs are leasing arrangements with a very specific fact pattern that the IRS views as having no valid purpose other than creating tax benefits (see Revenue Ruling 1999-14 and Notice 2005-13, which classify SILOs/LILOs as "listed transactions" that require Form 8886 disclosure, as discussed in section 3.1 of our paper). Note that the IRS would not require Wells or Con Ed to disclose their leveraged lease transactions to the IRS on Form 8886 unless firm managers and/or the company's tax return preparer believed that the transactions were SILOs/LILOs or "substantially similar" (as defined by Treas. Reg. §1.6011–4(c)(4)) to them. Due to confidentiality arrangements with the IRS, we cannot disclose whether Wells or Con Ed filed a Form 8886 related to its SILO/LILO transactions. See Graham and Tucker [2006] for details on SILOs/LILOs and other litigated tax shelters.

their 10-K footnote disclosures, for transactions qualifying for the settlement, Wells accepted the offer, while Con Ed did not.[5] Due to the resolution, Wells decreased its disclosed tax reserve by 40%, suggesting that these positions constituted a material amount of its existing reserve (see Wells' 2009 10-K income tax footnote). In contrast, Con Ed publicly maintained that it reported its leasing arrangements correctly for tax purposes and, as such, did not maintain a tax reserve in connection with these positions.

Determining whether a tax position constitutes a tax shelter is difficult because it requires a careful legal analysis of the detailed facts and circumstances of the transaction. Consistent with Con Ed's judgment not to maintain a reserve, the Court of Federal Claims upheld the tax deductions, concluding that the leases demonstrated a valid business purpose and were not tax shelters.[6] The public may never have access to the details of Wells's SILO/LILO transactions that were subject to the settlement agreement, although Wells's willingness to settle with the IRS in this case suggests that Wells's management lacked confidence in the strength of the facts and circumstances surrounding the details of their SILO/LILO transactions. Consistent with this view, the courts determined that the other leasing transactions for which Wells maintained a reserve, but that did not qualify for the settlement, were indeed tax shelters.[7]

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[5] For IRS remarks on this initiative, see http://www.irs.gov/Businesses/IRS-Commissioner%E2%80%99s-Remarks-Regarding-LILO-SILO-Settlement-Initiative—August 6, 2008 (last accessed September 17, 2012). To be clear, we refer to the IRS settlement offer accepted by Wells in 2009 that reduced its tax exposure on its overall leveraged lease portfolio "by approximately 90%" (see Wells's 2009 10-K income tax footnote). Wells continued to pursue separate disputes with the IRS related to leveraged lease transactions that did not qualify as part of the settlement. The courts settled these disputes in the IRS's favor (see Wells's 2012 10-K income tax footnote).

[6] See *Consolidated Edison Co. of New York, Inc. v. United States* No. 06-305T (Fed. Cir. 2009). The IRS appealed in December 2011 and awaits a final decision as of the writing of this manuscript. The Court of Appeals heard oral arguments in November 2012 and Coder [2012] reports that the court appeared critical of Con Ed's arguments. Interestingly, the IRS notes in its appeal that a new precedent set in the Wells case (issued *after* the decision in Con Ed) should have been applied to the Con Ed case, suggesting that the manner in which legal analyses are applied to facts and circumstances may actually change as new cases are tried. While an ultimate IRS victory could weaken the validity of this particular example in providing context for our study, legal scholars have written extensively on important differences between Con Ed and other leveraged leasing cases (e.g., Shakow [2010]). The Con Ed dispute also raises the possibility that what constitutes a tax shelter may change over time as new transactions are analyzed by courts and new precedents are set. That is, Con Ed's leveraged lease transactions may not, in its view, constitute tax sheltering (now or at the time Con Ed engaged in the initial transaction), but if the case was overturned, it may be that Con Ed *begins* to view these lease transactions as tax shelters going forward.

[7] In *Wells Fargo & Co. v. United States* No. 2010-5108 (Fed. Cir. 2011), the Court of Appeals for the Federal Circuit upheld the decision of the Court of Federal Claims to deny Wells its tax benefits for transactions not part of the original IRS settlement initiative. If the fact pattern of the firm's transactions that qualified as part of the settlement were similar to the fact pattern of the firm's litigated transactions, then the court decision provides some indication that the strength of the settled positions was relatively weak.

Notably, each firm's assessment of its respective lease's tax treatment—reflected in its decisions to maintain (or not maintain) a tax reserve—was consistent with conclusions reached after a careful legal analysis. Nevertheless, we caution that idiosyncratic factors can also determine tax reserves as well as outcomes of tax disputes, e.g., differences in fact patterns, managerial risk aversion, anticipated costs of litigation, and the quality of legal counsel.[8] However, the Con Ed and Wells anecdotes raise the possibility that, for a broad population of firms, interested parties can use tax reserves as ex ante indicators of tax shelters, many of which are never fully examined or publicly adjudicated like in the cases above.[9] Our premise is that linking reserves to tax shelters can provide a direct way to validate whether FIN 48 signals the use of aggressive tax positions.

Our analysis requires a robust empirical proxy for tax shelters to serve as a benchmark against which to evaluate how new financial disclosures made pursuant to FIN 48 relate to a firm's tax avoidance activities. Hence, we use private tax return disclosures of reportable transactions (i.e., the mandatory disclosures of tax shelters) made to the IRS Office of Tax Shelter Analysis (OTSA) during the initial years of FIN 48 reporting (i.e., 2006–2009). Access to these private disclosures uniquely positions us to answer our research question for several reasons. First, Lisowsky [2010] validates that private reportable transaction disclosures are a reliable proxy for publicly litigated tax shelters as identified in Graham and Tucker [2006]. Second, these disclosures help broaden our identification of tax shelters to transactions that may never be formally litigated, but that some parties believe could constitute tax sheltering in a court of law. Third, financial reporting incentives likely do not directly affect these tax return disclosures.

However, it is unclear whether we would observe a positive association between tax reserves and tax shelters in a large sample of firms as accounting

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[8] An interesting question is whether Con Ed's transactions constitute a tax shelter because the IRS challenged the tax benefits, or whether the transactions do not constitute a tax shelter because a court initially upheld the tax benefits. Consistent with our conceptualization of a tax shelter in section 2, the lower court's finding that Con Ed's fact pattern indicates a business purpose to the transactions suggests that they did not constitute tax sheltering. Relatedly, the lack of a tax reserve in this case suggests that Con Ed believed its facts and circumstances to be relatively strong. Indeed, the decision to litigate or settle the cases was likely related to the strength of the taxpayers' positions as opposed to the expected net benefits of litigation alone; their 2009 10-Ks disclose that Wells's tax benefits amounted to $2.7 billion and Con Ed's tax benefits equaled $205 million (and they continue to appeal $415 million in tax benefits). That is, the litigation costs would hardly be higher than the tax benefits at issue to have warranted Wells to settle if it believed that the leveraged lease transactions were not tax shelters.

[9] By ex ante, we mean that tax reserves can provide more timely public information as to firms' use of tax shelters by avoiding the need to rely on actual litigation outcomes, which are not only rare but are available many years after the firm engaged in the tax position. For example, Wilson [2009] finds 59 firms with litigated tax shelters over 28 years, while Graham and Tucker [2006] find 43 firms over 26 years. Hanlon and Slemrod [2009] find 108 firms over 14 years accused in the press of illegal tax shelters. A tax director of a large public company indicated to us that his firm litigated one tax issue in 30 years.

policies and procedures can be designed to attain some financial reporting objective (HH [2010]). Although accounting regulators intended for FIN 48 to standardize financial reporting of tax uncertainty (FASB [2006]), a tax reserve necessarily has a discretionary component, leaving it subject to financial reporting incentives. Even conditional upon finding a positive association between tax reserves and tax shelters, we acknowledge that alternative explanations exist. Foremost, conservatism in tax shelter reporting and financial reporting could explain the positive association if conservative managers are more likely to maintain a tax reserve *and* conclude that a tax position constitutes a reportable transaction.

To resolve whether financial statement users can reliably infer tax shelter use from FIN 48 tax reserves, we estimate logistic regressions of reportable transaction use on tax reserve ending balances and control variables in a sample of 3,262 firm-year observations during 2006–2009.[10] The coefficient on the reserve is significantly positive, suggesting that it does reveal information about tax shelter use. We also show that the explanatory power of the Lisowsky [2010] tax shelter inference model improves with the inclusion of the tax reserve, and that the out-of-sample ability of the tax reserve on its own can predict tax shelter use. Finally, using a variety of tests that employ several measures of tax shelter reporting and financial reporting conservatism, we find no evidence that conservatism drives the positive association between tax reserves and tax shelters. We conclude that publicly available FIN 48 tax reserves serve as a reliable proxy for tax shelter use.

Our evidence contributes to the literature by assessing how the new FIN 48 disclosures are related to a firm's tax avoidance activities, especially in comparison to other commonly used measures.[11] Existing measures used to study tax avoidance may or may not capture the construct of tax sheltering. For example, some measures capture tax benefits generated from certain types of tax positions (e.g., nonconforming or permanent), implicitly assuming homogeneity in tax benefits created by aggressive tax positions (HH [2010]). In addition, existing proxies can help measure the extent of tax savings, but they are silent as to their sustainability. We find that the reserve is the only tax avoidance measure significantly associated with reportable transactions, suggesting that the reserve is the most robust empirical proxy for tax shelters when compared to commonly used measures. Our study amplifies the call to researchers in HH [2010] to choose measures of tax avoidance to suit their particular research questions. Our findings are also germane to tax administrators keen to use the reserve to infer the nature

[10] Lisowsky [2010] provides the set of control variables that we use in our model. We use FIN 48 data gathered, reviewed, and validated by the IRS Large Business & International (LB&I) Division. We substitute the LB&I data with Compustat FIN 48 data and find similar results. See appendix B.

[11] We also examine the relation between reportable transaction use and (1) the GAAP effective tax rate; (2) the cash effective tax rate (Dyreng, Hanlon, and Maydew [2008]); (3) total book-tax differences (or BTDs) (Mills [1998]); (4) permanent BTDs; and (5) discretionary permanent BTDs (Frank, Lynch, and Rego [2009]).

of corporate tax compliance, and to accounting standard setters in evaluating whether FIN 48 meets its reporting objective (see Blouin and Robinson [2012]).[12]

The remainder of the paper is organized as follows: section 2 develops our conceptual framework, section 3 provides background information on tax return and financial statement disclosures, section 4 describes our data, section 5 explains our research design, section 6 reports our main results, section 7 discusses additional analyses, and section 8 concludes.

2. *Conceptual Development*

This section defines key terms and provides a conceptual framework within which we examine our research question—whether public disclosures of tax reserves reflect tax sheltering. We place our study in the context of the broader literature on corporate tax avoidance by comparing each measure of tax avoidance to a benchmark case of tax shelters.

Under the U.S. tax reporting system, a firm assesses its income tax liability and files a tax return showing how it determined that liability. We refer to these self-assessments as "tax positions." Reductions in tax liability arising from tax positions are "tax benefits," e.g., tax credits, deductions, or income exclusions. If the firm believes that there is a relatively high likelihood that the tax authority will disallow the position upon auditing the tax return because the tax benefits claimed are too high, then the firm is taking an "uncertain tax position." Uncertain tax positions arise when firm managers and their advisors apply ambiguous tax law to complicated facts and circumstances.

Uncertain tax positions are salient from both a tax and financial reporting perspective. The tax authority obtains revenue by identifying and challenging uncertain positions; it uses mandatory tax return disclosures as one policy tool to achieve this goal (see section 3.1). In terms of financial reporting, managers might prematurely recognize benefits from uncertain tax positions, decreasing tax expense and increasing earnings. In doing so, they provide little transparency to investors (e.g., Gleason and Mills [2002]). Consequently, FIN 48 seeks to improve and standardize information about uncertain tax positions in audited financial reports (FASB [2006]) (see section 3.2).

There is a large literature on the causes and consequences of corporate tax avoidance (see HH [2010] for a review).[13] We conceptualize "tax aggressiveness" to be a subset of tax avoidance, in which the underlying

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[12] The IRS introduced a tax return schedule for uncertain tax positions in 2010, Schedule UTP, which is essentially an attempt to refine FIN 48–type information for use in U.S. tax administration and enforcement. See section 3.1. The FASB reviewed the academic literature as part of their postimplementation review of FIN 48.

[13] We adopt terminology from HH [2010]. "Tax avoidance" captures certain (i.e., sustainable) and uncertain (i.e., unsustainable) tax positions that may or may not be challenged, i.e., the reduction of explicit taxes in any manner.

positions likely have weak legal support. In this we agree with Chirelstein and Zelenak [2005, p. 1]:

> The aim in every case is to create a tax benefit in the form of a loss, expense, or exclusion from gross income that has no economic corollary but is simply the consequence, or the hoped-for consequence, of rule manipulation. It is beyond doubt that such manipulations are contrary to Congressional intent, but that perception has not always been conclusive or even probative in the cases that have arisen.

Our notion of tax aggressiveness is also consistent with HH [2010, p. 137], who describe it as "pushing the envelope of tax law." We refer to the most extreme subset of tax aggressiveness as "tax sheltering," which tests the bounds of legality.[14] It follows that, as a firm's tax position becomes more aggressive, it should also become more uncertain as to whether the tax authority will allow the related tax benefits. Thus, we assert that tax shelter benefits, as conceptualized, are highly uncertain.

Researchers have developed a variety of empirical proxies to answer questions about corporate tax avoidance. These measures let us infer the amount and type of tax benefits generated from firms' tax positions, but they do not directly capture the aggressive nature of those positions. Figure 1 depicts our view of where the following five measures reside along the tax avoidance continuum that spans from perfectly legitimate positions on the left to tax sheltering on the right: (i) GAAP effective tax rate (*ETR*), (ii) cash ETR (*CashETR*), (iii) total book-tax differences (*BTDs*), (iv) permanent BTDs (*PermBTD*), and (v) discretionary permanent BTDs (*DTAX*). We briefly discuss each measure below and explain in section 3.2 how FIN 48 reserves fit into this taxonomy.[15]

ETR equals total tax expense divided by pretax financial income, while *CashETR* equals cash taxes paid divided by pretax financial income (Dyreng, Hanlon, and Maydew [2008]).[16] Both measures capture tax positions along the entire continuum. *BTD* equals the total difference between financial and (estimated) taxable income and resides further to the

[14] Tax aggressiveness, or even tax sheltering, does not imply illegality. Such a determination occurs in a court of law and relatively few tax shelter cases are litigated. Furthermore, we recognize that not all researchers share our notion of tax aggressiveness. Balakrishnan, Blouin, and Guay [2011, p. 3] define tax aggressiveness as "paying an unusually low amount of tax given a firm's industry and size." The notion of sustainability plays no role in this definition.

