Detecting Tax Avoidance:
Evidence from Quantitative and Linguistic Cues

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By

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Declaration

I, **Yicheng Wang**, declare that this thesis titled, **Detecting tax avoidance: evidence from quantitative and linguistic cues** and the work presented in it are my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

SIGNATURE  ……..

DATE……07 January 2022……...

Abstract

In this thesis, I examine tax avoidance detection by the use of quantitative and linguistic cues. This thesis provides a battery of approaches to detect tax avoidance, which contribute new tax avoidance means to the approaches already extant in the literature. All the approaches are based on the most used public disclosure of firms, the 10-Ks in the United States. I structure this thesis with three free-standing but theme-related papers.

In the first paper, I focus on the quantitative cues to detect tax avoidance by exploring conforming tax avoidance. Omitting conforming tax avoidance would result in an incomplete picture of the extent to which firms avoid tax. Given the importance of Badertscher et al.'s (2019) attempt to develop the only existing measure of conforming tax avoidance, it is vitally important to tax authorities and policy analysts that their approach provides rigorous and consistent results. Therefore, I present two major issues with their approach, which I analyse in some detail and provide solutions to. I apply the refined measure to two scenarios where the prior findings might be incorrect because of the lack of conforming tax avoidance measures.

Exploring the quantitative cues of tax avoidance could be inadequate, complex, and inefficient as financial measures are one-dimensional, misspecified, and/or not widely available. Taking 10-Ks as a repository of firms' narratives and treating accounting as a compound of philosophy and mathematics, I expect to see more linguistic cues of tax avoidance in 10-Ks. However, this kind of research is very limited in prior literature. Thus, in the second and third papers, I use textual analysis to detect tax avoidance in 10-Ks.

In the second paper, I focus on one specific section, Management Discussion and Analysis (MD&A) in 10-Ks. I use the existing well-established dictionaries to detect tax avoidance. I find that tax avoidance is significantly associated with the tone change of the MD&A section. In the third paper, I construct a tax-related dictionary to measure a firm's ability to engage in tax avoidance. I apply the dictionary in the entire 10-Ks and find a significantly positive relation between the raw counts of words in this dictionary and the level of tax avoidance. Both papers provide incremental linguistic cues beyond traditional accounting variables to reveal and predict tax avoidance.

The findings in all three papers together provide a set of multi-dimensional approaches for researchers, investors, and tax authorities to detect tax avoidance in 10-Ks in a more comprehensive, informative, and efficient way.

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Chapter 1 Introduction

Accounting is a compound of philosophy and mathematics.

—W. M. Cole, *The Fundamentals of Accounting*

Language is conceived in sin and science is its redemption

—W. V. Quine, *The Roots of Reference*

This thesis mainly explores the detection of tax avoidance[1] in the United States through quantitative and linguistic cues, with the aim of uncovering incremental information pertaining to the detection of tax avoidance behavior on the firm level by using quantitative or qualitative, direct or indirect tax avoidance measures or indicators[2].

1. Research Background and Motivation

A summary of the research branches of detecting tax avoidance as shown in FIGURE 1.1 indicates that the current research mainly focuses on nonconforming tax avoidance[3] measures such as effective tax rates (*ETR*), book-tax differences (*BTD*), abnormal *BTD,* and unrecognized tax benefit (*UTB*). This one-sided research approach would lead to incomplete or inefficient results for researchers and tax authorities if firms also engage in conforming tax avoidance. Considering that the detection of tax avoidance is an essential step at the beginning stage of tax avoidance research, preliminary to addressing other research questions, including determinants and consequences of tax avoidance, if researchers can only capture tax avoidance through the traditional measures of nonconforming tax avoidance, the subsequent findings based on these measures would have biased inferences. For tax authorities, detection work would be inefficient if they could only detect nonconforming tax avoiders through the traditional measures. Moreover, the use of quantitative information to detect tax avoidance might be inadequate. For example, most studies simply use the information in financial statements, such as tax expense, cash tax paid, pretax income, etc., which means that they ignore the majority of sections in firms' financial reports (10-Ks in the United States). In this thesis, I do not treat the firm characteristics measured by traditional accounting figures as

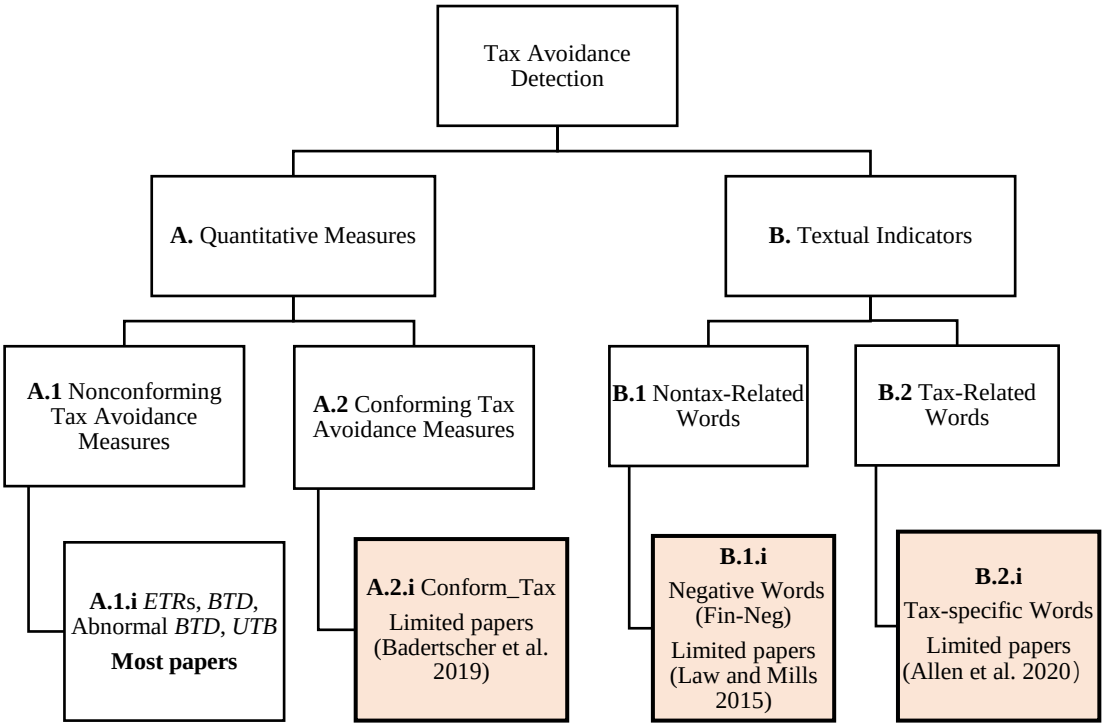
[1] In this thesis, tax avoidance is defined as "a continuum of tax planning strategies where something like municipal bond investments are at one end (lower explicit tax, perfectly legal), then terms such as ''noncompliance,'' ''evasion,'', "aggressiveness,'' and ''sheltering'' would be closer to the other end of the continuum. A tax planning activity or a tax strategy could be anywhere along the continuum depending upon how aggressive the activity is in reducing taxes" (Hanlon and Heitzman 2010, p.137).

[2] This is consistent with the assumption of Wilson (2009, p.970) that "tax-sheltering activity leaves a detectible footprint in the financial statements". However, I expand this assumption by using more than quantitative footprint in financial statements and focusing on the entire continuum of tax planning strategies, and both quantitative and textual clues to the existence and extent of those strategies.

[3] Nonconforming tax avoidance presents tax activities by lowering taxable income while keeping book income the same. Correspondently, conforming tax avoidance presents tax activities by lowering taxable income and book income simultaneously.

another valid way to detect tax avoidance because all of them are one-dimensional. It is not possible to use one determinant to predict idiosyncratic tax avoidance (Hanlon and Heitzman 2010). How about the textual information in 10Ks? Does it contain cues to detect tax avoidance? Is it possible to develop multi-dimensional indicators of tax avoidance? These questions are not solved adequately by prior literature. In this thesis, I treat accounting information as a language as it delivers quantitative information and considers textual information. Admittedly, the mandated format of 10-Ks could partially restrict their informativeness. However, from another perspective, because of this "stickiness", firms should release the information typically related to their business, which makes 10-Ks a potentially rich public depository of corporate narratives with a certain amount of comparability among different firms[4] (Miller 2017).

FIGURE 1.1 *Main Research Branches of Tax Avoidance Detection*



This figure presents the current research branches in the research of the detection of tax avoidance. Box A represents studies that use quantitative measures based on the quantitative information disclosed in 10-Ks. Box A.1 and Box A.2 represent two compositions of quantitative measures, including nonconforming and conforming tax avoidance. Box A.1.i describes detailed nonconforming measures used in studies. Most of the prior literature focuses on measures in this Box. Box A.2.i describes the conforming tax avoidance measures in studies. Box B represents studies that use textual information to detect tax avoidance. Box B.1 and Box B.2 describe studies that focus on nontax- or tax-related words. Box B.1.i describes studies that use well-established dictionaries to capture tax avoidance indirectly. Box B.2.i describes studies that use tax-related words to capture tax avoidance. My thesis focuses on box A.2.i, B.1.i and B.2.i by three papers, respectively.

[4] For example, SEC(2003) requires that Management Discussion and Analysis (MD&A) in 10-Ks must provide detailed managerial commentary related to the outlook of trends and events.

2. Research Questions

To better detect tax avoidance, it is essential to have more research in the other three subsidiary branches as presented in FIGURE 1.1. In this thesis, I focus on these three crucial but less exploited[5] branches of the research related to tax avoidance detection. The ***first*** one to be dealt with in the first paper is related to the quantitative measures of capturing another vital aspect of tax avoidance in addition to nonconforming tax avoidance. The ***second*** one is to capture tax avoidance based on existing dictionaries applied in the management discussion and analysis section (MD&A) in 10-Ks. The ***third*** one consists in constructing a new dictionary on tax strategies to measure a firm's ability to avoid tax. These three branches are derived from an underlying logic that tax avoidance behavior would be finally reflected in the presentation of both quantitative and textual information in firms' disclosures such as 10-Ks.

Specifically, in research into quantitative measures, prior literature mainly focuses on nonconforming tax avoidance, which means these measures can only capture kinds of tax avoidance where firms do not reduce book income and taxable income simultaneously. The nonconforming tax avoidance measures mainly include *ETR*s (Dyreng et al. 2008), *BTD* (Mills 1998; Phillips 2003), abnormal *BTD* (Frank et al. 2009), *UTB* ((Lisowsky et al. 2013; Gupta et al. 2014), and tax shelters (Graham and Tucker 2006; Wilson 2009). Nearly all the prior literature is based on these measures, which restrict the span of their research to the nonconforming tax avoidance context (Hanlon and Heitzman 2010). However, in practice, it may be the case that firms, e.g., private firms or firms with less capital market pressure, would reduce their book income and taxable income simultaneously to reduce their tax burden. This limitation in current tax research leads to some biased results and conclusions such as the 'under-sheltering puzzle' reflecting the phenomenon that some firms seem unreasonable to miss the full benefits of tax avoidance (measured by *ETR*s) in their operation (Weisbach 2002). Considering conforming tax avoidance, some firms subject to the under-sheltering puzzle may simply engage in conforming tax avoidance. This form of avoidance is not picked up in conventional (non-conforming) tax measures. It is thus essential to construct a measure to capture conforming tax avoidance separately. This undertaking has generally not been attempted in the literature, because of the considerable measurement issues involved, despite its importance to tax authorities and investors. To the author's knowledge, Badertscher et al. (2019) is the first and only paper to attempt this difficult task. Badertscher et al. (2019) construct a new conforming tax measure in the first study considering a broad measure to

[5] The prior literature on these three perspectives is quite limited. Badertscher et al. (2019) is the first and only paper to develop and validate a measure of conforming tax avoidance. Law and Mills (2015) and Allen et al. (2020) are the only two major papers on using bag of words for tax-related information to capture tax avoidance. "Bag of words" is a typical method used to parse the text documents into vectors of words and word counts (Jurafsky et al. 2009).

capture conforming tax avoidance. This new measure is a regression residual after the exclusion of items not related to conforming tax avoidance in regression with taxes paid to assets as an independent variable. However, this measure has some issues that could be refined. I modify this measure to address its pitfalls, as in my first paper.

Traditional measures are simply based on the quantitative information in 10-Ks. Considering the limited resources for researchers and tax authorities to investigate tax avoidance, it would be essential to fully use the existing cues as available in reports such as the 10-Ks. The informative 10-Ks as repositories of corporate narratives are likely to provide more text-based cues related to tax avoidance. My interest accordingly then focuses on whether linguistic cues can be found in 10-Ks to provide incremental tax avoidance information. This would be especially useful for tax authorities[6]but could also be of utility to financial analysts and investment decision-makers. Along with this logic, there are several studies trying to lift the curtain on this significant branch of disclosures, although quite limited in scope[7]. Law and Mills (2015) use Fin-Neg Dictionary developed by Loughran and McDonald (2011) to identify the relationship between tax avoidance and financial constraints measured by the percentage of negative words in 10-Ks. Allen et al. (2020) is one of the limited papers focusing on the relation between tax-specific-based textual analysis and tax avoidance. They construct tax-specific dictionaries and test them in tax-related discussions in 10-Ks. They find that these tax-specific dictionaries can be used to indicate tax avoidance measured by *ETR*s. Building on these papers, other aspects of the tax avoidance picture remain to be researched. For example, Law and Mill (2015) examine the textual information based on the entire 10-Ks. They do not investigate the information of MD&A in a specific tax avoidance context. The MD&A, as the least formatted part of the 10-K, tends to reveal more subjective disclosures in comparison to other regulated-format sections. Investigating MD&A would provide incremental information different from the entire 10-Ks. Meanwhile, these papers do not use or provide a text-based measure to capture tax avoidance activities based on textual information directly. Thus, in my second and third papers, I focus on whether the linguistic cues in 10-Ks can provide incremental information beyond the traditional accounting numbers or widely used tax avoidance measures to detect tax avoidance. Specifically, paper 2 investigates the association between management's tone change in MD&A and tax avoidance. Paper 3 constructs a new tax-related word list and examines the association between this word list and tax avoidance.

[6] Textual analysis is applied in some regulations. For example, the SEC has contemplated the use of the Fog Index (Li 2008) to capture poor disclosure quality of firms (McDonald and Loughran 2014).
[7] There are some other concurrent working papers (Luo et al. 2017; Hutchens 2017) investigating qualitative disclosure related to tax. However, they do not focus on the detection of tax avoidance.

3. Thesis Structure and Main Findings

My thesis consists of three self-contained papers found in Chapters 2, 3, and 4, respectively. Each of the three papers addresses a specific sub-branch related to the detection of tax avoidance in the U.S. market.

In Chapter 2, I focus on conforming tax avoidance measures. I refined the conforming tax avoidance measure by Badertscher et al. (2019) based on two limitations of their measure. I apply the refined measure to two scenarios where the prior findings might be incorrect because of the lack of conforming tax avoidance measures. In the first scenario, I investigate the effect of conforming tax avoidance on pretax return together with implicit tax before and after the enactment of the Tax Cuts and Jobs Act (TCJA) in 2017 in the United States. I find that implicit tax is still a valid explanation of the change of pretax return after controlling for conforming tax avoidance. In the second scenario, I use the refined measure to explore the undersheltering puzzle. By replicating the study of Desai and Dharmapala (2006), based on their sample, I find that the undersheltering puzzle is no longer a puzzle if conforming tax avoidance is considered. I also find a contrary finding to Desai and Dharmapala (2006) that instead of engaging less nonconforming tax avoidance, managers in poorly-governed firms engage in conforming tax avoidance when their firm's profitability is above the industry average.

In Chapter 3, I examine the effect of management's tone change on tax avoidance. I define the negative management's tone change as the change in the proportional occurrence of negative words in MD&A relative to the corresponding occurrence in the prior year. The larger this proportion, the more pessimistic is the tone change. I find that when management's tone changes in MD&A increase, firms are less likely to engage in tax avoidance activities. The results hold after a battery of robustness checks. I also find that the pattern would be weakened if managers had more stock-based executive compensation in poorly-governed firms.

In Chapter 4, I create a tax-strategy-related word list (*TAX_ABILITY*) to construct a multi-dimensional measure of a firm's ability to avoid taxes as an indicator of tax avoidance. Using different samples, including a large sample from 2004 to 2016 and extreme values obtained through Monte Carlo Simulation in traditional tax avoidance measures, I find a significant positive relation between a firm's ability to avoid taxes and the long-run and short-run aggressiveness of tax avoidance. However, the finding is the opposite in the tax sheltering firms. I interpret this as concealment of the ability by firms because these firms might be concerned that their tax avoidance activities are sufficiently aggressive to cross the bounds of legality. I also find that investors would negatively value this ability if firms do not adequately utilize it. This finding only exists in the well-governed firms with higher GAAP *ETR* than the industry average.

4. A Coherent Story of Three Papers and Contribution

These three papers provide a coherent story related to the detection of tax avoidance by exploring both quantitative and textual cues in 10-Ks. Specifically, Chapter 2 investigates the quantitative cues in 10-Ks by focusing on an important but less exploited component of tax avoidance, conforming tax avoidance. This paper contributes to a more comprehensive understanding of tax avoidance from the quantitative perspective. This is the first paper critically and empirically examining more conforming tax avoidance issues after the study of Badertscher et al. (2019).

After exploring the incremental quantitative cues related to tax avoidance detection, I find that it would be difficult to find out more quantitative cues further because traditional accounting variables are one-dimensional. That's why in past decades, the development of quantitative measures of tax avoidance is very little.

Thus, in Chapter 3 and Chapter 4, I change to focus on exploring textual information to detect tax avoidance. Chapter 3 documents the explanatory power of textual information in MD&A using the existing well-established dictionaries. This is an ex-ante indicator of tax avoidance. Especially for tax authorities, they can treat the management's tone change as an early warning and can employ it with other measures to improve the confidence and efficiency of detecting potential tax avoiders. This paper also contributes to the tax literature as one of the limited (less than five) papers focusing on qualitative information about firms' aggressive tax planning behavior.

However, Chapter 3 focuses on only a single section in the 10-Ks and loses potential cues in other sections of 10-Ks. Moreover, it utilises only nontax-related word lists. More seriously, as managers can easily manipulate the tone[8], the information in tone is not objective. Chapter 4 moves one step further to construct a tax-related word list based on tax strategies and applies the word list in the entire 10-Ks to find incremental textual information of tax avoidance. These words are more format-regulated and are more difficult to be avoided by managers. To my best knowledge, this is the first paper to detect tax avoidance by using a large set of tax-related words. This provides a new narrative picture of a firm's propensity to avoid taxes in addition to the measures and indicators based on the hard-to-translate tax quantitative information or other linguistic cues in prior literature.

All three papers improve and enrich the measures or indicators related to tax avoidance detection based on the 10-Ks, which would be helpful for researchers, investors, and tax authorities.

[8] There is no regulation related to the tone of textual information in 10-Ks. MD&A, for example, is generally voluntary and not audited. Managers might conceal the true performance due to an incentive or be biased caused by their own personalities. Thus, the tone is not a perfect objective description of firms.

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Chapter 2 Conforming Tax Avoidance and Its Applications

Abstract

In this study, I refine a tax avoidance measure developed by Badertscher et al. (2019) and apply the refined measure in different scenarios where prior literature does not consider the existence of conforming tax avoidance. I address two major issues of Badertscher et al.'s (2019) measure. First, they orthogonalize a ratio, taxes paid to assets, into book-tax difference (*BTD*) (a proxy of nonconforming tax avoidance) and a residual, extracted to represent a conforming tax avoidance measure. I find that the coefficients on the measure of book-tax difference (*BTD*) are not consistent in their method. To address this, I replace *BTD* with Cash ETR. Second, their method mixes poor performers and conforming tax avoiders. I set a threshold based on the change of short-term investment to separate two kinds of firms. Using the refined measure, I discuss two applications, implicit taxes, and undersheltering puzzle. I find that conforming tax avoidance is not an alternative explanation for implicit tax. I also find that the undersheltering puzzle is no longer a puzzle if conforming tax avoidance is considered.

Keywords: conforming tax avoidance; implicit tax; undersheltering puzzle

1. Introduction

Almost all prior tax avoidance studies focus on tax activities that involve the lowering of taxable income while keeping book income unchanged. These tax strategies are termed 'nonconforming tax avoidance'. Firms can also engage in conforming tax avoidance to reduce book income and taxable income simultaneously. The prior literature generally does not mention this kind of tax avoidance or is mainly focused on specific transactions (Guenther 1994; Maydew 1997). One major reason is that there is no well-established measure specifically designed to capture conforming tax avoidance. This stems from the fact that, because conforming tax avoidance impacts both taxable income and financial reporting income to the same extent, it does not show up in a direct and obvious manner in the income statement. The lack of a measure to capture conforming tax avoidance will result in incorrect inferences when analyzing some issues in tax contexts such as implicit taxes (Scholes and Wolfson 1992; Wilkie 1992; Callihan and White 1999) and the undersheltering puzzle (Weisbach 2002; Desai and Dharmapala 2006). Specifically, in implicit tax research, the prior literature (Jennings et al. 2012) cannot eliminate the possibility that the measured level of implicit tax or the reduction of pre-tax return is conflated with tax-induced earnings management (*i.e.*, conforming tax avoidance). In undersheltering puzzle research, the lack of conforming tax avoidance measures may result in an impression that many firms do not take

full advantage of tax avoidance (Weisbach 2002), while in reality, they may simply be using conforming tax avoidance activities as a substitute for non-conforming activities. The sole use of nonconforming tax avoidance measures would underestimate the total level of tax avoidance and result in incorrect inferences in research when examining the extent and determinants of tax avoidance[9].

Badertscher et al. (2019) (hereafter BKRW) construct a new measure in the first study considering a "clean" measure to capture conforming tax avoidance. This new measure is not, however, a *direct* measure. Instead, it starts from a measure of *total* (conforming plus non-conforming) tax avoidance (taxes-paid-to-assets) and strips out, through regression, the non-conforming component of this measure. What remains in the residual, they argue, proxies for conforming tax avoidance. This measure is validated by three different tests in their research. However, I have two concerns about their measure. First, their use of *BTD* as the right-hand-side variable in the regression to obtain residuals can result in an issue of the inconsistency of coefficients within the compositions of *BTD*. Second, their measure does not properly disentangle the earnings of firms with low performance versus those with conforming tax avoidance. Firms with low pretax income could be so simply due to their poor performance rather than as a result of conforming tax avoidance. In practice, it is not likely that a poor performer would still engage in conforming tax avoidance to further reduce their income since to do so would exacerbate an already poor reported income performance. The mixture of these two kinds of firms is not proper.

In this paper, I examine these two concerns of BKRW's measure critically and address them correspondingly. For the first concern, I split *BTD* into pretax income and taxable income as two individual variables in the BKRW regression that generates the conforming tax avoidance measure. I find that from mathematical derivation and empirical results, pretax income and taxable income cannot share a single coefficient. This could explain the counter-intuitive results in BKRW that 37.6% percent of the relations between *BTD* and taxes paid to assets is positive, contrary to their theoretical expectations. To address this concern, I replace *BTD* with Cash *ETR* in BKRW's method. This could eliminate the concern that the mixed composition of BTDs, including pretax income and taxable income, cannot share a single coefficient in its relation with total taxes. For the second concern, I set a threshold based on the changes of short-term investment to disentangle poor performers and conforming tax avoiders. I assume that the poor performers are not likely to engage in short-term investment, consistent with the cash flow investment sensitivity (Fazzari et al. 1988; Alti 2003). If the firms are not poor performers but deliberately reduce their pretax income to avoid taxes, or in

[9] In earnings management research, the conforming tax avoidance measure can also be used to separate tax-induced earnings management (Scholes et al. 1992; Guenther 1994; Maydew 1997) and real earnings management (Roychowdhury 2006).

other words, they save more cash from conforming tax avoidance, then they would be more likely to engage in short-term investment. By applying the threshold, I find that if poor performers and conforming tax avoiders are mixed in the sample, then incorrect inferences could be obtained in some of their results. There is no relationship between real earnings management and downward tax-induced earnings management (conforming tax avoidance) in the sample of poor performers, indicating that the "low" conforming tax avoidance of these firms is not a result of their conscious behavior.

I apply the refined measure in two specific tax contexts. The first one is implicit taxes (to be defined in Section 2.2). Implicit taxes are a second reason, quite apart from conforming tax avoidance, for lowered pre-tax income, and as such form a reason that may compete with conforming tax avoidance as a tax-based explanation for lowered pre-tax income. I use the Tax Cuts and Jobs Act (TCJA) in 2017, another major structural change of tax rate after 1986, as a natural setting to identify implicit taxes. I employ both tax preference measures[10] and conforming tax avoidance measures in a regression to determine their impacts as competing explanations of pre-tax return before and after TCJA. The results show that the reduction of pre-tax return after TCJA is majorly caused by the existence of implicit taxes rather than the conforming tax avoidance activities. This further confirms the presence of implicit taxes by eliminating the alternative explanation of conforming tax avoidance. The results are consistent with the proposition that the benefits of conforming tax avoidance are reduced whenever the statutory tax rate is reduced, thus shifting the balance of financial reporting cost versus tax benefit in favor of lower conforming tax avoidance. In the second tax context related to the undersheltering puzzle, based on the sample and methodology of Desai and Dharmapala (2006) (hereafter D&D), I find a complementary relationship between conforming tax avoidance and nonconforming tax avoidance during the sample period. Furthermore, the incentive compensation is still valid to explain conforming tax avoidance in the poorly-governed firms, but the story is completely different from D&D's findings.

My study makes several contributions. First, I refine BKRW's measure to better capture conforming tax avoidance. Second, to my knowledge, this is the first paper to analyze the effect of implicit taxes in TCJA and to compare this effect with conforming tax avoidance as a competing explanation of tax-induced earnings reduction. I find the existence of implicit taxes after controlling for conforming tax avoidance, an important alternative explanation that cannot be captured directly in prior literature (Jennings et al. 2012). Third, I explore the nature of the undersheltering puzzle with conforming tax avoidance and find that this puzzle is

[10] Tax preferences are thought to be related to, and indeed to generate, implicit taxes (Scholes and Wolfson 1992; Wilkie 1992; Callihan and White 1999; Wright 2001).

resolved when total (conforming plus non-conforming) tax avoidance is considered. This sheds light on managerial behavior in the choice of tax avoidance strategies.

2. Literature Review

2.1 RESEARCH ON MEASURES OF TAX AVOIDANCE

Prior literature focuses on nonconforming tax avoidance measures, mainly including effective tax rate measures (*ETR*), Book-Tax Difference *(BTD)*, abnormal *BTD*, unrecognized tax benefits (*UTB*), and tax shelters. *ETR* can be broadly classified as *GAAP ETR* and *Cash ETR*. *GAAP ETR* is computed as total income tax expense divided by pre-tax accounting income. This measure would be impacted by tax accruals using accounting income tax expenses. *Cash ETR* uses cash taxes paid in the numerator instead of income tax expense. The cash tax paid would not be distorted by tax accruals and thus captures both temporary and permanent book-tax differences (Dyreng et al. 2008). In these two measures, numerator and denominator would change in the same direction if managers reduce pretax income in tax planning. Thus, they cannot capture conforming tax avoidance. *BTD* follows a similar basic logic as *ETR*. It is calculated as the difference between pretax income and estimated taxable income (Mills 1998; Phillips 2003), and depending on the precise means of estimating taxable income, can be made to capture both temporary and permanent book-tax differences, or simply permanent differences[11] *BTD*, however, could be impacted by many nontax factors such as earnings management (Desai and Dharmapala 2006). To tackle these flaws, Desai and Dharmapala (2006) compute a measure by excluding earnings management from *BTD* in industry-year combined regressions. The residuals in the regressions are treated as 'abnormal' *BTD*: the component of BTD that is not due to mechanical differences between financial and tax reporting standards and normal levels of earnings management. Frank et al. (2009) generate the discretionary portion from the permanent difference part of *BTD*. These measures are consistent with the Jones (1991) model to remove the unintentional portion and leave the discretionary portion in the residual. *BTD*, including abnormal *BTD*, similar to ETR, cannot capture conforming tax avoidance because it also considers the relative difference between pretax income and taxable income at the initial stage. *UTB* is the accounting reserve for future tax contingencies after the issue of FIN 48 in 2006. *UTB* is significantly related to tax avoidance according to prior literature (Lisowsky et al. 2013; Gupta et al. 2014). However, this measure is based on the judgment of managers. The tax benefits may be all recognized to

[11] Taxable income is not generally directly observable to researchers. It is usually estimated by taking a measure of tax expense from the income statement, and deflating it by the statutory tax rate. Measures that include (exclude) deferred tax expense in the numerator will exclude (include) temporary differences in the *BTD* measure.

increase accounting earnings, and then tax avoidance cannot be captured (Hanlon and Heitzman 2010). Considering the subjectivity of this measure, it can partially capture some conforming tax avoidance (Hanlon and Heitzman 2010). Tax shelter firms represent firms with intentional tax planning at the aggressive end of the tax avoidance continuum. These are firms that were either caught or formally charged by Internal Revenue Service. Tax shelter firms can be used as a sample to prove the validity of other broad measures such as *BTD* (Frank et al. 2009) or directly to research the determinants of tax avoidance (Graham and Tucker 2006; Wilson 2009). However, as these firms comprise a tiny sample of extreme cases of tax avoidance, firms employing less extreme tax avoidance strategies, and those with extreme tax avoidance that goes unnoticed, are not captured in this sample. Tax shelter firms can thus only be used to perform tests at the extreme aggressive end of the tax avoidance spectrum. Nevertheless, such firms can provide a helpful check on the performance of models that attempt to detect and/or quantify tax avoidance activity.

All the above measures can properly capture nonconforming tax avoidance; simultaneously, they ignore conforming tax avoidance. Given the relative ease of computation of such measures, these measures are widely applied in a range of research studies covering the extent, determinants, and consequences of tax avoidance, such as the undersheltering puzzle (Weisbach 2002; Desai and Dharmapala 2006); executive effects on tax avoidance (Dyreng et al. 2010); reputational costs of tax avoidance (Gallemore et al. 2014); and firm value implications of tax avoidance (Desai and Dharmapala 2009; Tang 2019). The results of these studies are only applicable in a nonconforming tax avoidance context. In particular, the extent of tax avoidance discussed in the prior literature could be seriously underestimated without considering conforming tax avoidance. One implication of this fact is the possibility that, when conforming tax avoidance is quantified, the previously documented undersheltering puzzle may potentially be accounted for.

There are two reasons why the prior literature simply focuses on nonconforming tax avoidance. First, it is assumed that public firms are not likely to reduce their pretax income as they are under high capital market pressure. However, one cannot exclude the possibility of book-tax conforming tax strategies in public firms, even though the underlying mechanism is still unclear. It is necessary to understand the total tax avoidance to avoid incomplete conclusions. The choice of conforming versus non-conforming tax avoidance strategies will involve a balance of costs and benefits, and there are circumstances where non-conforming tax avoidance may be costly and highly visible (*e.g.,* when a large degree of non-conforming avoidance has already been performed); and where the financial reporting costs of conforming avoidance are outweighed by the tax benefits (*e.g.*, where the return on equity is high). A rigorous analysis of tax avoidance cannot rule out, *a priori*, the existence of such scenarios.

Second, prior to BKRW, there was no well-established measure of conforming tax avoidance. The prior literature can only detect tax-induced earnings management[12] through specific expenditures or revenues (Guenther 1994; Maydew 1997). BKRW is the first and only study that introduces a broad measure to capture conforming tax avoidance. The notion of this measure is similar to that of Jones (1991), Desai and Dharmapala (2006), and Frank et al. (2009). They compute conforming tax avoidance by regressing taxes-paid-to-assets on *BTD* and other tax-related variables, where taxes paid to assets, being based on a cash measure of taxes, capture both conforming and nonconforming tax avoidance, and *BTD* is intended to control for nonconforming tax avoidance. The residual is therefore used to proxy for conforming tax avoidance. BKRW (2019) validate their measure of conforming tax avoidance by (a) a simulation study that seeds financial reporting data with, first, increases in conforming tax avoidance, and, second, increases in non-conforming tax avoidance; (b) testing their measure on a sample known to have made a conforming change to their financial and tax reporting, by changing from FIFO to LIFO; and (c) performing matched comparisons of private and public firms. All of their tests give confirmation that their measure of conforming tax avoidance responds as expected to increases in conforming tax avoidance (and, in the case of (a), is not sensitive to nonconforming tax avoidance). These confirmatory results are to be expected given that, as shown above, their measure does pick up conforming tax avoidance where it is known to exist.

2.2 IMPLICIT TAXES

One application of conforming tax avoidance is implicit taxes which are less discussed in the current tax research. There is literature on implicit taxes from the 1990s and early 2000s that augments the prior research on explicit taxes. In that literature, the explicit tax burden is the tax actually paid (or incurred, or provided for in the tax expense figure) by the firm (Scholes and Wolfson 1992; Wilkie 1992; Callihan and White 1999; Wright 2001). The idea of the implicit tax is that if firms in a particular industry are able to get special tax treatments, etc., and have a systematically lower explicit tax burden than firms in other industries, then they will, *ceteris paribus*, have a higher after-tax return than firms in other industries. Then, competitive pressure will bid away that excess after-tax return: more firms will enter the industry, and/or existing firms will expand investments to the point where the risk-adjusted after-tax return is equalized across industries. But this will mean that tax-advantaged firms will end up with lower pre-tax returns than in other industries. This lowering of the pre-tax return, as a result of the firm having a lower explicit effective tax rate, is called an implicit tax.

[12] When considering conforming tax avoidance, the definition of this concept could be mixed with earnings management. The reduction of pretax income can be derived from both tax-induced earnings management or real earnings managements. In this paper, I assume conforming tax avoidance is the tax-induced earnings management.

Limited prior literature has mentioned the impact of tax planning, including tax shelters as an alternative explanation of implicit tax. Jennings et al. (2012) finds that firms began to rely more on tax shelters instead of debt after Tax Reform Act of 1986. However, they do not prove this further, considering conforming tax avoidance measures. Nevertheless, their finding is a piece of indirect evidence of tax planning which may impact pre-tax income in addition to implicit tax.

2.3 UNDERSHELTERING PUZZLE

The returns to investing in tax sheltering are extremely large. Bankman (1999) finds that $10 billion are saved by firms through tax avoidance annually. Graham and Tucker (2006) find that the benefits of tax sheltering are around a 9% deduction of total assets. Under this background, the undersheltering puzzle highlighted by Weisbach (2002) raises the question of why firms do not fully utilize the benefits related to tax shelters. The prior literature generally uses nonconforming tax avoidance measures in examining the undersheltering puzzle. Desai and Dharmapala (2006) use the complementary relationship between tax sheltering and rent diversion as a reason to discuss the small book-tax gap after earnings management in poorly-governed firms. Graham et al. (2014) analyze managers' survey responses and find that reputational costs are a reason for comparatively high *GAAP ETR*. Gallemore et al. (2014) find that the reputational costs as a factor of undersheltering puzzle do not hold if tax sheltering firms are used as the sample. Different tax avoidance measures might likely result in different implications. If one considers conforming tax avoidance, the story of this puzzle might also be different. For example, some firms can easily manipulate their book income to avoid taxes, especially those with high profitability or low costs of conforming tax avoidance, such as private firms and unlisted firms.

In the foregoing, I have demonstrated the importance of including conforming tax avoidance in the study of tax burdens in order to obtain a complete picture of the extent to which firms avoid tax. Given the high visibility of non-conforming tax avoidance, through readily calculable measures such as ETR and BTD, and the fact that researchers and policy-makers have prominently flagged up the falling ETRs in the U.S. as a significant concern[13], it is clear that the calculus of cost-versus-benefit in non-conforming tax avoidance may be changing in a way that makes it more difficult for firms to make their tax avoidance visible to investors. Thus, the recent paper by BKRW, which represents the first serious attempt at quantifying *conforming* tax avoidance, is an essential step in assessing the extent to which

[13] See for example, Hanlon and Shevlin (2005)

firms are moving their tax avoidance activities *away from* non-conforming tax avoidance and towards less visible conforming tax avoidance.

Given the importance of BKRW's attempt, it is vitally important to tax authorities and policy analysts that their approach provides rigorous and consistent results. In the following two sections of this paper, therefore, I present two major issues with the BKRW approach, which I analyse in some detail. In the case of both issues, I provide solutions to the problems raised by the BKRW approach.

3. Issue 1: Inconsistent Coefficients on *BTD*

BKRW (2019) attempt to isolate conforming tax avoidance by means of a two-stage procedure. First, they measure total tax avoidance by considering the ratio:

$$TTA_t = \frac{CTP_t}{TA_{t-1}} \tag{1}$$

where TTA_t measures total tax avoidance in year t, CTP_t denotes cash taxes paid in year *t*, and TA_{t-1} is Total Assets at the beginning of the period. A low TTA measure evidences tax avoidance.

They reason that CTP_t will be reduced for firm-years when tax avoidance takes place so that when the level of CTP_t in relation to opening total assets is low, this is evidence of (both conforming and non-conforming) tax avoidance.

In the second stage of their procedure, BKRW strip out the effect of non-conforming tax avoidance from their measure by regressing *TTA* on contemporaneous *BTD*, plus various control variables. Given that *BTD* captures the effect of non-conforming tax avoidance, the residual from this regression gives a measure of conforming tax avoidance. Given that the BKRW conforming (residual) measure (*CONFORM_BKRW*) arises from a regression that includes *BTD* as a right-hand-side variable, it is clear that they impose a single regression coefficient on the components of *BTD*. They define *BTD* as:

$$BTD_t = PTI_t - \frac{CTE_t}{\tau} \tag{2}$$

where τ is the statutory tax rate.

(In the regressions, BKRW deflate this measure by lagged total assets.) This formulation of the BKRW measure may be termed the *income-level* BTD, as it is stated in the form of the amount of income which effectively escapes taxation. One could alternatively, without any material modification to the model, state BTD on a *tax basis*, as:

$$BTD_t = PTI_t \times \tau - CTE_t \quad (3)$$

For convenience, this is the formulation I will employ in the sequel. Thus, in essence, BKRW impose a single regression coefficient on $PTI_t \times \tau - CTE_t$. However, I will now show that it is unlikely that $PTI_t \times \tau$ and *CTE* would share a single coefficient.

3.1 A SIMPLE PROOF

Suppose a firm engages in both conforming and nonconforming tax avoidance, PTI* is what PTI would be without conforming tax avoidance, and *CTE**, *CTP** are the complete tax measure. With conforming tax avoidance only, these become *PTI*, *CTE*^{c}, *CTP*^{c}. With nonconforming tax avoidance added, pre-tax income remains at *PTI*, but *CTE*^{c}, *CTP*^{c} lower to *CTE*, *CTP*[14].

Let *CTP**-*CTP*^{c}=Δ^c*CTP* be the change due to conforming tax avoidance and *CTP*^{c}-*CTP*=Δ^{NC}*CTP* be the nonconforming cash tax saving. Then:

$$CTP_t = CTP_t^c - \Delta^{NC} CTP_t \quad (4)$$

or

$$CTP_t = CTP^* - \Delta^C CTP_t - \Delta^{NC} CTP_t \ . \quad (5)$$

In other words, actual cash taxes paid equal (theoretical) cash taxes absent tax avoidance, minus the tax savings from both forms of tax avoidance (conforming and non-conforming).

Then BKWR's tax avoidance measure may be written as:

$$TTA = \frac{CTP^* - \Delta^C CTP_t - \Delta^{NC} CTP_t}{TA_{t-1}}. \quad (6)$$

As BKRW regress this *TTA* on *BTD*, deflated by lagged total assets. If we employ the tax basis *BTD*, this amounts to performing the following regression:

$$\frac{CTP_t^* - \Delta^C CTP_t - \Delta^{NC} CTP_t}{TA_{t-1}} = \beta_0 + \beta_1 \left(\frac{PTI_t * \tau - CTE_t}{TA_{t-1}} \right) + \varepsilon_t. \quad (7)$$

The residual, ε is supposed to capture conforming tax avoidance.

The regression can then be written as:

$$\frac{\Delta^C CTP_t}{TA_{t-1}} + \frac{\Delta^{NC} CTP_t - CTP_t^*}{TA_{t-1}} = -\beta_0 + \beta_1 \left(\frac{CTE_t - PTI_t * \tau}{TA_{t-1}} \right) - \varepsilon_t. \quad (8)$$

In the left-hand side of the above equation, we have utilized BKRW's claim that $TTA_t = \frac{CTP_t}{TA_{t-1}}$ measures conforming tax avoidance plus non-conforming tax avoidance, and accordingly split *TTA* into its hypothesized components.

The claim that the residual stands for conforming tax avoidance is tantamount to the claim that the non-residual part of the right-hand side measures non-conforming tax avoidance. In other words, that:

[14] *CTE* and *CTP* represent the current (book) tax expense and current (cash flow) tax paid after conforming and nonconforming tax avoidance.

$$\frac{\Delta^{NC} CTP_t - CTP_t^*}{TA_{t-1}} = -\beta_0 + \beta_1 \left(\frac{CTE_t - PTI*t}{TA_{t-1}} \right). \quad (8)$$

Ignoring the constant and cancelling the denominator, the claim is that:

$$\Delta^{NC} CTP_t - CTP_t^* = \beta_1 (CTE_t - PTI * t) \quad (9)$$

Now:

$$CTE_t = CTE_t^* - \Delta^C CTE_t - \Delta^{NC} CTE_t \quad (10)$$

and

$$PTI = PTI^* - \Delta^C PTI , \quad (11)$$

so equation (9) becomes:

$$\Delta^{NC} CTP_t - CTP_t^* = \beta_1 (CTE_t^* - \Delta^C CTE_t - \Delta^{NC} CTE_t - PTI^* t + \Delta^C PTI * t) \quad (12)$$

or

$$CTP_t^* - \Delta^{NC} CTP_t = \beta_1 (PTI * t - CTE_t^* - \Delta^C PTI * t + \Delta^C CTE_t + \Delta^{NC} CTE_t). \quad (13)$$

By definition, $\Delta^C PTI * t = \Delta^C CTE_t$,

so

$$CTP_t^* - \Delta^{NC} CTP_t = \beta_1 (PTI^* t - CTE_t^* + \Delta^{NC} CTE_t) \quad (14)$$

or

$$CTP_t^* - \Delta^{NC} CTP_t = \beta_1 (NI^* + \Delta^{NC} CTE_t). \quad (15)$$

In the last equation, looking at CTP_t^* versus NI^* suggests that $\beta_1 = t$. But a change in $\Delta^{NC} CTP_t$ should lead to a change in the tax expense of the same sign, suggesting β_1 should be negative. This leads to a contradiction. Thus, β_1 is unlikely to be a single coefficient. BKRW hypothesized that β_1 should be negative; according to the argument of their model, one would expect β_1 to be close to minus one.

3.2 EMPIRICAL EVIDENCE

In the empirical work of BKRW, the β_1 coefficient on *BTD* is also found not to be consistent in sign. They find that:

"The statistics in Panel C indicate that the mean and median coefficients on *BTD* are both negative, and across all 968 regressions, only 37.6 percent of the coefficients on *BTD* are positive. These results suggest that firms with more positive book-tax differences have lower ratios of cash taxes paid to lagged total assets (*TTA*)."

The positive coefficients on *BTD* in 37.6 percent of the regressions are counter-intuitive to the assumptions that nonconforming tax avoidance would reduce cash tax paid. To further examine this concern, instead of using *BTD* in combined form, I decompose *BTD* into: (1) *PTI* as pretax income divided by lagged total assets and (2) *TI* as the current tax expense divided

by statutory tax rate and scaled by lagged total assets. I substitute these two separate components of *BTD* for *BTD* itself in the BKRW regressions, each with its own coefficient, and compare the corresponding coefficients on these two variables[15]. The other variables are the same as in the BKRW regressions. I use the same sample period and sample selection process as BKRW. The sample is based on all public firm-years excluding observations for financial institutions or firms in regulated industries (SIC codes 4800–4900 and 6000–6999) in Compustat from fiscal years 1993 to 2015. Instead of conducting the regressions by three-digit NAICS industry and fiscal year combinations, year and industry fixed effects are included in the BKRW regression. The regression result in TABLE 2.1 suggests that all the variables are significantly related to *TTA*. The F-test to test whether the difference between the coefficient on *PTI* and *TI* is zero indicates that the difference is significant (F-statistics is 246.43; P-value is 0.000). This difference of coefficients would be an even bigger problem if the regressions were done the way that BKRW did them, on an industry-by-industry basis, instead of using a pooled panel sample.

TABLE 2.1 *Regression by Decomposing BTD into PI and TI*

Independent Variables	Dependent Variable: *TTA* (1)
PTI	0.007***
	(15.76)
TI	0.000***
	(12.58)
NEG	-0.002***
	(-6.09)
NEGBTD	-0.0 00***
	(-5.65)
NOL	0.023***
	(36.47)
ΔNOL	0.002***
	(5.26)
Year FE	YES
Industry FE	YES
Observations	42,671
Adjusted-R^2	0.252

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the results of regressions by decomposing *BTD* into *PTI* and *TI*. I use the same sample selection procedure as BKRW. I replace *BTD* with *PTI* and *TI* in BKRW's regression as follows:
$TAXESPAID\_TO\_ASSETS_{it}=\beta_0+\beta_1 PTI_{it}+\beta_2 TI_{it}+\beta_3 NEG_{it}+\beta_4 NEGBTD_{it}+\beta_5 NOL_{it}+\beta_6 \Delta NOL_{it}+\varepsilon_{it}$,
where ε_{it} is the measure of conforming tax avoidance. *BI* is pretax income. *TI* is taxable income, tax expense divided by statutory tax rates. All other variables are as defined in Appendix 2.2.

[15] I check the collinearity issue in this regression as *PTI* and *TI* are highly correlated. The VIF in this regression is below 5, which indicates that effectively, the BKRW procedure suffers from a correlated omitted variable problem, which biases the *BTD* coefficient estimate

3.3 METHOD TO REFINE THIS CONCERN

To address this limitation, I replace *BTD* with *CASH_ETR* computed by cash taxes paid divided by pre-tax income before special items in the baseline regression of BKRW to generate my refined conforming tax avoidance measure [16]. *CASH_ETR* can also capture nonconforming tax avoidance and is not affected by tax accounting accruals (Hanlon and Heitzman 2010). Similarly, I also include the net operating loss carryforwards (*NOL*) and changes in NOLs (*ΔNOL*), because *NOLs* would reduce cash taxes paid. The regression then changes to:

$$TAXESPAID\_TO\_ASSETS_{it} = \beta_0 + \beta_1 CASH\_ETR_{it} + \beta_2 NOL_{it} + \beta_3 \Delta NOL_{it} + \varepsilon_{it}. \quad (16)$$

Based on the same sample, I exclude firm-year observations with negative cash taxes paid or negative pretax income to eliminate the meaningless *CASH_ETR* (Henry and Sansingv2018). I conduct the regressions by three-digit NAICS industry and fiscal year combinations. The residuals extracted from Equation (1) are defined as my measures of conforming tax avoidance, *CONFORM_TAX*. TABLE 2.2, Panel A reports the descriptive statistics for the variables in Equation (1), and Panel B reports the correlation coefficients among variables. The means of *TTA* and *CASH_ETR* are 0.026 and 0.207, respectively, similar to those in BKRW. *TTA* is positively correlated with *CASH_ETR*, *NOL*, and *ΔNOL*. Panel C reports the descriptive statistics for 427 regressions (by three-digit NAICS industry and fiscal year combinations) to generate the *CONFORM_TAX* of each firm-year observations. Similar to BKRW, I drop the regressions with less than 15 observations. The coefficient on *CASH_ETR* is more consistent compared to BKRW as only 6.32% are negative. This indicates that, as expected, most regressions follow the pattern that firms with lower *CASH_ETR* would have lower *TTA*. The adjusted-R^2 is 32.4 percent, more than 10 percent larger than that in BKRW, suggesting the variables in the equation explain a more significant portion of the variation in *TTA* compared to BKRW.

To further test this refined measure, I replicate one of the validation tests of BKRW comparing the *CONFORM_TAX* for samples of quasi-private and public firms. The quasi-private firms are identified based on the same criteria as BKRW[17]. I propensity score match each quasi-private firm-year observation to a public firm based on similar earnings before interest and tax (*EBIT*), managerial ability (*MA_SCORE*), total assets (*ASSET*), and long-term debt (*LEV*), consistent with BKRW. TABLE 2.3 presents the comparison between quasi-

[16] When measuring conforming tax avoidance, I have a strong assumption, similar to BKRW, that nonconforming tax avoidance and conforming tax avoidance are orthogonal. However, I admit that nonconforming tax avoidance and conforming tax avoidance could be correlated. A firm can use conforming tax avoidance first by lowering pretax income to a threshold and then beyond that level, the firm may further engage in nonconforming tax avoidance. Perhaps future work can investigate this correlation.

17 The criteria are: (1) the firm's stock price at fiscal year-end is unavailable; (2) the firm has total debt and total revenues exceeding $1 million; (3) the firm is a U.S.-domiciled company; (4) the firm is not a subsidiary of another public firm; and (5) the firm is not a financial institution or in a regulated industry (SIC codes 6000–6999 and 4800–4900).

private firms and matched public firms. The quasi-private firms present significantly lower mean *TTA* and *CONFORM TAX*, indicating that my measure can also capture quasi-private firms that engage in more conforming tax avoidance activities compared to similar public firms. BKRW explain this finding as quasi-private firms have less capital market pressure.

TABLE 2.2 *Descriptive Statistics for Estimation of Conforming Tax Avoidance Measure*

Panel A: Descriptive Statistics for variables in Equation (1)

	n	Mean	Std. Dev.	p25	Median	p75
TTA	13,783	.026	.034	0	.012	.038
CASH_ETR	13,783	.207	.24	.005	.145	.313
NOL	13,783	.393	.488	0	0	1
ΔNOL	13,783	.162	.829	-.001	0	.024

The descriptive statistics in this TABLE are based on the same sample period and sample selection process of BKRW. The sample is based on all public firm-year, excluding observations for financial institutions or firms in regulated industries (SIC codes 4800–4900 and 6000–6999) in Compustat from fiscal years 1993 to 2015. I exclude firm-year observations with negative cash taxes paid and negative pretax income. I winsorize *CASH_ETR* to the range [0,1], and ratio values greater than one are reset to one. This results in a loss of many observations compared to BKRW. All variables are as defined in Appendix 2.2.

Panel B: Pearson (Spearman) Correlation Coefficients for Variables in Equation (1)

	TTA	*CASH_ETR*	*NOL*	*ΔNOL*
TTA	1	0.829***	0.419***	-0.241***
CASH_ETR	0.450***	1	0.351***	-0.204***
NOL	0.382***	0.251***	1	-0.052***
ΔNOL	-0.146***	-0.156***	-0.138***	1

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents Pearson (upper panel) and Spearman (lower panel) correlation coefficients for the regression variables. These correlations are calculated based on the sample used in Panel A. All variables are as defined in Appendix 2.2.

Panel C: Summary Statistics for 723 Industry-Year regressions Estimation

	Dependent Variable = *TTA*						
	n	Mean	Std. Dev.	p25	Median	p75	Percent<0
Coefficient on *CASH_ETR*	427	.07	.063	.028	.055	.097	6.32%
Coefficient on *NOL*	427	.017	.024	.004	.014	.026	
Coefficient on *ΔNOL*	427	-.024	.403	-.011	-.002	0	
Adjusted-R^2	427	.324	.243	.157	.283	.478	
Residual (= *CONFORM_TAX*)	427	.001	.025	-.011	-.001	.008	

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. These regressions are based on the sample in Panel A. I estimate Equation (1) by NAICS industry and year combination. I require at least 15 observations for each regression. 427 regressions are obtained. All variables are as defined in Appendix 2.2.

TABLE 2.3 *Comparisons of TTA and CONFORM_TAX of Quasi-Private and Public Firm-Years*

	Quasi-Private Firm-Years			Matched Public Firm-Years			Differences between	
	n	Mean	Median	n	Mean	Median	Means	Medians
TTA	515	0.019	0.007	515	0.025	0.013	-0.006***	-0.006***
CONFORM_TAX	515	-0.004	-0.004	515	-0.001	-0.002	-0.003***	-0.002***

*, **, *** Indicate significant differences between private and matched public firm-years at the 10 percent, 5 percent, and 1 percent levels, respectively. This table presents comparisons of *TTA* and *CONFORM_TAX* for quasi-private and public firm-years. These comparisons are based on the sample in TABLE 2. Two-tailed t-tests are used to test differences between means. I identify quasi-private firms based on the criteria of BKRW: (1) the firm's stock price at fiscal year-end is unavailable; (2) the firm has total debt and total revenues exceeding $1 million; (3) the firm is a U.S.-domiciled company; (4) the firm is not a subsidiary of another public firm; and (5) the firm is not a financial institution or in a regulated industry (SIC codes 6000–6999 and 4800–4900). I propensity score match the public firms by using *ASSET, EBIT, LEV, MA_SCORE*. Differences between means are tested using two-tailed t-tests; differences in medians are tested using two-tailed Wilcoxon signed rank tests. All variables are as defined in Appendix 2.2.

4. Issue 2: Mixture of Poor Performer and Conforming Tax Avoiders

As shown earlier, whilst a reduction in *CTP* can be caused by tax avoidance, the same effect is entirely consistent with a firm simply suffering lower profitability in the period. A lower profit figure would lead to lower taxable income and thus lower CTP_t relative to TA_{t-1}. Moreover, the sub-sample of firms with lower return-on-asset figures is likely to be over-represented by firms with lowered incentives to behave in a manner consistent with shareholder value maximisation. Thus, the methodology of BKRW (2019), rather than isolating firms that employ conforming tax avoidance strategies, instead may simply be isolating firms that report lower returns on assets. Whilst this sub-sample will include firms that employ conforming tax avoidance, it will also include firms that are simply inefficient or suffering from adverse product-market conditions. The foregoing issue with BKRW's (2019) methodology is particularly problematic if one wishes to employ the BKRW residuals to determine characteristics of firms whose preference is for conforming tax avoidance strategies. This is because the methodology has a built-in bias towards the finding that inefficient (and hence less profitable) firms are more likely to employ conforming tax avoidance strategies. Their study does not capture only book-tax conforming tax avoidance firms but rather conflates these with firms whose lowered profitability is not a result of tax avoidance strategies. BKRW (2019) do acknowledge this fact (on p. 3) when they state:

"…we acknowledge it is difficult to disentangle earnings that are low due to poor performance versus earnings that are low due to conforming tax avoidance."

They further acknowledge that, whilst they employ proxies for firm performance in their regressions as controls, and perform robustness checks that control directly for firm performance:

"…we cannot entirely eliminate the possibility that the documented conforming tax avoidance is related to firm performance."

Thus, whilst the BKRW methodology may in some cases provide confirmatory evidence that conforming tax avoidance exists where prior research suggests it exists (for example, in the case of privately-held firms), caution must be exercised in utilizing the approach to assess the extent to which conforming tax avoidance exists in general. This is particularly important in the tax policy context since firms in struggling but strategically important areas of the economy should, arguably, be targeted for tax preferences rather than receiving adverse attention for putative conforming tax avoidance.

In BKRW, there is an inconsistency of the inclusion of independent variables in the regression to calculate conforming tax avoidance measures. In Appendix 1 of their paper (BKRW, p.27), the measure of conforming tax avoidance is derived from a regression including a variable, *SALES_TO_NOA*. However, in the main text (BKRW, p.6), the baseline regression to obtain the residuals does not include this variable[18]. I can find that BKRW try to control the impact of low profitability. This inconsistency may further indicate the shortcomings of their measure. Even though they may have the idea to include a control variable in their regression to eliminate the effect of low profitability, it is also not proper to include the profitability in the control variable. The low profitability and conforming tax avoidance are a 1-0 thing. This is not usual for firms, especially public firms, to reduce book income with the existing low profitability.

4.1 METHOD TO REFINE THIS CONCERN

To address this limitation, I introduce a benchmark based on the change of short-term investments (*IVSTCH*). Specifically, if *IVSTCH* is above or equal to zero[19], the firm is classified as a conforming tax avoider; if it is below zero (including zero), the firm is classified as a poor performer. Low profitability firms or inefficient firms, on average, will be those with fewer prospects for making new profitable investments, whereas firms whose low reported profits are a result of book-tax conforming tax avoidance will generally have better prospects for new profitable investments. This can also be explained by cash flow investment sensitivity[20] (Fazzari et al. 1988; Alti 2003). If a firm has an actual low cash flow due to low profitability, then it would have much fewer incentives to engage in new investment. Instead,

[18] I also find that in the main text, BKRW require the at least 15 observations for each regression while in the appendix of variable definitions, they require at least 10 observations. In my replication of BKRW's results, I find that their findings are sensitive to different requirements of minimum observations. I set different observation requirements in my measures and find that my measures are not sensitive to these requirements.
[19] *IVSTCH* is reset to zero if missing.
[20] According to Alti (2003), cash flow investment sensitivity is not associated with financial constraints.

if a firm lowers its profitability through conforming tax avoidance, which means that they have a healthier profit (cash flow) than the reported income, this firm would be more likely to have a new short-term investment. Thus, if I consider the incremental short-term investment, this should give an approximate means of separating the two kinds of firms.

4.2 EMPIRICAL EVIDENCE

Based on this threshold, I compare the difference of conforming tax avoidance between these two types of firms using the entire sample from 1993 to 2015. TABLE 2.4 presents the difference of mean and median of conforming tax avoidance between poor performers and conforming tax avoiders. Under both measures, poor performers have less "conforming tax avoidance" than conforming tax avoiders. Whether the coefficient on those poor performers is higher or lower than on conforming firms is irrelevant. If the poor performers have a different coefficient, it does not mean they are doing less conforming avoidance than other firms. It just means low performers give different results from conforming firms because the coefficient is measuring a different thing. If I mixture the poor performers in the sample, I would have incorrect inferences by the inclusion of these low profitability firms when analyzing the firms' characteristics of conforming tax avoiders. Since a poorly-performing firm is not likely to engage in conforming tax avoidance simultaneously, my method should be better than putting controls into the regression for performance[21].

I replicate the examination of the impact of capital market pressure in conforming tax avoidance at public firms in BKRW[22] . I use *CONFORM_BKRW* and compare conforming tax avoiders and poor performers. I further validate my measure with the exclusion of firms having negative *IVSTCH*. I include firm and year fixed effect instead of industry and year fixed effect in BKRW. TABLE 2.5 presents regression results. Four capital market pressure proxies, *ST_ISSUE, AF*, *SALES_GR*, and *DACC* are all significant with the same sign for conforming tax avoiders in Column (1) and the entire sample in Column (3). This result is the same as BKRW's. However, for poor performers, the explanatory power of these proxies reduces largely, indicating that the *CONFORM_BKRW* may not perfectly capture conforming tax avoidance for these firms. Mainly because conforming tax avoidance is a kind of tax-induced earnings management with an adverse direction of real earnings management, for conforming tax avoiders, their conforming tax avoidance activities (*CONFORM_BKRW* or *CONFORM_TAX*) should be associated with earnings management (*DACC*). In *CONFORM_BKRW*, this relation is not significant for poor performers. *CONFORM_BKRW*

[21] Putting controls into the regression for performance has an underlying assumption that poor performers also engage in conforming tax avoidance. However, as discussed, this is not the case for public firms.
[22] I acknowledge that the two-step regression method used by BKRW could be biased. The corresponding discussions are shown in Appendix 2.1.

is not related to real earnings management, indicating that there are no "discretionary choices by managers to reduce income tax payments in a book-tax conforming manner" (BKRW 2019)[23]. This suggests that BKRW measure of conforming tax avoidance captures poor performers who may not engage in tax avoidance activities. In Column (4), I use my measure, *CONFORM_TAX,* and exclude poor performers. The results are consistent with and even stronger than BKRW's findings. All the findings suggest the importance of excluding poor performers from the entire sample.

Overall, my refined procedure to capture conforming tax avoidance is as follows. I first employ the BKRW method and use equation (1) to determine the book-tax conforming residual, which reflects either purely lowered profits due to bad performance, or due to book-tax conforming tax avoidance. I can assume that both do not occur at the same time, as a poorly-performing firm would have lowered incentive to engage in conforming tax avoidance which would further depress profitability. I then look at the new short-term investments (*IVTSCH*) for each of these firms. If this is below zero, the firm is classified as a poor performer, and its residual is regarded purely as a poor-performance residual; if it is above zero, it is a potential conforming tax avoider, and the residual is conforming tax avoidance.

TABLE 2.4 *Comparisons of CONFORM_BKRW and CONFORM_TAX for Poor Performer and Conforming Tax Avoider*

	Poor performer Firm-Years			**Conforming tax avoider** Firm-Years			**Differences between**	
	n	Mean	Median	n	Mean	Median	Means	Medians
CONFORM_TAX	2,242	0.005	-0.001	11,541	-0.001	-0.003	0.006***	0.002***
CONFORM_BKRW	2,843	0.004	-0.002	16,069	-0.001	-0.003	0.003***	0.001***

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively. This table represents the comparison of conforming tax avoidance between poor performers and conforming tax avoiders under two conforming tax avoidance measures, *CONFORM_BKRW* and *CONFORM_TAX*. These regressions are based on the sample in TABLE 2.2. Differences between means are tested using two-tailed t-tests; differences in medians are tested using two-tailed Wilcoxon signed rank tests. Both variables are as defined in Appendix 2.2.

[23] In BKRW, they particularly analyze the relationship between conforming tax avoidance and real earnings management. They follow the logic that earning management proxies are "intended to capture discretionary operating decisions that increase financial statement income; nonetheless, they also capture discretionary operating decisions that reduce financial and taxable income and, thus, should also capture conforming tax avoidance" (BKRW, p.29). In their mixed sample of poor performer and conforming tax avoiders, they find a significant relationship between conforming tax avoidance and real earnings management. However, based on my results, this relationship does not exist for poor performers.

TABLE 2.5 *Regressions of Conforming Tax Avoidance on Proxies for Capital Market Pressure*

	Dependent Variable:			
	CONFORM_BKRW			*CONFORM_TAX*
Independent	Conforming Tax Avoider (1)	Poor Performer (2)	Full Sample (3)	Conforming Tax Avoider (4)
ST_ISSUE	0.003***	0.008***	0.004***	0.004***
	(3.58)	(3.37)	(5.59)	(5.34)
AF	0.003***	0.004**	0.004***	0.001***
	(3.85)	(2.13)	(5.33)	(3.17)
SALES_GR	0.002***	0.003	0.002***	0.004***
	(4.07)	(1.19)	(4.12)	(5.47)
DACC	0.005***	0.012	0.006***	0.010***
	(2.71)	(1.46)	(3.23)	(4.73)
ACQUISITION_D	0.002**	-0.001	0.001	0.002**
	(2.21)	(-0.40)	(1.33)	(2.32)
EBIT	0.001	0.014**	0.002**	0.002***
	(1.45)	(2.07)	(2.24)	(4.38)
MA_SCORE	0.030***	0.033***	0.032***	0.034***
	(6.89)	(2.86)	(7.79)	(7.99)
INT_EXP	-0.001	-0.034	-0.001	-0.009
	(-0.28)	(-0.41)	(-0.12)	(-0.98)
LOG_ASSETS	-0.000	-0.007***	-0.001	-0.001
	(-0.26)	(-2.67)	(-0.79)	(-1.32)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Observations	7,648	1,012	9,214	7,211
Adjusted-R^2	0.379	0.417	0.383	0.430

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the replication of regression related to capital market pressure in BKRW. I divide the sample into two groups, poor performer (*IVSTCH*<0) and Conforming tax avoider (*IVSTCH*≥0). These regressions are based on the sample in TABLE 2.2. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 2.2.

5. Implicit Taxes Versus Conforming Tax Avoidance

5.1 HYPOTHESIS DEVELOPMENT

In prior literature, the reductions in pre-tax income due to a special tax treatment were thought to be due to implicit taxes. However, if we now consider conforming tax avoidance, then we know (consistent with BKRW) that a firm with conforming tax avoidance will report lower pre-tax income as a result of the conforming avoidance. So, if conforming tax avoidance and non-conforming tax avoidance are complements, then, for an aggressively tax-avoiding firm, one will observe both the explicit tax burden decreasing (via *ETR* and *BTD*, etc.) and the pre-tax return going down. Empirically, this will look like an implicit tax that is offsetting the reduced explicit tax, but in fact, it is not an implicit tax. Instead, it is a reduction in reported income (through tax-induced earnings management) resulting from conforming tax avoidance. The situation is complicated further for firms subject to implicit taxes. For these firms, the implicit tax effect is driven by persistent tax preferences, which reveal themselves as non-

conforming tax avoidance. Again, if non-conforming avoidance is positively correlated with conforming avoidance, then the implicit tax effect will be reinforced by a conforming tax avoidance effect, both of which lower pre-tax income. Thus, it is necessary to explore the complementarity between implicit taxes and conforming tax avoidance. In the former case, lowered pre-tax profits drive down tax expense; in the latter case, manipulation of tax expense drives down reported profits. The two effects have very different public policy implications.

Prior literature on implicit taxes (Scholes and Wolfson 1992; Wilkie 1992; Callihan and White 1999; Wright 2002; Jennings et al. 2012) mainly uses the sample before and after the Tax Reform Act of 1986 due to the lack of other structural changes of tax laws. On December 22, 2017, the Tax Cuts and Jobs Act (TCJA) was signed by President Trump, which is the only major structural change in the U.S. to have occurred after the Tax Reform Act of 1986. TCJA can be another natural place to identify the effect of implicit taxes at the firm level. In TCJA, the tax rate is reduced largely from 35% to 21%. But meanwhile, it also introduces some provisions to restrict tax avoidance[24]. These provisions are mainly related to nonconforming tax avoidance, such as net operating losses and foreign-derived intangible income[25]. If TCJA is reducing the tax rate, firms enjoying lower tax rates seem to have lower profitability, as explained by implicit taxes to reduce their pre-tax income through conforming tax avoidance. However, as TCJA also prevents various tax avoidance strategies, the firms are also likely to explore some other tax planning like conforming tax avoidance. For example, 100% bonus depreciation for capital expenditures in TCJA may also result in a smaller pre-tax income. When I discuss the impact of the change of tax laws, it will be more comprehensive to consider the implications and extent of both implicit taxes and conforming tax avoidance activities. The reduction in pre-tax returns after tax laws change could be the mixed results of implicit taxes and conforming tax avoidance. For example, the pre-tax return reduces due to more implicit taxes and more conforming tax avoidance. Or the decrease of pre-tax return could be caused by implicit taxes directly but offset by less conforming tax avoidance. Based on this logic, I examine relationships between pre-tax return and conforming tax avoidance in addition to the effect of tax preferences. My formal hypothesis is:

H1: Conforming tax avoidance decreases pre-tax return after TCJA

[24] In TCJA, interest expense deduction and net operating losses deductions are limited. R&D expenses related to tax avoidance strategies are prevented. There are some other provisions related to international taxation to increase tax on tax avoidance such as offshoring income and foreign-derived intangible income. Tax Reform Act of 1986 also eliminated some important tax preferences. For example, it phased out the deductibility of different types of debt. That's the reason why firms shifted away from debt after 1986, as found by Jennings et al. (2012). The prior literature usually discusses the implicit tax without the consideration of the other law provisions which may impact some other tax planning such as conforming tax avoidance.

[25] In TCJA, net operating losses are no longer allowed to be carried back and if firms carry forward net operating losses then they can only reduce taxable income by 80%. Compared to the significantly lower tax rate, this provision would potentially result in firms to reduce pre-tax income directly, as no net operating losses can further reduce tax payments.

5.2 SAMPLE SELECTION AND RESEARCH DESIGN

To analyze the effect of TCJA, I include the non-regulated and non-financial firm-year from 2015 to 2020[26]. Following Jennings et al. (2012), I drop the firms with (1) pre-tax book income less than $500,000, (2) opening adjusted book value of common equity less than $1 million, (3) nonpositive cash tax paid, (4) negative change in short-term investment[27]. I impose these standards to reduce the likelihood that low pre-tax income and cash taxes paid are simply because of poor performance rather than from tax preferences or conforming tax avoidance. I divide my sample into two sub-periods, 2015-2017 and 2018-2020. The first period is before, and the second period is after TCJA.

To test H1, I follow the study of Gupta and Newberry (1997) and Jennings et al. (2012) to estimate separate coefficients for the pre- and post- 2018 periods. The main interest is on the incremental coefficient estimates in the post-2018 period. I include year and firm fixed effects. Accordingly, I estimate the following regression:

$$\begin{aligned} PTROE \;=\; & \beta_0 + \beta_1\, PTTSE + \beta_2\, CONFORM_{TAX} + \beta_3\, SIZE + \beta_4\, LEV + \beta_5 CAP + \beta_6 INV + \\ & \beta_7 RD + \beta_8\, FOR + \beta_9\, MT + Post[\beta_{10} + \beta_{11}\, PTTSE + \beta_{12} CONFORM\_TAX + \\ & \beta_{13} SIZE + \beta_{14} LEV + \beta_{15} CAP + \beta_{16}\, INV + \beta_{17}\, RD + \beta_{18}\, FOR + \beta_{19}\, MT] + \varepsilon. \end{aligned} \tag{16}$$

The main dependent variable in my analysis is Pre-tax return on equity (*PTROE*). Consistent with the prior literature (Wilkie 1992; Salbador and Vendrzyk 2006), *PTROE* is defined as the pre-tax income divided by shareholder equity. To measure tax preferences, I first use the pre-tax tax subsidy on equity (*PTTSE*) measure adopted by Wilkie (1992). A tax subsidy is defined as "the difference between a firm's current explicit tax liability and the tax due if: (1) pre-tax accounting income (PTI) is used as the tax base and (2) all income is taxed at the highest statutory rate (t)" (Wilkie 1992, *p. 99*). *PPTSE* is:

$$PTTSE = \left[\frac{PTI(t) - CTAX\$}{OE}\right]\left[\frac{1}{1-t}\right] = \frac{PTR(t) - CTAX}{1-t} \tag{17}$$

where *PTI* is the pre-tax income excluding extraordinary items and discontinued operations; *CTAX$* is current tax expense; *OE* is the sum of common stockholders' equity, preferred stock, and deferred taxes; *PTR* is *PTI/OE,* and *CTAX* is *CTAX$/OE*.

[26] I acknowledge that my sample period is short to capture the long-term business changes to estimate the full impact of TCJA.

[27] I drop all the firms based on the first three requirements at the initial stage. I then drop firms based on requirement (4) after the regression of *CONFORM_TAX*.

Following Gupta and Newberry (1997) and Jennings et al. (2012), I include six firm-level control variables, including size (*SIZE*), leverage (*LEV*), capital intensity (*CAP*), inventory intensity (*INV*), research and development intensity (*RD*), foreign sales (*FOR*). I also include market share (*MS*) to control the industry-level variations further. *Post* is a dummy variable that equals one for years from 2018-2020 and zeroes otherwise. Interaction terms comprise *Post* multiplied with each of the explanatory variables. The coefficient estimates on the interaction terms test the slope shifts in each of the explanatory variables after TCJA. In addition, I include firm and year fixed effects. I include the fixed effect of firms to further ensure the results are not driven by the variation at the firm characteristic level. The decrease of *PTROE* could be impacted by the firm-level characteristics such as manager ability. The year fixed effect is used to absorb the variation in the macroeconomic environment, such as GDP and IPO volumes. The detailed variable descriptions are in Appendix 2.2.

5.3 SUMMARY STATISTICS

Panel A in TABLE 2.6 reports descriptive statistics and t-test of means of each pre- and post-2018 sample variable. *PTROE* decreased significantly from 0.203 before the 2018 period to 0.187 after 2018. This is consistent with the assumption of implicit taxes. Compared to these two periods, the absolute value of *PTTSE* increased significantly from 0.055 to 0.066, indicating the increased tax subsidy or tax preference suffered by firms. *CONFORM_TAX* is stable with no significant change between the two periods. Panel B in TABLE 2.6 shows a strong negative correlation between *PTROE* and *PTTSE*, which is consistent with the assumption of implicit taxes. Implicit taxes offset the increase of explicit tax preference. The correlation between *PTROE* and *CONFORM_TAX* is significant and positive. As expected, lower *CONFORM_TAX* indicates more conforming tax avoidance and would lead to lower *PTROE*.

TABLE 2.6 *Summary Statistics of Pre-TCJA and Post-TCJA Periods from 2015 to 2020*

Panel A: Descriptive statistics

	Pre-TCJA Period		Post-TCJA Period		Difference between
	n	mean	n	mean	Means
PTROE	1568	0.203	1233	0.187	0.016**
PTTSE	1563	-0.055	1237	-0.066	0.012***
CONFORM TAX	1555	0	1245	-0.001	0
NOL	1583	0.103	1246	0.097	0.007
LEV	1587	0.203	1242	0.208	-0.005
SIZE	1565	7.804	1235	8.022	-0.217***
CAP	1585	0.544	1244	0.534	0.01
INV	1579	0.06	1250	0.047	0.013***
RD	1584	0.053	1220	0.06	-0.007**
FOR	1564	0.026	1212	0.032	-0.006**
MT	1570	0.032	1209	0.032	0

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. The sample is based on all public firm-year, excluding observations for financial institutions or firms in regulated industries (SIC codes 4800–4900 and 6000–6999) in Compustat from fiscal years 2015 to 2020. I divide this sample into two periods, pre-TCJA period from 2015 to 2017 and post-TCJA period from 2018 to 2020. I exclude firm-year observations with negative cash taxes paid and negative pretax income. All variables are as defined in Appendix 2.2.

Panel B: Pearson and Spearman Correlation Coefficients

Correlation Variable *PTROE* to *SIZE*

	PTROE	*PTTSE*	*CONFORM_TAX*	*NOL*	*LEV*	*SIZE*
PTROE	1	-0.516***	0.381***	0.003	0.107***	0.142***
PTTSE	-0.628***	1	-0.137***	0.010	-0.114***	-0.166***
CONFORM_TAX	0.293***	-0.102***	1	0.013	-0.080***	-0.006
NOL	-0.018	0.025**	0.005	1	0.051***	0.067***
LEV	0.185***	-0.149***	-0.122***	0.041***	1	0.432***
SIZE	0.090***	-0.072***	-0.034***	0.066***	0.387***	1
CAP	-0.043***	-0.031***	0.009	0.218***	0.178***	0.155***
INV	0.030**	0.083***	0.022*	-0.048***	-0.093***	-0.157***
RD	-0.041***	-0.013	-0.061***	-0.167***	-0.168***	-0.053***
FOR	0.138***	-0.065***	0.093***	-0.140***	0.004	0.130***
MT	0.142***	-0.046***	0.011	-0.056***	0.152***	0.380***

Correlation Variable *CAP* to *MT*

	CAP	*INV*	*RD*	*FOR*	*MT*
PTROE	-0.035***	0.062***	-0.036***	0.160***	0.214***
PTTSE	-0.060***	0.072***	-0.040***	-0.004	-0.070***
CONFORM_TAX	0.055***	0.041***	-0.081***	0.041***	0.077***
NOL	0.241***	-0.040***	-0.268***	-0.233***	-0.046***
LEV	0.202***	-0.099***	-0.252***	0.035***	0.310***
SIZE	0.187***	-0.091***	-0.067***	0.138***	0.640***
CAP	1	0.058***	-0.387***	-0.184***	0.102***
INV	-0.126***	1	0.080***	0.080***	0.197***
RD	-0.261***	-0.111***	1	0.332***	-0.117***
FOR	-0.109***	-0.067***	0.140***	1	0.195***
MT	-0.028**	0.056***	-0.088***	0.055***	1

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents Pearson (upper panel) and Spearman (lower panel) correlation coefficients for the regression variables. These correlations are calculated based on the sample used in Panel A. All variables are as defined in Appendix 2.2.