[15] These commonly used measures are the most familiar to empirical researchers and are explained extensively in HH [2010], with a focus on the types of tax benefits each measure captures. As we show in section 4.2, tax sheltering generates numerous types of tax benefits, so we cannot evaluate each measure's potential to identify tax sheltering based on the type of tax benefits it captures. Instead, our discussion focuses on each measure's potential to capture the most aggressive end of the continuum by using tax shelters disclosed as reportable transactions (*RT*) as a benchmark case (see figure 1).

[16] We place *CashETR* to the right of *ETR* because Dyreng, Hanlon, and Maydew [2008] suggest that the former is a clearer signal of tax avoidance, while the latter contains accounting accruals (e.g., valuation allowances) that may obscure this signal.

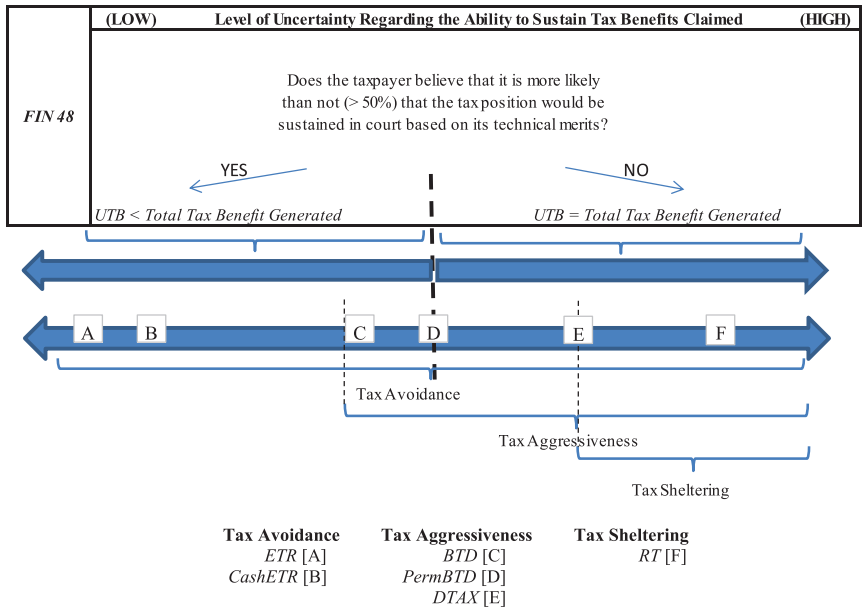

FIG. 1.—Tax avoidance continuum. This figure places various measures of tax avoidance from the empirical tax literature along a continuum of least aggressive (left) to most aggressive (right) tax positions. We associate each measure with the portion of the continuum on which it is placed inclusive of the portion to its right. We overlay the tax avoidance continuum with the FIN 48 recognition and measurement process to illustrate that the *UTB* account balance should be informative of tax sheltering. We define all variables in figure 2.

right; Mills [1998] links BTDs and IRS audit adjustments, a proxy for tax risk. However, *BTD* can also reflect benign tax positions such as differences in book and tax depreciation methods. Researchers typically consider permanent BTDs (*PermBTD*), a subset of BTD, as more aggressive because *PermBTD* reduce the firm's tax liability while increasing financial income (Shevlin [2002]). *DTAX* measures permanent BTDs (*PermBTD*) unexplained by legitimate tax positions (Frank, Lynch, and Rego [2009]).

At the most aggressive end of the continuum resides tax sheltering, measured as reportable transactions (*RT*) disclosed to OTSA (Lisowsky [2010]). While *RT* is the most direct measure of tax sheltering to date in the empirical literature, these data are not publicly available. For parties interested in identifying tax positions on the aggressive end of the continuum (i.e., *RT*), the five publicly available tax avoidance measures described above have notable limitations. First, they are not explicitly designed to capture tax sheltering, and thus all of them capture to some extent perfectly legitimate tax positions. Second, these measures do not capture conforming tax positions, whose effect on taxable and financial income is the same. Finally, because they capture the *quantitative* effects of various types of tax benefits, rather than the *qualitative* nature of a firm's tax position, they

cannot tell us about *uncertainty* of a tax position. In the next section, we develop the conceptual link between *RT* and tax sheltering, and show why FIN 48 information offers a potentially clearer signal of tax sheltering relative to existing proxies.

3. Institutional Background

3.1 REPORTABLE TRANSACTION TAX RETURN DISCLOSURES

To combat the rise of tax shelters in the late 1990s, the IRS established the Office of Tax Shelter Analysis (OTSA). Regulations under Internal Revenue Code (IRC) §6011 require a firm to attach a Form 8886 to its tax return for each "reportable transaction" in which it is involved and for each year that the transaction affects taxable income. OTSA compiles and analyzes these disclosures. Multiple legislative provisions penalize both tax shelter participants and their advisors for failing to comply with the tax shelter disclosure regulations. The most significant provisions include a nondisclosure penalty, an increased accuracy related penalty, a mandatory Securities and Exchange Commission (SEC) public disclosure exposing the noncompliance, a more stringent reasonable-cause and good-faith standard, an extended statute of limitations, and a denial of the "realistic possibility" defense in disputes over tax preparer negligence.[17]

IRC §6011 defines six categories of reportable transactions: (i) listed, (ii) confidential, (iii) contractual protection, (iv) loss, (v) brief asset holding period, and (vi) transactions of interest.[18] Certain statutory provisions, judicial doctrines, and IRS administrative guidance define and identify listed transactions, warning taxpayers that using such (or similar) transactions may lead to an audit and assessment of back taxes, interest, and penalties. The other five categories, collectively known as nonlisted transactions, refer to characteristics that tax shelters customarily exhibit, rather than describing specific transactions, e.g., limiting disclosure of the tax structure

[17] IRC §6707A provides for a nondisclosure penalty of up to $200,000 per transaction per year. Thus, the IRS would impose a $1 million penalty for a transaction that affects taxable income for five years. The accuracy-related penalty under IRC §6662A increases from 20% to 30% of the underpayment for nondisclosure. Based on discussions with a tax shelter attorney, the most onerous penalty for public companies is the mandatory SEC disclosure because it exposes the firm's noncompliance with a regulatory requirement. We searched SEC filings during our sample period and found no disclosure of a firm failing to disclose a reportable transaction on its tax return. The reasonable-cause and good-faith standard of IRC §6664 evaluates a taxpayer's effort to assess the proper tax liability (e.g., an honest misunderstanding of fact or law that is reasonable in light of all of the facts and circumstances, or reliance on erroneous information, provided the taxpayer maintained proper internal controls) in considering an exception to the imposition of penalties. The "realistic possibility" defense allows tax preparers to avoid negligence penalties if they had a good faith belief that the position had at least a one-in-three chance of being sustained on its merits.

[18] Though part of the original §6011 regulations, the IRS removed significant book-tax differences from the list of reportable transactions as of January 6, 2006. In 2007, the IRS added category vi) "transactions of interest." For a current list of listed transactions, see http://www.irs.gov/businesses/corporations/article/0,,id=120633,00.html.

or treatment to protect the confidentiality of the tax advisor, or promising the taxpayer a refund of fees if the taxpayer does not realize the intended tax benefits of a transaction.

From an efficiency standpoint, the IRS does not encourage disclosure on Form 8886 of legitimate transactions (i.e., those with a business purpose) that may otherwise exhibit these characteristics. Numerous notices and rulings explicitly exempt various positions from reportable transaction disclosure (e.g., Rev. Proc. 2004-66, 2004-50, IRB 1). Thus, managers and advisors exercise some judgment when determining if a transaction warrants disclosure, especially when idiosyncratic fact patterns underlie the position. As a result, and consistent with the legislative intent of combating tax shelters, tax positions underlying reportable transactions might not withstand IRS scrutiny. Thus, the design and intent of the disclosure regulations, as well as the strict penalty regime used to discourage obfuscation on the part of the firm and its advisors, supports our choice of reportable transactions as a proxy for tax sheltering.

In addition to Form 8886, the IRS mandates other disclosures that relate to tax shelters. As of 2004, IRS Schedule M-3 includes a disclosure of the aggregate dollar effect on financial and taxable income from reportable transactions. IRS Schedule UTP, adopted for the 2010 tax year, requires a ranking of material uncertain tax positions from largest to smallest, consistent with U.S. reserve decisions made under FIN 48.[19] Limited audit resources, coupled with increasingly complex transactions, make it difficult for the tax authority to identify and successfully challenge tax sheltering. The use of Form 8886, in combination with Schedule M-3 and Schedule UTP, is a clear IRS policy move toward obtaining a more complete profile of a firm's tax risk. However, these disclosures do not report the dollar value of uncertain tax benefits, and tax return information is not publicly available. As a result, FIN 48 disclosures are of great interest to a number of outside firm stakeholders, including tax administrators and investors.

3.2 UNRECOGNIZED TAX BENEFIT FINANCIAL STATEMENT DISCLOSURES

The financial accounting issue arising from uncertain tax positions is how financial statements should reflect tax benefits taken on a tax return when a tax authority may ultimately disallow those benefits. The FASB added FIN 48 to its agenda because of the SEC's concern that firms were prematurely recognizing benefits from uncertain tax positions in financial statements, leading to an overstatement of net income (FASAC [2004]).[20] FIN 48, effective for fiscal years beginning after December 15, 2006, standardizes the

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[19] A material tax position exceeds 10% of aggregate U.S. FIN 48 tax reserves. Currently, the IRS requires Schedule UTP for firms with assets exceeding $100 million. The IRS reduces the asset threshold to $50 million in 2012 and to $10 million in 2014. Schedule UTP data were not available as of the writing of this manuscript.

[20] Statement on Financial Accounting Standards No. 109, *Accounting for Income Taxes* (SFAS 109), is silent on how firms should measure tax reserves in financial statements. Anecdotally, firms were using a variety of methods for determining the tax reserve before FIN 48. Academic research assumes that firms followed SFAS 5, *Accounting for Contingencies*, and accrued the

recognition, measurement, and disclosure of tax reserves in financial statements.

The result of applying FIN 48 is that some reductions in cash taxes paid do not reduce tax expense, since additional taxes may be due upon a future tax audit. Firms cannot resolve this uncertainty while the statute of limitations remains open, typically for three years, i.e., the government is generally prohibited from assessing any additional income tax for a taxable year after three years from the date the taxpayer filed for that year. If the IRS challenges a tax position, the resolution may take even longer. Broadly speaking, the FIN 48 tax reserve, termed the "unrecognized tax benefit" (UTB), is a contingent liability that reflects the dollar amount of tax benefits related to all open tax positions that may ultimately be disallowed. FIN 48 requires firms to disclose the UTB amount in the financial statement footnotes.

Returning to the tax avoidance continuum depicted in figure 1, the UTB should increase in the level of uncertainty about a tax position. Tax benefits reduce tax expense only when the tax position generating those benefits will more-likely-than-not (>50%) be sustained in a court of law based solely on its technical merits. If a position does not pass this "recognition" step (to the right of the dashed line), the UTB amount reflects all tax benefits generated from the uncertain tax position. If a position does pass the recognition step (to the left of the dashed line), FIN 48 requires a "measurement" step, which determines the amount of the UTB as less than the total tax benefit, using probability assessments of the likely amounts realized upon settlement with the tax authority.[21] The judgment inherent in applying FIN 48 involves managers, auditors, and legal counsel.[22]

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expected value of the outcome from potential tax assessments, disclosing only material tax reserves (Gleason and Mills [2002]). Interest in FIN 48 by the business community is high; according to Audit Analytics, the FASB received 255 comment letters on the proposed version of FIN 48, nearly half of the 586 comment letters that were received when SFAS 109 itself was open for comment. Note that accounting for uncertain tax positions is only one of many issues addressed in SFAS 109.

[21] When a position fails the recognition step, the UTB is measured as the total tax benefit minus the recognized tax benefit. The recognized tax benefit is the *median* amount of the expected tax benefit retained based on a probability assessment of audit outcomes (considering settlement and litigation intentions), resulting in none, some, or all of the tax benefits reflected in the UTB.

[22] Based on discussions with a tax attorney and financial statement auditor, we enumerate reasons why the recognition threshold may not be met for financial accounting purposes, even with an opinion from legal counsel that a tax position is more-likely-than-not to be sustained: (i) the financial auditor may disagree with legal counsel; (ii) the strength of a tax position can change if the transaction affects many periods, as similar cases are litigated or new guidance is issued; (iii) the firm may have obtained a legal opinion to avoid civil fraud penalties, but does not itself believe that the tax position meets the recognition threshold (though avoiding the penalty does not always work; e.g., see *Long Term Capital Holdings v. United States*, 330 F.Supp.2d 122 D. Conn. 2004); or (iv) legal counsel may have based their opinion on unreasonable factual assumptions and representations given by the taxpayer. Additionally, our contacts noted

As with the existing measures shown in figure 1, the UTB could capture benefits from tax positions falling along the entire continuum. However, unlike most existing measures, the UTB has a strong conceptual link to the more aggressive end of the continuum, including tax sheltering, precisely because it involves not just the quantification, but also the qualification of tax positions as highly uncertain, i.e., we believe that tax shelters have the lowest chance of meeting the more-likely-than-not threshold. As a result, linking the UTB and reportable transactions provides a powerful empirical setting in which to evaluate whether FIN 48 reserves tell interested parties about tax shelter use.

4. Data

4.1 DATA SOURCES AND SAMPLE SELECTION

We use data from three sources: (1) UTB data from the IRS Large Business & International Division (LB&I),[23] (2) financial data from Compustat, and (3) reportable transaction data from OTSA. We determine our sample as follows: First, we obtain 19,271 firm-years from the intersection of LB&I and Compustat data during 2006–2009.[24] Second, we obtain OTSA data during 2006–2009 for 845 calendar year-end firms in the S&P 1500 as of the end of 2007.[25] Finally, the intersection of OTSA data and LB&I/Compustat data yields 3,262 firm-years. We also obtain limited OTSA data during 2003–2005 and LB&I Schedule M-3 data during 2006–2009 for descriptive purposes only to analyze trends and magnitudes of reportable transactions.