5.4 MAIN RESULTS

TABLE 2.7 presents results for tests of H1. In the pre-2018 period. *PTTSE* is negatively associated with *PTROE* as expected, indicating the negative effect of tax preference on pre-tax return at the corporate level. *CONFORM_TAX* is positively related to *PTROE,* consistent with the assumption that the larger *CONFOM_TAX* means less conforming tax avoidance and so that higher *PTROE*. *PTTSE* and *CONFORM_TAX* are ranked as the first and second-largest determinants of *PTROE*. For the other variables, *NOL* is negatively related to *PTROE,* suggesting that firms with lower *NOL* have higher pre-tax returns. This is consistent with the findings of Wilkie (1992). *LEV* is positively related to *PTROE,* indicating that firms with higher leverage can generate higher pre-tax returns due to the comparatively smaller equity. *SIZE* is negatively related to *PTROE,* suggesting that firms with smaller *SIZE* would have higher *PTROE*. *RD* reflects a negative relationship with *PTROE*. Firms with higher R&D expenses would naturally have lower pre-tax income and subsequently lower *PTROE*.

My main interest is in the incremental coefficient estimates of *PTTSE* and *CONFORM_TAX*. In the post-2018 period, the incremental coefficient estimates of PTTSE significantly increase the magnitude of the pre-2018 coefficient estimates. The impact of *PTTSE* from the pre-2018 period to the post-2018 period increases from -0.988 to -1.111. This indicates the implicit taxes offset the explicit tax preferences in TCJA. The incremental coefficient estimates of *CONFORM_TAX* are significant at the 10% level, and the sign is negative. This indicates that the impact of conforming tax avoidance on the reduction of *PTROE* is weaker than the pre-2018 period after TCJA. TCJA affects reducing conforming tax avoidance activities. This decline reflects the effect of new regulations such as limits on interest deductibility and R&D expenses after TCJA. This is not consistent with my hypothesis that the reduction of *PTROE* is partially caused by conforming tax avoidance after TCJA. Instead, the decline of *PTROE* is led by implicit tax, and the degree of decrease is partially offset by less conforming tax avoidance. This result can also be considered as another strong evidence of the validity of my new measure of conforming tax avoidance. After TCJA, it is more intuitive that firms would engage in less conforming tax avoidance due to the lower tax rates. This could be driven by income-shifting behaviors. Due to the large tax rate decrease, firms would shift income and losses in a book-tax conforming manner, similar to the findings after the Tax Reform Act of 1986 (Guenther 1994; Maydew 1997).

In TABLE 2.8, I regress Equation 16 without the interaction terms by each year to distinguish the short-term effect or longer-term effect of implicit taxes and conforming tax avoidance. Sames as the results in TABLE 2.7, according to the economic value of the coefficient, the impact of conforming tax avoidance decreases gradually in the long term after 2017. The effect of implicit taxes increases dramatically after 2016 but keeps stable after 2017.

TABLE 2.7 *Regressions of PTROE on Various Firm Characteristics over the Pre- and Post-TCJA periods*

		Dependent Variables: *PTROE*	
Independent Variables	Predicted Sign	Pre-2018 Estimates	Incremental Post-2018 Estimates
PTTSE	-	-0.988***	-0.223**
		(-10.91)	(-2.25)
CONFORM_TAX	+	2.486***	-0.868*
		(7.61)	(-1.78)
NOL		-0.018	-0.022
		(-0.61)	(-0.92)
LEV		0.211***	-0.067
		(3.96)	(-1.37)
SIZE		-0.092***	0.002
		(-6.31)	(0.61)
CAP		0.042	0.001
		(0.93)	(0.11)
INV		0.315*	0.026
		(1.82)	(0.69)
RD		-0.655***	0.087
		(-3.35)	(1.14)
FOR		-0.202*	0.375***
		(-1.85)	(3.41)
MS		0.181	-0.012
		(1.57)	(-0.15)
Year FE		YES	
Firm FE		YES	
Observations		2,170	
Number of Firms		607	
Adjusted-R^2		0.821	

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents coefficient estimates from Equation (16). The sample is defined in TABLE 2.6. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 2.2.

TABLE 2.8 *Regressions of PTROE on Various Firm Characteristics over the Pre- and Post- TCJA periods by each year*

	(1)	(2)	(3)	(4)	(5)
Independent Variables	2015	2016	2017	2018	2019
PTTSE	-1.026***	-0.849***	-1.249***	-1.522***	-1.518***
	(-8.69)	(-6.80)	(-11.36)	(-13.82)	(-14.51)
CONFORM_TAX	4.465***	5.060***	3.932***	3.602***	3.096***
	(7.07)	(5.99)	(7.48)	(8.47)	(6.47)
Controls	Identical to TABLE 2.7				
Observations	497	405	459	510	471
Industry FE	YES	YES	YES	YES	YES
Adjusted-R^2	0.516	0.378	0.556	0.679	0.706

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents coefficient estimates from Equation (16). The sample is defined in TABLE 2.6. The regression includes industry fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 2.2.

5.5 ROBUSTNESS TEST

I conduct four robustness tests to validate the result. In the first robustness test in TABLE 2.9, I replace the independent variable of *CONFORM_TAX* with *CONFORM_BKRW*. In this regression, *PTTSE* is still the driver of the decrease of *PTROE* in pre- and post-2018, while *CONFORM_TAX* has no additional impact on *PTTSE* after 2018. This further indicates that BKRW's measure may not be able to capture conforming tax avoidance properly. After TCJA, naturally, there would be less conforming tax avoidance as the tax rate decreases largely and the limits on some deductions such as interest and R&D expense increase, which would result in higher *PTROE* before implicit taxes. Nonetheless, this result still indicates that the main driver of the decrease of *PTROE* is implicit taxes rather than tax planning like conforming tax avoidance. In the second robustness test, I replace the independent variable of tax preference with another tax rate preference, *TRP*. It is measured by the difference between the top statutory rate and the firm's actual statutory rate, according to Chen and Hung (2010). In this case, *TRP* is zero (35%-35%) in pre-2018 period and 14% (35%-21%) in post-2018 period. I predict that *TRP* would have a negative relationship with *PTROE*. The result shown in TABLE 2.10 is similar to the baseline regression of equation (3). Third, I exclude observations in the year 2020. The COVID-19 and the tax relief provision under the Coronavirus Aid, Relief, and Economic Security (CARES) Act passed in 2020 would also reduce the pre-tax return and impact the tax avoidance activities. The untabulated result still holds. Fourth, I include the poor performers with *IVSTCH* less than zero. Under the full sample, my results still survive.

TABLE 2.9 *Regressions of PTROE on CONFORM_BKRW over the Pre- and Post- TCJA*

		Dependent Variable: *PTROE*	
Independent Variables	Predicted Sign	Pre-2018 Estimates	Incremental Post-2018 Estimates
PTTSE	-	-1.037***	-0.160**
		(-11.97)	(-2.07)
CONFORM_BKRW	+	1.350***	-0.216
		(6.90)	(-0.70)
Controls		Identical to TABLE 2.7	
Firm FE		YES	
Year FE		YES	
Observations		4,215	
Number of firms		1,177	
Adjusted-R^2		0.835	

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents coefficient estimates from Equation (16). I replace *CONFORM_TAX* with *CONFORM_BKRW* in Equation (16). The other variables are the same. The sample is defined in TABLE 2.6. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 2.2.

TABLE 2.10 *Regressions of TRP on CONFORM_TAX over the Pre- and Post- TCJA*

		Dependent Variable: *PTROE*	
Independent Variables	Predicted Sign	Pre-2018 Estimates	Incremental Post-2018 Estimates
TRP	-	-0.181*	-0.212**
		(-1.69)	(-2.51)
CONFORM_TAX	+	1.932***	-0.631**
		(6.90)	(9.05)
Controls		Identical to TABLE 7	
Firm FE		YES	
Year FE		YES	
Observations		2,170	
Number of firms		607	
Adjusted-R^2		0.811	

Notes: *, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents coefficient estimates from Equation (16). I replace *PTTSE* with *TRP* in Equation (3). The other variables are the same. The sample is defined in TABLE 2.6. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 2.2.

6. Conforming Tax Avoidance, Corporate Governance and Compensation

This section investigates the undersheltering puzzle, which currently has mixed evidence. Some firms that appear to be undersheltering may be simply utilizing book-tax conforming tax strategies. It would be more comprehensive to research undersheltering puzzle in a conforming versus nonconforming manner. To investigate the existence of undersheltering puzzle, I replicate one widely-cited research by D&D where they find undersheltering puzzle can be explained by the complementary relation between rent diversion and tax avoidance. Managers with higher incentive compensation tend to have a lower level of tax sheltering, especially for firms with relatively weak governance arrangements, which helps explain the undersheltering puzzle. However, this may be another story if conforming tax avoidance is considered from 1993 to 2001.

6.1 SAMPLE SELECTION AND RESEARCH DESIGN

I first generate the same sample of D&D. Accordingly, I use the same sample period from 1993 to 2001 and variables from the Compustat database. Based on governance index G (*GIndex*) developed by Gompers et al. (2003), I divide the sample into well-governed firms (GIndex≤7) and poorly governed firms (*GIndex*>7). Same as D&D, for the entire period, I use *GIndex* in 1998 as it covers the largest number of firms, and I assume that the firm's corporate governance does not vary largely in this period. I replicate the primary regression in D&D to find whether incentive compensation can explain the variation of CONFORM_TAX and

whether the undersheltering puzzle still exists at the firm level. I use *CONFORM_TAX* instead of tax sheltering (*TS*) they use to measure tax avoidance. I include the interaction terms with an indicator of good governance (*WELLGOV*) for all the right-hand-side variables. I also control the firm size and deferred tax expenses. In addition, I include an additional control variable, discretionary accruals (*DACC*), from the modified cross-sectional Jones (1991) model. *DACC* is used to reduce the concerns related to real earnings management, not tax-induced earnings management (BKRW). My interests are on *STKMIXGRANT*, *STKMIXREST*, the interaction of *WELLGOV* with *STKMIXGRANT*, and the interaction of *WELLGOV* with *STKMIXREST*. The regression model is as follows:

$$CONFORMTAX_{it} = \beta_0 + \beta_1 STKMIXGRANT_{it} + \beta_2\, STKMIXREST_{it} + \beta_3(WELLGOV * STKMIXGRANT_{it}) + \beta_4\,(WELLGOV * STKMIXREST_{it}) + Other\ Interaction\ terms + Firm\ Fixed\ Effects + Year\ Dummies + Controls + \varepsilon_{it} \quad (18)$$

6.2 SUMMARY STATISTICS

TABLE 2.11 represents the descriptive statistics of the main variables[28]. In Panel A, the variable summaries of mean and standard deviations are similar to D&D's. *CONFORM_TAX* is positively correlated with tax sheltering (*TS*), indicating a complementary relationship between conforming tax avoidance and nonconforming tax avoidance. As the overall pattern shown in FIGURE 1, the smaller average *TS* (less nonconforming tax avoidance) is along with average smaller *CONFORM_TAX* (more conforming tax avoidance) in each year. Intuitively, from this large perspective, the undersheltering puzzle may be incorrectly recognized due to the omittance of conforming tax avoidance. *CONFORM_TAX* is uncorrelated with *STKMIXGRANT* and *STKMIXREST*, potentially indicating that incentive compensations do not impact conforming tax avoidance. *CONFORM_TAX* is negatively related to *GIndex*, suggesting the negative relation between corporate governance and the level of conforming tax avoidance. *CONFORM_TAX* is negatively related to *SALES*. Apparently, firms with more sales would be more likely to engage in conforming tax avoidance as they have more "resources" at the top to be reduced. Panel B represents the comparison of *CONFORM_TAX* of firms in the top 25% and bottom 25% of the *TS* quartile. The result shows that firms in the top 25% *TS* quartile have larger *CONFORM_TAX* than firms in the bottom 25%. This indicates that firms with less nonconforming tax avoidance engage in more conforming tax avoidance. Again, the undersheltering puzzle may not be valid if conforming tax avoidance is considered.

28 This sample follow the sample selection criteria of D&D. In addition, I also deduct firms with negative change in short-term investment to generate *CONFORM_TAX*.

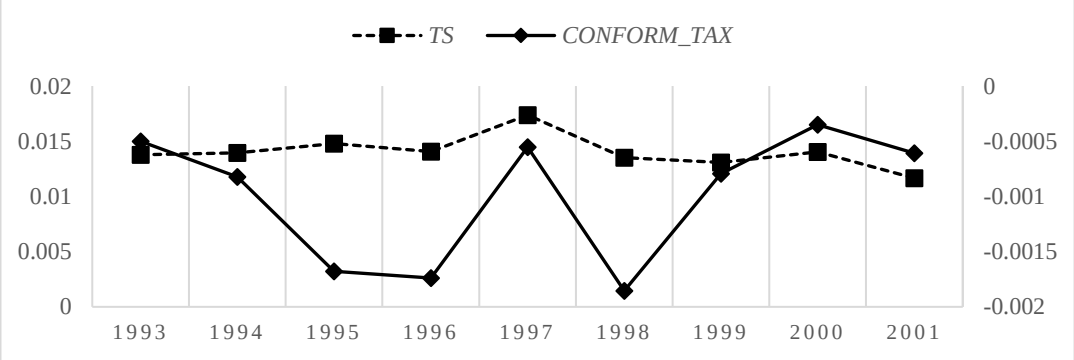
6.3 MAIN RESULTS

TABLE 2.12 presents the regression results in different divisions of samples. Based on the entire sample (Column 1), the coefficient estimates on *STKMIXGRANT* are negative and statistically significant. This is intuitive that managers with more high-powered incentives are more willing to reduce taxes in favor of shareholders. However, the interaction of *WELLGOV* with *STKMIXGRANT* is negative but not statistically significant. The coefficients on *STKMIXREST* and its interaction with *WELLGOV* are not significant, consistent with the findings of D&D. According to D&D, the pattern between *STKMIXGRANT* and *CONFORM_TAX* would be different in well- and poorly-governed firms. In Column 2 and Column 3, I divide the samples into two types of firms based on *GIndex* as discussed. I find that the pattern between compensation and conforming tax avoidance only exists in poorly-governed firms. This is contradictory to the findings of D&D. D&D explain the undersheltering puzzle based on an argument that the managers in poorly-governed firms have a concern that shareholders would mistreat their tax avoidance activities as an increase of possibility of rent diversion. Thus, they are reluctant to exploit tax avoidance opportunities, especially with high-powered incentives. My findings provide a different story. Managers in poorly-governed firms also engage in tax avoidance, but in a more "secret" way, conforming tax avoidance which is difficult to be captured by investors and regulators. High-powered incentives are likely to motivate managers to exploit tax avoidance opportunities for the benefit of shareholders. However, managers in poorly-governed firms are also worried about the potential negative impact of lower future return (as investors are concerned about the rent diversion from tax sheltering) when they engage in nonconforming tax avoidance. Thus, they might choose to use conforming tax avoidance. This is counterintuitive that managers would reduce their profit if their incentives are based on stock options. Thus, I further assume that managers might only be willing to reduce their profit to reduce taxes when they have superior performance than the industry average, e.g., higher sales to asset ratio. The large sales can also ensure that they can still achieve the target profit for their own interest after conforming tax avoidance. Accordingly, I assume that this pattern would only exist for firms with poor governance and high sales to assets ratio. I identify firms with sales to assets ratio higher than the industry average as the high sales firms and the others as the low sales firms. I then combine this criterion with the previous criterion, *GIndex*. I have four subsamples in Columns 4 to 7, and I re-conduct the regressions in Columns 2 and 3. As expected, the pattern is only significant for the poor-governed firms with higher sales to asset ratio compared to the industry average[29] (Column 7). This story further indicates that the undersheltering puzzle explained

[29] The results are still robust when I replace sales to assets with profits to assets. I also replace *GIndex* with institutional ownership based on Schedule 13F filings CDA Spectrum database. The results still hold.

by the complementary effect between tax sheltering and rent diversion (Desai and Dharmapala 2006) is not valid if I consider the conforming tax avoidance. Thus, to this extent, the undersheltering puzzle is not a puzzle anymore.

FIGURE 2.1 *Changes of TS and CONFORM_TAX from 1993 to 2001*



The figure plots the mean average conforming tax avoidance measure (*CONFORM_TAX*) discussed in the text from 1993 to 2001, along with the mean nonconforming tax avoidance measure (*TS*). The sample is as defined in TABLE 2.10.

TABLE 2.11 *Univariate Analyses for CONFORM_TAX and other Variables in D&D*

Panel A: Descriptive Statistics for Main Variables

Variables	Obs	Mean	Std. Dev.	P25	Median	P75	Corr.
CONFORM TAX	3085	.002	.025	-.011	-.001	.011	1
TS	3085	.009	.025	-.003	.008	.018	**0.038**
STKMIXGRANT	3085	.362	.256	.149	.35	.563	-0.000
STKMIXREST	3085	.062	.153	0	0	.03	-.012
GIndex	3085	9.187	3.186	7	10	11	**-0.045**
ASSET	3085	7.005	1.539	5.878	6.809	7.987	**-0.187**
MARKETVALUE	3085	7.324	1.431	6.270	7.177	8.345	0.119
SALES	3085	6.983	1.401	5.945	6.867	7.969	**-0.131**
DEFERREDTAXES	3085	0	.014	-.005	.001	.007	**-0.092**
DACC	3085	.001	.382	-.040	0	.044	0.015

This table uses the same sample period and sample selection process of D&D. The sample is based on all public firm-year, excluding observations for financial institutions or firms in regulated industries (SIC codes 4800–4900 and 6000–6999) in Compustat from fiscal years 1993 to 2001. I exclude firm-year observations with negative cash taxes paid and negative pretax income. Correlation coefficients in bold are significant at the 0.05 level or better (two-tailed t-test). All variables are as defined in Appendix 2.2.

Panel B: CONFORM_TAX by top 25% and bottom 25% TS Quartile

TS quantile	n	Mean *CONFORM_TAX*	Comparison	Diff. in Means	t value	Sig.
Q1	950	-.001				
Q4	912	.003	Q1 vs. Q4	-.004	-3.2	***

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the paired sample t-test of differences in the mean of *CONFORM_TAX* between *TS*'s top quantile and bottom quantile. This is aimed to investigate whether firms with higher *TS* (more nonconforming tax avoidance) would have higher *CONFORM_TAX* (less conforming tax avoidance). All variables are as defined in Appendix 2.2.

TABLE 2.12 *CONFORM_TAX, Managerial Compensation Structure and Firm Governance*

	Dependent Variable: *CONFORM_TAX*						
Independent Variables	All firms (1)	Well-governed firms (2)	Poorly-governed firms (3)	Well-governed firms & Low sales (4)	Well-governed firms & High sales (5)	Poorly-governed firms & Low sales (6)	Poorly-governed firms & High sales (7)
TKMIXGRANT	-0.006**	0.000	-0.006**	0.001	-0.010	-0.003	-0.010**
	(-2.32)	(0.10)	(-2.33)	(0.14)	(-1.57)	(-1.03)	(-2.26)
STKMIXREST	0.003	0.007	0.004	0.002	0.012	-0.001	0.009
	(1.15)	(0.91)	(1.22)	(0.30)	(0.75)	(-0.34)	(1.33)
WELLGOV #STKMIXGRANT	0.006						
	(1.37)						
WELLGOV #STKMIXREST	0.004						
	(0.49)						
Controls	Including *ASSET, MARKETVALUE, SALES, DEFERREDTAXES, DACC*						
Year FE	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES
Observations	3,085	868	2,217	431	346	1,042	887
Adjusted-R^2	0.508	0.585	0.472	0.630	0.564	0.461	0.514

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the results of the effects of management's compensation structure and firm governance on *CONFORM_TAX*. The sample is defined in TABLE 2.10. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 2.2.

7. Conclusions

The disregard for conforming tax avoidance in prior literature leads to an embedded concern of whether their results are still valid if the total tax avoidance is considered. To address this concern, the first step is to find a measure of conforming tax avoidance. In this study, I critically examine a young measure of conforming tax avoidance (BKRW). I find that when *BTD* is used in BKRW's method, the coefficients on *BTD* are not consistent and counter-intuitive. To address this issue, I replace *BTD* with *CASH_ETR* in their method. I validate my measure by comparing public and quasi-private firms. I also find that poor performers and conforming tax avoiders are not disentangled in the BKRW's method. This will result in incorrect inferences. To separate poor performers and conforming tax avoiders, I set a threshold based on the changes of short-term investments. If the threshold is above zero, the firm is classified as a conforming tax avoider; if it is below zero (including zero), the firm is classified as a poor performer. I find that the findings of BKRW are more robust after I exclude poor performers.

I apply the refined measure in two applications that are not uncovered completely in prior literature because of the lack of conforming tax avoidance measures. First, I investigate the existence of implicit tax to identify whether the decrease of pretax return can be explained by conforming tax avoidance rather than implicit taxes. I do not find any evidence that the reduction of pre-tax income is driven by conforming tax avoidance. Instead, after TCJA, I find

less conforming tax avoidance at firm level. For tax authorities, when they evaluate the impact of a certain change of tax laws, such as the reduction of tax rates with other tax avoidance provisions, it would be more comprehensive to consider the mixture effect of implicit taxes and conforming tax avoidance. Second, I examine the undersheltering puzzle and find that it is no longer the puzzle when I include the conforming tax measure into consideration. At the year level, *CONFORM_TAX* and *TS* represent the same change directions from 1993 to 2001, indicating that conforming and nonconforming tax avoidance are complementary. By replicating D&D's research, I also find this complementary relationship at the firm level, particularly in poorly-governed firms with high profitability.

My research makes three major contributions. First, BKRW's measure is a young and the only available measure of conforming tax avoidance in prior accounting literature. My modifications make their measure more solid and less noisy in applications. Alternatively, my measure can be used as another measure to be compared with BKRW's measure in future research, for example, in the robustness checks. Second, the findings in implicit taxes provide tax authorities some implications related to the effect of TCJA on firm's tax behavior related to conforming tax avoidance. Third, I explain the undersheltering puzzle from a new perspective, and my findings shed light on the more "secret" tax behavior of firms.

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Appendix 2.1 Using Residuals in the Second Regression

The two-step regression procedures used in BKRW may not be robust. In BKRW's research, conforming tax avoidance is decomposed from *TTA* as the residual from the first-step regression. The residuals are then used as the dependent variable in a second regression. According to Chen et al. (2018), this kind of procedure generates biased coefficients and standard errors. Both Type I and Type II errors can be caused. They also recommend two solutions to avoid bias. The most straightforward method is to include all the variables in one single regression instead of using two-step regressions. If this method is used, then regression by industry and fiscal year combinations is not suitable to obtain residuals. Instead, I include industry-year indicator variables and their interactions with each of the first-step regressors (the regression to generate *CONFORM_BKRW*) in the baseline equation. This would be consistent with an important assumption of BKRW that:

"My estimation method assumes that the average firm in the same three-digit NAICS industry and fiscal year is the appropriate benchmark for measuring an individual firm's relative amount of conforming tax avoidance" (BKRW, p.6).

In order to decompose the *CONFORM_BKRW* to discuss its sole impact in a different context, an alternative way based on the Frisch-Waugh-Lovell Theorem can be used. Particularly, Frisch-Waugh-Lovell Theorem demonstrates that in the first step, the residual ε_i is obtained from the following model:

$$y_i = \beta 0 + \beta_1 x_{1i} + \varepsilon_i. \quad \text{(a)}$$

In the second step, εi would be regressed on the residuals from equation of the regression of x_2 on x_1:

$$\varepsilon_i = \beta_0 + \beta_2 r_{2i} + \nu_i, \quad \text{(b)}$$

where r_2 is the set of residuals from a simple regression of x_2 on x_1:

$$x_{2i} = \alpha_0 + \alpha_1 x_{1i} + r_{2i}. \quad \text{(c)}$$

In a single regression, I combine equation (a) with equation (c) to one single regression and include industry-year indicator variables and their interactions with each of the first-step regressors (the regression to generate *CONFORM_BKRW*). The model is:

$$\begin{aligned} TAXESPAID\_TO\_ASSETS = {} & \beta_0 + \beta_1 BTD + \beta_2 NEGBTD + \beta_3 NEG + \beta_4 NOL + \beta_5 \Delta NOL + \\ & \beta_6 ST\_ISSUE + \beta_7 SALES\_GR + \beta_8 DACC + \beta_9 ACQUISITION\_ + \beta_{10} EBIT + \\ & \beta_{11} MA\_SCORE + \beta_{12} INT\_EXP + \beta_{13} LOG\_ASSETS + Year\ Fixed\ Effect * \\ & (\beta_{14} BTD + \beta_{15} NEGBTD + \beta_{16} NEG + \beta_{17} NOL + \beta_{18} \Delta NOL) + \\ & Industry\ Fixed\ Effect * (\beta_{19} BTD + \beta_{20} NEGBTD + \beta_{21} NEG + \beta_{22} NOL + \\ & \beta_{23} \Delta NOL) + Year\ and\ Industry\ Fixed\ Effect + \varepsilon \end{aligned} \quad \text{(d)}$$

TABLE 2.13 *Regressions of CONFORM_BKRW on Proxies for Capital Market Pressure_Single Regression vs. Two-Step Regression*

	A Single Regression	Two-Step Regression
Independent Variables	Dependent Variable = *TTA*	Dependent Variable= *CONFORM_BKRW*
BTD	0.003	
	(0.18)	
NEGBTD	0.001	
	(0.10)	
NEG	-0.005	
	(1.47)	
NOL	0.027***	
	(8.33)	
ΔNOL	-0.005	
	(-0.85)	
ST_ISSUE	0.006***	0.004***
	(9.45)	(5.20)
SALES_GR	0.006***	0.007***
	(5.21)	(4.00)
DACC	*0.001*	*0.014****
	(1.28)	*(3.76)*
ACQUISITION_D	0.005***	-0.000
	(6.85)	(-0.04)
EBIT	0.013***	0.003***
	(9.22)	(4.79)
MA_SCORE	0.066***	0.034***
	(17.78)	(8.66)
INT_EXP	-0.027***	-0.014***
	(-4.58)	(-2.99)
LOG_ASSETS	0.001***	0.001***
	(2,91)	(3.15)
Year FE	YES	YES
Industry FE	YES	YES
Observations	28,903	27,222
Adjusted-R^2	0.237	0.041

Notes: *, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. I use the same sample period and sample selection process of BKRW. The sample is based on all public firm-year, excluding observations for financial institutions or firms in regulated industries (SIC codes 4800–4900 and 6000–6999) in Compustat from fiscal years 1993 to 2015. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 2.2.

Based on Frisch-Waugh-Lovell Theorem, the three steps regressions are as follows.

In the first step, residuals of *TTA* are obtained from the same model in BKRW:

$$TTA = \beta_0 + \beta_1 BTD + \beta_2 NEGBTD + \beta_3 NEG + \beta_4 NOL + \beta_5 \Delta NOL + \varepsilon. \quad \text{(e)}$$

In the second step, the residuals of other variables including *ST_ISSUE*, *SALES_GR*, *ACQUISITION_D EBIT*, *MA_SCORE*, *INT_EXP*, *LOG_ASSETS* are obtained from the regression of these variables on the first-step regressors by three-digit NAICS industry and fiscal year:

$$Other\ Variables = \beta_0 + \beta_1 BTD + \beta_2 NEGBTD + \beta_3 NEG + \beta_4 NOL + \beta_5 \Delta NOL + \varepsilon. \quad \text{(f)}$$

In the third step, the residuals of *TTA* are regressed on residuals of other variables.

TABLE 2.14 *Regressions of CONFORM_BKRW on Proxies for Capital Market Pressure_ Frisch-Waugh-Lovell Theorem*

Independent Variables	Dependent Variable: *CONFORN_TAX*
rST_ISSUE	0.005***
	(4.42)
rSALES_GR	0.006***
	(2.85)
rDACC	0.000
	(1.28)
rACQUISITION_D	0.000
	(0.18)
rEBIT	0.005***
	(5.42)
rMA_SCORE	0.064***
	(11.41)
rINT_EXP	-0.009*
	(-1.73)
rLOG_ASSETS	0.001***
	(4.83)
Constant	-0.002***
	(-3.59)
Year FE	YES
Industry FE	YES
Observations	11,352
Adjusted-R^2	0.064

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. *rST_ISSUE, rSALES_GR, rDACC, rACQUISITION_D, rEBIT, rMA_SCORE, rINT_EXP, rLOG_ASSETS* are the residuals of other variables including *ST_ISSUE, SALES_GR, ACQUISITION_D EBIT, MA_SCORE, INT_EXP, LOG_ASSETS* are obtained from the regression of these variables on the first-step regressors by three-digit NAICS industry and fiscal year. The regression includes year and industry fixed effects. Industry Fixed Effects are fixed effects based on Fama–French 12 industry classifications. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All other variables are defined in Appendix 2.2.

TABLE 2.13 and TABLE 2.14 present the result of two methods. In both methods, the coefficients on *SALES_GR* and *ST_ISSUE* are significant and positive when the dependent variable is *TTA* or *CONFORM_BKRW*. However, the *DACC* is no longer significant in the single regression. Similar to the result found in TABLE 2.5, this result indicates that *CONFORM_BKRW* may not be related to discretionary choices by managers to reduce tax payments through real earning management to reduce book income. Both two methods suggest that the two-step procedures by BKRW are not robust. However, I acknowledge that similar to Chen et al. (2018), this finding is just "to illustrate the perils of estimating an OLS regression model using a two-step procedure as opposed to a single regression" (Chen et al. 2018, p.776).

Appendix 2.2 Variable Definitions

Variable		Definition
ACQUISITION_D	=	1 for firm i if the amount of acquisitions (ACQ) in year t is greater than 5 percent of a firm's total assets, and 0 otherwise.
AF	=	natural logarithm of the number of analysts forecasting EPS (IBES)
ASSET	=	natural logarithm of the total assets (AT) for firm i at the end of year t.
BTD	=	firm i's book-tax differences, which equal book income less taxable income scaled by lagged total assets. Book income is pretax income (PI) in year t. Taxable income is calculated by summing current federal tax expense (TXFED) and current foreign tax expense (TXFO) and dividing by the statutory tax rate (STR) and then subtracting the change in NOL carryforwards (NOL) in year t.
CAP	=	CAPEXP (CAPX) divided by total assets (AT).
CASH_ETR	=	firm i's cash effective tax rate, which equals cash taxes paid (TXPD) in year t scaled by pretax net income (PI) in year t before special items (SPI). I drop TXPD<0. CASH_ETR is truncated to [0,1], and ratio values greater than one are reset to one.
CONFORM_BKRW	=	firm i's conforming tax avoidance in year t is calculated as the residual (ε) from the following regression, which I estimate by three-digit NAICS and fiscal year combinations: $TAXESPAID\_TO\_ASSETS_{it} = \beta_0 + \beta_1 BTD_{it} + \beta_2 NEG_{it} + \beta_3 BTD_{it} \times NEG_{it} + \beta_4 NOL_{it} + \beta_5 \Delta NOL_{it} + \varepsilon_{it}$.
CONFORM_TAX	=	firm i's conforming tax avoidance in year t is calculated as the residual (ε) from the following regression, which I estimate by three-digit NAICS and fiscal year combinations: $TAXESPAID\_TO\_ASSETS_{it} = \beta_0 + \beta_1 CASH\_ETR_{it} + \beta_2 NOL_{it} + \beta_3 \Delta NOL_{it} + \varepsilon_{it}$.
DACC	=	firm i's discretionary accruals in year t is calculated as the residual (ε) from the following regression, which I estimate by three-digit NAICS and fiscal year combinations: $\frac{TACC_{it}}{TA_{i,t-1}} = \beta_0 + \beta_1 \left[\frac{1}{TA_{i,t-1}}\right] + \beta_2 \left[\frac{(\Delta REV_{i,t} - \Delta TR_{i,t-1})}{TA_{i,t-1}}\right] + \beta_3 \left[\frac{PPE_{i,t}}{TA_{i,t-1}}\right] + \varepsilon_{it}$. where: TACC is total accruals for firm j in year t, which is defined as income before extraordinary items (IBC) minus net cash flow from operating activities, adjusted to extraordinary items and discontinued operations (OANCF-XIDOC). TA is the beginning-of-the-year total assets (lagged AT). DREV is the change in sales in year t (SALE); PPE is gross property, plant, and equipment in year t (PPEGT); and DTR is the change in trade receivables in year t (RECTR).
DEFERREDTAXES	=	Deferred tax expense (TXDI) divided by total assets (AT).
EBIT	=	firm i's earnings before interest and taxes (EBIT) scaled by net operating assets, where net operating assets equal stockholders' equity (SEQ) minus cash and short-term investments (CHE) plus interest (XINT) plus debt in current liabilities (DLC) plus long-term debt (DLTT).
FOR	=	Foreign sales (PIFO) divided by total sales (SALE)
GIndex	=	Governance index developed by Gompers et al. (2003)
INT_EXP	=	firm i's interest expense (XINT) divided by total assets at the beginning of year t.
INV	=	Inventory (INV) divided by total assets (AT)
LEV	=	Long-term debt (DLTT) divided by total assets (AT)
LOG_ASSETS	=	natural logarithm of the total assets (AT) for firm i at the end of year t.

(*continued on next page*)

APPENDIX 2.2 (continued)

Variable		Definition
MA_SCORE	=	managerial ability score (MA_SCORE_2018). I use the updated 2018 dataset provided on Peter Demerjian's website at: http://faculty.washington.edu/pdemerj/data.html
MARKETVALUE	=	natural logarithm of the market value (MKVALT) for firm i at the end of year t.
MS	=	firm i's sales to total sales (SALES) in the firm's SIC code industry
NEG	=	1 if firm i's book-tax differences (BTD) are less than zero, and 0 otherwise.
NOL	=	1 if firm i has net operating loss carryforwards (TLCF) available at the beginning of year t, and 0 otherwise.
PTI	=	pretax income (PI) divided by lagged total assets (AT).
PTROE	=	pre-tax return, measured as pre-tax income (PI) before special items (SPI) / beginning of year owners' common equity (CEQ).
PTTSE	=	TSE divided by beginning of year owners' equity (OE). This expression is then divided by (1-t), where TSE is the difference between a firm's current explicit tax liability (PI-SPI-XIDO)*35% and the tax due (TXC) divided by beginning of year owners' common equity (CEQ)
RD	=	R&D expense (XRD) divided by the current year to sales for the current year (SALE)
SALES	=	natural logarithm of the sales (SALES) for firm i at the end of year t.
SALES_GR	=	firm i's sales growth, where sales growth is sales (SALE) at the end of year t less sales at the beginning of year t divided by sales at the beginning of year t.
SIZE	=	natural logarithm of the total assets (AT) for firm i at the end of year t.
ST_ISSUE	=	1 if shares outstanding in year t is greater than 110 percent of shares outstanding in year t 1.
STKMIXGRANT	=	For firm i in year t, the Black-Scholes value of stock options granted to each executive j (Execucomp variable OPTION_AWARDS_BLK_VALUE) is summed across all the firm's managers. Salary and bonus for that firm's executives in that year (Execucomp variables SALARY and BONUS) are summed in an analogous way. STKMIXGRANT is the ratio of the sum of the values of stock options to total compensation (defined as the sum of the value of stock options, salary, and bonus) (Desai and Dharmapala 2006, p.162)
STKMIXREST	=	restricted stock grants (Execucomp variable RSTKGRNT) as a fraction of total compensation defined in STKMIXGRANT
TI	=	sum of current federal tax expense (TXFED) and foreign tax expense (TXFO) divided by statutory tax rate and then scaled by lagged total assets (AT).
TS	=	firm i's tax sheltering activity in year t is calculated as the residual (ε) from the following regression: $BT_{it} = \beta_1 TA_{it} + \varepsilon_{it}$. where BT_{it} is book-tax gap for firm i in year t, scaled by the lagged value of assets; TA_{it} is total accruals for firm i in year t, scaled by the lagged value of assets
TTA	=	firm i's cash taxes paid (CTP) divided by total assets at the beginning of year t. I require all firms to have non-negative cash taxes paid.
WELLGOV	=	1 for well-governed firms (GIndex in 1998≤7) and 0 for less well governed firms (GIndex in 1998>7)
ΔNOL	=	change in firm i's net operating loss carryforwards (TLCF) available at the beginning of year t, scaled by total assets at the beginning of year t.

All continuous variables are winsorized at the 1st and 99th percentiles.

Chapter 3 Management's Tone Change in MD&A and Tax Avoidance

Abstract

In this paper, I examine the effect of management's tone change on tax avoidance. I measure the management's tone change based on the one-year difference of the frequency of negative words in the Management Discussion and Analysis (MD&A) section in 10-Ks. I find that the level of tax avoidance is significantly and negatively associated with management's tone change. This result is different from the findings in prior literature that the higher level of negative tone reveals and predicts a higher level of tax avoidance when focusing on the variation in the cross-section. My findings hold after a battery of robust checks. This paper also finds that the pattern between management's tone change and tax avoidance is impacted by executive compensation and corporate governance.

Keywords: Management's tone change; tax avoidance; negative words; disclosure

1. Introduction

The principal aim of this paper is to investigate the association between the information in management's tone in MD&A sections in 10-Ks and tax avoidance. It is aimed to find more multidimensional linguistic cues related to tax avoidance to help researchers, investors, and tax authorities to detect tax avoidance more efficiently. Current research related to tax avoidance centers mainly upon the quantified and one-dimensional firm characteristics, e.g., executive compensation (Desai and Dharmapala 2006) and financial constraints (Edwards et al. 2016; Dyreng and Markle 2016). With previous research in tax avoidance mainly focusing upon more readily quantifiable information of tax avoidance, there has been a relative dearth of studies examining more qualitative information on tax behavior. Until the novel work of Law and Mills (2015), there are no well-established papers examining linguistic cues as potential factors for predicting tax avoidance. Law and Mills' (2015) study is indicative of building an assumption that textual information in 10-Ks could be informative to predict tax avoidance[30]. This is an area that is underexploited in the recent empirical tax research literature.

To the extent that tax aggressiveness acts as a complement to or substitute for other means of improving corporate after-tax profitability and stock performance, it is to be expected that

[30] I replicate Law and Mills's (2015) baseline regressions and find that their results do not hold after controlling firm fixed effect instead of industry fixed effect in their model, even though their results survive in their instrumental variable regressions which may suffer a "local average treatment effect" issue as suggested by (Jiang 2017). This intrigues me about whether I can find more robust results from other perspectives, in other sections of 10-Ks, or by using other dictionaries.

a firm's managers will employ tax avoidance measures in pursuit of these performance goals. Specifically, to the extent that the benefits of tax avoidance are 'in phase' with other drivers of corporate performance, and hence form complements to those drivers, I expect to see a positive relationship between tax avoidance and those drivers. Where, conversely, tax avoidance activities are substitutes for other performance drivers employed, for example, at times when those other drivers have been rendered less effective, I should witness a negative relation between tax avoidance and those drivers. The latter situation would be expected to obtain where tax avoidance is costly, and the level of cost is inversely related to the efficacy of other drivers of firm performance. However, a positive relation between tax avoidance and those drivers may persist when firms are reluctant to take more risks caused by tax avoidance (Blouin 2014; Guenther et al. 2017). The overall pattern is still in mist. One concern when examining this pattern is that the traditional quantitative measures of those drivers are just one-dimensional. Thus, we can only capture one aspect of this pattern. The textual analysis allows us to use more general and conclusive measures to investigate this pattern. One such measure is management's tone change, based on the privileged information concerning future states of the firm possessed by the firm's management team. This multidimensional driver can capture more unobserved factors and provide an overall picture of a firm's current and future status (favorable or unfavorable) (Li 2008; Li 2010; Huang et al. 2013) than the traditional quantitative measures. Accordingly, understanding the relation between management's tone and tax avoidance activity would provide researchers with insight into the circumstances under which firms are willing to employ aggressive tax avoidance in their pursuit of after-tax profits. Meanwhile, as management's tone is very informative to capture different business activities and firm fundamentals (Larker and Zakolyukina 2012; Campell et al. 2010), ignoring the explanatory power of management's tone on tax avoidance would lead to a large loss of linguistic cues in 10-Ks. Finding more linguistic cues in 10-Ks can help investors, shareholders, researchers, and regulators detect tax avoidance more efficiently and understand it more comprehensively, in addition to using some simple financial measures such as effective tax rates (*ETR*) or other one-dimensional quantitative determinants.

Specifically, this research focuses on the relationship between management's tone change and tax avoidance under the sample of U.S. listed firms in Compustat over 1993 to 2017 inclusive. I do not treat management's tone as management's characteristics. My paper is not aimed to find the personal effect on tax avoidance[31]. Management's tone is temporally- and

[31] Bertrand and Schoar's (2003) study as the foundational paper of management style literature examines managers' impact on firm's decisions. Dyreng et al. (2010) find that firm's executives have significant effects upon corporate tax avoidance. Olsen and Stekelberg (2016) find an impact of CEO 'narcissism' on tax sheltering with a small sample size. Koester et al. (2017) find that executives with superior ability engage in higher levels of tax avoidance. The literature discussed above is predicated on the assumption that management's characteristics, the long-lived individual attributes, drive tax avoidance behavior. However, it is less likely that managers would consistently

firm performance-dependent and varies across accounting periods. The negative words in Fin-Neg (Loughran and McDonald 2011) presented by management in management discussion and analysis (MD&A) (Cole and Jones 2004; Li 2010), rather than the entire 10-K, are hypothesized to form indicators of tax avoidance behavior. I use differences rather than levels to measure the management's tone change following Feldman et al. (2010). By using differences, I intend to investigate the changes within a single firm rather than compare cross-sections' variations like Law and Mills (2015). Using differences rather than levels of negative words would also reduce the noise of different management's tone styles led by management characteristics and innate firm characteristics. Specifically, I define the management's tone change as the change in proportion occurrence of negative words in MD&A relative to the corresponding occurrence in the prior year. The larger this proportion, the more pessimistic is the tone change.

To measure tax avoidance, I use different types of measures, including Cash *ETR*, GAAP *ETR*, book-tax difference (*BTD*), and the scaled difference between adjusted cash tax payment and expected tax payment based on pre-tax income (Δ/BVA) (Henry and Sansing 2018). All the results indicate that when firms have more management's tone, they are less willing to engage in more tax avoidance and vice versa. This suggests a complementary relation between tax avoidance and other drivers of firm performance. This result is different from Law and Mills's (2015) finding that the higher level of frequency of negative words indicates lower tax avoidance. Law and Mills (2015) interpret their pattern as the relation between financial constraints and tax avoidance in cross-sections. My study is different from their study as I focus on the relative change of management's tone in MD&A, and I assume the change reflects the change of firm performance. But it is still surprising that the level and difference of management's tone provide a completely different story. I consider one possible explanation here. Law and Mills (2015) use the level of tone may omit some possibility related to the determinants of tone such as geographic segments. Li (2010) finds that firms with more geographic segments have a more negative tone. In practice, these firms with more foreign segments would naturally have lower taxes. Thus, it may seem that firms with higher negative tone (even though this tone does not reflect any time-varying changes of firm performance or firm characteristics) have lower taxes. Thus, I use the differences rather than the level, largely mitigating this concern. My result provides statistically significant improvement in model fit beyond the traditional quantitative disclosure. I also consider alternative explanations, including disclosure quality, operating risks, the effect of the Sarbanes-Oxley Act, and other

impact firm's tax avoidance if the firm fundamentals change. Thus, these findings are not useful for tax authorities to detect tax avoidance activities.

linguistic cues. My results still hold[32]. In additional analyses, I investigate whether more stock-based compensation would motivate managers to engage in more tax avoidance activities when they have a similar change of management's tone. I find that this motivation effect only exists in poorly-governed firms.

This paper contributes to the current literature in two main ways. This study targets the power of management's tone, a time-varying factor based on negative words used in MD&A, to explain tax avoidance behavior. This is one of the limited papers investigating the relationship between textual information and tax avoidance. It uncovers a larger set of linguistic cues in MD&A to detect tax avoidance, in addition to Law and Mills' (2015) findings on the entire 10-Ks and levels of tone in corporate disclosure. Researchers, investors, and tax authorities can apply the findings to capture tax avoidance in addition to the existing quantitative tax avoidance measures. This study also contributes to the study on the relation between firm performance and tax avoidance. Prior literature usually uses the one-dimensional measure to investigate one aspect of firm performance. My results are more introductive to provide an overall picture about whether the level of tax avoidance could be attributable to the favorable or unfavorable change of firm performance.

2. Literature Review and Hypothesis Development

2.1 THE INFORMATIVENESS OF MANAGEMENT'S TONE

A growing number of studies in accounting focus on using textual analysis of qualitative information. Several studies examine whether the tone can convey information to reveal firm behaviors. When predicting accounting manipulations, Larker and Zakolyukina (2012) find that qualitative information is more potent than a traditional quantitative measure, discretionary accruals. Bodnaruk et al. (2013) use negative words to gauge financial constraints. Most of the papers focus on the value-relevant information of management's tone. Feldman et al. (2010) use the change of management's tone in MD&A to predict post earnings announcement drift and accruals. Davis and Tama-Sweet (2012) find that the pessimistic tone in MD&A is negatively associated with future earnings. Huang et al. (2013) use the regression residuals from the positive tone after controlling firm fundamentals to predict future earnings. Some papers also focus on the individual level of management's tone termed managerial sentiment. Salhin et al. (2016) investigate the association between managerial sentiment and sector returns. Hribar et al. (2017) examine the relation between managerial sentiment and errors in accrual estimates. Chen et al. (2021) find the effect of managerial sentiment on

[32] The endogeneity concern of the reversal causality relationship between management's tone and tax avoidance is limited because the prior literature finds no evidence that tax avoidance would impact tone in MD&A (Balakrishnan 2019; Campbell et al. 2020).

corporate disclosure. In the tax context, Law and Mills (2015) is one of the limited papers focusing on using negative words to measure financial constraints and then using financial constraints to reveal tax avoidance. These studies indicate the ample informativeness of management's tone on different firm behaviors. Compared to traditional accounting numbers, management's tone is likely to include more unverifiable or forward-looking information beyond quantitative measures.

2.2 THE DETERMINANTS OF CHANGES OF MANAGEMENT'S TONE

Management's tone is informative in different research contexts because different firm characteristics impact it[33]. Management's tone acts as a vehicle of multi-dimensional firm fundamentals such as current or future performance, risks, growth, and complexity (Huang et al. 2013). Li (2008) finds that firms with low profits tend to have less readable 10-Ks. Li (2010) provides a very detailed discussion about the determinants of tone in MD&A. He finds that firm performance is positively related to a positive tone while earnings and returns volatilities are negatively associated with a positive tone. He also finds that firms with more geographic segments and non-missing financial items in Compustat have a more negative tone. Campbell et al. (2020) find that the changes of a firm's tone in MD&A and other press releases are impacted by the firm's innate operating risks and disclosure transparency. They also find that tax avoidance would not affect the tone of MD&A disclosure, consistent with the findings (Balakrishnan 2019)[34].

2.3 MANAGEMENT'S TONE AND TAX AVOIDANCE

As the management's tone contains multi-dimensional information of corporate performance and risks, it should have some implications on tax avoidance. There could be two types of relationships between management's tone and tax avoidance. One is a complementary relationship. As executive compensation packages typically include components relating to profitability or stock price performance (Slemrod 2004; Crocker and Slemrod 2005; Desai and Dharmapala 2006; Armstrong et al. 2012) and firm value is positively related to tax avoidance (Scholes et al. 2009; Wilson 2009; Blaylock 2016; Tang 2019), when management's tone change decreases, managers would use more tax avoidance considering that its benefits are in line with the benefits of other corporate performance. And meanwhile, the firms have adequate ability to take more risks as the current risk level is low. The alternative relationship is that other firm performance shown in management's tone and tax avoidance would substitute each other. If the tone indicates unfavorable corporate performance changes impacted by some

[33] Most of the prior literature focuses on the impact of firm characteristics rather than management's characteristics. I consider the impact of management's characteristics in Appendix 3.3.

[34] This, to some extent, rules out the possibility of reverse causality between tone in MD&A and tax avoidance.

hard-to-quantify firm factors, managers could be more likely to take risks and costs to use tax avoidance as a substitute to improve firm's profitability or enhance firm value; However, this is less likely to be this case when the firm performance is poor, and the consequent operating risks are high as shown in management's tone. The cost of tax avoidance would outweigh its benefits under the condition that firms are simultaneously facing other risks if firms engage in more aggressive tax avoidance. They would have more firm risks about the uncertainty of future tax payments and overall cash flows (Blouin 2014; Guenther et al. 2017) in addition to the current risk level. Thus, I do not expect to see this substitutional relationship between management's tone and tax avoidance when the management's tone changes to be more negative. Instead, I expect that managers would be more reluctant to engage in tax avoidance when management's tone change increases. Overall, I state this prediction formally as my hypothesis:

H1: The level of tax avoidance is negatively related to management's tone change.

2.4 THE EFFECT OF MANAGEMENT'S COMPENSATION

Desai and Dharmapala (2006) and Armstrong et al. (2012) find that managers paid with high-powered compensations in poorly-governed firms are less likely to engage in tax avoidance as investors would treat tax avoidance as a complement to rent diversion. This is assumed without considering the firm's performance and risks. In this paper, I can measure these two factors based on the change of management's tone. I further assume that the effect of management's tone changes on the reluctance to engage in tax avoidance will be weakened by a higher level of management's incentives, such as stock-based compensation. These managers are more sensitive to profitability change for their own interest. Moreover, suppose the firm's performance is poor and has high unverifiable high risks, in that case, I assume that managers in poorly-governed firms with more high-powered compensations would engage in more tax avoidance than the other managers because the poor governance together with the other risks, e.g., during the financial crisis, are very good camouflage for them to divert rent or achieve the profit target by using tax avoidance. In the other periods with good firm performance, these managers would engage in less tax avoidance. Thus, my formal hypothesis is that:

H2: There is a moderating effect of executive compensation on the relation between management's tone and tax avoidance in poorly-governed firms.

3. Measuring Management's Tone

3.1 SOURCES TO MEASURE MANAGEMENT'S TONE

In furtherance of this research question, a key issue is quantifying management's tone. Prior literature, as discussed above, use different resources as the target repository of management's tone, such as earnings press releases, conference calls, the entire 10-Ks, and MD&A. Jiang et al. (2019) use the whole 10-Ks and conference calls to measure management's tone (they term it as managerial sentiment). Loughran and McDonald (2011) use both 10-Ks and MD&A to measure the tone and find that there is no significant difference between the informativeness of 10-Ks and MD&A. Cole and Jones (2004) and Li (2010) use the tone in MD&A to investigate its relation with future earnings. Huang et al. (2013) use the earnings press releases to predict future earnings and cash flows. Even though many resources can be used to measure management's tone, one important concern is that managers would have incentives to manage the tones. For example, Huang et al. (2013) find that managers strategically manipulate the positive tone of earnings press releases to mislead investors. Davis and Tama-Sweet (2012) find that MD&A reports greater pessimism than earnings press releases. Li (2010) suggests that 10-Ks are not likely to be optimistic considering the litigious factors. Thus, from this perspective, using MD&A or 10-Ks would result in much fewer concerns of upward (at least) tone management. Compared to 10-Ks, MD&A would be more suitable in my research as it includes more subjective and forward-looking information. MD&A is the least formatted part of the 10-K and contains more voluntary and forward-looking disclosures (Campbell et al. 2020). Yuthas et al. (2002) find that MD&A as the management narrative disclosure is a strategic communication action and contains useful forward-looking information. Similar to earnings press releases, MD&A is an outlet for managers to communicate firm performance (Davis and Tama-Sweet 2012). Effectively, by conflating MD&A and other 10-K disclosures, the power to discern management's tone could be reduced. Accordingly, in this paper, I use tone in MD&A as a proxy for management's tone[35] [36].

[35] I also identify 50 tax sheltering firms in LexisNexis and read their annual reports around their tax sheltering years. I find more information in MD&A. For example, in the MD&A of Amazon (2005), it has detailed discussion related to its sophisticated tax planning and the corresponding risks. In the additional analysis I also test my findings in the corpus of entire 10-Ks.

[36] My study in this way is different from the prior literatures which focus on the impact of tax avoidance on firm disclosure such as MD&A (Balakrishnan et al. 2019), tax footnotes (Inger et al. 2018), earnings releases (Schwab 2009), financial statement (Nguyen 2020). I study from another perspective to find the impact of management's tone change on corporate policies such as tax avoidance activities.

3.2 DIFFERENCE OR LEVEL?

MD&A is likely to reflect some features of firms, e.g., accounting conservatism (D'Augusta and Deangelis 2020) and geographic segments (Li 2010). The level of year-to-year MD&A would be significantly different in different firms. Thus, when we focus on the cross-sectional variations, levels are more suitable. However, as suggested by (Feldman et al. 2010), the MD&A sections are expected to vary little from period to period. Suppose we use the levels to predict tax avoidance for individual firms. In that case, we may have limited information if the tone in MD&A persists around a certain level due to some reasons such as particular choice of words in an industry or a company name. Compared to the level, the difference would contain more useful information related to changes such as lower sales or new operating risks between two periods. Overall, I predict that the difference rather than the level of tone would be more indicative of tax avoidance. In the robustness checks below, I also use the level of management's tone but find no relation with tax avoidance.

3.3 FIN-NEG OR H4N?

Using a proper dictionary is another important issue when measuring management's tone by using textual information. Two standard dictionaries are Fin-Neg (Loughran and McDonald 2011) and Harvard Dictionary, H4N. Loughran and McDonald (2011) systematically examine the informativeness of these two dictionaries in some applications. They find that negative words in H4N in 10-Ks and MD&A do not have a relation with excess returns while Fin-Neg words have. Fin-Neg compared to H4N can capture much more information in the business environment. One interesting concern in tax context is that the top 30 most frequent words in H4N, including *tax, costs, cost expense, expenses, liabilities, taxes, foreign, liability,* and *depreciation,* are not classified as negative words in Fin-Neg. These words are specifically related to tax. Accordingly, whilst words such as *tax* and *cost* follow prescriptive disclosure requirements in most areas of the 10-K, in the freer MD&A context, such words are more likely to correspond with the communication of management's tone, rather than simply following mandated disclosure requirement. H4N, even though it cannot be applied in most of the accounting and finance context, could be naturally suitable in tax avoidance context[37]. Thus, in the robustness checks, I also use the negative words in H4N. However, I do not find any evidence that the level or the change of H4N can capture tax avoidance. This may indicate

[37] A real case example is that in Amazon's 10-K in 2005"A successful assertion by one or more states or *foreign* countries that I should collect sales or other *taxes* on the sale of merchandise or *services* could result in substantial tax *liabilities* for past sales, *decrease* my ability to compete with traditional retailers, and otherwise harm my business" (AMAZON.COM, INC. 2005). All these bold words are not in Fin-Neg, but covered by Harvard Dictionary.

that H4N captures more tax-related information than Fin-Neg while losing much more business-related information, which would impact tax avoidance.

3.4 POSITIVE OR NEGATIVE WORDS?

Prior literature uses positive words, negative words, or the difference between positive and negative words following the logic similar to the difference between revenues and costs. Tetlock (2007), Tetlock et al. (2008), Loughran and McDonald (2016), and Kothari et al. (2009) find that negative words are unambiguous and contain more information. Management seldomly negates a negative word to express the meaning. However, positive words are frequently negated to present a negative statement. The technology to account for negation around positive is inefficient, considering the complex negation rather than just *not* or *no* (Loughran and McDonald 2016)[38]. Thus, unlike the prior related research (Li 2010; Davis and Tama-Sweet 2012; Campbell et al. 2020) that uses the difference between positive and negative words, I form the measure by using negative words.

Overall, I use a one-year difference of negative words in MD&A as my main dependent variable (termed as *Delta_MT*) in this paper. Specifically, I normalize the counts of negative words by total words in MD&A and then subtract the use of negative words in the prior one year (Feldman et al. 2010), then multiply it by 100.

4. Data and Methodology

4.1 SAMPLE SELECTION

My sample covers a long period from 1993 to 2017. This is a period after the first year of EDGAR and before Tax Cuts and Job Act (TCJA) in 2017. The TCJA reduces the tax rates largely. This would add noise to the measure of tax avoidance and the textual information related to tax. I parse the 10-K files from EDGAR by Python programs and extract the MD&A sections of these files. I require the length of MD&A to be more than 250 (Loughran and McDonald 2011). The detailed parsing and processing process are shown in Appendix 3.1. Each observation represents the count of negative words and the total number of words. I then merge each observation with its financial information from Compustat using the Central Index Key (CIK). To calculate the tone difference in MD&A, I drop inconsecutive-year MD&A disclosures.

[38] In robustness tests, I also test the explanatory power of the fraction of positive words and the difference between positive words and negative words in both MD&A and 10-K. I find no significant pattern under these ratios.

4.2 METHODOLOGY

To test the hypothesis H1, I estimate the ordinary least squares baseline regression based on the following empirical model:

$$CASH\_ETR_{it}=\beta_0+\beta_1 Delta\_MT_{it}+\beta_2 Controls_{it}+\beta_3 Firm\ and\ Year\ Fixed\_Effects+\varepsilon_{it} \quad (1)$$

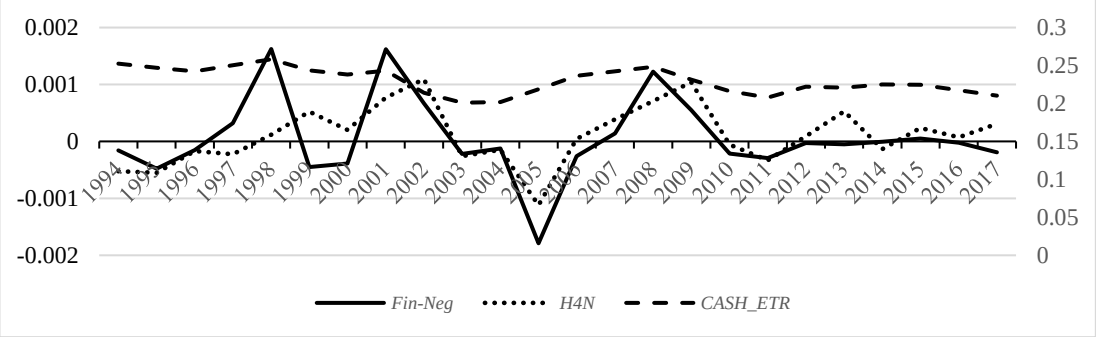
I regress the firm's Cash *ETR* (*CASH_ETR*) in year t on a one-year difference of management's tone (*Delta_MT*), firm-level characteristics, and a set of fixed effects. The dependent variable, *CASH_ETR*, is defined as income tax paid divided by pre-tax income minus special items (Dyreng et al. 2010)[39]. The measure is truncated at [0,1] to reduce the influence of outliers.

I include various control variables to control the firm characteristics that would impact the denominators and numerators of *CASH_ETR*. The more precise the control variables, the less scope would be left to be captured by the management's tone change. If the management's tone change can be impacted by the vector of controls of firm characteristics, then the variation left to management's tone change to directly impact tax avoidance behavior would be driven to zero. According to Dyreng et al. (2010), the control variables in my regressions include leverage ratio (*LEV*), earnings before interest and taxes (*EBIT*), foreign sales (*FOREIGNSALES*), firm size (*SIZE*), advertising expense (*ADV*), capital expenditure (*CAPEXP*), net operating loss carryforward (*NOL*), sales growth (*ΔSALES*), selling, general and administrative expense (*SGA*), research and development expense (*RD*), intangible assets (INTANG) and gross property, plant, and equipment (*GROSSPPE*). To eliminate the concerns of multicollinearity, I remove variables with a VIF score equal to or greater than 5. I include year and firm fixed effects to further control unobserved heterogeneity across years and firms. Overall, I am trying to leave fewer variations to be captured by management's tone change.

To test hypothesis H2, I measure the executive incentives following Desai and Dharmapala (2006). Similarly, I aggregate each type of managerial compensation (including salary, bonus, option granted, and restricted stock granted) of each manager in each firm in each year from Execucomp Database. I calculate two ratios, *STKMIXGRANT* and *STKMIXREST*, as defined in Appendix 3.4 to measure firm-level stock-based compensations. I interact *STKMIXGRANT* and *STKMIXREST* with *Delta_MT*. The primary variables of interest are the two interaction terms. I measure corporate governance based on the institutional ownerships (*INST*) from the Thomas-Reuters 13F database. I include all these additional variables in equation (1).

[39] I use *CASH_ETR* in the baseline regression based on another real-world concern that firms engaging in tax planning aim to optimize taxes on a cash basis. For example, Amazon's 10-K in 2005 reports that "we are not endeavoring to optimize our global taxes on a financial reporting basis, instead we endeavor to optimize our global taxes on a cash basis".

FIGURE 3.1 *Changes of Delta_MT from 1993 to 2017 Compared to H4N and CASH_ETR*



This figure reports the average change of one-year difference of negative words in MD&A under Fin-Neg and H4N, and *CASH_ETR* over the sample period from 1993 to 2017.

5. Results

5.1 SUMMARY STATISTICS

TABLE 3.1 reports the summary statistics of variables. The results of control variables are consistent with the prior literature (Dyreng et al. 2010; Loughran and McDonald 2011). Generally, the change of tone within firms is not significant. The mean is around 5.6%. This is consistent with Feldman et al.'s (2010) argument that the year-to-year change of tone is limited[40]. TABLE 3.2 presents Pearson and Spearman correlations for the variables included in the baseline regression. The Pearson and Spearman correlations between *Delta_MT* and *CASH_ETR* are positive and significant at $p<0.01$, indicating that firms would engage in less tax avoidance if the management's tone change increases. FIGURE 3.1 reports the changes of *Delta_MT*. I also re-estimate *Delta_MT* by the use of negative words in H4N. Fin-Neg and H4N generally follow a similar pattern, but we can find an apparent one-year lag of the tone measured by H4N in three years, 1999, 2002, and 2009. These are three years after several large world events, the Asian Financial Crisis in 1997 (with a more severe impact on the U.S. in 1998). the dot.com bubble in 2000, Enron Scandal and 911 in 2001, and the subprime crisis in late 2007 and 2008. This hysteresis feature of H4N might restrict its explanatory power of tax avoidance, as shown in the robustness checks. Fin-Neg reflects these events timely and accurately, indicating the ability of MD&A to capture firm performance, operating risks, and growth information. However, for the good news, such as the economic recovery in 2005, the tones measured under Fin-Neg and H4N react in time. In addition, the changes of *CASH_ETR* at the year level seem to be not correlated with the changes in management's tone. Thus, my measure is not simply capturing the average changes of *CASH_ETR* at the year level.

[40] Thus, it is not suitable to use the levels of tone to investigate the changes within firms as they can only reflect the cross-sectional differences. Most of these variations can be captured by firm fixed effects. This is a reason why Law and Mills's (2015) results are only robust when industry fixed effect is used.

TABLE 3.1 *Descriptive Statistics*

	n	Mean	Std. Dev.	P25	Median	p75
CASH_ETR	31083	.231	.183	.071	.222	.341
Delta_MT	31083	.056	.380	-.112	.001	.135
LEV	31078	.211	.427	.012	.163	.323
SIZE	31078	6.712	2.004	5.4	6.736	8.039
NOL	31083	.637	.481	0	1	1
EBITDA	31078	.235	9.918	.038	.073	.126
RD	31078	.022	.314	0	0	.016
ΔSALES	30978	.296	24.144	.007	.065	.19
ADV	31078	.011	.041	0	0	.003
SGA	31083	.216	3.029	.046	.157	.299
CAPEXP	31078	.049	.061	.012	.032	.064
CASH	31078	.142	.175	.02	.069	.201
FOREIGN	31012	.02	.137	0	0	.013
INTANG	31078	.148	.194	0	.053	.238
GROSSPPE	31078	.487	.794	.119	.352	.766

This table presents the descriptive statistics of the variables used in Equation (1). All sample firms must have MD&A with at least 250 words and non-missing corresponding firm characteristics from Compustat. Firms with SIC codes 4900-4999 and 6000-6999 are excluded. Continuous variables winsorized at the 1st and 99th percentiles. All variables are as defined in Appendix 3.4.

TABLE 3.2 *Correlation Coefficient Matrix*

Panel A: Correlation Variable *CASH_ETR* to *RD*

	CASH_ETR	*Delta_MT*	*LEV*	*SIZE*	*NOL*	*EBIT*	*RD*
CASH_ETR	1	0.069***	-0.108***	0.043***	0.014**	0.108***	0.001
Delta_MT	0.058***	1	0.012**	0.046***	0.001	-0.026***	-0.023***
LEV	-0.078***	-0.009	1	0.375***	-0.028***	-0.247***	-0.263***
SIZE	0.033***	0.058***	0.161***	1	-0.127***	-0.199***	-0.154***
NOL	0.011**	-0.002	0.009	-0.125***	1	0.191***	0.118***
EBIT	-0.010*	-0.003	-0.007	-0.055***	0.016***	1	0.201***
RD	-0.067***	-0.024***	-0.146***	-0.203***	0.066***	0.022***	1
ΔSALES	0.000	0.000	-0.004	-0.014**	0.005	-0.001	0.001
ADV	0.051***	0.003	-0.012**	-0.074***	0.058***	0.012**	-0.000
SGA	0.007	0.008	-0.016***	-0.027***	0.007	0.010*	0.028***
CAPEXP	-0.044***	0.001	0.056***	-0.020***	0.039***	0.007	-0.069***
CASH	-0.031***	-0.032***	-0.246***	-0.302***	0.098***	0.039***	0.419***
FOREIGN	-0.010*	0.011*	-0.018***	0.051***	0.018***	0.051***	0.040***
INTANG	0.098***	-0.005	0.106***	0.122***	0.129***	-0.010*	0.007
GROSSPPE	-0.015***	-0.005	0.079***	-0.010*	-0.004	0.079***	-0.068***

Panel B: Correlation Variable *ΔSALES to GROSSPPE*

	ΔSALES	*ADV*	*SGA*	*CAPEXP*	*CASH*	*FOREIGN*	*INTANG*	*GROSSPPE*
CASH_ETR	-0.005	0.098***	0.112***	0.075***	0.035***	0.083***	0.150***	0.037***
Delta_MT	-0.096***	-0.009	-0.022***	0.016***	-0.035***	-0.020***	-0.006	-0.009
LEV	-0.126***	-0.120***	-0.331***	0.114***	-0.511***	-0.015***	0.113***	0.234***
SIZE	-0.178***	-0.053***	-0.274***	-0.004	-0.272***	0.219***	0.134***	0.028***
NOL	0.025***	0.077***	0.078***	0.053***	0.124***	0.089***	0.126***	0.027***
EBITDA	0.253***	0.118***	0.123***	0.268***	0.307***	0.166***	0.064***	0.173***
RD	0.059***	0.119***	0.472***	0.005	0.418***	0.340***	0.207***	-0.058***
ΔSALES	1	0.041***	0.056***	0.088***	0.112***	-0.022***	0.077***	-0.108***
ADV	-0.001	1	0.391***	-0.005	0.185***	0.055***	0.149***	-0.059***
SGA	-0.000	0.011*	1	-0.077***	0.400***	0.198***	0.273***	-0.202***
CAPEXP	0.004	0.015***	-0.011*	1	-0.108***	0.022***	-0.089***	0.785***
CASH	-0.001	0.090***	0.053***	-0.128***	1	0.199***	0.045***	-0.228***
FOREIGN	-0.001	-0.001	0.007	0.014**	0.064***	1	0.285***	-0.001
INTANG	-0.004	0.017***	0.005	-0.199***	-0.125***	0.030***	1	-0.147***
GROSSPPE	-0.001	-0.011*	0.012**	0.324***	-0.131***	-0.006	-0.152***	1

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents Pearson (upper panel) and Spearman (lower panel) correlation coefficients for variables in baseline regression. All sample firms must have MD&A with at least 250 words and non-missing corresponding firm characteristics from Compustat. Firms with SIC codes 4900-4999 and 6000-6999 are excluded. Continuous variables are winsorized at the 1st and 99th percentiles. All variables are as defined in Appendix 3.4.

5.2 MAIN RESULTS

TABLE 3.3 reports the regression results of testing H1. The coefficient on *Delta_MT* is positively and significantly associated with *CASH_ETR*. To better interpret this result, I calculate the standardized coefficient on *Delta_MT*. The standardized coefficient is 0.034. The magnitude of its economic effect is meaningful. A one standard deviation increase in *Delta_MT* is associated with an increase in *CASH_ETR* by 5.00% *CASH_ETR*'s standard deviation, all else equal. I conducted a Tobit regression to provide a better fit for the observations that report zero *CASH_ETR*. The number of zero *CASH_ETR* accounts for a large proportion of the total sample, which will potentially bias the regression results. The untabulated Tobit regression results report more robust results. I also exclude some extreme years as shown in FIGURE 3.1, including 1998, 2001, 2005, and 2008. The results still hold at the 1% level. Another important concern would be that firms with a management's tone change larger than zero (more negative tone) may act differently to a firm with a management's tone change less than zero (less negative tone), even though both cases are on the same continuum of management's tone change. To investigate this concern, I split the sample into two subgroups. One is firms with a management's tone increase (*Delta_MT*>=0) in Column (2), and the other is firms with a management's tone decrease (*Delta_MT*<0) in Column (3). In both two columns, the coefficients on *Delta_MT* are still significant. The effect of management's tone change also exists in firms with a less negative tone. This indicates that among these firms, if one firm with more decrease of management's tone would be more likely to engage in tax avoidance than another firm, even though their firm performance is turning to be more favorable for both firms. To reduce the noise in measurement, I convert *Delta_MT* to a quintile score (from 1 to 5). The quintile score yields a more significant result. I also use the level, rather than the change of management's tone, as a new measure (*MT*). I find no relation between *MT* and tax avoidance in Column (5) and Column (6).

TABLE 3.4 reports the regression results. As expected, I find the negative coefficient on the interaction term *Delta_MT***STKMIXGRANT* in Column (1) with the total samples. I then divided the samples based on the median value of *INST*. Firms with *INST* larger than the median are defined as well-governed firms in Column (2) and poorly-governed firms in Column (3) otherwise. As hypothesized, the coefficient on the interaction term, *Delta_MT***STKMIXGRANT*, is only significant and negative in Column (3). In Column (4) and Column (5), firms in Column (3) are then split into firms with high compensation and low compensation based on the average compensation in these firms. The result is consistent with the findings in Column (3). Firms with high compensation have a minor relation between management's tone change and tax avoidance in magnitude and significance levels.

TABLE 3.3 *Regressions of CASH_ETR on Delta_MT*

	Dependent Variable: *CASH_ETR*					
	Entire Sample	*Delta_MT*>=0	*Delta_MT*<0	Entire Sample	Entire Sample	Entire Sample
Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Delta_MT	0.016***	0.013**	0.023**			0.019***
	(5.88)	(2.13)	(2.19)			(5.76)
Quintile Score				0.006***		
				(8.38)		
MT					0.469	-0.134
					(1.13)	(-0.27)
LEV	-0.001	0.002	-0.029*	-0.000	-0.006	-0.001
	(-0.05)	(0.09)	(-1.78)	(-0.03)	(-0.58)	(-0.09)
SIZE	0.034***	0.027***	0.040***	0.034***	0.035***	0.035***
	(10.07)	(5.38)	(8.11)	(9.91)	(11.11)	(10.17)
NOL	0.004	0.006	0.001	0.004	0.005	0.004
	(1.19)	(1.07)	(0.14)	(1.22)	(1.54)	(1.17)
EBIT	0.000	-0.170***	-0.075***	0.000	-0.000	0.000
	(0.04)	(-3.64)	(-2.98)	(0.01)	(-0.14)	(0.07)
RD	0.185**	0.154	0.147	0.184**	0.186***	0.182**
	(2.21)	(0.89)	(1.40)	(2.19)	(2.64)	(2.17)
ΔSALES	-0.003	-0.001**	-0.012***	-0.002	0.000***	-0.003
	(-1.62)	(-2.05)	(-3.18)	(-1.64)	(2.73)	(-1.62)
ADV	0.015	-0.014	0.100	0.014	0.016	0.011
	(0.25)	(-0.14)	(1.11)	(0.24)	(0.26)	(0.18)
SGA	0.052***	0.015	0.099***	0.052***	0.051***	0.052***
	(2.83)	(0.94)	(4.71)	(2.80)	(3.04)	(2.81)
CAPEXP	0.001	-0.021	0.007	0.000	0.013	-0.003
	(0.03)	(-0.46)	(0.14)	(0.02)	(0.47)	(-0.11)
CASH	-0.028*	-0.030	-0.015	-0.026	-0.031**	-0.029*
	(-1.65)	(-1.23)	(-0.61)	(-1.58)	(-2.01)	(-1.68)
FOREIGN	-0.154**	-0.255***	-0.160***	-0.154**	-0.132***	-0.156**
	(-2.57)	(-2.86)	(-3.03)	(-2.55)	(-2.97)	(-2.55)
INTANG	0.058***	0.037	0.034	0.058***	0.043**	0.056***
	(3.16)	(1.40)	(1.27)	(3.18)	(2.53)	(3.03)
GROSSPPE	0.034***	0.034**	0.036***	0.034***	0.034***	0.034***
	(3.54)	(2.55)	(3.14)	(3.59)	(3.84)	(3.57)
CONSTANT	-0.341	0.055	-0.068*	-0.049*	-0.037	-0.038
	(-1.31)	(1.45)	(-1.82)	(-1.91)	(-0.118)	(-1.45)
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Observations	26,524	13,358	13,166	26,524	32,731	26,524
Adjusted-R^2	0.388	0.386	0.389	0.389	0.377	0.387

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table reports the regression of *CASH_ETR* on *Delta_MT*. The sample period runs from 1993 to 2017. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 3.4.