4.2 REPORTABLE TRANSACTION DATA

Table 1 presents descriptive data for tax shelters disclosed as reportable transactions (RT). In panel A, the column labeled $RT = 1$ (our dependent

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that firms enter into a significant number of transactions (for nontax reasons) prior to seeking legal counsel regarding the appropriate tax treatment, and thus the firm may decide to take an aggressive (i.e., uncertain) tax position for which it is not able to obtain a more-likely-than-not legal opinion.

[23] See appendix B for a discussion of the UTB data we alternately obtain from Compustat.

[24] We initially obtain 15,925 firm-years during 2007–2009 from the intersection of LB&I and Compustat data. Specifying the *beginning* UTB in 2007 (when FIN 48 was adopted) as the *ending* UTB in 2006 yields a merged LB&I/Compustat sample of 19,271 firm-years during 2006–2009. Although FIN 48 is effective for fiscal years beginning after December 15, 2006, this approach allows us to include 2006 reportable transactions in our study and provides us with the largest sample of both firms and time periods. Results are qualitatively identical if we exclude 2006. Note that we use the larger sample of 19,271 firm-years to conduct one of our sensitivity tests in section 7.

[25] One of the authors' access to OTSA data is more restrictive than access to LB&I FIN 48 data. Therefore, we were able to expand the number of years, but not the number of firms, beyond those in the initial version of this manuscript; i.e., 845 calendar year end S&P 1500 firms (excluding REITs) with complete regression data in 2007.

TABLE 1

Descriptive Data for Firms Involved in Reportable Transactions Out of 3,262 Firm-Years

Panel A: Involvement in Reportable Transactions as Reported on Form 8886 by Year and Industry

By Year	*n* $RT = 1$	*n* Firms	% Firms	*n* Transactions	Mean Transactions	Median Transactions
2003		316	38	1,676	5.30	3
2004		209	25	1,240	5.93	2
2005		105	12	541	5.15	2
2006	**224**	67	8	191	2.89	1
2007	**170**	101	12	951	9.42	1
2008	**145**	87	11	442	5.08	2
2009	**141**	83	11	449	5.41	1
Sample period	**680**	338				
By Industry (2006–2009)						
Agriculture	ND	ND	ND	ND	ND	ND
Construction	36	16	9	109	6.81	2.5
Chemicals	131	67	13	232	3.46	1
Manufacturing	134	66	8	790	11.97	1
Transportation	118	52	12	203	3.90	1.5
Retail trade	31	17	8	27	1.59	1
Financial svcs.	158	83	14	609	7.34	2
Personal svcs.	42	18	6	46	2.56	1
Professional svcs.	22	12	8	12	1.00	1
Other	ND	ND	ND	ND	ND	ND
All Industries	680	338				

Panel B: Type of Reportable Transactions and Tax Benefits as Reported on Form 8886 (2007–2009)

Types of Transactions	*n* Firms	% Firms
Listed	64	24
Non-listed	244	90
Confidential	10	4
Contractual protection	49	18
Loss	183	68
Brief-asset holding period	22	8
Transaction of interest	8	3
Types of Tax Benefits		
Deduction	87	32
Capital loss	86	32
Ordinary loss	119	44
Exclusion from income	6	2
Non-recognition of gain	4	1
Adjustments to basis	8	3
Tax credits	66	24
Deferral	21	8
Other	46	17

(*Continued*)

TABLE 1—*Continued*

Panel C: Financial and Taxable Income Effects of Reportable Transactions per Schedule M-3 (2006–2009)

Income Effect of Transactions	*n* Firms	Mean $(mil)	Median $(mil)	Aggregate $(mil)
Financial income (FI)	166	−96.41	−0.45	−15,908.18
Taxable income (TI)	166	−204.41	−60.78	−33,725.26
Pattern of effect on FI and TI				
FI TI				
+ −	14			
− −	83			
0 −	47			
+ 0	4			
Other	18			
Book-Tax Differences by Year				
2006	52	−210.97	−63.27	−12,235.99
2007	48	−81.03	−22.46	−3,889.26
2008	37	−27.30	−16.69	−1,010.05
2009	29	−23.51	−19.93	−681.79
Book-Tax Differences by Type				
Total	166	−107.33	−29.30	−17,817.09
Temporary	166	−21.59	−1.17	−3,584.26
Permanent	166	−85.74	0.00	−14,232.83
Book-Tax Differences by Transaction Type				
Only listed				
Total	19	−66.93	0.00	−1,271.72
Temporary	19	−16.48	0.00	−313.18
Permanent	19	−50.45	0.00	−958.54
Only nonlisted				
Total	107	−132.86	−77.55	−14,215.93
Temporary	107	−27.12	−5.06	−2,901.82
Permanent	107	−105.74	0.00	−11,314.11
Both listed and nonlisted				
Total	40	−58.24	0.00	−2,329.45
Temporary	40	−9.23	0.00	−369.26
Permanent	40	−49.00	0.00	−1,960.19

This table presents descriptive data for involvement in reportable transactions per Form 8886, and dollar effects on financial and taxable income (i.e., BTDs) generated from reportable transactions per Schedule M-3. Panel A reports involvement in a reportable transaction by year and industry. We show involvement prior to the enactment of FIN 48 for illustrative purposes only. *RT,* the dependent variable in our study, equals 1 when a firm is involved in a reportable transaction during any of the current or prior two years, and 0 otherwise. Bolded values indicate the *RT* observations and sample period used in our tests. Means and medians are shown because some firms report involvement in more than one reportable transaction during the year. Panel B reports information about the types of reportable transactions and the types of tax benefits that these transactions generate. This information was made available by the IRS OTSA for 2007–2009 and we use it for descriptive purposes only. Neither the number of firms nor the percent of firms are additive to the figures presented in panel A because involvement in a single reportable transaction may be associated with multiple transaction types (i.e., listed, confidential) and/or tax benefit types (i.e., deductions, credits). Panel C reports information about the types of BTDs generated by types of reportable transactions. We use 2006–2009 Schedule M-3 data from IRS LB&I for descriptive purposes only. Monetary amounts are in $ millions. Because of IRS nondisclosure agreements, we cannot disclose descriptive data for small sample sizes. We indicate such restrictions with "ND" for "not disclosed."

variable as described in section 5) shows that 680 firm-years (21% of our 3,262 firm-years) participate in a reportable transaction during the current or prior two years.[26] Notably, the incidence of reportable transactions has declined sharply since 2003, consistent with the findings of Boynton, DeFilippes, and Legel [2008]. While some evidence suggests that FIN 48 reduced tax aggressiveness (e.g., Gupta, Mills, and Towery [2011]), the data in panel A indicate that, consistent with Donohoe and McGill [2011], firms started to change tax reporting behavior several years prior to FIN 48, potentially in response to other regulatory initiatives to improve corporate governance and business ethics (e.g., Sarbanes-Oxley Act).

Financial Services, Chemicals, and Transportation sectors exhibit the highest proportion of firms involved in a reportable transaction (14%, 13%, and 12%, respectively). The median number of disclosures made in a single year is the highest for Construction firms at 2.5. Firms employ discretion over the extent to which they aggregate individual tax positions for disclosure. For instance, an uncertain tax position taken with respect to five construction projects could plausibly be disclosed as five reportable transactions, or as just one. As a result, we rely on the incidence, not the count, of reportable transactions on Form 8886 to indicate tax shelter use.

Panel B of table 1 reports data on the types of reportable transactions and the types of tax benefits generated by these transactions.[27] The most common type of reportable transaction during our sample period (which includes a major recession) generates losses: 32% and 44% of our firm-years report a transaction that involves questionable capital and ordinary loss treatment, respectively. These figures indicate that tax sheltering can involve positions with multiple sources of tax uncertainty, i.e., not only uncertainties that generate reductions in taxable income, but also uncertainties about the character of income (e.g., ordinary vs. capital). Listed transactions, disclosed in 64 firm-years, include §351 contingent liability transactions (Notice 2001–17), foreign tax credit intermediaries (Notice 2004–20), SILOs (Notice 2005–13), §419 abusive trust arrangements (Notice 2003–24 and Notice 2007–83), and loss importations (Notice 2007–57).

Panel C of table 1 reports data on reportable transactions' BTDs from Schedule M-3, Part II, Line 12. We find that not all firms involved in a

[26] As we describe in more detail later, we consider tax shelter use over a three-year period corresponding to the average statute of limitations period because the tax reserve captures tax shelter use during all open tax years. The 338 firm-years reported in panel A correspond to firms involved in at least one reportable transaction during a particular year during 2006–2009. In contrast, the 680 firm-years reported in panel A correspond to firms involved in at least one reportable transaction in any of the current *or prior two years*, where the current year is defined to include 2006–2009. For example, 101 firms were involved in at least one reportable transaction during 2007, while 170 firms were involved in at least one reportable transaction during 2005–2007.

[27] The sample size figures in panel B cannot be directly reconciled to panel A because: (i) some firms report more than one type of reportable transaction in a single year, (ii) a single transaction can generate multiple types of tax benefits, and (iii) this detailed information is only available during 2007–2009.

reportable transaction complete this line item; we are able to obtain data for only 166 firm-years out of a total 338 (i.e., the sum of annual disclosures reported in panel A, $67 + 101 + 87 + 83 = 338$). The lower level of compliance on the M-3 relative to Form 8886 likely arises from a lack of significant penalties associated with M-3. We limit our use of M-3 data to providing a sense of the economic significance of reportable transactions.

In aggregate, these 166 firm-years reduce taxable income by $33.7 billion during 2006-2009, suggesting that firms enjoyed as much as $11.8 billion ($33.7 × U.S. tax rate of 35%) in tax benefits over this period. Interestingly, reportable transactions reduce financial income by a smaller amount—$15.9 billion—suggesting that the GAAP treatment of these transactions frequently differs. The most common pattern is in 83 firm-years that reduce both financial and taxable income; only six (untabulated) report this reduction as conforming (the same dollar amount). Interestingly, 14 firm-years achieve an "ideal" result of increasing financial income while decreasing taxable income.[28]

Regarding types of BTDs, Shevlin [2002, p. 433] states, "An ideal tax shelter (in addition to not being detectable) is one that permanently reduces taxable income without a similar reduction in book income. That is, the ideal corporate tax shelter gives rise to permanent differences." On average, the economic significance of permanent BTDs for reportable transactions ($85.74 billion) is higher than temporary differences ($21.59 billion); this is true for both listed and nonlisted reportable transactions. However, temporary differences are a more common feature of tax shelters, with a median of $1.17 billion versus $0 for permanent differences.

4.3 UTB DATA

Table 2 presents descriptive data for the FIN 48 tax reserves. Because the distribution of the raw dollar amounts (*UTB*) is highly skewed, we also report descriptive data for the natural log of the *UTB* (*UTB_LN*) and the *UTB* scaled by total assets (*UTB_SC*), both of which we use in our multivariate analyses. We discuss statistics for the *UTB* here to provide an economic sense for the tax reserves. Recall that the UTB relates to all *open* tax positions, which include those taken in the current or prior two years' returns, consistent with the general statute of limitations of three years.

Panel A of table 2 reports the UTB data separately for the 680 firm-years that involve reportable transactions from the current or prior two years

[28] The 18 firms that report an increase to taxable income (i.e., the "Other" category) are likely engaged in a multiperiod transaction whereby taxable income is deferred to later years (i.e., decreases to taxable income ultimately become increases, relative to what taxable income would have been absent the transaction). Such timing differences can be significant features of tax shelters (see Wilson [2009]) and firms must file Form 8886 each year taxable income is affected by a reportable transaction. Finally, we cannot conclude that the remaining 77 firm-years (83-6) exhibiting a -/- pattern represent nonconforming tax shelters because a single reportable transaction line item on Schedule M-3 may represent multiple transactions, some of which may be conforming and some of which may be nonconforming.

TABLE 2

Descriptive Data for Unrecognized Tax Benefits for 3,262 Firm-Years

Panel A: *Unrecognized Tax Benefits* by Year

	Full Sample [$n = 3{,}262$]							$RT = 1$ [$n = 680$]					
		UTB		*UTB_LN*		*UTB_SC*			*UTB*		*UTB_LN*		*UTB_SC*	
Year	n	Mean	SD	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD	Mean	SD
2006	843	99	214	2.837	1.967	0.011	0.015	224	254	324	4.412	1.796	0.014	0.016
2007	845	103	210	2.949	1.954	0.011	0.015	170	285	321	4.599	1.841	0.014	0.016
2008	797	99	201	2.921	1.947	0.012	0.018	145	256	296	4.548	1.746	0.013	0.014
2009	777	96	198	2.879	1.959	0.012	0.018	141	254	302	4.406	1.904	0.013	0.015
	3,262	99	206	2.897	1.957	0.011	0.015	680	262	312	4.487	1.818	0.013	0.016

Panel B: *Unrecognized Tax Benefits* by Industry

	Full Sample [$n = 3{,}262$]							$RT = 1$ [$n = 680$]					
		UTB		*UTB_LN*		*UTB_SC*			*UTB*		*UTB_LN*		*UTB_SC*	
Industry	n	Mean	SD	Mean	SD	Mean	SD	n	Mean	SD	Mean	SD	Mean	SD
Agriculture	ND							ND						
Construction	181	55	92	2.552	1.897	0.006	0.009	36	137	118	4.080	1.823	0.008	0.007
Chemicals	524	159	272	3.521	1.994	0.016	0.016	131	365	363	4.958	1.741	0.019	0.014
Manufacturing	853	83	169	3.060	1.697	0.016	0.018	134	234	277	4.654	1.404	0.018	0.013
Transportation	430	133	234	3.128	2.181	0.009	0.015	118	288	315	4.718	1.736	0.013	0.015
Retail Trade	220	34	80	2.237	1.563	0.007	0.008	31	102	157	3.608	1.507	0.012	0.011
Financial svcs.	585	106	228	2.531	2.188	0.003	0.006	158	258	314	4.279	2.061	0.003	0.005
Personal svcs.	307	82	189	2.736	1.822	0.018	0.025	42	293	335	4.662	1.764	0.028	0.031
Professional svcs.	147	23	35	2.173	1.473	0.010	0.012	22	29	41	2.439	1.520	0.010	0.015
Other	ND	240	389	3.663	2.027	0.007	0.005	ND	436	456	4.579	2.342	0.005	0.004
	3,262	99	206	2.897	1.957	0.011	0.015	680	262	312	4.487	1.818	0.013	0.016

This table presents descriptive data for the ending balance in the unrecognized tax benefit (*UTB*) account by year and industry for our sample of 3,262 firm-years during 2006–2009. Panel A reports the UTB by year separately for the full sample and for the 680 observations where $RT = 1$. *RT*, the dependent variable in our study, equals 1 when a firm is involved in a reportable transaction during any of the current or prior two years, and 0 otherwise. Panel B reports UTB data by one digit SIC codes separately for the full sample and for the 680 observations where $RT = 1$. *UTB* is in $ millions, *UTB_LN* is equal to the natural log of (1 + *UTB*), and *UTB_SC* is the ratio of *UTB* to total assets. Because of IRS nondisclosure agreements, we cannot disclose descriptive data for small sample sizes. We indicate such restrictions with "ND" for "not disclosed."