TABLE 3.4 *The Effect of Stock-based Compensation on the Relation between Management's Tone and Tax Avoidance*

	Dependent Variable = *CASH_ETR*				
Independent Variables	Total Sample (1)	Well-governed Firms (2)	Poorly-governed Firms (3)	Poorly-governed Firms & Low Compensation (4)	Poorly-governed Firms & High Compensation (5)
Delta_MT	0.016***	0.016**	0.019***	0.020***	0.009*
	(3.76)	(2.34)	(3.19)	(3.20)	(1.95)
SKTMIXGRANT	-0.033***	-0.037**	-0.030**		
	(-3.37)	(-2.27)	(-2.54)		
*Delta_MT*SKTMIXGRANT*	-2.616**	-2.802	-4.106***		
	(-1.97)	(-1.09)	(-2.81)		
SKTMIXREST	-0.003	0.007	-0.005*		
	(-1.07)	(1.12)	(-1.78)		
*Delta_MT*SKTMIXREST*	0.026	-0.946	0.411		
	(0.05)	(-0.67)	(0.82)		
Control Variable	Identical to TABLE 3.3				
Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Observations	14,771	6,939	7,504	5,826	8,344
Adjusted-R^2	0.448	0.504	0.466	0.385	0.409

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 3.4.

6. Robustness Checks

6.1 OTHER MEASURES OF TAX AVOIDANCE

In the first robustness check, instead of using *CASH_ETR* as the dependent variable, I use GAAP effective tax rate (*GAAP_ETR*) and book-tax difference (*BTD*) as the dependent variables to re-estimate baseline regression (1). *GAAP_ETR* is defined as total tax expense divided by pre-tax accounting income. This is a more widely used ratio to measure tax avoidance than *CASH_ETR* by investors and tax authorities. All the loss firms are deleted, and the ratio is truncated to [0,1]. *BTD* is defined as the difference between book income and taxable income (Mills 1998; Wilson 2009). Similarly, all the loss firms where pretax income is negative are excluded. In TABLE 3.5, the coefficient on *GAAP_ETR* in Column (1) is significant and positive, and the coefficient on *BTD* in Column (2) is significant and negative. Both findings are as expected and consistent with the main finding.

TABLE 3.5 *Regressions of GAAP_ETR and BTD on Delta_MT*

	Dependent Variables	
	GAAP_ETR	*BTD*
Independent Variables	(1)	(2)
Delta_MT	0.006***	-0.003***
	(3.37)	(-3.80)
Controls	Identical to TABLE 3.3	
Year FE	YES	YES
Firm FE	YES	YES
Observations	31,271	25,528
Adjusted-R^2	0.582	0.585

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the association between *Delta_MT* and other tax avoidance measures, including *GAAP_ETR* and *BTD*. The sample period runs from 1993 to 2017. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 3.4.

6.2 LOSS FIRMS

All the three variables, *CASH_ETR*, *GAAP_ETR*, and *BTD*, ignore the loss firms as one of the limitations of these variables (Henry and Sansing 2018). To investigate whether my main findings still survive in the loss firms, in this section, I use a new measure, *Δ/BVA* introduced by Henry and Sansing (2018). This ratio has several merits to *CASH_ETR* in the baseline regression. First, *CASH_ETR* can be varied by the change of either the numerator (cash tax paid) or by the denominator (pre-tax income). The decrease of *CASH_ETR* could be either driven by the management of cash tax paid or by earnings management. *Δ/BVA* would reduce the possibility that managers reduce the ratio through earnings management. Second, the use of pretax income would result in data truncation due to a large number of negative pretax incomes in the sample. If pretax income is used in the denominator, loss firms should be deducted because firms with cash tax refund and negative pretax income would have the same *CASH_ETR* for firms with cash tax payment and positive pretax income. This would result in a limited understanding of the determinants of tax avoidance in loss firms (Hanlon and Heitzman 2010; Henry and Sansing 2018). Specifically, this new measure is defined as:

$$\Delta/BVA = \frac{CTP_{ADJ} - \tau * PTI}{BVA}, \quad (2)$$

where CTP_{ADJ} is the cash taxes paid after the adjustment of tax refund receivable; τ is the tax rate set to 35%; *PTI* is the pre-tax income, and *BVA* is the book value of assets.

I use this new measure to re-estimate equation (1). TABLE 3.6 presents the results, including using the entire sample, profit firms only, or loss firms only. The result is still consistent with my findings in TABLE 3.3 and 3.4 and even more significant in the entire sample. The magnitude of the coefficients on *Delta_MT* is larger in loss firms than profit firms. This further supports my findings as loss firms face more risks and would be more reluctant to engage in tax avoidance. But once the tone change decreases, these firms would be more eager to reduce their loss through tax avoidance.

TABLE 3.6 *Regressions Based on a Larger Sample with Loss Firms*

	Dependent Variable: *Δ/BVA*		
	Entire sample	Profit firms	Loss firms
Independent Variable	(1)	(2)	(3)
Delta_MT	0.013***	0.002***	0.021***
	(8.82)	(6.00)	(4.32)
Controls	Identical to TABLE 3.3		
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Observations	45,714	32,030	11,874
Adjusted-R^2	0.715	0.285	0.698

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the explanatory power of *Delta_MT* on another tax avoidance measure, *TTA*. This measure considers loss firms and conforming tax avoidance activities. The sample period is from 1993 to 2017. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 3.4.

6.3 IMPROVEMENT OF FIT

Even though, as illustrated in the previous analysis, the management tone change has explanatory power on the four widely used tax avoidance measures, it may not provide incremental information in addition to the quantitative control variables. I then consider how well the inclusion of this qualitative and multi-dimensional measure can improve the overall fit measured by the R-Squared. I compute the F-statistic to compare the difference of R-Squared between two models with the inclusion and exclusion of *Delta_MT* in equation (1). I also replace *CASH_ETR* with *GAAP_ETR*, *BTD*, and *Δ/BVA*. Precisely, I follow Allen et al. (2021) to calculate the F-statistic as F = [(R^2 change from Base model)/number of independent variables added]/[(1 - R^2 in model with extra variables)/(n-k-1)], where n is the sample size, and k is the original number of independent variables. TABLE 3.7 shows that all the F-statistics are significant. This indicates that the use of management's tone change also improves the amount of variation explained by the model.

TABLE 3.7 *Test of the Change in R^2*

	Dependent Variable			
	(1)	(2)	(3)	(4)
	CASH_ETR	*GAAP_ETR*	*BTD*	*Δ/BVA*
Delta_MT	43.11***	14.97***	18.44***	44.95***

***,** Indicate the difference in R^2 is significant at the 1 percent and 5 percent level, respectively.

6.4 DECOMPOSING MANAGEMENT'S TONE

Campbell et al. (2020) find two components that impact that firm's tone volatility. One is the firm's innate operating risks, and the other is the extent of disclosure transparency. The operating risk is exactly one of the factors I expect management's tone to capture, and this risk will ultimately impact tax avoidance. If the pattern between management's tone and tax avoidance can be replaced by the relation between operating risk and tax avoidance, then the use of management's tone as a multidimensional indicator of tax avoidance would be meaningless. Researchers and tax authorities can simply use quantitative information to detect tax avoidance. Thus, I decompose *MT* into two components. One is explained by operating risk and disclosure transparency, and the other one is an unexplained part of management's tone. My main interest is whether the unexplained part's change can still reveal tax avoidance. Following the method used in Huang et al. (2013), I extract operating risks and disclosure transparency from the *MT* based on a simple OLS regression. The residuals from the regressions are the unexplained components of management's tone. I then use the one-year difference of the unexplained components as the new measure of management's tone (*Delta_MT_U*). Specifically, according to Campbell et al. (2020), to control for operating risk, I use book-to-market ratio (*BTM*), firm size (*LN_MVE*), income before extraordinary items (*BI*), number of segments (*SEGMENTS*), firm operation in the high-litigation industry (*LITI*), the standard deviation of the analysts' estimates for the next period's earnings (*DISP*), Big N auditor (*AU*), institutional ownership (*INST*), and number of analysts forecasting EPS (*ANALYSTS*)[41]. To control for disclosure transparency, I use a file size of 10-Ks (*FILESIZE*). Specifically, the regression is:

$$MT_{it}=\beta_0+\beta_1 BTM_{it}+\beta_2 LN\_MVE_{it}+\beta_3 BI+\beta_4 SEGMENTS_{it}+\beta_5 LITI_{it}+\beta_6 DISP_{it}+\beta_7 AU_{it}+\beta_8 INST+\beta_9 ANALYSTS+\beta_{10} CASH\_ETR_{it}+\beta_{11} FILESIZE_{it}+\varepsilon_{it} \quad (3)$$

TABLE 3.8 presents the regression results of the determinants of management's tone. All the variables except for *LITI* and *FILESIZE* are significantly related to *MT*. The adjusted R^2 is around 4%, similar to Huang et al. (2013). This indicates that there is still a large proportion unexplained. TABLE 3.9 reports the results of the regressions of equation (1) by replacing *Delta_MT* with *Delta_MT_U*. The coefficients on *Delta_MT_U* are still positive and significant at the 1% level. I further use *GAAP_ETR* and *BTD* to check the robustness. The results still hold. These findings suggest that my measure provides incremental information to the financial measures. This indicates the advantage of textual analysis: it can produce a multidimensional measure much more informative than quantitative information.

[41] All the definitions are in Appendix 3.4.

TABLE 3.8 *Two Determinants of Management's Tone: Operating risk and Disclosure Transparency*

	Dependent Variables=*MT*
Intendent Variables	(1)
BTM	0.001***
	(6.22)
LN_MVE	-0.000***
	(-4.77)
BI	-0.004***
	(-9.08)
SEGMENT	0.001***
	(15.07)
LITI	-0.000
	(-0.25)
DISP	0.000***
	(4.66)
AU	0.001***
	(5.72)
INST	0.001***
	(6.46)
ANALYSTS	0.000**
	(1.97)
FILESIZE	-0.000
	(-1.64)
Constant	0.008***
	(18.78)
Observations	15,782
Adjusted-R^2	0.039

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the regression results of decomposing *Delta_MT* into unexplained components and explained components by operating risk (*CASH_ETR to ANALYSTS*) and disclosure transparency (*FILESIZE*). The residuals from the regressions are the new measures of management's tone. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 3.4.

TABLE 3.9 *Regressions of Tax Avoidance on Unexplained Components of Management's Tone*

	Dependent Variables =		
	CASH_ETR	*GAAPETR*	*BTD*
Independent Variables	(1)	(2)	(3)
Delta_MT_U	0.020***	0.010**	-0.007***
	(3.25)	(2.13)	(-3.05)
Control Variables		Identical to TABLE3.3	
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Observations	9,609	7,921	7,400
Adjusted-R^2	0.379	0.518	0.468

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the regression results of tax avoidance on the residuals from equation (3). The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 3.4.

6.5 MORE LINGUISTIC MEASURES IN MD&A AND 10-KS

As discussed above, positive words are ambiguous and inefficient in measuring tone (Loughran and McDonald 2011). Considering a large set of literature that uses positive words and finds significant results, I use other managerial tones to investigate whether my measure overlaps with these linguistic measures. They are measured by positive words in FIN-POS (Loughran and McDonald 2011), the difference between positive words and negative words in MD&A and 10-Ks, and negative words in FIN-NEG and H4N in 10-Ks[42].

TABLE 3.10 presents the results of the regressions of 11 linguistic measures. In MD&A, the positive words (*MT_FINPOS_MDA*) or the difference between positive and negative words (MT_DIFF_MDA) are insignificant. The difference between these two ratios *Delta_MT_FINPOS_MDA* and *Delta_MT_DIFF_MDA* are also insignificant. In the entire 10-Ks, the level of negative words, *MT_FINNEG_10-K* is negative, consistent with Law and Mills (2015) [43] but not significant anymore. The coefficients on positive words (*MT_FINPOS_10-K*) and the difference between positive and negative words (*MT_DIFF-10-K*) are insignificant. Coefficients on the changes of negative words (*Delta_MT_FINNEG_10-K*), positive words (*Delta_MT_FINPOS_10-K*), and the difference between positive words and negative words (*Delta_MT_DIFF_10-K*) are positive, negative, and negative, respectively, and significant. This is consistent with my expectation that differences would provide more incremental information than levels. However, these findings cannot explain tax avoidance after 2008 while my measure is still robust. In addition, I also use negative words in H4N to measure the management's tone (*Delta_MT_H4N_MDA*). The coefficient on this measure is not significant, suggesting similar implications in FIGURE 3.1. My measure is still significant at the 1% level when these linguistic cues are added in equation (1).

[42] In Appendix 3.2, I discuss another category of words, active words in MD&A to provide more examples of the power of different word list.

[43] I replicate Law and Mills's (2015) study and find that their work is very robust if unrecognized tax benefits (*UTB*) is used as a measure of tax avoidance but not significant if widely used *ETR*s are used.

TABLE 3.10 *Other Linguistic Cues and CASH_ETR*

	Dependent Variables = *CASH_ETR*										
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
MT_FINPOS_MDA	0.074										
	(0.26)										
MT_DIFF_MDA		-0.188									
		(-0.71)									
Delta_MT_FINPOS_MDA			0.021								
			(1.38)								
Delta_MT_DIFF_MDA				0.017							
				(1.14)							
MT_FINNEG_10-K					-0.184						
					(-0.60)						
MT_FINPOS_10-K						-1.021					
						(-1.22)					
MT_DIFF_10-K							-0.061				
							(-0.21)				
Delta_MT_FINNEG_10-K								0.010***			
								(3.64)			
Delta_MT_FINPOS_10-K									-0.020**		
									(-2.49)		
Delta_MT_DIFF_10-K										-0.008***	
										(-3.66)	
Delta_MT_H4N_MDA											0.004
											(1.26)
Controls	Identical to TABLE 3.3										
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	32,731	32,731	29,335	29,335	45,589	45,606	45,581	40,634	39,791	41,522	20,957
Adjusted-R^2	0.343	0.344	0.347	0.347	0.353	0.350	0.353	0.357	0.360	0.356	0.407

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the regression results of the baseline regression with Fin-Pos (Loughran and McDonald 2011) and negative words in Harvard Dictionary. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 3.4.

TABLE 3.11 *Predictive Power of Delta_MT Before and After SOX*

	Dependent Variable = *CASH_ETR*		*GAAP_ETR*		*BTD*	
	Post-SOX	Pre-SOX	Post-SOX	Pre-SOX	Post-SOX	Pre-SOX
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
Delta_MT	0.020***	0.010*	0.006**	0003	-0.003***	-0.003**
	(5.63)	(1.86)	(2.43)	(1.23)	(-2.86)	(-2.31)
Controls	Identical to TABLE 3.3					
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Observations	21,520	7,214	22,500	8,071	18,666	6,320
Adjusted-R^2	0.401	0.457	0.563	0.731	0.613	0.599

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the regulation (SOX) change impact on the relation between *Delta_MT* and *CASH_ETR*. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 3.4.

6.6 PRE- AND POST-SOX PERIODS

The disclosure requirements of MD&A are varied in my large sample period from 1993 to 2017. During this period, the largest disclosure requirement change is the SOX issue, which impacts the informativeness of MD&A and further impacts the power management's tone change. For example, MD&A requires more disclosures, such as a narrative explanation of financial statements and future earnings or cash flow variability. Li (2008) finds no significant change of information in MD&A after the passage of SOX. However, Loughran and McDonald (2008) find fewer strong modal words after SOX relative to weak ones. Thus, it is still unclear whether the SOX regulations contribute to some differences in the explanatory power of management's tone change on tax avoidance. I split the total sample into two periods, the post-SOX period (year>2002) and the pre-SOX period (year<=2002). I re-estimate equation (1) with three tax avoidance measures, *CASH_ETR*, *GAAP_ETR*, and *BTD*. TABLE 3.11 reports the regression results. In the post-SOX period in Column (1), Column (3), and Column (5), the coefficients on *Delta_MT* are all significant with the predicted signs. However, in the pre-SOX period, the significance of *Delta_MT* decreases dramatically in all three tax avoidance measures. Especially in *GAAP_ETR*, *Delta_MT* turns to be insignificant at the 10% level. These findings suggest that SOX issues do have some impacts on the informativeness of MD&A. At least for the year-to-year differences, after SOX, MD&As seem to become more informative to reflect the changes of firm fundamentals and risks.

8. Conclusions

This paper investigates the dynamic of tax management regarding the textual information, incremental to conventional raw measures of tax avoidance, such as *ETR*s and *BTD*. In this study, I examine the power of texts in the MD&A part, not the entire 10-Ks, to reveal and predict tax avoidance. I focus on the differences in management's tone rather than the widely used levels. This enables me to investigate the information of tone within firms rather than cross-sections. This would be more powerful to detect tax avoidance as some firms' tone may persist at high levels for a certain period. It would be difficult to capture other tax-avoiding firms with a comparatively low tone level.

The management's tone change is determined by various factors such as firm performance and operating risks. That's why in FIGURE 3.1, during the financial crisis such as the year 1997 and 2008, the management's tone change increases dramatically. The management's tone change has explanatory power on multiple traditional tax avoidance measures. Firms are more reluctant to tax avoidance when management's tone change increases. In other words, when firms are experiencing unfavorable changes in the business, they are less likely to engage in more risky activities such as tax avoidance. The results are robust after a battery of checks. This finding amplifies the current research about the complementary or substitutional relation between tax avoidance and other firm performance drivers.

Meanwhile, the currently extant research to quantify motives for tax avoidance using textual analysis is limited and in its infancy. The overwhelming majority of prior research focuses on the power of financial reporting figures to find explanatory drivers of tax avoidance. The power of texts in tax avoidance research is underexplored. This study contributes to more linguistic cues in the study of the detection of tax avoidance, following the spirit of Law and Mills (2015). The management's tone change includes incremental multidimensional information beyond the traditional accounting numbers to detect tax avoidance. To my best knowledge, this is one of the limited papers to use textual analysis in tax avoidance research and apply management's tone change, rather than the level, in the study of the tone of corporate disclosure.

Admittedly, there is an apparent limitation in my research. Management's tone change, even though informative, might not be neutral. It suffers the biases of managers and thus, becomes less transparent. If managers conceal unfavorable tones unconsciously or consciously, this finding would be less beneficial for tax authorities. However, this would not be a big concern if tax authorities or researchers only use this tone change as an indicator rather than tax avoidance measure.

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Appendix 3.1 MD&A Extraction Procedure

1. Collecting 10-K reports and extracting MD&A from txt filings

1.1 Locate and download EDGAR Index Files.

The SEC provides the daily and quarterly index files based on the submissions of 10-K filings. I download the monthly RSS feeds from the Edgar website, https://www.sec.gov/Archives/edgar/full-index/. I can download a master.zip from this link, including each filling with the firm name, form type, CIK, data, and file links.

1.2 Extract the links to 10-K filings.

The master.zip only links the 10-K filings, not the actual data. I extract the actual data from the links by the python program.

1.3 Extract the MD&A from 10-K filings

Step 1 - Locate the beginning of the MD&A. The MD&A usually has one beginning in "item 7. Managements discussion and analysis" with different possible variations. I use a regular expression to locate the beginning of the MD&A. I also exclude the possibilities that "item 7" is after the words "see", "refer to", "included in", "contained in" to avoid the incorrect location of MD&A.

Step 2 - Locate the ending of the MD&A. The end of the MD&A is usually followed by "item 8. Financial statements", "item 8. consolidated financial statements," etc. The variations are considered in the program. I also exclude the possibilities that "item 8" is after the words "see", "refer to", "included in", "contained in" to avoid the incorrect location of MD&A.

Step 3 - Based on the location of the beginning and ending of MD&A, I then extract the text between these two locations as the main body of MD&A.

2. Cleaning the 10-K Reports and MD&A

The 10-K reports including MD&A in text files include XML or HTML tags and tables. This information will distort the textual analysis, which should be removed.

2.1 The heading information between <SEC-HEADER> and </SEC-HEADER> is deleted.

2.2 The XML or HTML tags are excluded including <DIV>, <TR>, <TD>, <FONT>, '<a' and '<hr' and <sup Sections.

2.3 The TABLE section is then removed for the tables begin with <TABLE> and end with </TABLE>.

Appendix 3.2 Active Words in Harvard Dictionary

There are different categories of words in the Harvard Dictionary. H4N, as argued by Loughran and McDonald (2011), has many words not related to the business environment. Thus, it would misrepresent the tone or sentiment of corporate disclosure. However, the other word lists in Harvard Dictionary are less explored, for example, active words. Active words indicate the activeness of a person. For example, words such as *accelerate*, *expand* and *exploit*. If applied in the business environment, these words are likely to be related to the potential tendency related to business strategies. The use of active words could capture management's tone to engage in more aggressive business strategies such as tax planning. Thus, I developed a measure, *ACTIVE* measured by the percentage of use of active words in MD&A. Accordingly, I conduct the baseline regressions with *ACTIVE* instead of *Delta_MT* under three different dependent variables of tax avoidance measures. TABLE 3.12 reports the regression results. The coefficients on *ACTIVE* are positive and significant in Columns (1) and (2) while negative in Columns (3). The results suggest that the higher frequency of active words indicates less tax avoidance, even though the results are no longer significant when I include *Delta_MT*. This initial finding seems counter-intuitive as active managers might engage in more tax avoidance. However, investigating this word list is not the point of these regressions. This is just an example of how the other word lists would be robust when examining corporate disclosure. It is suggestive that other well-established dictionaries can also be used, or in the future, researchers can develop specific word lists designed for detailed research.

TABLE 3.12 *Regressions of Tax Avoidance Measures on ACTIVE*

	Dependent Variables =		
	CASH_ETR	*GAAP_ETR*	*BTD*
Independent Variables	(1)	(2)	(3)
ACTIVE	0.413**	0.318**	-0.286***
	(1.96)	(2.25)	(-4.19)
Controls		Identical to TABLE 3.3	
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Observations	33,137	35,434	29,066
Adjusted-*R*2	0.379	0.571	0.575

*, **, *** Represent significance at the level of 10 percent, 5 percent, and 1 percent levels, respectively. This table presents the regression of tax avoidance measures on *ACTIVE*. The sample period runs from 1993 to 2017. Robust standard errors are clustered at the firm level. Two-tailed t-statistics are reported in parentheses. Variable definitions are in Appendix 3.4.

Appendix 3.3 Managerial Characteristics

Most prior literature does not consider the impact of managers on management's tone. They treat management's tone as an objective reflection of firm characteristics (Li 2008; Huang et al. 2013). The pattern I capture in the baseline regressions might be explained by managerial characteristics, which means management's tone change may be just a reflection of managerial characteristics rather than the hard-to-quantify firm performance. To address this concern, I add three common managerial characteristics, *AGE* measured by the average age of the management team (Marquez-Illescas et al. 2019), *GENDER* measured by the proportion of males in management team (Olsen and Stekelberg 2016), and *MASCORE* measured by the efficiencies of managers to concert firm resources into revenues (Demerjian et al. 2012). Lanis et al. (2017) find a negative association between females and tax avoidance. Marquez-Illescas et al. (2019) find that the managers with higher age would be less likely to present disclosure biased upward. Following Koester et al. (2017), there is a positive relation between managerial ability, and tax avoidance as higher-ability executives utilize firm resources more efficiently. TABLE 3.13 reports the regression results by including these three additional variables with three tax avoidance measures, *CASH_ETR*, *GAAP_ETR*, and *BTD*. The coefficients on *Delta_MT* in all three regressions are still significant with the expected signs. Consistent with Dyreng et al. (2010), both *GENDER* and *AGE* are not significant. *MASCORE* is significant but positively related to *CASH_ETR* and *GAAP_ETR*, which is not consistent with the findings of Koester et al. (2017)[44]. Overall, my findings are still robust after controlling managerial characteristics.

TABLE 3.13 *Regressions of Tax Avoidance Measure on Delta_MT with Manager Characteristics*

	Dependent Variable:		
	CASH_ETR	*GAAP_ETR*	*BTD*
Independent Variables	(1)	(2)	(3)
Delta_MT	0.013***	0.008***	-0.002**
	(3.18)	(2.88)	(-2.15)
AGE	-0.000	-0.000	-0.000
	(-0.92)	(-0.36)	(-0.34)
GENDER	-0.034*	0.003	-0.002
	(-1.75)	(0.20)	(-0.35)
MASCORE	0.045***	0.032***	-0.005
	(2.67)	(2.59)	(-0.98)
Controls		Identical to TABLE 3.3	
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Observations	11,917	12,017	11,699
Adjusted-R^2	0.338	0.345	0.451

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the regression results of the baseline regression with three additional variables, *AGE*, *GENDER*, and *MASCORE* to further control the manager-level characteristics. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 3.4.

[44] I find that *MASCORE* is only significantly negative if the control variables in Koester et al. (2017) are used..

Appendix 3.4 Variable Definitions

Variable		Definition
ADV	=	advertising expense (XAD) divided by net sales (SALE); when missing, reset to 0.
AGE	=	the average of age of management team in year t.
ANALYSTS	=	natural logarithm of the number of analysts forecasting EPS (IBES)
AU	=	1 for firms with a Big N auditor, and 0 otherwise
BI	=	income before extraordinary items (IB) divided by lagged total assets (AT)
BTD	=	book income (PI) less taxable income ((TXFED+TXFO)/0.35) scaled by lagged total assets (AT).
BTM	=	book value of equity (CEQ) divided by market value of equity (PRCC_F*CSHO)
CAPEXP	=	CAPEXP (CAPX) divided by total assets (AT).
CASH	=	cash and cash equivalents (CHE) divided by total assets (AT)
CASH_ETR	=	firm i's cash effective tax rate, which equals cash taxes paid (TXPD) in year t scaled by pretax net income (PI) in year t. CASH_ETR is set to missing when the denominator is zero or negative.
Delta_MT	=	one-year difference between *MT* in $year_{t-1}$ and *MT* in $year_t$, multiplied by 100.
Delta_MT_DIFF_10-K	=	one-year difference between *MT_DIFF_10-K* in $year_{t-1}$ and *MT_DIFF_10-K* in $year_t$, multiplied by 100.
Delta_MT_DIFF_MDA	=	one-year difference between *MT_DIFF_MDA* in $year_{t-1}$ and *MT_DIFF_MDA* in $year_t$, multiplied by 100.
Delta_MT_FINNEG_10-K	=	one-year difference between *MT_FINNEG_10-K* in $year_{t-1}$ and *MT_FINNEG_10-K* in $year_t$, multiplied by 100.
Delta_MT_FINPOS_10-K	=	one-year difference between *MT_FINPOS_10-K* in $year_{t-1}$ and *MT_FINPOS_10-K* in $year_t$, multiplied by 100.
Delta_MT_FINPOS_MDA	=	one-year difference between *MT_FINPOS_MDA* in $year_{t-1}$ and *MT_FINPOS_MDA* in $year_t$, multiplied by 100.
DISP	=	standard deviation of the analysts' estimates for the next period's earnings (I/B/E/S)
EBIT	=	firm i's earnings before interest and taxes (EBIT) scaled by net operating assets, where net operating assets equal stockholders' equity (SEQ) minus cash and short-term investments (CHE) plus interest (XINT) plus debt in current liabilities (DLC) plus long-term debt (DLTT).
FILESIZE	=	logarithm of the10-K file size.
FOREIGNSALES	=	foreign sales (PIFO) divided by total sales (SALE)
GAAP_ETR	=	income taxes, divided by pre-tax income minus special items (TXT/(PI – SPI)). I truncate GAAP_ETR to the range [0,1].
GENDER	=	the proportion of males in management team in year t.
GROSSPPE	=	gross property, plant, and equipment (PPEGT) divided by total assets (AT)
INST	=	the number of shares owned by institutional investors from Thomas-Reuters 13F database divided by the total shares (CSHO). I truncate IO to the range [0,1].
INTANG	=	the ratio of intangible assets (INTAN) to total assets (AT);
INTEXP	=	firm i's interest expense (XINT) divided by total assets at the beginning of year t.
LEV	=	long-term debt (DLTT) divided by total assets (AT)
LITI	=	equal to one if the firm is in a high-litigation industry, and 0 otherwise. High-litigation industries are industries with SIC codes 2833–2836, 3570–3577, 3600–3674, 5200–5961, and 7370–7374. (Francis et al. 2004)
LN_MVE	=	Log of the market value of equity (PRCC_F×CSHO)

(*continued on next page*)

APPENDIX 3.4 (continued)

Variable		Definition
MT	=	the negative words in Fin-Neg in MD&A divided by the total words in MD&A.
MT_DIFF_10K	=	the difference between positive words in Fin-Pos and negative words in Fin-Neg divided by total words in 10-K.
MT_DIFF_MDA	=	the difference between positive words in Fin-Pos and negative words in Fin-Neg divided by total words in MD&A.
MT_FINNEG_10K	=	the negative words in Fin-Neg divided by the total words in 10-K.
MT_FINPOS_10K	=	the negative words in Fin-Pos divided by the total words in 10-K.
MT_FINPOS_MDA	=	the positive words in Fin-Pos in MD&A divided by the total words in MD&A.
MT_H4N_MDA	=	the negative words in H4N in MD&A divided by the total words in MD&A.
NOL	=	1 if firm i has net operating loss carryforwards (TLCF) available at the beginning of year t, and 0 otherwise.
RD	=	research and development expense (XRD) divided by net sales (SALE); when missing, reset to 0.
SALES	=	natural logarithm of the sales (SALES) for firm i at the end of year t.
SEGMENT	=	number of segments per year.
SGA	=	selling, general, and administrative expense (XSGA) divided by net sales (SALE); missing values of SGA are set to 0;
SIZE	=	natural logarithm of the total assets (AT) for firm i at the end of year t.
STKMIXGRANT	=	For firm i in year t, the Black-Scholes value of stock options granted to each executive j (Execucomp variable OPTION_AWARDS_BLK_VALUE) is summed across all the firm's managers. Salary and bonus for that firm's executives in that year (Execucomp variables SALARY and BONUS) are summed in an analogous way. STKMIXGRANT is the ratio of the sum of the values of stock options to total compensation (defined as the sum of the value of stock options, salary, and bonus) (Desai and Dharmapala 2006, p.162)
STKMIXREST	=	restricted stock grants (Execucomp variable RSTKGRNT) as a fraction of total compensation defined in STKMIXGRANT
STKMIXGRANT_IND	=	the different between STKMIXGRANT and industry average of STKMIXGRANT
STKMIXREST_IND	=	the different between STKMIXREST and industry average of STKMIXREST
TTA	=	firm i's cash taxes paid (CTP) divided by total assets (AT) at the beginning of year t. I require all firms to have non-negative cash taxes paid.
UTB	=	the balance of unrecognized tax benefits balance at the end of year (TXTUBEND) scaled by total assets (AT).
ΔSALES	=	firm i's sales growth, where sales growth is sales (SALE) at the end of year t less sales at the beginning of year t divided by assets (AT) at the beginning of year t.

All continuous variables are winsorized at the 1st and 99th percentiles.

Chapter 4 Tax-Strategy-Related Words, Firm's Ability, and Tax Avoidance

Abstract

In this paper, I construct a tax-strategy-related (TSR) word list to investigate the linguistic cues of tax avoidance in 10-Ks. I use TSR words to measure a firm's innate ability to avoid taxes and find a positive relationship between this ability and the level of tax avoidance. I use three tests to validate this pattern. First, I find that the TSR words have explanatory power on multiple traditional tax avoidance measures after a battery of robustness checks. Second, I introduce a method to identify the extreme values in tax avoidance measures and examine the pattern with extreme values. The results still hold. Third, I collect the tax shelter firms to check whether this pattern survives in the most aggressive cases. Interestingly, the pattern turns to be the opposite. I interpret this result as indicating that these firms try to conceal their abilities of tax avoidance to avoid being captured by tax authorities. In an additional analysis, I find that investors negatively value the disclosure of TSR words in well-governed and less tax-avoiding firms.

Keywords: Tax avoidance; tax strategy; firm's ability; disclosure

1. Introduction

Following the growing body of textual analysis in accounting and finance research (Li 2008; Tetlock et al. 2008; Loughran and Mcdonald 2011; Bodnaruk et al. 2013), in this paper, I construct a tax-strategy-related word list and investigate its power to reveal and predict tax avoidance. Regulators and traditional tax research generally use quantitative information in 10-Ks to detect tax avoidance. Examples are effective tax rates (*ETR*) (Dyreng et al. 2008)[45], book-tax differences (*BTD*) (Mills 1998; Phillips 2003; Desai and Dharmapala 2006), and unrecognized tax benefits (*UTB*) (Lisowsky et al. 2013; Gupta et al. 2014). These studies simply focus on the financial statement data, which would lead to some errors and limitations in detecting tax avoidance (Hanlon 2003; McGill and Outslay 2004; Hanlon and Heitzman 2010). The quantitative financial information accounts for a small proportion of 10-Ks. It may only provide limited cues of tax avoidance, especially when firms deliberately under-report tax reserves or have no mandatory disclosure of tax reserves (Law and Mills 2015). Treating 10-Ks as a repository of firms' narratives, the textual information in 10-Ks is likely to provide incremental information about tax avoidance. Following this logic, several studies (Law and

[45] Regulators use low *ETR* to capture tax avoiding firms such as Starbucks and Google.

Mills 2015; Inger et al. 2018; Campell et al. 2019; Allen et al. 2020) [46] use textual analysis to examine the effect of linguistic information in 10-Ks to detect tax avoidance activities. My study follows and expands their findings from another new perspective.

The major challenge in using textual analysis in tax research is the choice of proper word lists in different research questions. One reason for the limited textual analysis studies in tax research is the lack of well-established tax-related dictionaries. The current widely used dictionaries are not designed to capture tax-related information (Law and Mills 2015). For example, Fin-Neg (Loughran and McDonald 2011), the most used word classification in accounting and finance research, is not suitable to capture tax information directly because it does not include many tax-related words such as *tax, liability, cost,* etc., and contains other nontax words related to tone and sentiment. It would be necessary to have more word lists from different perspectives to predict and reveal tax avoidance. Thus, the first question I address in this paper is to construct a word list that can directly capture tax-related information.

I determine the TSR words based on the common conforming and nonconforming tax avoidance strategies. I assume that the TSR words in the entire 10-Ks would reveal the innate ability of firms to engage in tax avoidance. Different firms would have distinct abilities to engage in tax avoidance due to their various business attributes (Dyreng et al. 2008). The higher occurrences of TSR words indicate that firms have more opportunities and resources to use tax strategies, even though they may not use them[47], which shows a more vital ability to avoid taxes. The key assumption here is that taking tax departments as profit centers, rather than cost centers, reasonable firms would engage in tax avoidance until tax risk costs outweigh tax-saving benefits (U.S. Department of the Treasury 1999) if their business attributes and firm characteristics allow them to use more tax strategies. These words depict the richness of the repository of different tax avoidance tools for firms to use if they want to plan their taxes aggressively. For example, multinational firms with more mergers and acquisitions and lease transactions are easier to avoid taxes[48]compared to private firms. My word list has some merits. First, as my word list starts from the common tax strategies, it provides a straightforward routine about why and how firms have more aggressive tax avoidance. Second, my word list contains incremental information related to conforming and nonconforming tax strategies. Thus, it can also provide linguistic cues on conforming tax avoidance ignored by most traditional measures[49]. Third, it is objective and replicable to any firm with a 10-K file

[46] To my best knowledge, these are the only four well-established papers of textual analysis in tax avoidance research. Among them, only Law and Mills (2015) and Allen et al. (2020) are trying to use textual information to detect tax avoidance.

[47] I cannot determine whether firms take these tax avoidance strategies or not. What I can ensure is that these firms have a higher propensity to use these strategies because they have more likely business attributes such as more foreign sales captured by a higher frequency of words, *foreign, globally, subsidiaries* etc.

[48] These firms would be captured by more words such as *merger, acquisition, lease, restructuring* etc.

[49] There is only one conforming tax avoidance measure developed by Badertscher et al. (2019).

(Bodnaruk et al. 2013). Fourth, it is multidimensional, so it is more informative compared to the other quantitative determinants used to reveal tax avoidance. Fifth, my words are related to the required disclosure of certain transactions and firm characteristics. My words are not like the negative and positive words of Loughran and McDonald (2011), which managers can easily manipulate[50].

There is an apparent endogenous issue that a firm's ability to avoid taxes is derived from its prior strategic decisions in which tax avoidance is not their first-order concern (Hanlon and Heitzman 2010), or this ability is a direct result of tax avoidance. For example, firms have several foreign physical locations for their business operations, resulting in more opportunities for tax avoidance. In another way, firms may simply move their physical location to foreign countries for tax advantages (Koester et al. 2017). In practice, the former would be more common, or a firm may register a subsidiary in some tax havens but would not move its physical locations considering the high costs. Firms might allocate some resources for tax purposes, such as hiring more experienced consultants, implementing tax information systems, or lobbying (Brown et al. 2015). However, all these allocations of resources are not costly and will not change a firm's characteristics. My word list captures the innate firm characteristics, resources, and business operations of which the primary aims are not for taxes[51]. Thus, it is not likely to be influenced conversely by the tax avoidance activities of firms. In addition, I use the long-run tax avoidance measure, which further mitigates this concern as the future tax avoidance would be much less likely to impact the current firm characteristics.

Another concern is that my measure of a firm's ability to avoid taxes may also indicate the firm complexity. Prior literature presents a similar logic to measure complexity as my measure of the firm's ability to avoid taxes. Doye et al. (2007) and Cohen and Lou (2012) use foreign sales or the number of Compustat business segments, similar to my words such as *foreign* and *subsidiary*. Gome et al. (2007) use the percentage of intangible assets to total assets as the measure, similar to my words such as *intangible* and *research*. Chang et al. (2016) consider the complexity of derivatives, similar to my words such as *derivatives*. Thus, I control variables such as foreign sales, firm size, intangible to reduce the possibility that my measure is a proxy for firm complexity. In robustness tests, my results still survive after controlling the total words in 10-Ks and Fog index, two measures of complexity in past studies (Li 2008). I acknowledge that it is still not possible to rule out the concerns that a firm's ability to avoid taxes differs from firm complexity. I leave it to readers to decide to what extent they treat this as an ability to avoid taxes.

[50] For example, managers are reluctant to disclose unfavorable information or negative tone by considering the increase cost of capital (Kothari et al. 2009; Johnstone 2016).
[51] One more example is that firms usually do not sign lease contracts simply for tax purposes. For example, they must have a need of some equipment first. Then the details of contracts may be further designed for tax advantages.

According to the constructed word list, I develop a textual measure, *TAX_ABILITY*, based on the raw counts (not proportional occurrence) of TSR words with a log transformation of TSR words in 10-Ks. Raw counts of TSR words would be more suitable in my case because most of my words are required to be disclosed. The more TSR words would directly indicate more vital ability. I validate *TAX_ABILITY* based on three tests. First, I investigate whether *TAX_ABILITY* has explanatory power on tax avoidance proxied by traditional measures of tax avoidance. My primary dependent variable is the long-run (three-year) average Cash *ETR* (*CASH_ETR_3Y*) (Dyreng et al. 2008). I use this measure to assume that the innate firm's ability could impact a firm's tax avoidance in an extended period. For example, a lease contract for tax advantages usually lasts more than one year. I find that, as expected, *TAX_ABILITY* is significantly and negatively related to *CASH_ETR_3Y* after controlling a large set of variables and firm and year fixed effect. In the robustness test, I use more traditional tax avoidance measures that capture different tax avoidance types. The overall results suggest that firms with high raw word counts of TSR words disclosed in 10-Ks have a high level of tax avoidance. This indicates that firms with more available tax strategies are more likely to engage in tax avoidance. I also consider other alternative explanations. I include various linguistic measures in the baseline regressions and find that *TAX_ABILITY* is still significant and not overlapped by other measures. The results are also robust after controlling obfuscation and readability of 10-Ks. In addition, I rule out the possibility that a firm's ability to avoid tax is just a reflection of managerial ability. I find that the pattern between managerial ability and tax avoidance (Koester et al. 2017) does not exist after controlling my measure of a firm's ability. This indicates that a firm's ability is more likely to be the prerequisite of tax avoidance compared to managerial ability.

In the second validation test, I examine whether *TAX_ABILITY* is still valid when explaining the extreme values of two tax avoidance measures, *TTA* (Badertscher et al. 2019) and *UTB*. I focus on the extreme values as most prior literature drops the extreme values by winsorization or truncation. This would result in some information loss, especially in tax avoidance research where most likely and least likely tax-avoiding firms could be the minorities in the two tails of distributions of measures. To identify the extreme values, instead of using artificially cut-off, I introduce a method by using Monte Carlo simulation with reference to the tail index and mean square errors (De Vries 1991; Longin and Solnik 2001). According to the extreme values, I use a dummy variable that indicates whether the extreme values are in the right and left tails to conduct a logistic regression with the same control variables in the first test. The results suggest that the explanatory power of *TAX_ABILITY* is similar to the results in the first test and is superior to *ETR* and *BTD*.

In the last test, I use *TAX_ABILITY* to detect real tax shelter firms compared to quantitative measures and another textual measure under Fin-Neg. The tax shelter firms are those already caught by IRS and thus, are the most aggressive tax avoiders. These firms may have different disclosure behavior of TSR words. I collected a sample of tax legal cases from 1993, the starting year when 10-K links are available, to 2010, the latest year when the legal case is confirmed and settled. I developed a matched sample of these tax shelter firms and conducted a logistic regression to compare the explanatory power of *TAX_ABILITY* and other measures. The result is interesting, suggesting an opposite association in Tests 1 and 2. I find that the lower raw word counts of TSR words indicate higher possibilities of tax shelter firms. I interpret this result as these most aggressive firms (Hanlon and Heitzman 2010) are more likely to conceal TSR information to avoid being captured by tax authorities, consistent with the findings of Inger et al. (2018) that firms with high tax avoidance have more incentive to conceal tax avoidance through poorer readability. This, however, from another perspective, indicates that TSR words are related to a firm's tax avoidance activities. This finding is contributable to the research of disclosure behavior of tax shelter firms.

In an additional analysis, I examine the association between firm value and *TAX_ABILITY*. Similar to the prior studies (Desai and Dharmapala 2009), this section focuses on how investors would value the disclosure of tax-related information in the function of corporate governance. The overall results show that investors negatively value tax-related information only in well-governed firms with lower tax avoidance levels. This indicates that investors prefer well-governed firms to fully utilize their ability to avoid taxes as there are lower risks of rent diversion as in poorly-governed firms.

I make several contributions to the literature. To my best knowledge, this is the first paper to detect tax avoidance by using the linguistic cues of potential or existing tax strategies. This gives researchers and regulators a new narrative picture of a firm's ability to avoid taxes in addition to the measures and indicators based on the hard-to-translate tax quantitative information or other linguistic cues in prior literature. Moreover, I introduce a method to examine the extreme values in tax avoidance measures, which complements the prior literature arguing the issues of ignoring extreme values (Kothari et al. 2005; Leone et al. 2019). I also enrich the findings of corporate disclosure in tax context from the perspectives of tax shelter firms and investors.

2. Literature Review

2.1 TEXTUAL ANALYSIS IN TAX RESEARCH

Most prior research focuses on the quantitative information (e.g., financial statements) in 10-Ks to detect tax avoidance. Several quantitative measures such as *ETR* (Dyreng et al. 2008), *BTD* (Mills 1998; Phillips 2003; Desai and Dharmapala 2006; Frank 2007), and *UTB* (Lisowsky et al. 2013; Gupta et al. 2014) have some corresponding limitations in applications (Hanlon and Heitzman 2010). Hanlon (2003), McGill and Outslay (2004), and Gupta et al. (2016) further point out that simply using financial statements or quantitative financial accounting information to detect tax avoidance has some limitations. They argue that it is not efficient to translate the financial statements to infer a firm's taxable income due to the limited and opaque quantitative information related to tax. This spawns the need to use other information in 10-Ks, such as textual information.

However, the studies on the textual analysis used in tax research are limited. The prior research in tax mainly focuses on the readability of sections of financial reports and the tone in financial reports. Inger et al. (2018) find the impact of tax avoidance on the readability of tax footnotes. Campbell et al. (2014) introduce tax risk-related words. Campbell et al. (2019) further enrich their tax-related words, but they do not investigate the implications of tax avoidance by tax-related words. Meanwhile, their word lists mainly focus on the tax risk directly disclosed in the 10-Ks, rather than aimed to detect potential tax avoidance. Their word lists are short and can be avoided by firms easily. If the firms do not disclose the risks voluntarily, simply capturing the words in their wordlists is not likely to find any information related to tax avoidance. Law and Mills (2015) find the relationship between taxes and financial constraints using negative words in Fin-Neg developed by Loughran and McDonald (2011). However, even though modified to suit the accounting and finance context, the word lists they use may not be precise in the tax context. In Fin-Neg, they exclude six words that are *tax, costs, capital, cost, expense,* and *expenses*. Interestingly, all these words are closely related to tax. If I directly use Fin-Neg, I might lose a large amount of information related to tax. Words like *tax, cost, liability, depreciation,* and *foreign* are not defined as negative tones in the finance context. Still, in the tax avoidance context, these words are likely to provide more indicators of the aggressiveness of tax avoidance. For example, assuming the qualities of disclosure of all firms are the same if one firm's annual report with high raw word counts of the word, 'foreign', it is more likely that this firm may engage in more foreign operations. Ultimately the likelihood of tax shelters will increase, which can drive the notice of investors and tax authorities. Allen et al. (2020) is the first paper focusing on the relationship between tax-specific-based textual analysis and tax avoidance. This is the only concurrent study that resembles a similarity to mine. They develop tax-specific dictionaries and test them in tax-

related discussions in 10-Ks. They find these tax-specific dictionaries can be used to indicate tax avoidance measured by *ETRs*. Allen et al. (2020) consider words or phrases such as *tax court* or *penalty* in their dictionaries. To use these words to predict *ETR* is more problematic and less informative because these words indicate the tax avoidance activities which already happen. This is a posteriori method and is more likely to conclude tax avoidance rather than detection. For example, firms would disclose more words such as tax court or penalty when they are in tax lawsuits that may be related to their tax avoidance activities several years ago[52]. Thus, we cannot detect tax avoidance based on this logic.

2.2 FIRM'S ABILITY TO AVOID TAXES

Before my paper, there is limited paper introducing the concept of a firm's ability to avoid taxes. Most papers focus on the managerial ability on tax avoidance (Koester et al. 2017; Khurana et al. 2018). Koester et al. (2017) assume that higher-ability executives have a better understanding of their firm's operating environment, enabling more alignment of tax strategies in business decisions. Managerial ability is an important factor to impact tax avoidance. My word list moves one step further to capture this firm's operating environment suitable for tax avoidance and business decisions that are potentially related to tax strategies, which I named as a firm's ability to avoid taxes. Moreover, suppose a firm does not have the prerequisite of tax avoidance, such as foreign operations for nonconforming tax avoidance and adequate selling expenses for conforming tax avoidance. In that case, the managerial ability will not contribute much to tax avoidance. Koester et al. (2017) also discuss this alternative explanation of their findings of the effect of managerial ability. They use ROA to control the resources available for tax planning. However, ROA is more like a measure of profitability and cannot capture the information of other resources such as foreign operations. It is still a mist whether managerial ability impacts tax avoidance or simply because large firms and large firms usually hire these highly-ability managers with more resources and opportunities for tax avoidance. Thus, a firm's ability to engage in tax avoidance would be a very important factor when trying to reveal the determinants of tax avoidance.

Dyreng et al. (2008) could be the first paper to introduce the concept of a firm's ability to avoid taxes. They define tax avoidance as the ability to sustain a cash effective tax rate. They find that firms with large size, incorporations in tax havens, a high ratio of property, plant, and equipment to assets, more intangibles, and higher leverage are more able to engage in long-run tax avoidance. Many other papers discuss the tax strategies or the specific firm characteristics that can lead to tax strategies and impact tax avoidance behaviors. Rego (2003) finds that profitable firms have more resources for tax planning. However, this paper does not

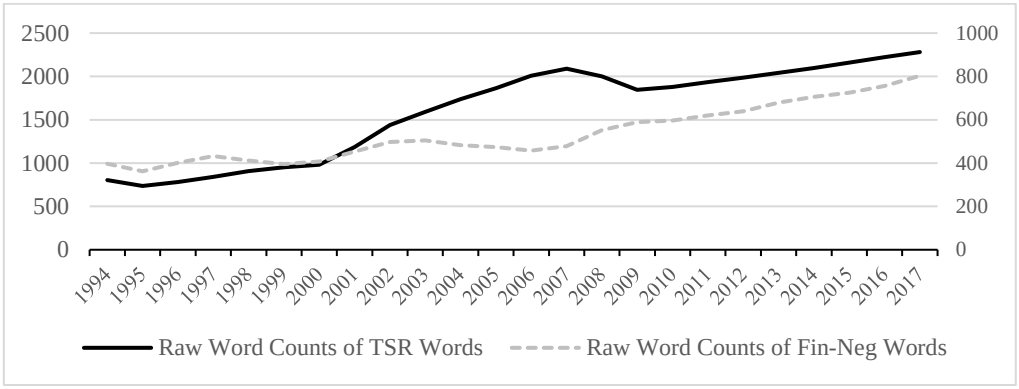
52 This is very common as shown in the legal cases in Table 4.11.

specify the resources. Graham and Tucker (2006), Wilson (2009), Badertscher et al. (2019) summarize different types of tax strategies, including both conforming and nonconforming. These tax strategies require the firms to have the ability to have some specific transactions, for example, lease or foreign sales. For instance, if I find a firm with more discussion related to these transactions or the corresponding tax consequences, I would expect these firms to have a stronger ability to avoid taxes in these strategies. Specifically, several papers discuss different tax strategies in detail. Scholes et al. (1992) identify how firms shift income through selling, general, administrative expenses in the Tax Reform Act of 1986. Cheng et al. (2021) find a strong association between patents and tax planning in multinational firms, shifting domestic income to low-tax countries. Reese (1998) obtains evidence that firms delay the sales of appreciated assets to increase after-tax returns. Erickson (1998) and Erel et al. (2012) find the firms consider the tax consequences of cross-border mergers and acquisitions and use these activities to create tax shields. Zechman (2010) finds that managers of cash-constrained firms are more likely to use synthetic leases, which are tax favorable. However, these firms are less likely to disclose these lease contracts' existence and financial consequences voluntarily. In addition, Graham et al. (1998) also find a negative association between operating leases and tax rates. Kempe (1992) discusses the practical use of the recurring item for tax shelter purposes. Eichfeder et al. (2018) investigate the tax-motivated cost allocation within groups in a formula apportionment tax regime. Klassen et al. (2004) find that the level of R&D expenditure decisions is associated with the tax incentives compared to the U.S. and Canada. Baldenius et al. (2004) provide a framework for optimal intracompany discounts (transfer pricing) considering tax savings due to different divisional tax rates. Hope et al. (2013) examine the relation between tax avoidance and disclosure of geographic earnings and find that after implementing Schedule M-3 in the annual tax filing in 2004, the relation between these two variables reduces. This indicates that firms after 2004 are less able to mask their tax avoidance.

I combine the findings of these papers and use textual analysis to capture the overall tax avoidance ability of firms. I assume that if a firm has a higher raw count of TSR words, then it would have a higher propensity to engage in tax avoidance because it has more tax strategies (resources) to choose. From another perspective, if tax avoidance is identified as a performance measure of tax departments (Robinson et al. 2010; Armstrong 2012), according to the incomplete revelation hypothesis (Bloomfield 2002), managers have the incentive to signal their good tax performance by more disclosure of TSR information in addition to the quantitative information. My formal hypothesis, stated in the alternative, is:

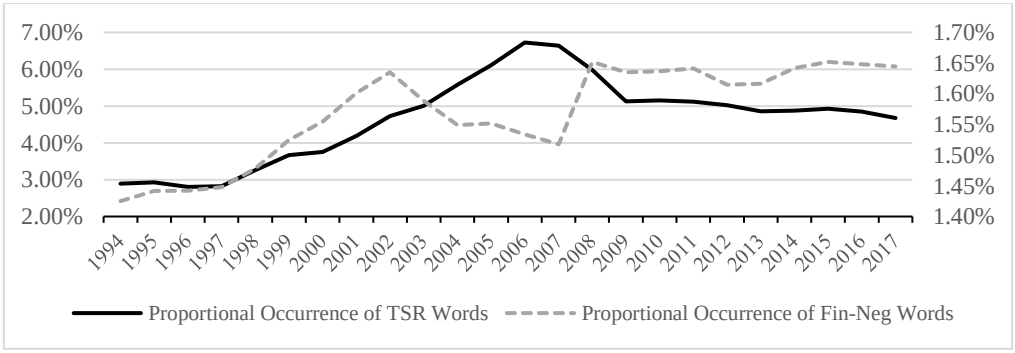
H1: The level of tax avoidance of a firm increases when the firm's ability to avoid taxes measured by the raw word counts of TSR words increases.

FIGURE 4.1 *Trend in TSR and Fin-Neg Words Over Time*



This figure presents the changes of average TSR words and Fin-Neg words during the sample period from 1994 to 2017 based on a sample of 171,435 firm-year observations.

FIGURE 4.2 *Proportional Occurrence of TSR Words and Fin-Neg Words*



This figure presents the changes of proportional occurrence of TSR words and Fin-Neg words in 10-Ks during the sample period from 1994 to 2017 based on a sample of 171,435 firm-year observations.

3. TSR Word Lists

3.1 DATA AND PARSING PROCESS

I downloaded all 10-Ks and 10-K405s and excluded 10-K/A from EDGAR from 1994 to 2016. I require the total number of words in 10-K larger than 2000 (Loughran and McDonald 2011). This yields a large sample of 171,435 10-Ks of 17,469 firms. The detailed parsing process is in Appendix 4.1. I exclude 10-K tables and exhibits, which are more likely to contain template language. To exclude these items, I can further reduce the noise of the template when I generate the TSR words.

3.2 DEVELOPMENT OF WORD LISTS

As the lack of established tax-related dictionaries, the prior studies use word lists such as the Harvard Dictionary or Fin-Neg (Loughran and McDonald 2011). However, both word lists are not suitable for tax avoidance research if I want to capture tax information directly. In this

section, I develop a new word list containing TSR words. Prior literature finds different strategies of tax avoidance based on quantitative information. I assume that textual information can also capture or reflect these strategies. There are two strategies to develop the word lists. First, machine learning can be applied to let the data determine the most potent words by itself. However, the current quantitative measures to assess tax avoidance are not solid. Using these measures to set a standard to identify tax avoiders is not valid. Meanwhile, machine learning results also lack causal representations of the words included (Scholkopf et al. 2021). More seriously, machine learning would develop a relatively small number of words. Managers can easily avoid them if they know the word list can expose them to tax avoidance detection. The second strategy I use in this paper is to find a more extensive word list starting from the tax strategies used by firms to avoid tax. This method presents a clearer causality to explain why the word counts of certain words increase[53]. I select the TSR words[54] based on the findings of tax strategies in prior literature. I assume that these TSR words reveal a firm's ability to use corresponding tax strategies. If a firm has a high raw word count of TSR words, it has stronger ability of tax planning. Even though I do not know whether they use them or not, I can predict whether managers have a higher propensity to avoid taxes to maximize the value of shareholders or their interests. The word classification, examples of words, and corresponding references are presented in TABLE 4.1. The complete word list is in Appendix 4.2.

3.3 EXAMINING THE COMPOSITION OF TSR WORD LIST

TABLE 4.2 indicates the 30 most frequent words under the Fin-Neg and my word list. The check mark indicates whether the TSR words (Fin-Neg words) are in Fin-Neg (TSR words). The Fin-Neg word list only has three words, *loss*, *losses,* and *impairment,* in the 30 most common words of TSR. This demonstrates that my word list is considerably different from Fin-Neg. FIGURE 4.1 and FIGURE 4.2 compare the raw counts and proportional occurrence of TSR words and Fin-Neg from 1994 to 2017. The raw word counts of both TSR and Fin-Neg words increase substantially, more than doubled from 1994 to 2004. The impact of disclosure requirements such as the Sarbanes and Oxley Act is significant (Dyer et al. 2017). The increasing trend tends to be much slower after 2005 as fewer new disclosure requirements are introduced. The increase of TSR words after 2005 would be more related to the change of the economic fundamentals of firms. The proportional occurrences of these words in 10-Ks also increase markedly from 1994 to 2002. Afterward, the pattern is not regular as the denominator; total words in 10-Ks are also rising due to other disclosure requirements such as internal control not related to these words.

[53] Appendix 4.5 illustrates the causality in more details using real legal cases.
[54] The classification of words considers inflections and different forms of the same words. For example, when I consider *accelerate*, a tax-related word, I also include the words such as *accelerated*, *accelerating*, *acceleration*.

Compared to the word lists of Campbell et al. (2019), my word list is more comprehensive, and most of Campbell et al.'s (2019) words are not shown with high frequencies in my result. Referring to the dictionaries of Allen et al. (2020), their dictionaries mainly focus on the collections of phrases. Their sample's top three frequent words and phrases are *tax benefit*, *tax credit*, *net operating loss* in EXPPOS, and *interest*, *penalties*, *examination* in EXPNEG. Except for the word, *interest* which is the third frequent word in my dictionary, the other words or phrases are different. Their dictionaries, as discussed, are related to the tax planning already captured by tax authorities. For example, words like penalties or examination in the tax discussion section are very likely relevant to tax avoidance cases[55].

3.4 TEXTUAL MEASURE USING TSR WORDS

Most recent papers use proportional occurrence measures to normalize term unique word counts, especially when measuring tone (Jiang et al. 2019; Campbell et al. 2020). The proportional occurrence is suitable when measuring the tone of a corporate filing, as the tone is a relative concept. However, this is not suitable in my case. For example, some firms might have comparatively large 10-Ks due to some special events they have to disclose[56]. Their disclosure of the raw counts of TSR words may not differ mainly from other firms because of the similar firm characteristics and tax-related business activities which are required to be disclosed in 10-Ks. If I use proportional occurrence rather than the raw counts of TSR words, I will underestimate this firm's ability to avoid taxes. Thus, a firm's ability is more like an absolute concept. Moreover, referring to FIGURE 2, the proportion of TSR words in total words of 10-Ks goes up and down during the sample period. However, it is impossible to find a significant decrease in a firm's ability, further indicating the inappropriateness of using proportional occurrence. Thus, I measure a firm's ability to avoid taxes based on the raw counts of tax words with a simple log transformation to normalize it (Chisholm and Kolda 1999; Li 2006; Loughran and McDonald 2019). The measure named *TAX_ABILITY* is as follows:

$$TAX\_ABILITY = Log\,(Raw\ Counts\ of\ TSR\ Words) \quad (1)$$

[55] From their EXPNEG, they also include words and phrases like *litigation*, *tax audits*, *tax court*, *us tax court*. All these are related to the tax avoidance already captured by tax authorities. Then, their dictionaries would be meaningless to be used by tax authorities to detect tax avoidance in advance.

[56] I exclude exhibits in 10-Ks, which largely reduce the possibility that the large raw counts of words are due to the itemization of information such as leases and subsidiaries.

TABLE 4.1 *Word Classification*

Tax Strategies Available	Examples	References[a]
Panel A: Conforming Tax Avoidance		
Timing of discretionary expense recognition	research, patent, advertising, selling, general, administrative, expenditure, expense, cost, income, sales, value, payment, employee, compensation	Scholes et al. (1992); Graham (2003); Badertscher et al. (2019); Cheng et al. (2021)
Timing of losses recognized on the sale of assets	sales, loss, income, investment, disposal, value	Reese (1998) Badertscher et al. (2019)
Timing of restructuring charges recognized	restructure, acquisition, merger, value, interest	Erickson (1998); Erel et al. (2012); Badertscher et al. (2019)
Losses related to sale-and-leasebacks transactions	leaseback, lease, leasehold, sale-lease, leasing	Graham et al. (1998); Zechman (2009)； Badertscher et al. (2019)
Prepayment of financing costs	prepayment, financing, interest	Isin (2018); Badertscher et al. (2019)
Recurring item exceptions	accrued, revenue, expense	Kempke (1992) Badertscher et al. (2019)
Panel B: Nonconforming Tax Avoidance		
Group relief	group, relief, branch, geographic, subsidiary, profit, interest	Eichfelder et al. (2018)
Capital allowances	depreciation, impairment, allowance, cost, value, amortization	Reese (1998); House et al. (2008)
Research and development	research, capitalize, cost, value	Klassen et al. (2004)
Finance leases	lease, leasing, leasehold, cost	Graham et al. (1998); Graham and Tucker (2006); Wilson (2009)
Foreign income (transfer pricing, cross-border dividend capture)	foreign, currency, haven, income shift, jurisdiction, repatriate, tax, income	Baldenius et al. (2004); Graham and Tucker (2006); Wilson (2009); Hope et al. (2013); Campbell et al. (2019).
Loss carried forward	loss, carryforward, tax	Graham and Tucker (2006); Wilson (2009)
Corporate-owned life insurance deal	insurance	Graham and Tucker (2006); Wilson (2009)
Contingent-payment installment sales	installment, deductions, sales	Graham and Tucker (2006); Wilson (2009)
Panel C: Other Words		
Other words related to tax strategies	tax, deductible, transactions	Wilson (2009); Lisowsky e t al. (2013); Campbell et al. (2019)

This table presents the TSR words collected based on common tax avoidance strategies related to conforming tax avoidance or nonconforming tax avoidance. The strategies are summarized based on the studies of Badertscher (2019) and Graham and Tucker (2006). The complete wordlists are in Appendix 4.2.

[a] These are the prior studies discussing different tax strategies commonly used by firms.

TABLE 4.2 *Thirty Most Frequent Words Occurring in 10-Ks from TSR Words and Fin-Neg*

Word in Fin-Neg	Word	% of Total Tax Word Count	Cumulative %	Word in TSR	Word	% of Total Fin-Neg Word Count	Cumulative %
	income	5.68%	5.68%	√	Loss	8.56%	8.56%
	value	5.52%	11.20%	√	losses	5.95%	14.51%
	interest	4.45%	15.65%	√	impairment	5.48%	19.99%
	tax	4.08%	19.74%		adverse	4.03%	24.02%
	sales	2.51%	22.24%		adversely	4.02%	28.03%
	cost	2.12%	24.36%		against	2.92%	30.96%
	costs	2.12%	26.48%		claims	2.85%	33.81%
	expense	1.98%	28.46%		failure	1.79%	35.60%
	liabilities	1.85%	30.32%		restated	1.75%	37.35%
	debt	1.77%	32.09%		unable	1.72%	39.08%
	foreign	1.64%	33.73%	√	litigation	1.49%	40.56%
√	loss	1.37%	35.10%		closing	1.33%	41.89%
	outstanding	1.36%	36.46%	√	termination	1.29%	43.18%
	expenses	1.36%	37.82%		negative	1.22%	44.40%
	employee	1.24%	39.06%	√	discontinued	1.22%	45.62%
	revenue	1.23%	40.29%		decline	1.17%	46.79%
√	losses	1.23%	41.51%		negatively	1.07%	47.86%
	taxes	1.15%	42.67%	√	restructuring	1.04%	48.90%
	decrease	1.08%	43.75%		limitations	0.97%	49.87%
√	impairment	1.00%	44.75%	√	impaired	0.96%	50.82%
	subsidiaries	0.96%	45.71%		default	0.91%	51.74%
	liability	0.95%	46.66%		critical	0.87%	52.61%
	currency	0.92%	47.58%		penalties	0.85%	53.46%
	revenues	0.83%	48.41%		fail	0.83%	54.29%
	valuation	0.83%	49.24%		difficult	0.78%	55.07%
	payments	0.78%	50.02%	√	damage	0.70%	55.77%
	employees	0.73%	50.76%		delay	0.67%	56.44%
	acquisition	0.73%	51.49%		delays	0.67%	57.11%
	transactions	0.73%	52.21%		harm	0.65%	57.76%
	amortization	0.72%	52.93%		inability	0.63%	58.40%

The Fin-Neg word list is developed by Loughran and McDonald (2011). The Tax-Risk word list includes all the TSR words under different tax avoidance strategies and TSR disclosure requirements in the entire sample of 10-Ks from 1994 to 2016. The full word lists are available in Appendix 4.2. My word list consists of 208 words, including inflections. Fin-Neg includes 2,337 words, including inflections.

4. Firm's Ability and Tax Avoidance

To validate the explanatory power of TSR words on capturing tax avoidance, the first test I use is to examine the association between *TAX_ABILITY* and tax avoidance measured by traditional tax avoidance measures.

4.1 SAMPLE AND RESEARCH DESIGN

The sample period used is from 2004 to 2016. This is a period after Sarbanes-Oxley (SOX) Act in 2003 and before the Tax Cuts and Job Act (TCJA) in 2017[57]. I choose this sample period based on two reasons. First, the SOX Act regularizes the financial disclosures, likely making 10-Ks lengthier and more informative than pre-act decades. Second, the TCJA reduces the tax rates vastly. This would add noise to the measure of tax avoidance and the textual information related to tax. As shown in FIGURE 1, the raw word counts of TSR words are stable during this period at an average of around 2000 words[58]. This sample period selection excludes the possibility that my word counts simply present the increased disclosure requirement. I include all the firms in Compustat. I also require the 10-K documents with a word length of more than 2,000 (Loughran and McDonald 2011). I merge this sample with the other data required in my research design.

To test H1, I estimate the following baseline regression of three-year average cash *ETR* on the raw counts of TSR words after a log transformation:

$$CASH\_ETR\_3Y_{it}=\beta_0+\beta_1 TAX\_ABILITY_{it}+\beta_2 Control_{it} + Fixed\ Effects+\varepsilon_{it} . \quad (2)$$

I use the long-run (three-year) average cash *ETR* to measure tax avoidance for the following reasons. First, as identified by Dyreng et al. (2008), this measure overcomes the limitations of GAAP *ETR*[59]. Second, it adjusts tax payments and refunds that happened years ago. Third, a firm's ability to avoid taxes would impact the firm's tax avoidance in long

[57] After Sarbanes- Oxley Act (SOX) in 2002, firms are required to disclose more detailed information in 10-Ks, especially in MD&A. SOX is effective for accelerated filers for fiscal years ending on or after November 15, 2004. The samples after 2004 would then have the same disclosure requirement, which provides a stable benchmark to compare. Moreover, after 2004, there are more compulsory disclosure requirements issued. For example, the Schedule M-3 issued in 2004 requires firms to disclose information of specific foreign entities that are included in consolidated income but not in taxable income. As shown in FIGURE 4.1, I do find a sharp increase of TSR words after SOX in an extended sample, especially after 2004. In 2017, President Trump officially signed the Tax Cuts and Job Act (TCJA) into law. TCJA is another large tax reform after the Tax Reform Act of 1986 (TRA86). This major event would result in abnormal increase of tax-related words around 2017. Meanwhile, it will also impact a firm's tax avoidance behavior with an expectation that tax rates would be reduced. Even though there is no well-established literature focusing on the impact of TCJA on tax avoidance, prior literature finds that firms reacted in various ways in response to the enforcement of TRA86 (Guenther 1994; Maydew 1997). Thus, I only include the tax years before 2016 to eliminate the abnormal impacts of TCJA.

[58] This is consistent with the findings of Dyer et al. (2017) that the disclosure of business and property description and compliance with SEC & Accounting standards remains stable after a dramatic increase in 2004.

[59] For example, *GAAP_ETR* cannot capture deferred taxes changes because it mixes deferred and current taxes together.

horizons. It is unlikely that this ability would be one-time in just one year[60]. Fourth, because the future tax avoidance is less likely to impact the current innate firm characteristics, this long-run measure as a metric of tax avoidance for the following three years would largely address the endogenous concern that tax avoidance would adversely impact a firm's ability. The measure of *CASH_ETR_3Y* is:

$$CASH\_ETR\_3Y_{\,i} = \frac{\sum_{t=1}^{3} Cash\ Tax\ Paid_{it}}{\sum_{t=1}^{3} (Pretax\ Income_{it} - Special\ Items_{it})}. \quad (3)$$

I include a battery of control variables for the various factors that would confound the relationship between *TAX_ABILITY* and *CASH_ETR_3Y*, according to the prior literature (Dyreng et al. 2010; Law and Mills 2015; Inger et al. 2018). The more variables I include in controls, the less variation I leave for the TSR words to reveal tax avoidance behavior. Specifically, I use size (*SIZE*) and percentage change in sales (*ΔSALES*) to control firm size and growth opportunity. I use cash holdings (*CASH*) to control firms' incentives to avoid taxes. I use leverage (*LEV*), Intangible to total assets (*INTANG*), property, plant and equipment to total assets (*GROSSPPE*), research and development (*RD*) to control for book and tax reporting environments. I use foreign sales (*FOREIGN*), capital expenditures (*CAPEXP*), return on equity (*ROE*), equity earnings (*EIEA*), net operating loss (*NOL*), deferred revenue (*DEFREV*), advertising (*ADV*), selling, general, administrative expenses (*SGA*), and accumulated other comprehensive income (*OCI*) to control firms' operations and profitability [61]. These control variables also reduce the possibility that my word list simply reflects firms' characteristics that financial accounting figures can replace[62]. For example, variables such as *ADVERSTISING*, *RD*, and *INTANGIBLES* may already contain the information of my words such as *advertising*, *research*, *intangibles*. If this is the case, my words would be meaningless[63]. I include year and firm fixed effects to control for unobserved heterogeneity across years and industries. The year fixed effects control the macroeconomic changes. The firm fixed effects reduce the possibility that stationary firm characteristics affect both tax avoidance and *TAX_ABILITY*. Therefore, the coefficient on *TAX_ABILITY* can capture the firm-specific variation in the relation between a firm's ability and tax avoidance.

[60] Table 4.11 and Appendix 4.5 present the tax legal cases and discussion of some of them. I can find that most of these firms engaged in tax avoidance for more than one-year consecutive period.
[61] See Appendix 4.6 for variable definitions.
[62] Higgins (2013) finds that managers are more likely to disclose incremental tax-related information in 10-K, especially when the firm has greater foreign operations and special items.
[63] I regress *TAX_ABILITY* on the residual control variables with lagged *CASH_ETR*, firm and year fixed effect. I find that all the variables, except for *LEV*, *SGA* and *GROSSPPE*, have no significant association with *TAX_ABILITY* at 10% level. This indicates that *TAX_ABILITY* is not simply a conclusion of firm fundamental characteristics measured by quantitative information.

4.2 SUMMARY STATISTICS

TABLE 4.3 presents descriptive statistics of variables. The summary of variables is consistent with the prior literature (Dyreng et al. 2010; Law and Mills 2015; Inger et al. 2018; Badertscher et al. 2019). FIGURE 4.3 plots the distribution of TSR words and *TAX_ABILITY*. Both distributions are approximately normal. TABLE 4.3 also shows the univariate correlations between *TAX_ABILITY* and other variables in the last column. Its correlations with five different tax avoidance measures (*CASH_ETR_3Y*, *TTA*, *CASH_ETR_1Y*, *GAAP_ETR*, *UTB*) are significant at a 0.1% level with the expected signs in H1. *TAX_ABILITY* is also significantly correlated with all the other control variables at the 1% significant level, but all the correlation coefficients are less than 0.200[64], except for *SIZE*, *LEV*, and *OCI*. Mainly, *TAX_ABILITY* is significantly and positively correlated with a firm's size. Large firms would naturally have more resources for tax planning. This also indicates that my measure has the power to capture a firm's ability to avoid taxes based on firm resources.

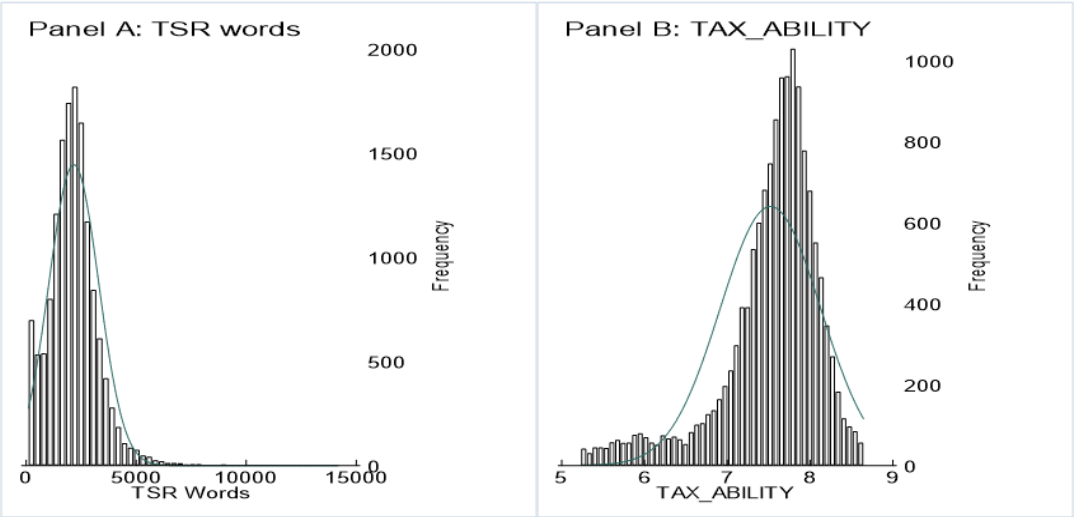
TABLE 4.3 *Descriptive Statistics*

Variables	n	Mean	Std. Dev.	p25	Median	p75	Corr.
TAX_ABILITY	10,321	7.551	.581	7.349	7.666	7.913	1.00
CASH_ETR_3Y	10,321	.224	.142	.116	.235	.32	**-0.17**
TTA	28,492	.017	.024	.001	.006	.024	**-0.05**
CASH_ETR_1Y	19,266	.235	.167	.099	.234	.336	**-0.06**
GAAP_ETR	19,147	.27	.143	.192	.302	.362	**-0.13**
UTB	6,363	.011	.042	.001	.005	.012	**0.22**
CONFORM_TAX	23,346	.0002	.016	-.007	-0.0005	.003	-0.00
SIZE	10,321	5.953	2.127	4.435	6.005	7.47	**0.45**
NOL	10,321	.44	.496	0	0	1	**0.07**
FOREIGN	10,321	.01	.034	0	0	.005	**0.13**
CAPEXP	10,321	.044	.062	.006	.023	.055	**-0.02**
EIEA	10,321	.01	.058	0	0	0	**0.10**
LEV	10,321	.209	.245	.026	.144	.31	**0.25**
DEFREV	10,321	.402	.49	0	0	1	**0.08**
ROE	10,321	.09	.625	-.008	.128	.245	0.01
OCI	10,321	.014	.027	0	.002	.013	**0.22**
RD	10,321	.106	.592	0	0	.034	**-0.06**
ADV	10,321	.01	.022	0	0	.01	**-0.03**
SGA	10,321	.325	.544	.097	.238	.389	**-0.13**
ΔSALES	10,321	.126	.369	-.028	.068	.193	**-0.02**
CASH	10,321	.177	.198	.033	.095	.25	**-0.12**
INTANG	10,321	.148	.189	.004	.053	.24	**0.20**
GROSSPPE	10,321	.39	.398	.062	.26	.621	**-0.06**

This table presents the descriptive statistics of the variables used in Equation 1. All sample firms must have 10-K filings with at least 2,000 words, 100 TSR words, and non-missing corresponding firm characteristics from Compustat. The sample period runs from 2004 to 2016. Correlation (Corr.) reports Spearman's correlation with *TAX_ABILITY*. Correlation coefficients in bold are significant at the 0.001 level or better (two-tailed t-test). All Continuous variables winsorized at the 1st and 99th percentiles. All variables are as defined in Appendix 4.6.