($RT = 1$). In every year, the mean UTB is significantly larger for firms involved in reportable transactions compared to the full sample. The aggregate *UTB* in our sample as of 2009 is \$74.6 billion (777 firms in 2009 × \$96 million mean UTB). This amount represents 9.3% of the total U.S. corporate tax revenue collected in 2007 through 2009 (i.e., the current and previous two years).[29] This figure is an upper bound on the potential recoverable tax revenue for the IRS from those years because (1) UTBs also reflect uncertain tax positions in state and international jurisdictions, (2) the IRS must undergo a costly audit and settlement process to recover these tax dollars for which it may not have sufficient resources, and (3) the outcome of any potential litigation could ultimately be decided in favor of the taxpayer.

We offer two ways of estimating the economic significance of tax sheltering underlying FIN 48 tax reserves. First, the aggregate UTB for the tax shelter sample in 2009 is \$35.8 billion. This implies that 18% of our sample accounts for 48%—or almost half—of the aggregate UTB.[30] If we assume that our tax shelter firms *only* engaged in tax positions characterized as tax sheltering, then 48% represents an upper bound of the share of tax sheltering underlying the aggregate UTB in our sample. Second, we consider the possibility that tax shelter firms engage in aggressive tax positions besides tax shelters, which may also be reflected in the UTB. Incorporating Schedule M-3 data with UTB data in a subset of our tax shelter firms, we determine a lower bound estimate of 12% as the share of the UTB related to tax sheltering for those firms.[31] Extending the 12% lower bound to all tax shelter firms for 2009, we conservatively estimate a lower bound of 6% as the aggregate UTB represented by tax sheltering activities in our sample [(141 firms × \$254 × 0.12)/(777 firms × \$96)].

The significance of tax sheltering in the reserve appears to be decreasing over time (68% of the aggregate UTB in 2006 vs. 48% in 2009).[32]

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[29] For IRS Data Books for 2007, 2008, and 2009, see: http://www.irs.gov/uac/SOI-Tax-Stats—IRS-Data-Book.

[30] Using the figures reported in table 2, panel A for 2009, we calculate the share of the aggregate UTB concentrated in tax shelter firms ($RT = 1$) as (141 $RT = 1$ firms × \$254 million mean UTB)/(777 total firms × \$96 million mean UTB) = \$35.8 billion/\$74.6 billion = 48%.

[31] For a sample of 114 firm-years (48 + 37 + 29) reporting on Schedule M-3 during 2007–2009, the aggregate reduction in taxable income from reportable transactions is almost \$5.6 billion (3,889.26 + 1,010.05 + 681.79), suggesting nearly \$2.0 billion (\$5.6 × U.S. statutory tax rate of 35%) in tax benefits. Comparing this number to the \$16.2 billion aggregate UTB for these firms at the end of 2009 yields an estimate of 12% (\$2.0/\$16.2 billion). This is a lower bound estimate because a firm's UTB includes local, state, federal, and international tax uncertainties, while the dollar amount of tax benefits that we obtain from the M-3 relates only to the federal jurisdiction. The effect on taxable income also does not include the effect of tax credits, even though 24% of our sample firms report tax benefits in the form of credits arising from reportable transactions (see table 1, panel B).

[32] For 2006, we calculate the share of the aggregate UTB concentrated in tax shelter firms ($RT = 1$) as (224 $RT = 1$ firm × \$254 million mean UTB)/(843 total firms × \$99 million mean UTB) = 68%.

These numbers are consistent with Graham, Hanlon, and Shevlin [2011, p. 39], which reports "57% of surveyed executives indicate their willingness to engage in aggressive tax positions would decrease as a result of FIN 48." Finally, firms in the Chemical ($83 billion), Financial Services ($63 billion), and Transportation ($57 billion) industries report the largest aggregate UTBs. These industries also report the highest reportable transaction counts in table 1.

5. *Research Design*

We design our empirical tests to examine the extent to which outside parties can infer tax shelter use from publicly available FIN 48 tax reserves. We estimate a pooled cross-sectional logistic regression model of reportable transaction (*RT*) participation (for firm i in year t) on FIN 48 tax reserve (*UTB*) ending balance amounts and control variables, as follows:[33]

$$RT_{it} = \beta_0 + \beta_1 UTB_{it} + \sum_{k=2}^{15} \beta_k Controls_{it} + \sum_{k=16}^{24} \beta_k Ind_{it} + \sum_{k=25}^{27} \beta_k Year_{it} + \varepsilon_{it} \quad (1a)$$

We define the model variables in figure 2.

Our variable of interest is *UTB*, which we alternately specify as *UTB_LN*, or the log of one plus the ending balance in the reserve, and *UTB_SC*, or the ending balance of the reserve scaled by total assets. Because *UTB* captures uncertainty arising from all *open* tax positions, and statutory regulations impose a three-year statute of limitations for most tax positions, we measure all other model variables over a three-year period. Accordingly, *RT* is equal to 1 if a firm participates in a reportable transaction in the current or prior two years, and 0 otherwise.[34]

We calculate our control variables to maintain consistency with Lisowsky [2010], who infers the likelihood of participation in a reportable transaction from financial statement data. His set of control variables includes discretionary accruals, leverage, size, profitability, foreign income, research

[33] Since our sample period is short (2006–2009), we follow Petersen [2009] and cluster the standard errors by firm and include year fixed effects in all of our regressions. All regressions also include industry fixed effects. We winsorize continuous variables at the 1st and 99th percentiles to mitigate the effect of outliers.

[34] If a firm participates in a reportable transaction in the prior but not current year, or if a reportable transaction affects taxable income in a prior but not current year, then the UTB should still indicate involvement in that reportable transaction because the UTB reflects uncertain tax benefits for all open tax years. All results are robust to using one-year measures for *RT* and our control variables, as well as using either the logged or scaled *UTB*.

Variable		Definition
Dependent Variable		
RT	=	Indicator variable equal to one if a firm is involved in a reportable transaction during any of the current or prior two years; zero otherwise. Source: OTSA, IRS Form 8886.
UTB Measures		
UTB	=	Ending balance (in millions) of the unrecognized tax benefit (UTB) accrual. Source: IRS LB&I.
UTB_LN	=	The natural log of (1 + *UTB).*
UTB_SC	=	*UTB* / Total Assets (AT).
Other Tax Avoidance Measures (BTD included below)		
ETR	=	The ratio of Tax Expense (TXT) / Pretax Income (PI).
CashETR	=	The ratio of Cash Taxes Paid (TXPD) / Pretax Income (PI) before Special Items (SPI).
PermBTD	=	The ratio of (Pretax Income (PI) minus Estimated Taxable Income) / Total Assets (AT), where Estimated Taxable Income = (Current U.S. Tax Expense (TXFED) + Current Foreign Tax Expense (TXFO)) / 35%, minus (Deferred Tax Expense (TXDI) / 35%).
DTAX	=	Discretionary Permanent Book-Tax Differences are the residual from a regression of *PermBTD* (defined above) on Goodwill and Other Intangibles (INTAN), Equity in Earnings (ESUB), Minority Interest in Earnings (MII), Current State Tax Expense (TXS), change in Tax Loss Carry Forward (ΔTLCF), and Prior-Period *PermBTD*, all scaled by prior-period Total Assets (AT). The estimation is performed by year and two-digit SIC code on the entire population of Compustat firms with at least 15 observations in each industry-year (Frank, Lynch, and Rego [2009]).
Lisowsky [2010] Controls		
BTD	=	The ratio of (Pretax Income (PI) minus Estimated Taxable Income) / Total Assets (AT), where Estimated Taxable Income = (Current U.S. Tax Expense (TXFED) + Current Foreign Tax Expense (TXFO)) / (35% minus Change in Tax Loss Carry Forward (ΔTLCF)). If TXFED and TXFO are missing, we calculate the sum of (TXFED+TXFO) as (TXT-TXDI-TXS-TXO).
DAP	=	Performance-Adjusted Discretionary Accruals (Kothari, Leone, and Wasley [2005]).
Leverage	=	The ratio of Long-Term Debt (DLTT) / Total Assets (AT).
Size	=	The natural log of Total Assets (AT).
ROA	=	The ratio of Pretax Income (PI) / Total Assets (AT).
ForInc	=	The ratio of Foreign Pretax Income (PIFO) / prior-period Total Assets (AT).
R&D	=	The ratio of R&D Expense (XRD) / prior-period Total Assets (AT).
TaxHaven	=	Indicator variable equal to one if firm reports in 10-K Schedule 21 a tax haven subsidiary; zero otherwise. Source: We thank Scott Dyreng for providing these data.
LagETR	=	The ratio of prior-period Tax Expense (TXT) / prior-period Pretax Income (PI).
EqEarn	=	Indicator variable equal to one if Equity in Earnings (Loss) (ESUB) is non-zero; zero otherwise.
MezzFin	=	The ratio of Convertible Debt & Preferred Stock (DCPSTK) / Total Assets (AT).
Big4	=	Indicator variable equal to one if the financial statement auditor is Deloitte & Touche, PricewaterhouseCoopers, Ernst & Young, or KPMG; zero otherwise. Source: Audit Analytics.
Litigation	=	Indicator variable equal to one if Pretax (SETP) or After-Tax (SETA) Litigation/Insurance Settlement is negative; zero otherwise.
NOL	=	Indicator variable equal to one if Tax Loss Carry Forward (TLCF) is non-zero; zero otherwise.

FIG. 2.—Variable definitions. This figure provides detailed definitions for variables used to estimate equations (1a) and (1b). The data source is Compustat North American Fundamentals annual data unless otherwise noted; Compustat mnemonics are shown in parentheses where applicable. For brevity, each variable is defined in figure 2 as a one-year measure; however, the UTB account balance reflects tax positions during open tax years in which the statute of limitations has not expired, typically three years. Thus, we use three-year measures in our regressions. We adopt the following procedure for computing three-year measures: (1) we set indicator variables equal to 1 if the one-year measure is equal to 1 in any of the current or prior two years, (2) we set ratio and natural log measures equal to the average of the one-year measure for the current and prior two years, (3) for *ETR* and *CashETR*, we compute the ratio of the sum of the numerator over the current and prior two years to the sum of the denominator over the same time period, and (4) for *DAP*, *R&D*, *BTD*, *PermBTD*, and *DTAX*, we compute the sum over the current and prior two years.

and development, the use of subsidiaries located in a tax haven, consolidation BTDs inferred from equity earnings, mezzanine financing, use of a Big 4 audit firm, payouts related to litigation settlements, and net operating losses. We compute these variables over a three-year period.

Although we establish in our discussion of figure 1 that the tax reserve and tax sheltering have a strong conceptual link, two factors create tension with respect to whether we can detect this link in the cross-section of firms. First, as HH [2010] point out, two underlying determinants—taxes and financial reporting incentives—could drive the UTB. For example, if managers engage in tax shelters to reduce taxable income, but also wish to maximize financial income, "the reserve will not be recorded (i.e., all benefits will be recognized so as to increase earnings) and tax sheltering will not be captured in the UTB" (HH [2010], p. 143).[35] Second, we do not know the economic significance of uncertain tax positions reflected in the UTB that are not characterized as tax sheltering (see figure 1 and section 4.3). Note that we are associating a continuous variable (dollar amount of uncertain tax benefits) with an indicator variable (involvement in a reportable transaction or not). If tax sheltering were the only type of uncertain tax position that creates a UTB, all else equal, this association would be a foregone conclusion. However, if the economic significance of uncertain nonsheltering activities is sufficiently high, then the UTB may provide a weak (or no) signal of tax sheltering.

We extend our analysis to also examine the ability of other tax avoidance measures—*ETR*, *CashETR*, *BTD*, *PermBTD*, and *DTAX*—to provide information about tax sheltering. Our purpose is to evaluate how the new financial disclosures made pursuant to FIN 48 relate to the firm's tax avoidance activities, especially in comparison to other commonly used measures. Thus, the following equation allows these various measures to compete with the UTB in the model of tax shelter use:

$$RT_{it} = \beta_0 + \beta_1 UTB_{it} + \sum_{k=2}^{7} Other\ Tax\ Avoidance\ Measures_{it} + \sum_{k=8}^{23} \beta_k Controls_{it} + \sum_{k=24}^{32} \beta_k Ind_{it} + \sum_{k=33}^{35} \beta_k Year_{it} + \varepsilon_{it} \quad (1b)$$

Our access to OTSA data in the FIN 48 reporting environment provides a unique opportunity to answer the call by HH [2010, p. 146] encouraging future research to help "identify firms that pursue [aggressive tax] strategies" and to consider which measures are appropriate for particular research questions. Recall from our tax avoidance continuum (figure 1) that tax sheltering is conceptualized as the most aggressive form of tax avoidance. While we do not purport to say that one tax avoidance measure is unconditionally superior to another, we believe that it is useful to learn which tax

[35] The validity of this outcome depends partly on the effectiveness of the auditor in ensuring the appropriate tax reserve. Gleason and Mills [2011], in a pre-FIN 48 environment, find that firms purchasing auditor-provided tax services are more adequately reserved for IRS disputes. We leave it to future research to examine the role of the auditor in ensuring proper reserves post-FIN 48.

avoidance measures relate empirically to tax sheltering, and which do not, as researchers may desire a measure that best identifies firms along the tax avoidance continuum.