[64] I test multi-collinearity issues by using VIF. The VIF is around 2, less than 10 as suggested by Hair et al. (1995).

FIGURE 4.3 *Distribution of TSR Words and TAX_ABILITY*



Panel A and Panel B show the unique word counts distribution of TSR words and *TAX_ABILITY* across all firm years in the sample.

4.3 MAIN RESULTS

TABLE 4.4 reports baseline regression results for *CASH_ETR_3Y*. *TAX_ABILITY* is negatively and significantly associated with *CASH_ETR_3Y*. To better interpret this result, I calculate the standardized coefficient on *TAX_ABILITY*. The standardized coefficient is 0.065. The economic effect is meaningful, and the magnitude is significant. All else equal, a one standard deviation increase of *TAX_ABILITY* is associated with a decrease in *CASH_ETR_3Y* by 6.5% of the standard deviation of *CASH_ETR_3Y*. The explanatory power of *TAX_ABILTY* is ranked as the second determinant after *SIZE*. In Column 2, the dependent and independent variables are averaged over the period t through t +2 so that all the variables are measured contemporaneously. The results are similar but less significant. For example, it is reasonable that many firms would disclose their new business operations such as new leases, new foreign operations, or new mergers in detail in the same year while less in the following years. Thus, the average *TAX_ABILITY* would be smaller than *TAX_ABILITY* at t_0. To further reduce the noise in measurement, in Column 3, I convert *TAX_ABILITY* to a *QUINTILE SCORE* (from 1 to 5). My results still hold.

TABLE 4.4 *Test of the Relationship between Firm Ability and Long Run Tax avoidance*

	Dependent Variable: *CASH_ETR_3Y*		
Independent Variables	(1)	(2)	(3)
TAX_ABILITY	-0.016***	-0.012**	
	(-3.01)	(-1.94)	
QUINTILE SCORE			-0.005**
			(-2.26)
SIZE	0.020***	0.031***	0.020***
	(5.00)	(6.10)	(5.01)
NOL	-0.004	0.008	-0.004
	(-0.82)	(1.28)	(-0.82)
FOREIGN	0.016	0.044	0.017
	(0.26)	(0.45)	(0.28)
CAPEXP	-0.092***	-0.108**	-0.094***
	(-2.65)	(-2.33)	(-2.72)
EIEA	-0.051	-0.053	-0.051
	(-1.49)	(-0.97)	(-1.49)
LEV	0.011	0.021	0.011
	(0.59)	(0.90)	(0.62)
DEFREV	0.006	0.005	0.007
	(1.08)	(0.55)	(1.15)
ROE	0.004	0.007	0.004
	(1.24)	(1.62)	(1.24)
OCI	-0.160*	0.163	-0.156*
	(-1.70)	(1.43)	(-1.66)
RD	-0.249	-0.307	-0.247
	(-0.86)	(-1.14)	(-0.86)
ADV	-0.090	-0.196	-0.091
	(-0.48)	(-0.83)	(-0.49)
SGA	-0.112	0.047	-0.111
	(-1.33)	(0.27)	(-1.32)
ΔSALES	-0.016***	0.009	-0.015***
	(-2.79)	(1.09)	(-2.76)
CASH	-0.049**	0.004	-0.048**
	(-2.14)	(0.13)	(-2.11)
INTANG	0.013	0.044	0.015
	(0.47)	(1.16)	(0.53)
GROSSPPE	-0.039*	0.006	-0.037
	(-1.69)	(0.19)	(-1.62)
CONSTANT	0.283***	0.104	0.178***
	(5.76)	(1.44)	(5.16)
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Observations	10,072	8084	10,072
Adjusted-R^2	0.683	0.711	0.682

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the regression results of equation (2). The sample period runs from 2004 to 2016. Column (2) shows the dependent and independent variables are averaged over the period t through t +2. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

4.4 ALTERNATIVE PROXIES FOR TAX AVOIDANCE

I use other measures of tax avoidance to replicate the baseline regression to include more tax avoidance information *CASH_ETR_3Y* cannot capture. Specifically, I first use a young measure, *TTA*, a ratio of cash taxes paid to lagged total assets (Badertscher et al. 2019). This measure has two merits. First, it can capture complete tax avoidance, including both conforming and nonconforming tax avoidance [65](Badertscher et al. 2019). The denominator of this measure is the lagged total asset which is unchanged under conforming tax avoidance. As my word lists capture a firm's innate ability to avoid taxes based on both conforming and nonconforming tax strategies, *TAX_ABILITY* is expected to be more significant when predicting this measure compared to the traditional measures such as *ETRs* and *BTD*, which can only capture nonconforming tax avoidance (Hanlon and Heitzman 2010). Second, I can include the information of loss firms as the denominator in this ratio is usually positive (Henry and Sansing 2014). In addition, I use another three nonconforming tax avoidance measures, one-year Cash *ETR* (*CASH_ETR_1Y*), one-year GAAP *ETR* (*GAAP_ETR*), and unrecognized tax benefit (*UTB*). *CASH_ETR_1Y* is income taxes paid divided by pretax income minus special items (Dyreng et al. 2008). It can capture permanent and temporary tax deferral strategies. *GAAP_ETR* is income tax expense divided by pretax income minus special items. Armstrong et al. (2012) find that *GAAP_ETR* is an important metric for the tax departments. One of my assumptions in this paper is that if a firm can avoid taxes, taking tax departments as profit centers, firms would engage in more aggressive tax avoidance. In addition to reducing tax expense for financial accounting purposes (Dyreng et al. 2010), I predict that firms would use their ability to avoid taxes to impact their *GAAP_ETR*. *UTB* is the unrecognized tax benefit required to disclose by FIN 48, which can capture nonconforming and some conforming tax avoidance (Hanlon and Heitzman 2010). I also use a newly developed conforming tax avoidance measure, *CONFORM_TAX*, to purely capture conforming tax avoidance (Badertscher et al. 2019). The results in TABLE 4.5 present that the pattern between *TAX_ABILITY* and tax avoidance still holds in these five tax avoidance measures. One difference is that my findings are only robust in *UTB* if industry fixed effect instead of firm fixed effect is controlled. In addition, Bozanic et al. (2017) find that firms increased their tax-related disclosure after FIN 48 was issued in 2007. I exclude the sample before 2007 and find that my results still hold after FIN 48.

[65] In Badertscher et al. (2019), they develop a pure conforming tax avoidance by extracting *BTD* (a nonconforming tax avoidance measure) from *TTA*. They assume that *TTA* can capture both conforming and nonconforming tax avoidance

TABLE 4.5 *Test of the Relationship of TAX_ABILITY with Different Quantitative Measures*

	Dependent Variables:				
	TTA	*CASH_ETR_1Y*	*GAAP_ETR*	*UTB*	*CONFORM_TAX*
Independent Variables	(1)	(2)	(3)	(4)	(5)
TAX_ABILITY	-0.002***	-0.004**	-0.007**	0.001**	-0.000**
	(-5.35)	(-2.40)	(-2.38)	(2.01)	(-2.33)
SIZE	0.004***	0.005	0.015***	0.000	0.002***
	(15.36)	(1.23)	(5.60)	(0.19)	(8.07)
NOL	-0.002***	-0.015***	-0.007*	0.003**	0.003***
	(-4.70)	(-3.16)	(-1.93)	(2.06)	(6.48)
FOREIGN	0.025***	-0.106	-0.175**	0.036***	-0.002
	(4.62)	(-1.57)	(-2.46)	(2.74)	(-0.38)
CAPEXP	0.024***	-0.059	-0.039	-0.035***	0.008**
	(6.60)	(-1.57)	(-1.25)	(-3.16)	(2.54)
EIEA	-0.005**	-0.022	-0.035	-0.008*	-0.005*
	(-2.17)	(-0.62)	(-1.34)	(-1.85)	(-1.88)
LEV	-0.007***	-0.018	-0.054***	0.005	-0.003**
	(-5.38)	(-0.95)	(-3.53)	(0.93)	(-2.49)
DEFREV	-0.000	0.010	-0.000	0.001	-0.000
	(-0.67)	(1.58)	(-0.06)	(0.55)	(-0.12)
ROE	0.002***	-0.020***	0.006**	-0.003*	0.001***
	(9.01)	(-3.14)	(2.19)	(-1.75)	(2.87)
OCI	-0.009	-0.168*	0.063	-0.007	-0.006
	(-1.00)	(-1.88)	(0.88)	(-0.56)	(-0.62)
RD	-0.000	0.764***	-0.034	-0.006*	0.000
	(-0.09)	(4.44)	(-0.38)	(-1.77)	(0.48)
ADV	-0.068***	-0.213	-0.033	-0.036	-0.005
	(-3.60)	(-0.95)	(-0.23)	(-1.08)	(-0.32)
SGA	-0.001***	-0.299***	-0.049*	0.007**	-0.000
	(-2.99)	(-5.82)	(-1.80)	(2.22)	(-0.08)
ΔSALES	0.001***	-0.078***	-0.016***	-0.004	0.001**
	(3.73)	(-9.82)	(-3.95)	(-1.37)	(2.40)
CASH	-0.001	-0.075***	-0.023	0.027***	-0.001
	(-0.39)	(-3.24)	(-1.17)	(2.76)	(-0.37)
INTANG	-0.011***	0.067**	0.004	-0.001	-0.010***
	(-4.75)	(2.50)	(0.21)	(-0.27)	(-4.42)
GROSSPPE	-0.004***	-0.005	0.002	0.004	-0.001
	(-2.95)	(-0.27)	(0.14)	(1.33)	(-0.60)
CONSTANT	0.010***	0.313***	0.273***	-0.004	-0.009***
	(3.37)	(9.11)	(8.79)	(-0.82)	(-4.56)
Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	NO	YES
Industry FE	NO	NO	NO	YES	NO
Observations	26,892	18,571	18,928	6,470	22,567
Adjusted-R^2	0.683	0.417	0.503	0.145	0.450

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the regression results of equation (2). The sample period runs from 2004 to 2016. I lose a large sample *UTB* due to its availability after 2007. The regression includes year and firm fixed effects (except for *UTB*). I also try to include firm fixed effects in *UTB* but find that around 80% of *UTB* can be explained by firm fixed effects. Industry Fixed Effects are fixed effects based on Fama–French 12 industry classifications. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

TABLE 4.6 *Tobit Regression*

	Dependent Variables:					
	CASH_ETR_3Y	*TTA*	*CASH_ETR_1Y*	*GAAP_ETR*	*UTB*	*CONFORM_TAX*
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
TAX_ABILITY	-0.013	-0.005***	-0.007***	-0.004***	0.001***	-0.001***
	(-8.58)	(-20.37)	(-5.10)	(-4.17)	(3.95)	(-6.87)
Controls	Identical to TABLE 4.4					
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	11,044	27,938	19,466	19,147	5,806	23,457
Chi^2	1,253.45	9,892.47	2,036.52	1,724.03	779.30	1,682.55
Prob >Chi^2	0.000	0.000	0.000	0.000	0.000	0.000

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table reports the standardized estimates from Tobit regressions where the left lower bound of each tax avoidance measure is set to zero. Chi^2-value are reported for all the regression models. The regression includes year and industry fixed effects. Industry Fixed Effects are fixed effects based on Fama–French 12 industry classifications. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

4.5 TOBIT REGRESSION

The number of zero in different traditional measures in TABLE 4.4 and 4.5 accounts for a large proportion of the total sample, which would result in biased results under OLS regressions. Thus, I conduct Tobit regressions to better fit the observations that report zero. TABLE 4.6 presents the results of Tobit regressions. It indicates stronger relationships between *TAX_ABILITY* and the six tax avoidance measures.

4.6 TAX_ABILITY EXPLAINS LONG-RUN CASH ETR INCREMENTAL TO TRADITIONAL MEASURES

I next consider whether *TAX_ABILITY* can detect the long-run tax avoidance incremental to traditional short-run tax avoidance measures. If the coefficients on *TAX_ABILITY* are not significant anymore after the inclusion of conventional tax avoidance measures on the right-hand side of Equation (2), simply using quantitative measures like ETRs, rather than linguistic cues would be adequate. To determine whether *TAX_ABILITY* can provide incremental information, I control for *CASH_ETR_1Y/GAAP_ETR /BTD* when estimating *CASH_ETR_3Y*. In TABLE 4.7, the coefficients on ETRs are significant, but the value is less than one. Dyreng et al. (2008) indicated that short-run ETRs are not good predictors of long-run cash ETR. *TAX_ABILITY* is still significant, providing incremental information to the long-run cash *ETR*.

TABLE 4.7 *Incremental Information Tests*

	Dependent Variables: *CASH_ETR_3Y*		
Independent Variables	(1)	(2)	(3)
CASH_ETR_1Y	0.267***		
	(23.85)		
GAAP_ETR		0.134***	
		(8.31)	
BTD			-0.051***
			(-4.04)
TAX_ABILITY	-0.013***	-0.015***	-0.016***
	(-3.16)	(-3.12)	(-3.10)
Constant		Identical to TABLE 4.4	
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Observations	9,672	9,382	10,050
Adjusted R-squared	0.753	0.685	0.683

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the regression results of equation (2) with the inclusion of CASH_ETR_1Y/GAAP_ETR /BTD. The sample period runs from 2004 to 2016. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

4.7 OTHER LINGUISTIC CUES

One of my fundamental assumptions is that I construct a unique dictionary to capture a firm's ability to avoid taxes. According to Law and Mills (2015), the use of negative words in Fin-Neg (Loughran and McDonald 2011) can reveal and predict tax avoidance. Other word lists might likely overlap my word list. Then my findings of the TSR words would not contribute anymore. Thus, I include various other linguistic measures based on different word lists constructed by Loughran and McDonald (2011) in the baseline regression. I include another seven linguistic measures, including the use of negative words in Fin-Neg (*NEGATIVE*), positive word (*POSITIVE*), uncertainty words (*UNCERTAINTY*), litigious words (*LITIGIOUS*), constraining words (*CONSTRAIN*), strong modal words (*STRONG*), negation words (*NEGATION*)[66]. TABLE 4.8 presents the regression results by adding these seven linguistic measures separately (from Column 1 to Column 7). *TAX_ABILITY* is still significantly and negatively related to *CASH_ETR_3Y* [67]. I also include *TAX_ABILITY* in Column 12 and exclude it in Column 13 to show that my results are not caused by collinearity between *TAX_ABILITY* and other linguistic measures. I find that there is no difference before

[66] The correlation coefficients between *TAX_ABILITY* and these 7 measures are less than 0.10 at 1% level. *TAX_ABILITY* is positively correlated with NEGATIVE and POSITIVE, indicating that my measure is not designed to capture the tone of firms.

[67] In Appendix 4.3, I also test the other tax avoidance measures. The results still hold.

or after dropping *TAX_ABILITY*. Overall, these findings indicate that the TSR words can provide incremental information to reveal and predict tax avoidance.

4.8 READABILITY

Firms engaged in tax avoidance may not disclose high raw word counts of TSR words. They can deliberately conceal the information related to tax avoidance activities or make the reporting content more difficult to read (Li 2008). The unique word counts of TSR words may be simply driven by managers' obfuscation and thus, could be replaced by the measure of readability. In this way, TSR words and readability can substitute for each other. Therefore, I include readability measures including Fog index (*FOG*), Flesch Reading Ease (*FLESCH*), Flesch-Kincaid Grade level (*KINCAID*), and total words of 10-Ks (*LENGTH*) in the baseline regression to control the total disclosure quality and further exclude the impact of obfuscation and readability. In addition, readability is a proxy of firm complexity in several accounting papers (You and Zhang 2009; Loughran and McDonald 2014). Including these measures of readability in the baseline regression would further address the concern that my measure substitutes firm complexity. Columns 8 to 11 in TABLE 4.8 present the regression results by including four readability measures. The coefficients on *TAX_ABILITY* are still negative and significant, indicating that disclosure readability or firm complexity is not an alternative explanation of my measure. The insignificant coefficient on *LENGTH* also suggests that my measure is not simply a proxy of the file size of firms. Firms with long files do not necessarily have more TSR words. I also replace *TAX_ABILITY* with *LENGTH* in the baseline regression but find that *LENGTH* has no explanatory power on tax avoidance.

TABLE 4.8 *Other Quantitative Measures and Long-Run Tax Avoidance*

	Dependent Variable: *CASH_ETR_3Y*												
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
TAX_ABILITY	-0.014***	-0.014**	-0.014**	-0.014**	-0.014**	-0.014**	-0.014**	-0.015***	-0.015***	-0.015***	-0.016***	-0.011***	
	(-2.66)	(-2.54)	(-2.54)	(-2.54)	(-2.54)	(-2.54)	(-2.53)	(-2.84)	(-2.84)	(-2.83)	(-3.02)	(-2.84)	
NEGATIVE	-1.849***											-2.340***	-2.331***
	(-3.00)											(-3.34)	(-3.31)
POSITIVE		0.263										0.259	-0.096
		(0.65)										(0.21)	(-0.08)
UNCERTAINTY			-0.085									-0.110	-0.085
			(-0.33)									(-0.13)	(-0.10)
LITIGIOUS				0.045								0.498	0.602*
				(0.65)								(1.59)	(1.91)
CONSTRAIN					0.010							-0.345	-0.518
					(0.05)							(-0.40)	(-0.60)
STRONG						0.148						0.383	0.374
						(0.34)						(0.41)	(0.41)
NEGATION							-1.711					-10.761*	-10.976**
							(-1.07)					(-1.91)	(-1.96)
FOG								0.003*				-0.027*	-0.030*
								(1.71)				(-1.82)	(-1.95)
FLESCH									-0.000**			0.004	0.010
									(-2.01)			(0.25)	(0.68)
KINCAID										0.002**		0.047	0.094
										(2.01)		(0.44)	(0.88)
LENGTH											0.002	0.003	-0.000
											(0.63)	(0.32)	(-0.06)
Controls	Identical to TABLE 4.4												
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,954	8,523	8,523	8,523	8,523	8,523	8,523	10,072	10,072	10,072	9,954	8,523	8,678
Adjusted-R^2	0.684	0.714	0.714	0.714	0.714	0.714	0.714	0.683	0.683	0.683	0.683	0.716	0.713

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table reports the regression results of the relation between other quantitative measures and tax avoidance. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

TABLE 4.9 *The Effect of Managerial Ability on the Relation between TAX_ABILITY and Tax Avoidance*

	Dependent Variable:			
	CASH_ETR_3Y		*CASH_ETR_1Y*	
Independent Variables	(1)	(2)	(3)	(4)
TAX_ABILITY	-0.019***	-0.018***	-0.008***	-0.008***
	(-4.70)	(-4.69)	(-3.17)	(-3.15)
*MASCORE*TAX_ABILITY*		0.01		0.006
		(0.35)		(0.29)
MASCORE	0.05**	-0.030	0.018	-0.030
	(2.25)	(-0.14)	(0.93)	(-0.18)
Controls	Identical to TABLE 4.4			
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Observations	7,279	7,279	12,744	12,744
Adjusted-R^2	0.141	0.141	0.090	0.090

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the regression results of baseline regression in TABLE 4.4 with the inclusion of management's ability (*MASCORE*) and the interaction term between *MASCORE* and *TAX_ABILITY*. The regression includes year and industry fixed effects. Industry Fixed Effects are fixed effects based on Fama–French 12 industry classifications. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

4.9 MANAGERIAL ABILITY

Following Koester et al. (2017), my findings may simply capture the relation between managerial ability and tax avoidance as higher-ability executives are more likely to create and utilize firm resources. In the baseline regression, I further include the managerial ability (*MASCORE*) developed in Demerjian et al. (2012) to capture the ability of managers to convert firm resources efficiently. I also include an interaction term between *MASCORE* and *TAX_ABILITY* to investigate whether managerial ability will impact the utilization of a firm's innate ability to avoid taxes. TABLE 4.9 reports the regression results with *MASCORE* and the interaction term. In Column (1), without the interaction terms, the coefficient on *TAX_ABILITY* is still negative and significant. The coefficient on *MASCORE* is negative but insignificant, which is not consistent with the findings of Koester et al. (2017). One explanation would be that if I consider more innate firm characteristics instead of ROA in their research, the effect of managers would be reduced. In Column (2), I find that the pattern between *TAX_ABILITY* and *CASH_ETR_3Y* still holds while the coefficient on the interaction term is negative but insignificant. This indicates that when firms with similar innate abilities to avoid taxes, one firm with higher managerial ability has no significant difference in utilizing the corporate resources to avoid taxes compared to another firm with lower managerial ability. The results are similar in Column (3) and Column (4) if I replace *CASH_ETR_3Y* with *CASH_ETR_1Y* as Koester et al. (2017) use in their research.

5. Extreme Values in Tax Avoidance Measures

To further test H1, I use the observations in tails of distributions of tax avoidance measures to investigate the explanatory power of *TAX_ABILITY* on extreme values. Most prior tax literature (Desai and Dharmapala 2006; Rego and Wilson 2012) uses pooled OLS regressions and excludes the extreme values of tax avoidance measures through winsorization or truncation[68], discarding observations beyond those cutoffs. However, if I simply cut the extreme values or influential observations to "manipulate" the regression[69], I may likely lose some incremental information or even obtain biased results, known as "data truncation bias" (Teoh and Zhang 2011; Henry and Sansing 2018). This issue is prevalent in a tax context where some extreme values are legitimate observations. In practice, most firms would have similar tax avoidance levels and revert to the mean. For example, the tax shelter firms may exist in the 1% left tail of *ETRs* distributions because *ETRs* are not the exact measures to capture the exact tax avoidance activities and can only indicate the propensity of tax avoidance and the potential extent of tax avoidance. Thus, finding the peak and skewed distributions with fat tails in tax avoidance measures[70] is common. Meanwhile, excluding the extreme values may exclude the most or least likely tax avoiders. The researchers should be most interested in the firms with the highest or lowest propensity of tax avoidance rather than the mean. If the tails are cut off arbitrarily, probably the most informative data are eliminated. Overall, the simple winsorization or truncation does not consider the unique characteristics of data or the nature of tax research questions (Kothari et al. 2005; Leone et al. 2019).

When considering the extreme values (quantiles) in tax avoidance distribution, prior literature obtains different results from the comparative research focusing on the mean (Armstrong et al. 2015; Chen et al. 2019; Leone et al. 2019). For example, Leone et al. (2019) replicate one tax study by Hanlon (2005). They consider all the values in the sample of temporary book-tax difference instead of using winsorization as Hanlon (2005) conducted, and they find significantly different results. They also recommend that robust regression outperform other methods such as winsorization, truncation, and influence diagnostics (Cook's Distance). However, studies using quantile regression or robust regressions cannot identify the extreme values separately. Quantile regressions provide a rough threshold to cut

[68] Admittedly, it is necessary to truncate or winsorize the tax avoidance measures such as *CASH_ETR* and *GAAP_ETR* due to the limitations of these measures. The use of income as the denominator in ETR calculation has a major drawback that *ETR*s will be difficult to interpret when the denominator is negative (Dunbar and Sansing 2002; Musumeci and Sansing 2014). A firm with negative *ETR* could be caused by a negative (positive) numerator, cash refund (cash taxes paid) divided by a positive (negative) denominator, profit (loss). Thus, researchers delete loss firms or truncate *ETR*s to [0,1]. In the following studies in this paper, I do not identify the extreme values of *ETR*s because the negative *ETR*s in the left tails of the distribution of *ETR*s are difficult to interpret.

[69] The results of OLS are sensitive to extreme values which affect OLS coefficients and standard errors.

[70] The kurtoses of the distributions of *CASH_ETR_3Y, TTA, GAAP_ETR,CASH_ETR_1Y, UTB* and *CONFORM_TAX* are larger than 3 in the sample used in the baseline regressions, indicating the heavy tails. This would arise the consideration to evaluate the information in tails, rather than the average effect.

the more likely or less likely tax avoiders. Robust regression efficiently deals with extreme value issues by down-weighting influential observations. However, researchers cannot identify the characteristics of the extreme value separately. Responding to this limitation of the prior accounting research, I apply a Monte Carlo simulation method inspired by De Vries (1991) and Longin and Solnik (2001) to identify the extreme values of the skewed distribution of two tax avoidance measures, *TTA* (Badertscher et al. 2019) and *UTB* (Gupta et al. 2014)[71].

5.1 EXTREME VALUES BASED ON OPTIMAL THRESHOLD LEVEL

To apply the Monte Carlo simulation method, I assume the distribution of tax avoidance measures is similar to the financial phenomenon like jumps defined as discontinuities and fluctuations in asset prices (Ati-Sahalia 2004; Lee and Mykland 2008). Although tax avoidance measures are not time-series data, the pattern of their distributions is similar to asset prices with heavy tails. Assuming most firms are not tax avoiders, they would have similar tax avoidance measures and are gathered around the mean of the distribution. The most aggressive or least aggressive tax avoiders would be the extreme values in the tails and exist like jumps in the entire distributions. Investigating the firms with jumps in the two tails of tax avoidance measures would provide incremental information to researchers to understand the determinants of tax avoidance. Based on this idea, there can be a cut-off point in the two tails of the distribution to capture the nontax avoiders and tax avoiders. Following De Vries (1991) and Longin and Solnik (2001), I use a Monte Carlo simulation to identify the threshold of extreme values in tails by optimizing the tradeoff between bias and inefficiency[72]. There would be a concern that if the entire distributions of measures along the sample period are treated as a whole, a particular year may have more extreme values, simply due to the macroeconomic factors. Thus, I split the sample period to each year and identify the extreme values in each year's distributions of tax avoidance measures. I then combine the extreme values in each year as a new sample containing most-likely tax avoiders and least-likely avoiders.

5.2 REGRESSIONS USING EXTREME VALUES

Using the samples of extreme values in *TTA* and *UTB*, I conduct logistic regressions with the same control variables in TABLE 4.4. I construct two dummy variables, *JUMP_TAXESPAID* and *JUMP_UTB*, based on the optimal threshold level instead of directly

[71] These two measures do not suffer the issues of negative income in *ETRs*. Both loss firms and profit firms are valid observations along the entire distributions of these measures.
[72] See Appendix 4.4 for detailed calculation of optimal threshold levels.

using the value of measures. Specifically, *JUMP_TAXESPAID* equals 1 (0) if the observation is below (beyond) the threshold of the left (right) tails in the distribution of *TTA*. *JUMP_UTB* equals 1 (0) if the observation is below (beyond) the threshold of the right (left) tails in the distribution of *UTB*. This treatment of extreme values is similar to Hanlon (2005) and is a tradeoff between maintaining all the influential observations and eliminating the impact of extreme values in regressions. Meanwhile, I also estimate the regression by using the values of these measures.

TABLE 4.10 compares the means and medians of *TAX_ABILITY* and control variables for firms with high (*JUMP_TAXESPIAD*=0) and low (*JUMP_TAXESPAID*=1) *TTA* and firms with low (*JUMP_UTB*=0) and high (*JUMP_UTB*=1) *UTB*. The univariate comparisons find some common firm characteristics in both two measures. Generally, tax-avoiding firms have larger *TAX_ABILITY*, larger *NOL*, larger *OCI*, and larger *INTANG*, consistent with the findings of Hanlen et al. (2007), Desai and Dharmapala (2009), and Inger et al. (2018). However, SIZE, CASH, and FOREIGN are contradictory results in two measures[73].

TABLE 4.11 presents the results of the regressions of extreme values on a firms' ability. Column (1) and Column (3) use the value of *TTA* and *UTB*. Column (2) and Column (4) use the dummy variables, *JUMP_TAXESPAID* and *JUMP_UTB*. The coefficients on *TAX_ABILITY* in Column (1) and Column (3) are significant, and the signs are as expected. The economic effects are meaningful, and the magnitude is much more significant than the results in TABLE 4.5 as the extreme values are used. The coefficients on *TAX_ABILITY* in Column (2) and Column (4) are significant and positive as expected in the logistic regressions. These findings indicate that *TAX_ABILITY* can also explain the variations of the extreme values in the tails of these tax avoidance measures. To further test the additional value of *TAX_ABILITY* when I can simply rely on the quantitative measures, I include three quantitative measures, *CASH_ETR*, *GAAP_ETR*, *BTD*, in the regressions used in TABLE 4.11. The TABLE 4.12 show that the coefficients on *TAX_ABILITY* are still significant at least at the 10% level. At the same time, most of the quantitative measures are not or less significant, indicating the power of textual-based measures to capture extreme values. Combining these results with the results in TABLE 4.4, *TAX_ABILITY* is valid along with the entire distribution of *TTA* and *UTB*.

[73] The effect of size on tax avoidance is still in mist in prior literature. Zimmerman (1983) uses firm size as a proxy for political costs and find a negative relationship between firm size and tax avoidance. However, this paper is not designed to find the association between tax avoidance and firm size. The higher cash holdings of firms are firms with higher foreign operations in both two measures. These firms have more tax risks such as higher repatriation costs (Foley et al. 2007). However, the contradictory results of the effect of foreign operations and cash holdings on tax avoidance is still not clear in the extreme values of two measures.

TABLE 4.10 *Descriptive Statistics of Extreme Values*

Panel A: *JUMP* in *TTA*

	JUMP_TAXESPAID=0			*JUMP_TAXESPAID*=1			Difference between	
Variables	n	mean	median	n	mean	median	means	medians
TAX_ABILITY	318	7.278	7.336	218	7.572	7.588	-0.294***	-0.252***
TTA	288	0.325	0.214	193	-0.046	-0.031	0.371***	0.245***
FOG	318	20.12	20.239	213	20.211	20.277	-0.091	-0.038
SIZE	318	6.265	6.283	213	5.111	5.153	1.154***	1.130**
NOL	318	0.264	0.000	213	0.526	1.000	-0.262***	-1.000***
FOREIGN	318	0.026	0.000	213	-1.051	0.000	1.077*	0.000
CAPEXP	288	0.174	0.051	193	0.04	0.024	0.134	0.027***
EIEA	318	0.016	0.000	213	-0.138	0.000	0.154*	0.000
LEV	318	0.542	0.001	213	0.233	0.134	0.309	-0.133***
DEFREV	318	0.487	0.000	213	0.455	0.000	0.032	0.000
ROE	288	-0.05	0.827	193	-0.679	-0.125	0.629	0.952***
OCI	318	0.01	0.001	213	0.016	0.002	-0.006**	-0.001
RD	306	0.172	0.000	210	0.625	0.000	-0.453	0.000**
ADV	306	0.021	0.000	210	0.018	0.000	0.004	0.000
SGA	306	2.045	0.234	210	0.394	0.265	1.65	-0.031**
ΔSALES	306	2.126	0.198	210	0.542	0.02	1.585	0.178***
CASH	306	0.35	0.344	210	0.218	0.156	0.132***	0.188***
INTANG	306	0.08	0.011	210	0.122	0.054	-0.042***	-0.043***
GROSSPPE	306	0.411	0.254	210	0.507	0.394	-0.096	-0.14***

Panel B: *JUMP* in *UTB*

	JUMP_UTB=0			*JUMP_UTB*=1			Difference between	
Variables	n	mean	median	n	mean	median	means	medians
TAX_ABILITY	156	7.365	7.447	188	7.702	7.810	-0.337***	-0.363***
UTB	156	-0.002	0.000	188	0.17	0.086	-0.173***	-0.086***
FOG	156	10.266	20.345	188	10.253	20.314	0.013	0.031
SIZE	156	4.994	4.905	188	5.777	5.749	-0.784***	-0.844***
NOL	156	0.5	0.500	188	0.777	1.000	-0.277***	-0.500***
FOREIGN	156	0.017	0.000	188	0.025	0.000	-0.008	0.000***
CAPEXP	156	0.07	0.028	188	0.029	0.021	0.041***	0.007**
EIEA	156	0.075	0.000	188	0.041	0.000	0.034	0.000**
LEV	156	0.268	0.083	188	0.233	0.090	0.035	-0.007
DEFREV	156	0.429	0.000	188	0.585	1.000	-0.156***	-1.000***
ROE	156	-0.964	0.103	188	-0.691	-0.009	-0.273	0.112***
OCI	156	0.022	0.003	188	0.023	0.004	-0.001	-0.001
RD	156	0.875	0.000	188	2.144	0.121	-1.269	-0.121***
ADV	156	0.01	0.000	188	0.014	0.000	-0.004	0.000
SGA	156	1.443	0.224	188	0.954	0.420	0.489	-0.196***
ΔSALES	156	0.175	0.058	188	0.011	-0.010	0.164**	0.068***
CASH	156	0.216	0.167	188	0.321	0.276	-0.105***	-0.109***
INTANG	156	0.11	0.021	188	0.152	0.053	-0.042**	-0.032**
GROSSPPE	156	0.595	0.384	188	0.443	0.352	0.153***	0.032*

*, **, *** Represent significance at the level of 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents a t-test of the difference of means of variables by JUMP in the distribution of quantitative measures, including *TTA* and *UTB*. *JUMP_TAXESPAID* equals 1 (0) if the observation is below (beyond) the threshold of the left (right) tails in the distribution of *TTA*. *JUMP_UTB* equals 1 (0) if the observation is below (beyond) the threshold of the right (left) tails in the distribution of *UTB*. The samples are obtained based on the Monte Carlo simulation in Appendix 4.4. The number of observations drops slightly, as the other control variables for some firms are not available. Differences between means are tested using two-tailed t-tests; differences in medians are tested using two-tailed Wilcoxon signed-rank tests. All variables are as defined in Appendix 4.6.

TABLE 4.11 *Regression of the Relationship between TAX_ABILITY and Jumps*

	Dependent Variables:			
	TTA	*JUMP_TAXESPAID*	*UTB*	*JUMP_UTB*
Independent Variables	(1)	(2)	(3)	(4)
TAX_ABILITY	-0.119***	2.913***	0.042**	1.073**
	(-5.70)	(4.19)	(2.30)	(2.26)
SIZE	0.025***	-0.774***	-0.023**	0.107
	(4.58)	(-5.55)	(-2.32)	(1.21)
NOL	-0.039**	1.353***	0.041	1.126***
	(-2.19)	(3.89)	(0.94)	(3.15)
FOREIGN	0.004***	-2.126	0.010	-0.174
	(4.07)	(-0.95)	(0.52)	(-0.42)
CAPEXP	0.263***	-10.843***	0.051	-7.290**
	(15.58)	(-6.18)	(0.28)	(-2.17)
EIEA	0.003	-0.217*	-0.019	-0.309
	(1.06)	(-1.74)	(-0.85)	(-1.42)
LEV	0.021	-0.723**	-0.022	0.219
	(1.29)	(-2.30)	(-1.14)	(0.94)
DEFREV	-0.025	0.587*	-0.023	-0.184
	(-1.52)	(1.79)	(-0.40)	(-0.57)
ROE	0.000	-0.001	0.000	0.008
	(0.88)	(-0.27)	(0.71)	(1.23)
OCI	-0.445*	15.277***	-0.324	-0.968
	(-1.69)	(2.94)	(-1.46)	(-0.32)
RD	0.002***	-0.026*	-0.001	0.028
	(3.56)	(-1.66)	(-0.68)	(0.93)
ADV	-0.090	-0.522	0.137	2.667
	(-0.51)	(-0.08)	(0.49)	(0.48)
SGA	0.024***	-0.037	-0.001*	-0.048
	(216.54)	(-0.14)	(-1.66)	(-1.37)
ΔSALES	0.000	-0.046***	-0.054*	-1.035***
	(0.14)	(-2.58)	(-1.81)	(-2.82)
CASH	0.293***	-6.463***	0.342	3.216***
	(5.28)	(-6.14)	(1.33)	(3.21)
INTANG	0.074	-2.307**	0.162	0.940
	(1.38)	(-2.28)	(1.19)	(0.77)
GROSSPPE	-0.003	-0.181	0.065	0.160
	(-0.25)	(-1.27)	(1.08)	(0.45)
CONSTANT	0.801***	-15.566***	-0.234	-9.800***
	(5.17)	(-3.32)	(-1.30)	(-2.73)
Year FE	YES		YES	
Industry FE	YES		YES	
Observations	474	474	344	344
Adjusted-R^2	0.95		0.08	
Chi^2 Test		107.25		55.29
Pseudo-R^2		0.467		0.241

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-/z-test. This table presents the regressions of the relationship between *TAX_ABILITY* and extreme values in the distribution of quantitative measures, including *TTA* and *UTB*. The sample is identified in TABLE 4.20. The regression includes year and industry fixed effects. Industry Fixed Effects are fixed effects based on Fama–French 12 industry classifications. Robust standard errors are clustered at the firm level, and two-tailed t-/z-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

TABLE 4.12 *Incremental Information Tests*

	TTA			*JUMP_TAXESPAID*			*UTB*			*JUMP_UTB*		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
TAX_ABILITY	-0.121***	-0.104***	-0.105***	3.377***	2.822***	2.875***	0.048*	0.051*	0.051*	1.083**	1.125**	1.202**
	(-5.67)	(-5.05)	(-5.13)	(4.14)	(3.90)	(4.07)	(1.76)	(1.85)	(1.94)	(2.27)	(2.25)	(2.37)
CASH_ETR	0.011			-0.336**			-0.015			-0.565		
	(1.19)			(-2.33)			(-0.47)			(-1.01)		
GAAP_ETR		0.075***			-1.496*			-0.010*			-0.225***	
		(3.21)			(-1.72)			(-1.78)			(-2.60)	
BTD			0.078**			-0.357			-0.067			-0.025
			(2.40)			(-1.23)			(-1.08)			(-0.07)
Controls	Identical to TABLE 4.10											
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	465	465	469	465	465	469	336	336	336	337	337	337
R-squared	0.959	0.961	0.462				0.187	0.185	0.212			
Chi^2 Test				109.83	114.94	103.69				56.69	59.14	58.66
Pseudo-R^2				0.497	0.479	0.468				0.26	0.27	0.282

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-/z-test. This table presents the regressions of the relationship between *TAX_ABILITY* and extreme values in the distribution of quantitative measures, including *TTA* and *UTB*. The sample is identified in TABLE 4.20. The regression includes year and industry fixed effects. Industry Fixed Effects are fixed effects based on Fama–French 12 industry classifications. Robust standard errors are clustered at the firm level, and two-tailed t-/z-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

6. Tax Shelter Firms and Firm's Ability

Section 4 and 5 indicate that the disclosure of TSR words in 10-Ks can reveal tax avoidance measured by various tax avoidance measures. However, these measures simply present the propensity of sheltering. I still have the concerns that these observations identified as tax avoiders may be simply due to some nontax reasons. In this section, my interest is whether *TAX_ABILITY* can provide incremental information to detect tax shelter activities already captured by tax authorities, compared to the other quantitative tax avoidance measures and other dictionaries.