6. Main Results

6.1 DESCRIPTIVE STATISTICS

Panel A of table 3 presents descriptive statistics for the variables included in equations (1a) and (1b). In our sample of 3,262 firm-years, 680 (21%) are tax shelter firms ($RT = 1$). Tests for differences in means indicate that tax shelter firms have larger raw, logged, and scaled FIN 48 reserves relative to nontax shelter firms (i.e., raw *UTB* of $262 vs. $56 million, *UTB_LN* of 4.487 vs. 2.478, and *UTB_SC* of 0.013 vs. 0.011).[36] Tax shelter firms also exhibit larger permanent BTDs (*PermBTD*) and higher values of discretionary permanent BTDs (*DTAX*). This is consistent with tax shelters generating significant permanent BTDs; however, as shown in table 2, tax sheltering also generates temporary BTDs, albeit smaller on average.

In terms of our control variables, tax shelter firms are larger (*Size*), less profitable (*ROA*), have more foreign activity (*ForInc*), have fewer research and development expenditures (*R&D*), are more likely to have a tax haven subsidiary (*TaxHaven*), have lower prior period ETRs (*lagETR*), report greater equity-method earnings (*EqEarn*), use less hybrid financing (*MezzFin*), are more likely to engage a Big 4 audit firm (*Big4*), are more likely to pay out in litigation settlements (*Litigation*), and utilize more debt in their capital structure (*Leverage*).

Panel B of table 3 reports correlations among *UTB_LN*, *RT*, and other measures of tax avoidance included in equation (1b). For brevity, we only report and discuss correlations pertaining to *UTB_LN*. It is positively correlated with *RT*, consistent with the tax reserve capturing tax positions at the more aggressive end of the tax avoidance continuum in figure 1. *UTB_LN* is also positively correlated with *PermBTD* and *DTAX*, which also reside towards the aggressive end of the continuum. Finally, there is a significantly positive relation between *RT* and *PermBTD*, but a marginally significant positive relation between *RT* and *DTAX* (untabulated p-value = 0.105). These univariate statistics suggest that *UTB, PermBTD,* and *DTAX* provide information about tax shelters.

6.2 MAIN REGRESSION RESULTS

Panel A of table 4 presents the results of estimating equation (1a). Columns [1] and [2] use the logged UTB (*UTB_LN*), while columns [3]

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[36] Note that, relative to the mean, the standard deviation for *UTB_LN* (mean = 2.897, $SD = 1.957$) is lower than for the *UTB_SC* (mean = 0.011, $SD = 0.016$), suggesting the logged transformation is more appropriate in reducing heteroscedasticity in the FIN 48 tax reserve. The skewness (kurtosis) statistic for *UTB_LN* is 0.235 (2.115), while for *UTB_SC*, it is 3.220 (16.656). This observation supports testing the UTB as both logged and scaled values.

TABLE 3
Reportable Transaction Regression Variables

Panel A: Descriptive Statistics for Reportable Transaction Regressions

	Full Sample [n = 3,262]					RT = 1 [n = 680]		RT = 0 [n = 2,582]	
Variable	Mean	SD	P25	P50	P75	Mean	SD	Mean	SD
UTB Measures									
UTB	99.136	205.689	2.700	15.358	75.000	262.199*	312.265	56.191	137.666
UTB_LN	2.897	1.957	1.308	2.795	4.331	4.487*	1.818	2.478	1.768
UTB_SC	0.011	0.016	0.001	0.006	0.015	0.013*	0.016	0.011	0.017
Other Tax Avoidance Measures									
ETR	0.301	0.174	0.238	0.323	0.372	0.298	0.006	0.302	0.003
CashETR	0.262	0.185	0.154	0.251	0.334	0.265	0.007	0.261	0.004
BTD	0.035	0.180	-0.009	0.035	0.099	0.042	0.139	0.033	0.189
PermBTD	0.011	0.162	-0.004	0.016	0.061	0.025*	0.099	0.007	0.175
DTAX	0.046	0.227	-0.027	0.007	0.069	0.059*	0.213	0.043	0.231
Lisowsky [2010] Controls									
DAP	0.055	0.962	-0.121	-0.004	0.105	0.019	0.724	0.065	1.015
Leverage	0.179	0.150	0.054	0.157	0.271	0.211*	0.146	0.171	0.150
Size	8.084	1.693	6.779	7.987	9.189	9.514*	1.536	7.707	1.523
ROA	0.067	0.107	0.019	0.063	0.119	0.061*	0.074	0.069	0.114
ForInc	0.020	0.037	0.000	0.000	0.029	0.024*	0.039	0.018	0.036
R&D	0.078	0.154	0.000	0.000	0.087	0.048*	0.111	0.086	0.163
TaxHaven	0.607	0.488	0.000	1.000	1.000	0.718*	0.453	0.579	0.494
LagETR	0.305	0.165	0.252	0.328	0.373	0.295*	0.149	0.307	0.169
EqEarn	0.353	0.478	0.000	0.000	1.000	0.475*	0.500	0.321	0.467
MezzFin	0.025	0.072	0.000	0.000	0.000	0.018*	0.049	0.027	0.077
Big4	0.953	0.211	1.000	1.000	1.000	0.993*	0.085	0.943	0.232
Litigation	0.285	0.452	0.000	0.000	1.000	0.400*	0.490	0.255	0.436
NOL	0.469	0.499	0.000	0.000	1.000	0.451	0.498	0.474	0.499

(*Continued*)

TABLE 3—*Continued*

Panel B: Correlations Among Tax Avoidance Measures

	UTB_LN	*ETR*	*CashETR*	*BTD*	*PermBTD*	*DTAX*
ETR	**−0.039**					
CashETR	−0.007	**0.136**				
BTD	0.008	**0.067**	**−0.190**			
PermBTD	**0.093**	**0.093**	**−0.033**	**0.499**		
DTAX	**0.130**	**−0.032**	**−0.055**	**0.251**	**0.483**	
RT	**0.417**	0.008	0.007	0.021	**0.042**	0.029

This table presents descriptive statistics for variables used in estimating equations (1a) and (1b). * indicates that the mean of the variable for the observations where $RT = 1$ is significantly different from the mean of the variable for the observations where $RT = 0$ at $p \leq 0.10$. *RT,* the dependent variable in our study, equals 1 when a firm is involved in a reportable transaction during any of the current or prior two years, and 0 otherwise. We are not able to compute Other Tax Avoidance Measures for the full sample of 3,262 firm-years due to missing data. Therefore, Panel B provides Pearson correlations among measures of tax avoidance and *UTB_LN* for 3,074 firm-years where we are able to compute all Other Tax Avoidance Measures. Correlations in bold are significant at the $p \leq 0.10$ level (two-tailed). We define all variables in figure 2.

TABLE 4

Reportable Transaction Regression Summary Statistics

Panel A: Logistic Regressions of Reportable Transaction Involvement (*RT* = 1) on the *UTB* and Control Variables

Variable	[1] Coefficient (Robust SE)	[2] Marginal Effect	[3] Coefficient (Robust SE)	[4] Marginal Effect
UTB_LN	0.2476***	0.0680		
	(0.0521)			
UTB_SC			0.0961***	0.0264
			(0.0291)	
BTD	0.0231	0.0063	0.0129	0.0035
	(0.0382)		(0.0396)	
DAP	−0.0256	−0.0070	−0.0231	−0.0063
	(0.0260)		(0.0260)	
Leverage	0.0199	0.0054	0.0279	0.0077
	(0.0381)		(0.0379)	
Size	0.3700***	0.1022	0.5741***	0.1608
	(0.0617)		(0.0460)	
ROA	−0.0667	−0.0182	−0.0506	−0.0139
	(0.0462)		(0.0484)	
ForInc	0.0008	0.0002	0.0031	0.0008
	(0.0381)		(0.0378)	
R&D	−0.1399***	−0.0383	−0.1362***	−0.0374
	(0.0460)		(0.0473)	
TaxHaven	0.0210	0.0057	0.0407	0.0110
	(0.0384)		(0.0388)	
LagETR	−0.0323	−0.0088	−0.0354	−0.0097
	(0.0311)		(0.0315)	
EqEarn	0.0041	0.0011	0.0093	0.0026
	(0.0333)		(0.0331)	
MezzFin	0.0062	0.0017	0.0061	0.0017
	(0.0383)		(0.0361)	
Big4	0.0599	0.0164	0.0681	0.0187
	(0.0485)		(0.0498)	
Litigation	0.0575***	0.0157	0.0598***	0.0164
	(0.0271)		(0.0270)	
NOL	0.0444	0.0122	0.0528	0.0145
	(0.0350)		(0.0355)	
Industry FE	YES		YES	
Year FE	YES		YES	
Observations	3,262		3,262	
Likelihood Ratio	−1,248.82		−1,265.99	
Pseudo R^2	25.21%		24.19%	

(*Continued*)

TABLE 4—*Continued*

Panel B: Logistic Regressions of Reportable Transaction Involvement (*RT* = 1) on the *UTB*, Other Measures of Tax Avoidance, and Control Variables

Variable	[1] Coefficient (Robust SE)	[2] Marginal Effect	[3] Coefficient (Robust SE)	[4] Marginal Effect
UTB_LN	0.2492***	0.0685		
	(0.0548)			
UTB_SC			0.0934***	0.0257
			(0.0316)	
ETR	0.0259	0.0071	0.0271	0.0074
	(0.0282)		(0.0286)	
CashETR	0.0164	0.0045	0.0174	0.0048
	(0.0296)		(0.0286)	
BTD	0.0141	0.0039	−0.0008	−0.0002
	(0.0427)		(0.0421)	
PermBTD	0.0873	0.0239	0.0969	0.0266
	(0.0634)		(0.0644)	
DTAX	0.0215	0.0059	0.0274	0.0075
	(0.0446)		(0.0464)	
Lisowsky [2010] Controls	YES		YES	
Industry FE	YES		YES	
Year FE	YES		YES	
Observations	3,074		3,074	
Likelihood Ratio	−1,182.80		−1,199.57	
Pseudo R^2	24.78%		23.72%	

This table presents the results of estimating logistic regressions of equations (1a) and (1b). *RT,* the dependent variable in our study, equals 1 when a firm is involved in a reportable transaction during any of the current or prior two years, and 0 otherwise. Panel A reports results of estimating equation (1a). Panel B reports results of estimating equation (1b) that includes existing measures of tax avoidance from the empirical tax literature. In panels A and B, we report robust standard errors, clustered by firm, in parentheses below standardized coefficients in columns [1] and [3]. We report marginal effects in columns [2] and [4]. We define all variables in figure 2. The symbols ***, **, and * denote significance at the $p <$ 0.01, 0.05, and 0.10 (two-tailed) levels, respectively.

and [4] use the scaled UTB (*UTB_SC*). We report standardized logit coefficients and marginal effects to allow for a relative comparison of each variable's association with tax sheltering. We find that the coefficient estimates on both *UTB_LN* and *UTB_SC* are positive and significant. To provide a clearer economic interpretation of the strength of this association, we interpret our result using marginal effects (see columns [2] and [4]). The marginal effect of 0.0680 (0.0264) reported in column [2] ([4]) indicates that a one standard deviation increase in *UTB_LN* (*UTB_SC*) increases the probability that a firm uses a reportable transaction by 6.8 (2.6)%. Only *Size*, *R&D*, and *Litigation* are significant control variables.

The results reported in table 4 show that the UTB has the largest marginal effect of all the model variables (except the *Size* control).[37] To

[37] We obtain qualitatively identical results when we estimate our regressions within asset or sales quintiles. We also assign a size quintile dummy (based on either assets or sales) to each

provide additional information about the importance of incorporating the UTB into the Lisowsky [2010] tax shelter model, we compute likelihood ratio tests that compare equation (1a) to the Lisowsky [2010] model. The results of these tests indicate that regressions including the UTB, reported in table 4 panel A, have significantly more explanatory power than the Lisowsky [2010] model without the UTB ($\chi^2_{UTB\text{-}LN} = 49.653$, $p < 0.001$; $\chi^2_{UTB\text{-}SC} = 15.674$, $p < 0.001$). We explore the predictive power of the UTB separately in section 6.4.

6.3 REGRESSION RESULTS INCLUDING OTHER TAX AVOIDANCE MEASURES

Panel B of table 4 presents the results of estimating equation (1b). When we include each of the tax avoidance measures—*ETR*, *CashETR*, *BTD*, *PermBTD*, and *DTAX*—in the regression along with the *UTB_LN* or *UTB_SC*, our results indicate that no tax avoidance measure provides information about tax sheltering *except for the UTB*.[38] Additionally, the significance and marginal effects on *UTB_LN* and *UTB_SC* remain qualitatively similar to those reported in panel A. This result is consistent with our discussion of the tax avoidance continuum in section 2.

The fact that the UTB is the only tax avoidance measure significantly associated with reportable transactions suggests that the reserve is the strongest empirical proxy for tax sheltering when compared to commonly used existing measures. This result likely reflects the fact that both the UTB and reportable transactions include conforming and nonconforming tax positions, while the other measures only capture nonconforming positions, which would limit the ability of interested parties to infer tax shelters generally. Our findings are consistent with executive survey evidence from Graham, Hanlon, and Shevlin [2011], which reports finding larger UTB amounts in firms that characterize themselves as aggressive tax planners than in those that do not, while finding no significant difference between aggressive and nonaggressive tax planning firms with respect to their *ETR*, *CashETR*, *BTD*, or *PermBTD*. While our study supports the UTB as a useful measure in empirical analyses that require qualifying a firm's tax positions

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firm and interact these dummy variables with *UTB* in equations (1a) and (1b). We find no significant results on any interaction term, suggesting that the relation between *UTB* and *RT* is not significantly different across firms of different sizes.

[38] We conduct several additional tests (untabulated). First, we include the other tax avoidance measures, but exclude the UTB, and still do not find significance on these other measures. This suggests that the lack of significance is not due to any serious multicollinearity with the UTB. Second, we include each tax avoidance measure one at a time, both with and without the UTB, and find results qualitatively identical to those reported in panel B. Third, we estimate equation (1a) using the reduced sample of 3,074 firm-years available in testing equation (1b), yielding consistent results. Finally, we adjust *BTD* to eliminate the change in the UTB because *BTD* estimates taxable income from current tax expense, which includes the change in the UTB. Our results remain qualitatively identical using the adjusted *BTD* amount.

as relatively more aggressive, the UTB is only available beginning at the end of 2006, limiting research requiring a longer time series.[39]

6.4 VALIDATING THE UTB AS AN EMPIRICAL PROXY FOR TAX SHELTERING

Having established a robust empirical link between tax reserves and tax shelters, we directly investigate in out-of-sample tests whether the reserve has *predictive* power for tax shelters. These tests are important because they validate the UTB's usefulness for capturing tax aggressiveness more broadly. To examine this issue, we mirror the methodology in Lisowsky [2010] by calculating "tax shelter scores," or the predicted probability of tax shelter participation, using publicly available data. Briefly, the score is obtained by reestimating equation (1a) on 2006–2008 data, then applying those coefficients to the 2009 (i.e., out-of-sample) data. In particular, we always estimate the score using equation (1a) with at least year and industry controls by including the UTB or the Lisowsky [2010] variables separately, then together, to evaluate the incremental contribution of each set of variables for inferring tax shelters. We then regress actual tax shelter use ($RT = 1$) in 2009 onto the tax shelter score, without industry controls. Following Lisowsky [2010], this design directly evaluates how well the expectation (i.e., the score) reflects reality (i.e., tax shelter use).

In untabulated tests, we find that the tax shelter score, or *TSScore*, developed using only the logged UTB, is strongly predictive of out-of-sample tax shelters ($z = 8.79$; $p < 0.001$). We also find that *TSScore* developed using only the Lisowsky [2010] variables is also predictive of shelter use ($z = 9.76$; $p < 0.001$). Notably, each set of variables improves the other set when they are combined; the *TSScore* based on *both* the logged UTB and the Lisowsky [2010] variables is significant ($z = 10.13$, $p < 0.001$). Using likelihood ratio tests, we find that this combined model improves the predictive power over each of (a) the *TSScore* based only on logged UTB (difference in $\chi^2 = 46.79$; $p < 0.001$) and (b) the *TSScore* based only on the Lisowsky [2010] variables (difference in $\chi^2 = 14.21$; $p < 0.001$). Interestingly, the predictive ability of *TSScore* based on the scaled UTB fares worse; it alone is unable to predict tax shelter use in out-of-sample tests ($z = 0.73$; $p = 0.47$), but is able to when the Lisowsky [2010] controls are added (difference in $\chi^2 = 144.96$; $p < 0.001$). This finding points researchers toward using the logged UTB over the scaled UTB as a predictor variable of tax

[39] As some research is using UTB measures other than, or in addition to, the ending balance as a measure of tax aggressiveness (e.g., Frischmann, Shevlin, and Wilson [2008] and Brown, Drake, and Martin [2010]), we consider the ability of these measures to provide information about tax sheltering (untabulated). First, we replace UTB with the portion of the UTB that, if recognized, would impact the effective tax rate. This amount includes, among other things, tax positions associated with permanent book-tax differences, which are anecdotally considered more aggressive. Second, we consider the portion of the UTB amount that arises specifically from tax positions taken on the current year tax return. To test the latter, we use one-year measures for *RT* and all control variables. We find that both of these portions of the UTB (logged or scaled) are significantly associated with reportable transactions.

shelters when used alone. Additionally, ROC curve analysis supports this finding. The area under the ROC curve for *TSScore* based on only logged (scaled) UTB is 0.777 (0.614). The area under the ROC curve using only the Lisowsky [2010] variables is 0.804. The area under the ROC curve using the Lisowsky [2010] variables with the logged (scaled) UTB is 0.812 (0.806).

We highlight these comparisons because the Lisowsky [2010] model contains computational challenges, e.g., the variable *TaxHaven* must be hand-collected or found using text-recognition software. Because there is only a slight degradation in predictive power when using the logged UTB with the Lisowsky [2010] controls than without, we conclude from our tests that researchers are no worse off using the logged UTB as a summary proxy for tax sheltering than if the entire model were specified. Of course, researchers do not have access to tax reserves before FIN 48, so the Lisowsky [2010] prediction model remains the strongest signal of tax shelter use during that period.

7. *Sensitivity Tests*

Our empirical analysis yields a robust positive association between tax reserves and reportable transactions. Our interpretation of this result is that the UTB is a robust empirical proxy for tax sheltering. However, an alternative explanation for our results is conservatism in tax shelter and financial reporting. Conservative tax shelter reporting describes the notion that some firms would classify a tax position with a relatively high likelihood of being sustained as a reportable transaction. Conservative financial reporting describes the notion that some firms promptly reserve for events with an expected unfavorable outcome (e.g., an accrual of a tax reserve), but defer recognition of the effects of expected favorable events (Givoly, Hayn, and Natarajan [2007]).

If conservative firms both report a tax position as a reportable transaction and establish a (larger) tax reserve when the position is neither a tax shelter nor one requiring a reserve, then we would still document a positive association between tax reserves and reportable transactions.[40] Resolving this issue is important because it determines the correct interpretation of the positive association we document in table 4. We conduct additional tests to investigate whether conservatism can be ruled out as an alternative explanation.

7.1 IDENTIFYING CONSERVATIVE FIRMS

Note that the alternative explanation presumes that conservative firms behave conservatively with respect to *both* tax shelter reporting and

[40] We thank two anonymous referees for highlighting this issue. Conservatism in financial reporting but not tax sheltering reporting (or vice versa) would instead bias against finding a positive association.

financial reporting, because conservatism in one but not the other would not induce a positive association. Therefore, we identify conservative firms by looking to *either* tax shelter reporting or financial reporting characteristics. For robustness, we identify conservative reporting in multiple ways.

7.1.1. Measuring and Testing Conservative Tax Shelter Reporting. Our first set of tests (untabulated) identifies subsamples of firms that potentially report tax shelters conservatively. Specifically, we reconduct our analyses reported in table 4 after excluding tax shelter firms that disclose (1) the dollar amount of tax benefits obtained from reportable transactions on Schedule M-3, (2) 10 or more transactions on Form 8886 in a single year, or (3) nonlisted transactions.

Although the IRS requires all tax shelter firms to complete both Form 8886 and the related line item on Schedule M-3, our descriptive statistics (table 1, panel C) show that only about half of our sample completed the Schedule M-3 line item (166 firm-years). Revealing information regarding dollar effects of reportable transactions is relatively costly for taxpayers; as a result, we use Schedule M-3 compliance as our first proxy of conservative tax shelter reporting.[41] Next, our reportable transaction data indicate that some firms disclosed 10 or more reportable transactions in a single year (36 firm-years). While these firms may represent heavy shelter users, their managers may wonder whether every uncertain transaction they undertake necessitates disclosure, which indicates tax shelter reporting conservatism. Finally, disclosure of nonlisted transactions requires greater judgment relative to listed transactions where statutory provisions, judicial doctrines, and administrative guidance describe specific transactions requiring disclosure. Therefore, tax shelter reporting conservatism could be more evident when firms only report nonlisted transactions (310 firm-years). We form groups of tax shelter reporting conservatism based on these three classifications, and note that all three are significantly positively correlated ($p < 0.05$).

To maintain a sufficient sample of tax shelter firms, we reestimate equation (1a) after dropping, in turn, each group deemed conservative as identified above. In all three cases, we obtain qualitatively similar results as those reported in table 4. Thus, using various measures of tax shelter reporting conservatism to conduct our tests, we find no evidence that tax reporting conservatism explains the positive relation between tax reserves and reportable transactions.

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[41] Mills, Robinson, and Sansing [2010] highlight how tax authorities can use information regarding the dollar amount of tax benefits generated from taxpayers' uncertain tax positions to improve the audit selection process. In this model, knowledge of participation in a tax shelter alone (Form 8886) would not be as useful to the tax authority as the dollar amount of tax benefits generated (Schedule M-3) because audit costs must be considered. Thus, a firm willing to disclose the dollar amount of tax benefits received may represent conservative tax shelter reporting because the cost of disclosing this information on Schedule M-3 is relatively low if the firm is reporting a relatively benign underlying tax position on Form 8886.

7.1.2. Measuring and Testing Conservative Financial Reporting. Our second set of tests (untabulated) utilizes various measures of conservative financial reporting (Watts [2003a], [2003b]). We choose three traditional firm-level measures used in the accounting literature: (1) *MVNOA*, the market value of net operating assets (Easton and Pae [2004]); (2) *CS*, the conservatism score (Penman and Zhang [2002]); and (3) *CR*, the conservatism ratio (Callen, Segal, and Hope [2010]).[42] *MVNOA* and *CS* measure unconditional conservatism, while *CR* measures conditional conservatism, which is conceptually linked to timely loss recognition (Basu [1997]).

To examine the alternative explanation using measures of conservative financial reporting, we interact each measure with the FIN 48 tax reserve when explaining tax shelter use. In particular, we set an indicator variable equal to 1 for observations with conservatism measures above the industry median for each year (i.e., relatively more conservative), 0 otherwise, then incorporate into equation (1a) each indicator variable along with its interaction with the tax reserve. If conservatism accounts for some of the positive association between *UTB* and *RT*, then we expect a positive coefficient on the interaction term as well as on *UTB*. However, if conservatism entirely explains the association, then the interaction term, but not *UTB* itself, will be statistically significant.

Results indicate that the association between *RT* and *UTB* is not significantly different in conservative firms relative to other firms, and that the main effect on *UTB* continues to be positive and significant. The only significant interaction in these regressions is *UTB*× *CR*—but it is *negative*—suggesting that the association between *RT* and *UTB* is slightly *lower* when conservatism is high. One interpretation is that conservative financial reporting somewhat diminishes the ability of the UTB to signal tax sheltering, and that conservatism in financial reporting does not appear to translate into conservatism in tax shelter reporting. Taken together, these results do not support conservatism as an alternative explanation for the positive association in table 4.[43]

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[42] We measure each variable as follows (Compustat mnemonics in parentheses): *MVNOA* = market value of equity (*PRCCF* × *CSHO*) less the book value of financial assets (*CHE* + *IVAO*), scaled by the book value of operating assets (*CEQ* + *DLTT* + *DLC*); *CS* = Sum of the LIFO Reserve (*LIFR*) and the capitalized value of R&D (*XRD*) and advertising (*XAD*) expenses, deflated by the book value of operating assets. We capitalize R&D (advertising) over five (two) years and amortize the capitalized values using sum-of-the-years digits amortization; *CR* = the current period earnings shock (CES) divided by earnings news (see equations (6b) and (10) in Callen, Segal, and Hope [2010] for the precise definition of CES and earnings news, respectively).

[43] We repeat all the conservative financial reporting tests using continuous measures instead of indicators. These alternative tests yield qualitatively identical results, except that the interaction term *UTB*× *CR* becomes statistically insignificant. Using another method to identify degrees of conservatism, we use industry/year median splits to classify firm-years as having low or high conservatism *levels* and low or high conservatism *growth* (we compute the growth measures based on three-year changes in *CS* and *CR*; Balachandran and Mohanram [2011]

We supplement these tests with a more context-specific measure of conservative financial reporting. Here, we characterize firms as conservative if their tax reserve decreased as a result of adopting FIN 48. Blouin et al. [2010] explain that most firms were expected to be under-reserved upon FIN 48 adoption both because FIN 48 ignores detection risk and because firms had earnings management incentives to release "excess" reserves prior to adoption. We argue that firms with decreasing tax reserves upon adoption also more conservatively measure tax reserves. Based on the adoption adjustment disclosed during 2007, we identify 43% ($n = 363$) of firms in our sample as conservative. Again, the association between *RT* and *UTB* is not significantly different for this group of firms, relative to other firms.

7.2 DECOMPOSING THE UTB

To further examine whether conservatism drives the association between *RT* and *UTB*, we use a two-equation approach to decompose the total UTB into estimates of its nondiscretionary and discretionary components (e.g., McNichols and Wilson [1988] and Beaver and Engle [1996]). As discretionary factors that influence accounting accruals are nuanced and difficult to measure directly (Beaver and Engle [1996]), we design our first equation to measure the nondiscretionary factors influencing the tax reserve accrual, leaving the discretionary factors (including conservatism) in the residual. If conservatism does not account for our main empirical finding, then the nondiscretionary component of the UTB will have significant explanatory power for tax shelters because conservatism is a discretionary factor, and thus captured in our estimate of the discretionary component.

Our estimate of the nondiscretionary UTB is based on the specification of the UTB as a function of a set of variables motivated from the Burton and Karlinsky [2011] survey of practitioners as exposing the firm to the most complex areas of tax law. It is within these complex areas that uncertain tax positions arise and ambiguity is precisely the mechanism that presents opportunities for tax sheltering. The discretionary component is the difference between the total UTB and the estimated nondiscretionary component, and reflects additional adjustments made to the UTB based on a variety of discretionary factors.[44] We use all U.S. public firms with

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note that conservatism measures are unstable over short periods). We form four indicators based on the intersection of these two groups, interact these indicators with the reserve, and repeat the robustness tests described above. All of the interactions are insignificant, except for the high *CR* level/high *CR* growth interaction, which is *negative* and significant. This result implies that high conservatism level/high conservatism growth firms drive the negative *UTB*×*CR* interaction reported above.

[44] In addition to conservatism, there are a number of discretionary factors that may influence the tax reserve accrual. These factors include the independent audit process (Gleason and Mills [2011]), corporate governance (Desai and Dharmapala [2006]), compensation (Armstrong, Blouin, and Larcker [2012]), the desire to signal aggressive tax positions to investors (Koester [2011]), strategic tax compliance (Mills, Robinson, and Sansing [2010]), differences of opinion on the technical merits of a tax position (De Simone, Robinson, and

available data during 2006–2009, or 19,271 firm-years, to decompose the UTB (see appendix A for variable definitions and results for this first equation). Although we report results of the first equation using a Tobit regression, we note that nondiscretionary factors explain 55% of the UTB in an OLS regression, suggesting that these factors explain a majority of the UTB.

In our second equation, we replace the total UTB in equation (1a) with the discretionary UTB (*D_UTB*) and nondiscretionary UTB (*N_UTB*) components. Columns [1] and [2] ([3] and [4]) in panel A of table 5 alternatively specify the logged (scaled) pair of independent decomposed UTB variables. As with our main tests, we report standardized logit coefficients and marginal effects to allow for a relative comparison of each component's association with tax sheltering. In both specifications, the marginal effect of *N_UTB* is significantly greater than that of *D_UTB* ($\chi^2 = 18.94$ for *N_UTB_LN* vs. *D_UTB_LN*, $p < 0.001$; and $\chi^2 = 11.57$ for *N_UTB_SC* vs. *D_UTB_SC*, $p < 0.001$). Further, when we compare the coefficients of the UTB decomposition in panel A of table 5 to the coefficient on UTB in Panel A of table 4, we find that *N_UTB* > *UTB* > *D_UTB* (e.g., 0.3108 > 0.2476 > 0.1503 in the logged specifications).[45]

This coefficient pattern is interesting for two reasons. First, these results do not support conservatism as an alternative explanation for our results because the predicted value of the UTB from nondiscretionary factors has significant explanatory power for tax shelters. Second, it suggests that the net effect of various discretionary factors on the tax reserve accrual process reduces—but does not eliminate—the ability of the total UTB to signal tax sheltering. Indeed, the Guay, Kothari, and Watts [1996] theoretical framework on accruals predicts that discretion need not be used opportunistically, but can also make accruals more informative. Consider that two firms expending equal amounts of R&D could determine different tax reserve amounts based on discretion as the sustainability of tax benefits claimed from R&D tax credits. The nondiscretionary component captures the reserve accrual of the average firm, while the discretionary component captures firm-specific adjustments. The latter could be informative of the extent to which that specific firm's R&D tax positions are more likely to constitute tax sheltering if the discretion is not used opportunistically.

Panel B of table 5 reports results of reestimating equation (1b) that include *N_UTB*, *D_UTB*, and other commonly used measures of tax avoidance. We find qualitatively identical results with respect to *N_UTB* and *D_UTB* as in panel A. Interestingly, the discretionary component of the UTB is significantly more informative of tax sheltering than existing

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Stomberg [2011]), or capital market incentives to manage earnings (Gupta, Laux, and Lynch [2011]). It is beyond the scope of our study to determine appropriate empirical measures of these various discretionary factors and to determine separately their influence on the tax reserve itself and/or their effect on the information in the reserve for tax shelters.

[45] This coefficient pattern holds in all comparisons of the specifications in table 5 (containing the decomposed UTB) to those in table 4 (containing the nondecomposed UTB).

TABLE 5

Reportable Transaction Regression Summary Statistics: UTB Decomposition

Panel A: Logistic Regressions of Reportable Transaction Involvement (*RT* = 1) on the *UTB* Decomposition and Control Variables

Variable	[1] Coefficient (Robust SE)	[2] Marginal Effect	[3] Coefficient (Robust SE)	[4] Marginal Effect
N_UTB_LN	0.3108***	0.0860		
	(0.0919)			
D_UTB_LN	0.1503***	0.0414		
	(0.0402)			
N_UTB_SC			0.2485***	0.0675
			(0.0826)	
D_UTB_SC			0.0574**	0.0158
			(0.0290)	
Lisowsky [2010] Controls	YES		YES	
Industry and Year FE	YES		YES	
Observations	3,262		3,262	
Likelihood Ratio	−1,181.68		−1,195.94	
Pseudo R^2	24.85%		23.95%	

Panel B: Logistic Regressions of Reportable Transaction Involvement (*RT* = 1) on the *UTB* Decomposition, Other Measures of Tax Avoidance, and Control Variables

N_UTB_LN	0.3024***	0.0834		
	(0.0907)			
D_UTB_LN	0.1488***	0.0408		
	(0.0401)			
N_UTB_SC			0.2467***	0.0677
			(0.0809)	
D_UTB_SC			0.0615**	0.0168
			(0.0290)	
ETR	0.0280	0.0077	0.0303	0.0083
	(0.0283)		(0.0287)	
CashETR	0.0152	0.0042	0.0188	0.0051
	(0.0295)		(0.0282)	
BTD	0.0124	0.0034	0.0009	0.0003
	(0.0438)		(0.0429)	
PermBTD	0.0873	0.0239	0.0998	0.0273
	(0.0646)		(0.0664)	
DTAX	0.0165	0.0045	0.0212	0.0058
	(0.0439)		(0.0453)	
Lisowsky [2010] Controls	YES		YES	
Industry and Year FE	YES		YES	
Observations	3,074		3,074	
Likelihood Ratio	−1,178.25		−1,191.42	
Pseudo R^2	25.07%		24.24%	

This table presents the results of estimating logistic regressions of equations (1a) and (1b) including the UTB decomposed into estimates of its discretionary and nondiscretionary components using equation (A1), outlined in appendix A. *RT*, the dependent variable in our study, equals 1 when a firm is involved in a reportable transaction during any of the current or prior two years, and 0 otherwise. Panel A reports results of estimating equation (1a) including the nondiscretionary component (*N_UTB*) and the discretionary component (*D_UTB*). Panel B reports results of estimating equation (1b) that includes *N_UTB*, *D_UTB*, and other commonly used measures of tax avoidance from the empirical literature. *N_UTB_LN* and *D_UTB_LN* (*N_UTB_SC* and *D_UTB_SC*) represent the nondiscretionary and discretionary portions of the tax reserve, respectively, when equation (A1) in the appendix is estimated using *UTB_LN* (*UTB_SC*) as the dependent variable. In panels A and B, we report robust standard errors, clustered by firm, in parentheses below standardized coefficients in columns [1] and [3]. We report marginal effects in columns [2] and [4]. We define all variables in figure 2. The symbols ***, **, and * denote significance at the $p < 0.01$, 0.05, and 0.10 (two-tailed) levels, respectively.

measures of tax avoidance that are often used to proxy for tax aggressiveness. Again, this result supports the notion that discretionary factors influencing the reserve are not always used opportunistically (Guay, Kothari, and Watts [1996]).

For robustness, we more directly explore the extent to which conservatism itself impacts the reserve and its association with tax shelter use. In particular, we estimate the discretionary component directly in a modified version of equation (A1) that includes the three measures of conservatism (*MVNOA*, *CS*, and *CR*) from section 7.1.2 instead of the transaction variables. This specification leaves the nondiscretionary component in the residual as the difference between the total UTB and the estimated discretionary (i.e., conservatism) component. If conservatism explains some of the positive association between tax reserves and tax shelters, then the discretionary component of the UTB estimated using this respecified first equation should have explanatory power for tax shelters in the second equation.

Untabulated results indicate that the predicted value of *UTB_LN* from the discretionary conservatism variables (*D_UTB_LN*) is not significantly associated with tax shelters in either the reestimated equation (1a) (coefficient = −0.052, *z*-stat = −0.11, $p = 0.912$) or equation (1b) (coefficient = −0.187, *z*-stat = −0.37, $p = 0.712$). The nondiscretionary portion of the UTB (*N_UTB_LN*) remains significantly positively related to tax shelter use in the reestimated equation (1a) (coefficient = 0.334, *z*-stat = 4.70, $p < 0.001$) and equation (1b) (coefficient = 0.328, *z*-stat = 4.60, $p < 0.001$). We obtain similar results using the predicted value of *UTB_SC* as those reported in table 5. Thus, while our financial reporting conservatism measures are significantly associated with the UTB in the first equation, the estimated discretionary UTB has lower explanatory power for tax shelters than the nondiscretionary UTB. This suggests that conservatism does not overly influence the information in the reserve for tax shelters relative to nondiscretionary factors, and that financial reporting conservatism does not necessarily translate into tax shelter reporting conservatism.

Overall, although our findings suggest that a decomposition of the UTB into nondiscretionary and discretionary components improves the informativeness of the UTB for tax shelters, our earlier tests confirm that the UTB on its own remains a suitable, easily implemented summary proxy for tax aggressiveness, and that the link between the FIN 48 tax reserves and tax shelter use are not driven by reporting conservatism.

8. Conclusion

Our study examines a central issue in current empirical tax research—whether new disclosures of tax reserves made pursuant to *Financial Interpretation No. 48* (FIN 48) provide publicly available information useful for inferring a firm's tax sheltering activities. By combining these public tax reserve disclosures with private disclosures of tax shelter participation made

to the IRS Office of Tax Shelter Analysis, we find a robust and significantly positive relation between tax shelter use and the ending balance of the FIN 48 tax reserve. In addition, we show that the explanatory power of the Lisowsky [2010] tax shelter inference model improves with the inclusion of the tax reserve, and that the reserve can perform reasonably well on its own to predict out-of-sample tax shelter use. Furthermore, we confirm that the positive link between FIN 48 tax reserves and tax shelter use are not driven by tax or financial reporting conservatism. In combination, our results suggest that the tax reserve is a reliable and suitable summary measure for predicting tax shelters. Finally, we estimate that the tax benefits of shelters are economically significant, accounting for up to 48% of the aggregate reserves in our sample.

We complement our main finding by examining the ability of other tax avoidance measures—GAAP ETR, Cash ETR, BTDs, permanent BTDs, and discretionary permanent BTDs—to provide information about tax sheltering. We find that none are related to tax shelter use, either on their own or together, with or without the FIN 48 tax reserve. Therefore, the FIN 48 tax reserve is the only one of these tax avoidance measures that is significantly associated with tax sheltering. Additional analyses also reveal that discretionary factors do not unduly eliminate the ability of the reserve to inform interested parties about tax shelter use.

Our findings contribute broadly to the literature on accounting for income taxes by offering conceptual and empirical support for research that seeks to use the reserve as a measure of corporate tax aggressiveness. In doing so, this study answers the call in Hanlon and Heitzman [2010] to critically evaluate a variety of measures of tax avoidance. It demonstrates that researchers should condition their choice of variable on the research question asked, and as a result, opens opportunities for future research to examine tax aggressiveness in larger samples using FIN 48 reserve information, thus reducing the need to gain access to privately disclosed tax shelter data.

APPENDIX A

UTB Decomposition

A.1. Two-Equation Research Design

Our primary focus is to examine the extent to which the FIN 48 UTB provides information on tax shelter use. This appendix describes how we decompose the total UTB into estimates of its discretionary and nondiscretionary components to conduct the sensitivity analysis described in section 7.1 of the paper. The nondiscretionary component is estimated using a set of variables that captures the significance of business transactions expected to create uncertain tax positions. The discretionary component is estimated as the difference between the total UTB and the estimated nondiscretionary component. Using 19,271 firm-years, we estimate the

following pooled, cross-sectional model, which specifies the UTB as a function of business transactions expected to create tax uncertainty, controlling for size.[46] We use the predicted and residual values from the following equation as our estimate of the nondiscretionary UTB (*N_UTB*) and the discretionary UTB (*D_UTB*), respectively:

$$\begin{aligned} UTB_{it} = {} & \delta_0 + \delta_1 Size_{it} + \delta_2 PP\&E_{it} + \delta_3 R\&D_{it} + \delta_4 M\&A_{it} + \delta_5 PctForSale_{it} \\ & + \delta_6 Countries_{it} + \delta_7 Haven_{it} + \delta_8 EqEarn_{it} + \delta_9 MezzFin_{it} \\ & + \delta_{10} AOCI_{it} + \delta_{11} DefRev_{it} + \delta_{12} StockComp_{it} \\ & + \delta_{13} NOL_{it} + \delta_{14} Nexus_{it} \\ & + \sum_{i=15}^{23} \delta_i Ind_{it} + \sum_{i=24}^{26} \delta_i Year_{it} + \varepsilon_{it} \end{aligned} \tag{A1}$$

We define the model variables in appendix A, figure A1.

Variable		Definition
Size	=	The natural log of Total Assets (AT).
PP&E	=	The ratio of Property, Plant & Equipment (PPEGT) / Total Assets (AT).
R&D	=	The ratio of R&D Expense (XRD) / Total Assets (AT).
M&A	=	Indicator variable set equal to one if the firm engaged in an M&A transaction as the acquirer in the current year; zero otherwise. Source: Securities Data Corporation (SDC).
PctForSale	=	The ratio of total sales of non-U.S. segments (Source: Compustat Segment data) to total firm sales (SALE).
Countries	=	The natural log of the number of distinct countries (other than the U.S.) in which the firm reports a significant subsidiary per 10-K Schedule 21 of the current year. Source: We thank Scott Dyreng for providing these data.
TaxHaven	=	Indicator variable equal to one if firm reports in 10-K Schedule 21 a tax haven subsidiary; zero otherwise. Source: We thank Scott Dyreng for providing these data.
EqEarn	=	The ratio of the absolute value of Equity in Earnings (Loss) (ESUB) / the absolute value of Income Before Extraordinary Items (IB).
MezzFin	=	The ratio of Convertible Debt & Preferred Stock (DCPSTK) / Total Assets (AT).
AOCI	=	The ratio of the absolute value of Accumulated Other Comprehensive Income (AOCI) / Total Assets (AT).
DefRev	=	Indicator variable equal to one if Deferred Revenue (DRC+DRLT) is non-zero; zero otherwise.
StockComp	=	Indicator variable equal to one if Stock Compensation Expense (STKCO) is non-zero; zero otherwise.

FIG. A1.—Variable definitions. This figure provides detailed definitions for the variables used to estimate equation (A1). The data source is Compustat unless otherwise noted; mnemonics are shown in parentheses where applicable. For brevity, each variable is defined as a one-year measure; however, the UTB reflects tax positions during open tax years in which the statute of limitations has not expired, typically three years. Thus, we use three-year measures in our regressions. We adopt the following procedure for computing three-year measures: (1) we set indicator variables equal to 1 if the one-year measure is equal to 1 in any of the current or prior two years, (2) we set ratio and natural log measures equal to the average of the one-year measure for the current and prior two years, and (3) for *R&D*, we compute the sum over the current and prior two years.

[46] Footnote 24 describes our sample selection process for the 19,271 firm-years.

We include year and industry fixed effects in the model.[47] We motivate our independent variables primarily from the Burton and Karlinsky [2011] survey of tax practitioners, which identifies the most complex areas of the tax law as those related to foreign operations (*PctForSale*, *Countries*, *TaxHaven*), mergers and acquisitions (*M&A*), operating loss limitations (*NOL*), tax credits (*R&D*), consolidations (*EqEarn*), derivatives and foreign exchange (*AOCI*), stock compensation (*StockComp*), revenue recognition (*DefRev*), state taxes (*Nexus*), complex financing (*MezzFin*), and capitalization (*PP&E*). Consistent with equations (1a) and (1b), these variables are computed over a three-year period. The results of estimating equation (A1), as well as equations (1a) and (1b) with the decomposed UTB, are qualitatively identical if we instead use one-year measures. We present descriptive statistics in appendix table A1 for the three-year measures.

TABLE A1
Descriptive Statistics for UTB Regression Variables

	Full *UTB* Sample [$n = 19{,}271$]					*UTB* > 0 [$n = 10{,}062$]		*UTB* = 0 [$n = 9{,}209$]	
Variable	Mean	SD	P25	P50	P75	Mean*	SD	Mean	SD
UTB	30.516	115.31	0.00	0.135	6.700	58.445	154.378	0.000	0.000
UTB_LN	1.206	1.722	0.000	0.127	2.041	2.610	1.769	0.000	0.000
UTB_SC	0.008	0.018	0.000	0.000	0.008	0.015	0.022	0.000	0.000
Size	5.961	2.508	4.339	6.115	7.590	6.927	1.999	4.904	2.581
PP&E	0.407	0.405	0.077	0.272	0.645	0.418	0.366	0.394	0.444
R&D	0.171	0.435	0.000	0.000	0.116	0.133	0.304	0.213	0.540
M&A	0.444	0.497	0.000	0.000	1.000	0.565	0.496	0.313	0.464
PctForSale	0.094	0.203	0.000	0.000	0.000	0.142	0.238	0.042	0.154
Countries	0.893	1.145	0.000	0.000	1.609	1.416	1.255	0.322	0.632
TaxHaven	0.312	0.463	0.000	0.000	1.000	0.482	0.500	0.125	0.331
EqEarn	0.220	0.414	0.000	0.000	0.000	0.286	0.452	0.148	0.355
MezzFin	0.048	0.167	0.000	0.000	0.000	0.040	0.133	0.057	0.198
AOCI	0.013	0.029	0.000	0.002	0.012	0.015	0.027	0.011	0.030
DefRev	0.417	0.493	0.000	0.000	1.000	0.458	0.498	0.372	0.483
StockComp	0.910	0.286	1.000	1.000	1.000	0.960	0.196	0.856	0.351
NOL	0.467	0.499	0.000	0.000	1.000	0.517	0.500	0.413	0.492
Nexus	0.139	0.346	0.000	0.000	0.000	0.156	0.363	0.119	0.324

This table presents descriptive statistics for variables used in estimating equation (A1). * indicates that all means of the variables for *UTB* > 0 sample are significantly different from the means of the variables for the *UTB* = 0 sample at $p \leq 0.05$. We define all variables in appendix figure A1.

A.2. UTB Regression Results

Recall that the purpose of equation (A1) is to decompose the UTB into tax (nondiscretionary) and nontax (discretionary) components and

[47] The results of estimating equation (A1), as well as equations (1a) and (1b) with the decomposed UTB, are qualitatively identical if we estimate equation (A1) by industry and year with at least 15 available observations. Additionally, results are substantially similar if we include the tax avoidance measures in equation (A1).

reestimate equations (1a) and (1b) including these components rather than the total UTB. These results are discussed in section 7.1. However, given our large sample of firm-years, we report the results of estimating equation (A1) in appendix table A2 and briefly discuss these results below.[48] We report standardized coefficients and marginal effects to compare the association of each variable with the UTB.

Columns [1] and [5], respectively, present coefficient estimates using the log (*UTB_LN*) and scaled (*UTB_SC*) transformations of the UTB. The results in column [1] indicate a significantly positive association between *UTB_LN* and firm size (*Size*), R&D intensity (*R&D*), merger and acquisition activity (*M&A*), the number of countries in which a firm operates (*Countries*), the presence of hybrid debt-equity instruments (*MezzFin*), accumulated other comprehensive income (*AOCI*), deferred revenue (*DefRev*), and the use of stock compensation (*StockComp*). The results in column [5] using *UTB_SC* as the dependent variable are similar to the results of the *UTB_LN* model, except that *UTB_SC* is also significantly related to PP&E intensity (*PP&E*), foreign sales (*PctForSale*), and presence of a net operating loss (*NOL*), but not related to *MezzFin* or *AOCI*.

Columns [2], [3], and [4] ([6], [7], and [8]) report the marginal effect decomposition of the Tobit parameters when the dependent variable is *UTB_LN* (*UTB_SC*), which we use to interpret the coefficient estimates. The unconditional expected value (UEV) provides the marginal effect of a one-unit change[49] in an independent variable on the *UTB*. The conditional expected value (CEV) provides the marginal effect of the predictor variables conditional on the UTB being uncensored (i.e., positive). Finally, the probability of being uncensored (PUC) tells us how the probability of observing a positive UTB changes given a unit increase in the independent variable. We focus our discussion on the three transaction-related variables with the largest marginal effects, *StockComp*, *Countries*, and *R&D*. For brevity, we discuss the marginal effects of the regression with *UTB_LN* as the dependent variable.

The marginal effect of *StockComp* on the unconditional (conditional) expected value of *UTB* is 0.4500 (0.3358), which suggests that firms that use stock compensation have UTBs that are 45% (34%) higher than firms that do not. The PUC marginal effect (column [4]) of 0.2388 suggests that the use of stock compensation increases the probability of recording a UTB by

[48] In table A2 of appendix A, we present results from estimating a Tobit model of equation (A1) because 48% of the observations in our sample exhibit a UTB of zero. Greene [2003] recommends the Tobit model to analyze "corner solutions," i.e., where the dependent variable takes on zero for a significant proportion of the sample. We use OLS regressions to generate the residuals used in equations (1a) and (1b) because Tobit model residuals are not well defined (Feng, Gramlich, and Gupta [2009]). The results reported in appendix table A2 and table 5 are qualitatively identical using either Tobit or OLS to estimate equation (A1).

[49] We standardize the independent variables, so the unit of analysis for all marginal effects is one standard deviation.

TABLE A2

UTB Regression Summary Statistics

	UTB_LN				*UTB_SC*			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Variable	Coefficient (Robust SE)	UEV	CEV	PUC	Coefficient (Robust SE)	UEV	CEV	PUC
Size	1.8386***	1.0298	0.7312	0.4538	0.0089***	0.0037	0.0029	0.1404
	(0.0456)				(0.0005)			
PP&E	−0.0395	−0.0221	−0.0157	−0.0097	−0.0010**	−0.0004	−0.0003	−0.0157
	(0.0318)				(0.0005)			
R&D	0.2169***	0.1215	0.0863	0.0535	0.0036***	0.0015	0.0012	0.0572
	(0.0324)				(0.0007)			
M&A	0.2466***	0.1389	0.0986	0.0607	0.0011*	0.0005	0.0004	0.0179
	(0.0450)				(0.0006)			
PctForSale	−0.0035	−0.0020	−0.0014	−0.0009	0.0008**	0.0003	0.0003	0.0130
	(0.0267)				(0.0004)			
Countries	0.6531***	0.3658	0.2597	0.1612	0.0052***	0.0022	0.0017	0.0822
	(0.0423)				(0.0006)			
TaxHaven	−0.0417	−0.0233	−0.0165	−0.0103	0.0010	0.0004	0.0003	0.0151
	(0.0745)				(0.0012)			
EqEarn	0.0707	0.0397	0.0282	0.0175	0.0016	0.0007	0.0005	0.0260
	(0.0480)				(0.0007)			
MezzFin	0.0463*	0.0259	0.0184	0.0114	0.0004	0.0002	0.0001	0.0070
	(0.0258)				(0.0005)			

(*Continued*)

TABLE A2—*Continued*

	UTB_LN				*UTB_SC*			
Variable	[1] Coefficient (Robust SE)	[2] UEV	[3] CEV	[4] PUC	[5] Coefficient (Robust SE)	[6] UEV	[7] CEV	[8] PUC
AOCI	0.0517**	0.0289	0.0206	0.0128	0.0006	0.0003	0.0002	0.0099
	(0.0250)				(0.0005)			
DefRev	0.1560***	0.0879	0.0623	0.0384	0.0036***	0.0016	0.0012	0.0577
	(0.0496)				(0.0007)			
StockComp	0.9759***	0.4500	0.3358	0.2388	0.0103***	0.0037	0.0030	0.1548
	(0.1264)				(0.0013)			
NOL	0.0707	0.0397	0.0282	0.0175	0.0016**	0.0007	0.0005	0.0260
	(0.0480)				(0.0007)			
Nexus	−0.1135	−0.0624	−0.0445	−0.0281	−0.0003	−0.0001	−0.0001	−0.0042
	(0.1889)				(0.0022)			
Industry FE	YES				YES			
Year FE	YES				YES			
Observations	19,271				19,271			
Likelihood Ratio	−23,481.56				−18,511.03			
Pseudo R^2	25.19%				16.39%			

This table presents the results of estimating Tobit regressions of equation (A1) on a sample of 19,271 observations from 2006 to 2009. The dependent variable is the ending balance in the *UTB* account (in millions) modified as follows: *UTB_LN* is equal to the natural log of (1 + *UTB*) and *UTB_SC* is the ratio of *UTB* to total assets. We report robust standard errors, clustered by firm, in parentheses below standardized coefficients in columns [1] and [5]. We report marginal effects based on the McDonald and Moffit [1980] decomposition of Tobit coefficients. Columns [2] and [6] report the unconditional expected value (UEV), columns [3] and [7] report the conditional expected value (CEV), and columns [4] and [8] report the probability of being uncensored (PUC). We define all variables in appendix figure A1. The symbols ***, **, and * denote significance at the 0.01, 0.05, and 0.10 (two-tailed) levels, respectively.

23.88%. Equity compensation takes many forms—options, restricted stock, phantom stock, stock appreciation rights and others, and the potential for significant future tax assessments can arise in a number of ways. For example, uncertain tax positions may arise with respect to the IRC §162(m) performance-based compensation exception.[50] Another example is the use of equity compensation in cost sharing agreements (*Xilinx Inc. et al. v. Commissioner*, 567 F. 3d 482 (9th Cir. 2009)).

The marginal effect of *Countries* on the unconditional (conditional) expected value of *UTB* is 0.3658 (0.2597), which suggests that the UTB increases 37% (26%) for every one standard deviation change in *Countries*. The average UTB for the full ($UTB > 0$) sample is approximately $30.5 ($58.5) million of UTBs. Therefore, the average firm in the full sample accrues about $11.16 million ($30.5 \times 0.3658$) when expanding operations into additional countries. The conditional marginal effect implies a $15.18 million ($58.5 \times 0.2597$) UTB accrual related to expanding foreign operations. The PUC marginal effect (column [4]) of 0.1612 suggests that a standard deviation increase in *Countries* increases the probability of recording a UTB by 16.12%.

Finally, the marginal effect of *R&D* on the unconditional (conditional) expected value of *UTB* is 0.1215 (0.0863), which suggests that the UTB increases 12.15% (8.63%) for every one standard deviation change in *R&D*. The unconditional (conditional) marginal effects imply a $3.7 ($5.04) million UTB accrual by the average firm in the full ($UTB > 0$) sample for each standard deviation change in *R&D*. The PUC marginal effect of 0.0535 suggests that each standard deviation change in *R&D* increases the probability of recording a UTB when a firm engages in an R&D-related transaction by 5.35%.

We conduct a number of sensitivity tests related to model specification, variable definition, and sample selection. Given the sensitivity of the Tobit model to various assumptions, we estimate both UTB regressions using OLS; the inferences from the OLS specifications are qualitatively similar to those of the Tobit model presented in table A2. We also replace the predictor variables computed over three years with single-year measures. Again, the results of using single-year measures in the UTB regression are qualitatively similar to those reported in table A2.[51]

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[50] See, for example, http://www.reedsmith.com/IRS-Clarifies-That-Dividends-and-Dividend-Equivalents-Must-Separately-Satisfy-Section-162m-as-Performance-Based-Compensation-07-10-2012/.

[51] The sample size for the UTB regression increases to 20,224 using predictor variables measured over one year.

APPENDIX B

FIN 48 Tax Reserve (UTB) Data

Firm-level UTB data are publicly available in financial statements prepared for fiscal years beginning after December 15, 2006. Although we use IRS-LB&I's FIN 48 data in this study, as it was the first large-sample UTB data set to be gathered, an alternative commercially available data source for UTB data is Compustat. The Compustat mnemonic for the UTB ending balance variable that we feature in our study is *TXTUBEND*.

In replicating our analyses using Compustat UTB data instead of the LB&I data, we discovered useful information for empirical tax researchers using *TXTUBEND*.[52] Importantly, as of the writing of this manuscript, there are a large number of missing values in Compustat for *TXTUBEND*, and we find that the missing values cannot be treated as zero values. We also note that Compustat sometimes captures incorrect dollar units (e.g., billions instead of millions). Overall, we encourage researchers without access to IRS-LB&I's FIN 48 data to retrieve (or at least validate) missing UTB data directly from financial statements, or else to drop observations with missing values from the analysis. We also caution researchers to check units for accuracy either by looking at time series data for individual firms (noting any significant changes), or by closely examining outliers based on, for example, the ratio of *TXTUBEND* to Total Assets (mnemonic: *AT*).

In particular, of the 3,262 firm-years in our main analysis, 1,046 show a missing value for *TXTUBEND*. A comparison to IRS-LB&I's FIN 48 data reveals that of the 1,046 missing firm years, 258 have a zero UTB, while 788 are, in fact, nonzero. Similarly, for our larger sample of 19,271 firm-years (from appendix A), 11,151 show a missing value for *TXTUBEND*, of which 7,698 have a zero UTB while 3,453 are nonzero. Thus, while missing data appear to represent a zero value for a considerable proportion of observations when considering the entire Compustat universe (69%), this is not the case in our sample drawn from S&P 1500 firms and that are commonly featured in empirical studies (25%).

To uncover any systematic differences across firms with and without missing data, we compared various firm characteristics in our sample of 3,262 firm-years. Firms with missing UTB data in Compustat are generally smaller (*Size* of 7.90 vs. 8.47) and have smaller UTBs (*UTB_LN* of 2.43 vs. 3.11); these mean differences are statistically significant. Notably, however, tax shelter participation across firms with and without missing UTB data is not significantly different (22% vs. 20%). Thus, using Compustat UTB data, one would fail to capture a nontrivial portion of tax shelter activity. We are able to replicate the empirical results reported in table 4 and table 5 using only the firm-years in Compustat with nonmissing values. However, the

[52] An analysis of the empirical properties of all 14 FIN 48 variables captured by Compustat from financial statement disclosures, when compared to IRS-LB&I'S FIN 48 data, is beyond the scope of this paper.

results generally show slightly weaker statistical significance, likely due to a smaller sample size.

Further analysis reveals that the incidence of missing data is declining over time, e.g., 35% and 22% missing in 2007 and 2009, respectively. It is unclear whether Compustat will backfill. Finally, we observe that missing data in Compustat are highly concentrated in the Transportation and Financial Services industries (66% and 63% missing, respectively).

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