6.1 SAMPLE SELECTION

It is difficult to obtain systematic data related to tax avoidance (Weisbach 2001). Tax avoidance as an endogenous behavior in firms is difficult to detect. Using the actual tax shelter firms as a classification of tax avoidance would be a more effective method, as I do not have to infer the propensity of sheltering. Graham and Tucker (2006) generate a sample of 43 firms accused of tax sheltering between 1975 and 2000. Most of these firms are before 1993. In my research context, I cannot use the majority sample of Graham and Ticker (2006) because the EDGAR links of 10-Ks are not available before 1993. Accordingly, I generate an updated sample covering firms that received notice of deficiency from 1993 to 2010 in the United States. I use LexisNexis and Westlaw to conduct exhaustive electronic searches for sheltering firms. I search the keywords related to *tax courts*, *tax shelter*, *tax avoidance*, *transfer pricing*,

sham transaction doctrine, and *notice of deficiency*. In addition to Graham and Tucker's (2006) tax shelter firms after 1993, TABLE 4.13 reports the sample of tax shelter firms from 1993 to 2010. To investigate the explanatory power of *TAX_ABILITY*, I match the tax shelter firms to nontax shelter firms based on the matching criteria of Graham and Tucker (2006) and Wilson (2009). I require the match samples having (1) the same two-digit SIC, (2) the same year as the tax shelter firm-year, and (3) nearest log assets in the current year. The sample selection procedure is in TABLE 4.14.

TABLE 4.13 *Sample of Tax Shelter Firms*

Firm	Tax Shelter Years	Case citation
American Electric Power	1990-1996	136 F. Supp. 2d 762
Florida Power and Light	1992-1994	80 T.C.M. (CCH) 686
Bmc Software Inc.	1993	73 F. Supp. 2d 751
Winn-Dixie	1993	113 T.C. 254
InterTAN, Inc.	1993-1994	T.C. Memo 2004-1
Merrill Lynch & Co.	1993-1995	120 T.C. 12
Union Carbide Corp.	1994-1995	T.C. Memo 2009-50
Microsoft Corp.	1995-1996	39 Cal. 4th 750
WFC Holdings Corp.	1996	728 F.3d 736
Altria Group, Inc.	1996-1997	694 F. Supp. 2d 259
BB&T Corp.	1996-1998	523 F.3d 461
Entergy Corp.	1997-1998	T.C. Memo 2010-197
Hewlett-Packard Co.	1997-2003	875 F.3d 494
Barnes Group, Inc.	1998,2000,2001	T.C. Memo 2013-109
Exelon Corp.	1999, 2001	906 F.3d 513
Duquesne Light Holdings, Inc.	2000,2005	T.C. Memo 2013-216
Veritas Software Corp.	2000-2001	133 T.C. 297
General Mills	2002-2006	957 F.3d 1275
Pilgrim's Pride Corp.	2004	141 T.C. 533
Eaton Corp.	2005-2006	140 T.C. 410
Medtronic, Inc.	2005-2006	900 F.3d 610
Amazon.com, Inc.	2005-2007	148 T.C. 108
BMC Software	2006	780 F.3d 669
Crestek, Inc. & Subsidiaries	2008-2009	149 T.C. 112

This sample identifies 18 firms as tax shelter firms captured by tax authorities between 1993 and 2010, in addition to the samples collected by Graham and Tucker (2006). The sample period is from 1993, as 10-Ks can only be obtained on EDGAR from 1993. Most of the tax law cases would last several years before final decisions. Thus, this sample does not cover the law cases after 2010. The corresponding law case citations are provided.

TABLE 4.14 *Sample Selection of Tax Shelter Firms*

	Firms	Firm-Years
Total tax shelter firms from 1993 to 2010	24	78
Less:		
Links of tax shelter firm-year not available	20	72
Data not available for a matched control firm-year	18	58
Links of control samples firm-year not available	18	26
Total observations	18	32

I lose many tax shelter firms due to the following reasons. First, as the text links of 10-Ks on EDGAR are only available from 1993, I lose samples before 1993. Second, I lose samples that do not have 10-Ks available on EDGAR. Third, I lose samples that are not available to find the control samples based on the matching criteria. Fourth, I lose samples due to the unavailable text links of 10-Ks of their control samples

6.2 RESEARCH DESIGN

Based on the sample with tax shelter firms and control firms, according to Frank et al. (2009), logistic regression is conducted[74]:

$$TS_{it}=\beta_0+\beta_1 TAX\_ABILITY_{it}+\beta_2 SIZE_{it} + \beta_3 ROA_{it} + \beta_4 NOL_{it} + \beta_5 FOR_{D_{it}} +\beta_6 SIZE_{it} + \beta_7 FOG_{it} + \varepsilon_{it}. \quad (4)$$

The dependent variable is an indicator variable, *TS*, that equals one if a firm is identified as having tax shelter activity and 0 otherwise. In addition to the control variables used by Frank et al. (2009), I also include the Fog index in the regressions to control the possibility that tax-avoiding firms may use lower readability to conceal tax-related information (Inger et al. 2018). To investigate the explanatory power of other measures on *TS* compared to *TAX_ABILITY*, I also conduct the same logistic regressions under three quantitative tax avoidance measures, *CASH_ETR_1Y*, *GAAP_ETR*, *BTD*, and one qualitative measure, *NEGATIVE* as the measure of tone in10-Ks.

6.3 MAIN RESULTS AND ROBUSTNESS CHECKS

TABLE 4.15 presents the summary statistics of each variable. According to the two-tailed Wilcoxon test between tax shelter firms and control firms, *TAX_ABILITY* and foreign operation (*FOR*)[75] are the only two significant differences between them. Interestingly, tax shelter firms' ability to avoid taxes is lower than control firms'. The average *TAX_ABILITY* of tax shelter firms is only 6.53, much lower than control firms and the average *TAX_ABILITY* in the sample from 2004 to 2016 in TABLE 4.3. This univariate result is contradictory to my expectation. TABLE 4.16 reports the logistic regression results. The coefficient on *TAX_ABILITY* is negative and significant at a 5% level, indicating that firms with lower raw word counts of TSR words are more likely to be tax shelter firms. Again, this is contradictory to my findings in the above sections. However, from another perspective, this negative association could be evidence of the power of *TAX_ABILITY* to reveal tax avoidance. This result is consistent with Inger et al.'s (2018) findings that managers of high tax avoidance firms are more likely to conceal tax avoidance from tax authorities. Thus, tax shelter firms at the rightest end of the tax avoidance continuum[76] would most likely conceal TSR information. They are the most aggressive firms and have the highest possibility to be monitored by tax authorities if they fully disclose their ability. Ideally, I would expect that *TAX_ABILITY* of

[74] Standard errors are clustered at firm level for the correction of any potential autocorrelation (Peterson 2009).
[75] In the following regressions, *FOR* is positively related to tax shelter, suggesting the multinational firms may have more resources to conduct tax planning or they are more likely to be captured by tax authorities.
[76] Hanlon and Heitzman (2010, p.137) define tax avoidance as "a continuum of tax planning strategies where something like municipal bond investments is at one end (lower explicit tax, perfectly legal), then terms such as ''noncompliance,'' ''evasion,'', "aggressiveness,'' and ''sheltering'' would be closer to the other end of the continuum. A tax planning activity or a tax strategy could be anywhere along the continuum depending upon how aggressive the activity is in reducing taxes".

these firms would be higher, consistent with the results in Section 4 and 5. However, this imposes a strong and impractical assumption that firms cannot conceal my word list[77]. Thus, one valid explanation of why tax shelter firms have abnormal lower *TAX_ABILITY* is that the TSR words do have the power to depict the firm's ability to avoid taxes. These most aggressive firms would prefer to conceal or understate their ability, even though they may still disclose their business as required. For example, as illustrated in Appendix 4.5, the TSR words can still provide some linguistic cues of their tax sheltering activities. The word counts of some specific words related to their tax shelter activities are still higher in their active tax shelter years than one year before or after the tax shelter years[78]. However, these words are too narrow to depict a firm's ability overall picture. The changes of these words are not significant enough to draw the attention of tax authorities. These firms might also reduce the details of other firm fundamentals or activities to deliver a low-ability impression to tax authorities.

The regressions under the other traditional measures do not show the expected results[79] [80]. The coefficient on *BTD* is significant at a 1% level. However, the coefficient is negative. This is against the assumption that the tax shelter firms will have higher *BTD*, consistent with the findings that some tax shelters generate no book-tax differences (Hanlon and Heitzman 2010). The text-based measure, *NEGATIVE* is also not significant. In the robustness test, I use an extended sample of control sample based on the similar matching criteria of samples in TABLE 4.16. Instead of limiting the firms to the nearest firm size, I use another two criteria: (1) pre-tax return on assets (*ROA*) at year t-1 within +/- 50% of tax shelter firm-year, and (2) log assets at a current year within +/- 25% of tax shelter firm-year. In TABLE 4.17, the results are the same in multiple matched firm-year observations. I replace FOG with other readability measures in untabulated regression, Flesch Reading Ease (*FLESCH*), and Flesch-Kincaid Grade level (*KINCAID*). The results are the same. Overall, these findings indicate that they do not deliberately conceal their abilities for less aggressive tax avoiders, especially when most of the TSR words are required to be disclosed. That's why my results are significant and robust in Sections 4 and 5. However, the most aggressive tax avoiders like these tax shelter firms have more incentives to understate their abilities because they may already realize that their activities are illegal. They may intentionally make an impression to tax authorities that they do not have a superior ability to avoid taxes.

[77] I admit that this is one serious limitation of my measure when firms deliberately conceal or do not specifically disclose firms' fundamentals related to tax activities. However, as my words are closely related to disclosure requirements, this concern may only be serious in the most aggressive tax avoiding firms.

[78] In practice, I suggest that regulators can capture some tax avoiding firms by detecting abnormal low *TAX_ABILITY* within their industry, together with some other specific tax-related words as shown in Appendix 4.5.

[79] If *TAX_ABILITY* is excluded in Column (6) in Table 4.16, the Pseudo R^2 will reduce from 0.26 to 0.17. It is evident that TAX_ABILITY contributes to the model predictability significantly.

[80] There are some direct cues that traditional measures are not powerful to reveal tax avoidance. For example, in Amazon's 10-Ks in 2007 (case citation: 148 T.C. 108) it states that "The effective tax rate in 2006 was higher than the 35% U.S. federal statutory rate resulting from establishment of my European headquarters in Luxembourg."

TABLE 4.15 *Descriptive Statistics*

Panel A: Summary Statistics

	Tax Shelter Sample						Matched Control Sample						
	n	Mean	Median	Std. Dev.	Min	Max	n	Mean	Median	Std. Dev.	Min	Max	Prob[1] Median Test
TAX_ABILITY	32	6.536	6.886	1.223	4.304	8.097	32	7.357	7.437	.779	4.934	8.813	0.02
CASH_ETR	32	.163	.114	.187	-.036	.781	32	.204	.027	.523	-.192	2.97	0.54
GAAP_ETR	32	.292	.33	.14	-.215	.425	32	.306	.348	.137	-.158	.423	0.18
BTD	32	-.001	.019	.088	-.352	.079	32	.019	.016	.034	-.063	.133	0.53
NEGATIVE	32	59.697	59.589	3.386	51.379	65.78	32	59.011	59.152	3.766	50.657	64.38	0.46
SIZE	32	9.455	9.809	1.431	6.038	11.938	32	9.118	9.362	1.387	6.178	12.127	0.19
ROA	32	.045	.05	.063	-.139	.209	32	.057	.05	.052	-.039	.183	0.94
NOL	32	.156	0	.369	0	1	32	.176	0	.387	0	1	0.82
FOR	32	.406	0	.499	0	1	32	.176	0	.387	0	1	0.04
LEV	32	.258	.25	.146	.003	.751	32	.264	.247	.167	.003	.919	0.86
FOG	32	20.085	18.809	.826	16.449	22.357	32	18.824	18.978	1.048	6.139	24.143	0.20

This table presents the summary statistics of the sample of 18 firms as tax shelter firms captured by tax authorities between 1993 and 2010 and the matched samples based on the (1) the same two-digit SIC, (2) the same year as the tax shelter firm-year, and (3) nearest log assets in the current year. All variables are as defined in Appendix 4.6.
[1] Wilcoxon test (two-tailed).

Panel B: Pearson and Spearman Correlation Coefficients

	TAX_ABILITY	*CASH_ETR*	*GAAP_ETR*	*BTD*	*NEGATIVE*	*SIZE*	*ROA*	*NOL*	*FOR*	*LEV*	*FOG*
TAX_ABILITY	1	-0.239*	-0.296**	0.013	-0.130	-0.063	-0.084	0.206*	0.036	-0.267**	-0.242***
CASHETR	0.030	1	0.166	-0.233*	0.187	-0.389***	0.548***	0.069	0.265**	0.346***	0.186**
GAAPETR	-0.213*	0.140	1	-0.051	-0.025	0.135	0.100	-0.136	-0.245**	0.093	-0.072
BTD	-0.106	-0.068	0.521***	1	-0.178	-0.037	0.363***	0.133	0.113	-0.317***	0.047
NEGATIVE	0.212*	0.169	-0.115	-0.045	1	0.090	-0.024	0.001	0.196	0.211*	0.077
SIZE	-0.070	-0.103	0.188	0.107	0.152	1	-0.574***	-0.330***	-0.437***	-0.014	-0.125
ROA	-0.114	0.131	0.472***	0.626***	-0.147	-0.337***	1	0.283**	0.398***	-0.009	0.168**
NOL	0.260**	-0.037	-0.312**	-0.180	-0.012	-0.260**	0.120	1	0.434***	-0.210*	0.143*
FOR	-0.127	0.024	-0.292**	-0.079	0.216*	-0.439***	0.238*	0.434***	1	-0.106	0.190**
LEV	-0.237*	0.243**	0.103	-0.059	0.222*	0.171	-0.086	-0.213*	-0.076	1	0.135*
FOG	-0.283***	0.044	-0.011	-0.031	0.070	0.023	0.092	0.119	0.105	0.058	1

This table presents Pearson (lower panel) and Spearman (upper panel) correlation coefficients for the regression variables. All variables are as defined in Appendix 4.6.

TABLE 4.16 *Regressions Examining Determinants and Characteristics of Tax Shelter Firms Matched Control Sample*

		Dependent Variable = *TS*					
Independent Variables	Exp. Sign	(1)	(2)	(3)	(4)	(5)	(6)
TAX_ABILITY	+	-0.967**					-1.026**
		(-2.37)					(-2.36)
CASH_ETR_1Y	-		-0.014				-0.122
			(-0.02)				(-0.24)
GAAP_ETR	-			1.701			0.250
				(0.63)			(0.09)
BTD	+				-12.005**		-12.626**
					(-2.07)		(-2.14)
NEGATIVE	+					-0.034	0.092
						(-0.44)	(1.19)
SIZE	?	0.432	0.477	0.454	0.660*	0.492	0.574
		(1.26)	(1.54)	(1.36)	(1.85)	(1.59)	(1.59)
ROA	+	-8.281*	-5.385	-8.064	2.818	-5.641	-0.910
		(-1.90)	(-1.17)	(-1.21)	(0.34)	(-1.19)	(-0.10)
NOL	+	-0.336	-1.331	-1.221	-1.564	-1.323	-0.299
		(-0.36)	(-1.30)	(-1.19)	(-1.45)	(-1.32)	(-0.29)
FOR	+	2.206**	2.538**	2.704**	2.576**	2.597**	2.056**
		(2.42)	(2.30)	(2.32)	(2.20)	(2.39)	(2.13)
LEV	-	-1.274	-1.152	-1.169	-1.912	-0.993	-2.780
		(-0.37)	(-0.50)	(-0.48)	(-0.87)	(-0.41)	(-0.80)
FOG	+	-0.274	0.217	0.214	0.341	0.245	-0.233
		(-0.54)	(0.45)	(0.44)	(0.69)	(0.49)	(-0.46)
Constant	?	0.432	-6.600	-6.807	-9.586	-5.046	-1.061
		(1.26)	(-1.18)	(-1.18)	(-1.58)	(-0.76)	(-0.12)
Observations		64	64	64	64	64	64
Chi^2 Test		16.44	8.88	8.60	13.48	9.07	19.39
Pseudo-R^2		0.258	0.138	0.142	0.169	0.140	0.269

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed z-test. This table presents the logistic regressions of tax shelter firms on different tax avoidance measures. Tax shelter firms are categorized as a dummy variable that equals if a firm is identified as having tax shelter activity and 0 otherwise. Samples are identified in TABLE 4.14. Robust standard errors are clustered at the firm level, and two-tailed z-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

TABLE 4.17 *Regressions Examining Determinants and Characteristics of Tax Shelter Firms Extended Control Sample*

		Dependent Variable = *TS*					
Independent Variables	Exp. Sign	(1)	(2)	(3)	(4)	(5)	(6)
TAX_ABILITY	+	-0.754***					-0.645***
		(-3.47)					(-3.20)
CASH_ETR	-		-0.073				-0.222
			(-0.13)				(-0.29)
GAAP_ETR	-			-0.680			-0.819
				(-1.25)			(-0.51)
BTD	+				-9.954**		-8.094
					(-2.00)		(-1.40)
NEGATIVE	+					-0.068	-0.053
						(-1.03)	(-0.79)
Controls		Identical to TABLE 4.14					
Observations		155	155	155	155	155	155
Chi^2 Test		40.89	11.89	11.92	16.96	12.18	30.41
Pseudo-R^2		0.222	0.146	0.171	0.171	0.152	0.261

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed z-test. This table presents the logistic regressions of tax shelter firms on different tax avoidance measures. Tax shelter firms are categorized as a dummy variable that equals if a firm is identified as having tax shelter activity and 0 otherwise. The matched sample is identified based on the following criteria: (1) the same two-digit SIC, (2) the same year as the tax shelter firm-year, (3) pre-tax return on assets (*ROA*) at year t-1 within +/- 50% of tax shelter firm-year, and (4) log assets at a current year within +/- 25% of tax shelter firm-year. Robust standard errors are clustered at the firm level, and two-tailed z-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

7. Firm's Ability and Firm Value

7.1 HYPOTHESIS DEVELOPMENT

Prior studies find a favorable value implication of tax avoidance measured by traditional tax avoidance measures (Desai and Dharmapala 2009; Bryant-Kutcher et al. 2012; Chan et al. 2016; Tang 2019). Investors would be very sensitive to the disclosure of tax avoidance such as *ETR*s and compare *ETR*s to the statutory rate (Tang 2019). According to the results in the above sections, *TAX_ABILITY* can provide incremental information to traditional measures when used to detect tax avoidance in most cases except for the most extremely aggressive firms. Thus, investors might be sensitive to these linguistic cues in addition to the traditional measures. In this section, I examine the relationship between *TAX_ABILITY* and firm value to investigate the degree to which investors value the textual information related to tax in the same sample period from 2004 to 2016. As the lack of well-established tax-related word lists, to my best knowledge, no prior studies have examined whether investors would doubt the

value of firms by the textual information related to tax in 10-Ks[81]. Investors would have an overall impression of a firm's ability to avoid taxes based on the textual disclosure. They may be mainly focused on several key TSR words, such as *tax*, *foreign*, *acquisition*, *lease*, or *subsidiaries*. If investors treat these TSR words as a reflection of a firm's ability to avoid taxes, I would expect that investors may negatively value a firm if it does not utilize its ability properly, e.g., higher *GAAP_ETR* than the industry peer. I further predict that this pattern will not be significant in poorly-governed firms. In these firms, there is a risk that the value of tax avoidance may be offset by the increasing opportunities of rent diversion (Desai and Dharmapala 2009). This indicates that even though a poorly-governed firm does not utilize its ability to avoid taxes, investors will not punish these firms because they would feel "safe" as there is no rent diversion due to increasing tax sheltering. However, for well-governed firms, investors will be stricter and punish these firms that do not use their abilities to create incremental value for shareholders. Thus, my formal hypothesis is:

H2: The firm's ability to avoid taxes is negatively related to its value when it is well-governed, and its tax avoidance level is below the industry average.

7.2 RESEARCH DESIGN

I use the same sample in Section 4. To test this hypothesis, in addition to the raw word counts of TSR words measured by *TAX_ABILITY*, the other two important variables, firm value, and corporate governance, are measured as follows. I use *Tobin's q*, a widely used proxy to measure firm value (Kaplan and Zingales 1997; Desai and Dharmapala 2009; Graham 2017), and institutional ownership (*IO*) from the Thomas-Reuters 13F database to measure corporate governance[82]. I add an interaction term between *TAX_ABILITY* and institutional ownership (*IO*) to test the moderating effect of corporate governance on the relationship between *TAX_ABILITY* and *Tobin's q*. Following prior tax literature (Desai and Dharmapala 2009), I include the following control variables: total accruals (*TACC*), total sales (*SALE*), volatility of pretax income (*VOL*), net operating loss (*NOL*), short-term debt (*STDEBT*), long-term debt (*LTDEBT*), research and development expenses (*RD*) and foreign operations (*FOREIGN*). All variables are as defined in Appendix 4.6. Specifically, *TACC* is a proxy for earnings management. Firms can adjust the income level through earnings management and further impact firm value. *SALE* is a proxy for firm size. Larger firms usually have higher firm values and vice versa. *VOL* is a proxy for earnings volatility related to stock volatility (Tang 2017).

[81] Inger et al. (2018) discuss the association between readability of tax footnotes and firm value. However, they do not focus on the detailed disclosure of tax information. Meanwhile, for investors, readability is a less intuitive factor than tax-related information when valuing firms. Investors could be more likely to be sensitive to the tax-related words rather than readability such as word lengths or document lengths.

[82] I cannot use G-Index (Gompers et al. 2003) to measure corporate governance because G-Index is unavailable after 2006.

NOL, *STDEBT*, and *LTDEBT* are proxies for tax shields that affect the value of engaging in tax avoidance. *RD* is a proxy for the change in intangibles, and *FOREIGN* is a proxy for foreign activities. Overall, the regression specification is:

$$Tobin's\ q_{it} = \beta_0 + \beta_1 TAX\_ABILITY_{it} + \beta_2 IO_{it} + \beta_3 TAX\_ABILITY_{it} * IO_{it} + \beta_4 Control_{it} + Fixed\ Effects + \varepsilon_{it}, \quad (5)$$

where fixed effects include year and firm fixed effects and ε_{it} is the error term. $Control_{it}$ is a vector of control variables discussed above.

7.3 SUMMARY STATISTICS AND MAIN RESULTS

TABLE 4.18 presents the descriptive statistics of variables in the regression. I find that *TAX_ABILITY* has a significant and negative correlation with firm value (*Tobin's q*) and a significant and positive correlation with Institutional Ownership (*IO*). TABLE 4.19 presents the regression results for the test of H2. Column (1) shows the results from estimating equation (3) without *IO* and the interaction term, *TAX_ABILITY*IO*. *TAX_ABILITY* is negatively and significantly associated with *Tobin's q* in the entire sample. Column (2) shows the coefficients on the interaction between *IO* and *TAX_ABILITY* are insignificant. I do not find a moderating effect of corporate governance on the relation between *TAX_ABILITY* and firm value. Column (3) and Column (4) further separate the firms into low and high levels of tax avoidance. Firms are identified as low levels of tax avoidance if their *GAAP_ETR* is larger than the industry-year average and vice versa. I use *GAAP_ETR* because this is the most straightforward tax avoidance measure used by investors (Tang 2019). I find that the negative relation between *TAX_ABILITY* and *Tobin's q* only survive in the firms with less tax avoidance. This means that investors would lower value these firms because they do not utilize their ability properly. However, as Desai and Dharmapala (2009) discussed, investors may not prefer tax avoidance for poorly governed firms because this will increase the risks of rent diversion. Thus, in Column (5) and Column (6), I further divide the sample in Column (3) into well-governed firms (*IO*>0.51) and poorly-governed firms (*IO*<0.51), based on the median of *IO*. I find the negative pattern only survives in well-governed firms, consistent with H2. This finding also concerns that my measure is a proxy for firm complexity. If investors treat these words as a reflection of firm complexity, I would expect to find a negative relation between *TAX_ABILITY* and firm value in the poorly-governed firms as investors would be more worried about the transparency and risks of rent diversion (Armstrong et al. 2010). Meanwhile, I would not find a relation in H2. The result is still robust in untabulated robustness tests to add lagged *TAX_ABILITY* to the model. The effect of the lagged *TAX_ABILITY* is insignificant, indicating no substantial delay of market reaction to the raw word counts of TSR words used in 10-Ks. I include *CASH_ETR_1Y*, *GAAP_ETR*, *TTA* to equation (5) to examine whether

TAX_ABILITY explains *Tobin's q* incremental to these quantitative measures. The untabulated results present that *TAX_ABILITY* is still negative and significant at a 1% level in well-governed firms with high *GAAP_ETR*.

TABLE 4.18 *Descriptive Statistics*

Panel A: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	p25	Median	p75
Tobin's q	7,607	1.546	1.1	.889	1.348	1.952
TAX_ABILITY	7,607	7.525	.531	7.317	7.618	7.856
IO	7,607	.586	.295	.347	.652	.847
TACC	7,607	-.038	.059	-.07	-.036	-.006
SALE	7,607	1.037	.834	.399	.904	1.449
STDEBT	7,607	.032	.055	0	.008	.041
LTDEBT	7,607	.173	.193	.002	.108	.28
RD	7,607	.02	.04	0	0	.019
NOL	7,607	.059	.167	0	0	.032
FOR	7,607	.016	.032	0	0	.018
VOL	7,607	9.615	16.367	1.159	3.059	9.525

Panel B: Pearson (Spearman) Correlation Coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Tobin's Q (1)	1	**-0.087**	**0.347**	**-0.303**	**0.358**	**-0.294**	**0.098**	**0.314**	**0.159**	**0.232**	**0.241**
TAX_ABILITY (2)	**-0.060**	1	**0.214**	**-0.028**	**-0.261**	**0.118**	**0.286**	**-0.027**	**0.126**	**0.121**	**0.372**
IO (3)	**0.267**	**0.239**	1	**-0.202**	**0.211**	**-0.155**	**0.129**	**0.175**	**0.208**	**0.317**	**0.488**
TACC (4)	**-0.204**	**-0.056**	**-0.168**	1	**-0.177**	**0.153**	**-0.092**	**-0.069**	**-0.141**	**-0.032**	**-0.119**
SALE (5)	**0.255**	**-0.154**	**0.146**	**-0.063**	1	**-0.172**	**-0.108**	**0.159**	**0.191**	**0.195**	**0.091**
STDEBT (6)	**-0.193**	0.013	**-0.172**	**0.114**	**-0.059**	1	**0.334**	**-0.214**	**-0.088**	**-0.060**	-0.004
LTDEBT (7)	**0.085**	**0.220**	**0.135**	**-0.094**	**-0.092**	**0.052**	1	**-0.247**	**0.052**	**-0.040**	**0.252**
RD (8)	**0.282**	0.011	**0.112**	**-0.093**	**0.006**	**-0.133**	**-0.225**	1	**0.285**	**0.440**	**0.047**
NOL (9)	**0.050**	**0.036**	**-0.008**	**-0.069**	**0.055**	**-0.030**	**0.010**	**0.208**	1	**0.295**	**0.157**
FOR (10)	**0.172**	**0.086**	**0.234**	0.008	**0.071**	**-0.037**	**-0.078**	**0.256**	**0.090**	1	**0.256**
VOL (11)	**0.122**	**0.242**	**0.369**	**-0.046**	0.012	-0.010	**0.205**	**-0.018**	**-0.025**	**0.173**	1

This table presents the descriptive statistics of variables in equation (3). The sample period runs from 2004 to 2016. Due to the availability of CDA/Spectrum data on institutional ownership and the truncation of GAAP_ETR to [0,1], I lose several samples. These correlations are calculated based on the sample in Panel A. Correlation coefficients in bold are significant at the 0.01 level or better (two-tailed t-test). All variables are as defined in Appendix 4.6.

TABLE 4.19 *Firm Value, Raw Word Counts of TSR Words, and Corporate Governance*

	Dependent Variable: *Tobin's q*					
	All firms	All firms with interactions	Firms High *GAAP_ETR*	Firms Low *GAAP_ETR*	Well-governed firms & High *GAAP_ETR*	Poorly-governed firms & High *GAAP_ETR*
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
TAX_ABILITY	-0.078***	-0.024	-0.115***	-0.058	-0.174**	-0.047
	(-3.01)	(-0.60)	(-3.13)	(-1.23)	(-2.39)	(-1.26)
IO		1.073*				
		(1.74)				
*IO*TAX_ABILITY*		-0.106				
		(-1.35)				
TACC	0.576***	0.581***	0.626*	0.271	0.407	0.932*
	(2.86)	(2.88)	(1.92)	(1.11)	(0.98)	(1.79)
SALE	0.543***	0.549***	0.647***	0.490***	0.763***	0.488**
	(7.62)	(7.65)	(5.44)	(6.02)	(6.76)	(2.55)
STDEBT	-1.151***	-1.115***	-1.283***	-1.073***	-1.502***	-0.684**
	(-6.82)	(-6.52)	(-4.74)	(-3.94)	(-4.34)	(-2.04)
LTDEBT	0.099	0.093	-0.121	0.079	-0.166	-0.281
	(0.80)	(0.72)	(-0.51)	(0.53)	(-0.82)	(-0.37)
RD	2.326*	2.177	2.420	2.510	-0.861	6.012*
	(1.69)	(1.58)	(0.95)	(1.38)	(-0.22)	(1.80)
NOL	0.181	0.181	0.149	0.222	0.474	-0.409
	(1.22)	(1.22)	(0.44)	(1.42)	(0.86)	(-1.53)
FOR	2.083***	2.062***	1.432	2.421***	1.090	4.556*
	(2.98)	(2.96)	(1.27)	(2.68)	(0.85)	(1.90)
VOL	0.002***	0.002***	0.003***	0.002**	0.003***	0.001
	(4.55)	(4.50)	(3.29)	(2.25)	(3.27)	(0.18)
Observations	7,607	7,490	3,589	2,731	2,217	1,196
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Adjusted-R^s	0.800	0.800	0.809	0.803	0.797	0.834

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table presents the regressions to test H2. Column (1) presents the results from estimating equation (3) without *IO* and the interaction term, *TAX_ABILITY*IO*. Column (2) shows the full regression of equation (3). Column (3) and Column (4) separate the firms into High *GAAP_ETR* (firm-year *GAAP_ETR* larger than industry-year average *GAAP_ETR*) and Low *GAAP_ETR* (firm-year GAAP_ETR smaller than industry-year average *GAAP_ETR*). Column (5) and Column (6) further separate firms in Column (3) into firms with high (*IO*>0.51) and low (*IO*<0.51) levels of institutional ownership. The sample is based on TABLE 4.16. The regression includes year and firm fixed effects. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 4.6.

8. Conclusions

This paper examines whether a firm's ability to avoid taxes measured by textual information can reveal long-run or short-run tax avoidance. I construct a new word list to capture a firm's ability to pursue aggressive tax planning. The word list is based on the commonly used tax strategies, which provides a clear causal relationship between the change of words and the variation of tax avoidance. I use the raw word counts of TSR words to measure a firm's ability to avoid taxes, *TAX_ABILITY*. The higher raw word counts of TSR words in 10-Ks indicate that the firm has more available tax strategies when needed. This firm would have a higher propensity to engage in tax avoidance. I validate *TAX_ABILITY* in three unique tests which cover different levels of aggressiveness of tax avoidance. In the first test, I find that firms with higher raw word counts of TSR words report - (1) lower *CASH_ETR_3Y*, (2) lower *TTA*, (3) *lower GAAP_ETR*, (4) lower *CASH_ETR_1Y*, (5) higher *UTB*, and (6) lower *CONFORM_TAX*. After controlling various traditional accounting variables, these findings hold the fixed effect of year and firm (or industry). These results are still robust after a set of checks. I also find that *TAX_ABILITY* provides incremental information to the other well-established word lists. I then focus on whether my findings still survive in extreme values in measures of *TTA* and *UTB* and extreme cases (tax shelter firms). I introduce a Monte Carlo simulation method to identify the extreme values and hand collect the tax shelter firms after 1993. The patterns persist in extreme values. However, in tax shelter firms, the results are opposite to my main findings. I interpret this finding as to the result of firms concealing important tax-related information captured by my word list, which provides a counter-example about the power of *TAX_ABILITY* to reveal tax avoidance. I further investigate how investors will value the disclosure of TSR words in 10-Ks considering corporate governance. I find that a negative association between *TAX_ABILITY* and firm value. This association only exists in well-governed firms with less tax avoidance than the industry average.

My study extends the growing literature in the accounting and finance context that seeks to find linguistic cues on firms' behavior. Regulators can use my measure to rank different firms with different levels of ability and, thus, the propensity of tax avoidance and then exert different monitoring levels. This paper also sheds light on investors' reactions to tax-related textual information beyond the traditional accounting numbers. As a by-product in this study, I also complement the accounting literature that seeks to consider the information of extreme values.

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Appendix 4.1 10-Ks Extraction Process

1. Collecting 10-K Reports

1.1 Locate and download EDGAR Index Files.

The SEC provides the daily and quarterly index files based on the submissions of 10-K filings. I download the monthly RSS feeds from the Edgar website, https://www.sec.gov/Archives/edgar/full-index/. I can download a master.zip from this link, including each filling with the firm name, form type, CIK, data, and file links.

1.2 Extract the links to 10-K filings.

The master.zip only links the 10-K filings, not the actual data. I extract the actual data from the links by the python program.

2. Cleaning the 10-K Reports

The 10-K reports in text files include XML or HTML tags and tables. This information will distort the textual analysis, which should be removed.

2.1 The heading information between <SEC-HEADER> and </SEC-HEADER> is deleted.

2.2 The XML or HTML tags are excluded including <DIV>, <TR>, <TD>, <FONT>, '<a' and '<hr' and <sup Sections.

2.3 The TABLE section is then removed for the tables, to begin with <TABLE> and end with </TABLE>.

Appendix 4.2 TSR Words from A-Z (with inflections)

Accelerate$^{N(1)}$	Damaged$^{C(1)}$	Employment$^{C(1)}$	Leaseback $^{C(4)}$	Repatriated $^{N(5)}$
Accelerated$^{N(1)}$	Damages$^{C(1)}$	Entertainment$^{C(1)}$	Leasehold $^{C(4)/N(4)}$	Repatriates $^{N(5)}$
Acceleration$^{N(1)}$	Debt$^{C(5)}$	Evaluate$^{N(1)}$	Lease $^{C(4)/N(4)}$	Repatriation $^{N(5)}$
Accrual^{N}	Debts$^{C(5)}$	Evaluated$^{N(1)}$	Leases $^{C(4)/N(4)}$	Repatriations $^{N(5)}$
Accruals^{N}	Decrease$^{G\backslash C}$	Evaluating$^{N(1)}$	Leverage $^{C(5)}$	Research$^{C(1)/N(1)/N(3)}$
Accrue^{N}	Decreased$^{G\backslash C}$	Evaluation$^{N(1)}$	Liabilities ^{G}	Reserve^{G}
Accrued^{N}	Decreases$^{G\backslash C}$	Expenditure $^{N/C/G}$	Liability^{G}	Reserves^{G}
Accumulate$^{N(1)}$	Deduct$^{G\backslash C}$	Expenditures$^{N/C/G}$	Litigation$^{G(1)}$	Restructure $^{C(3)}$
Accumulated$^{N(1)}$	Deductibility$^{G\backslash C}$	Expense $^{N/C/G}$	Loss$^{C(2)\backslash G}$	Restructuring $^{C(3)}$
Acquisition$^{C(3)}$	Deductible$^{G\backslash C}$	Financing $^{C(5)/N(5)}$	Losses$^{C(2)\backslash G}$	Revenue$^{C\backslash N\backslash G}$
Acquisitions$^{C(3)}$	Deductibles$^{G\backslash C}$	Fluctuation$^{G/C(5)}$	Luxembourg $^{N(5)}$	Revenues$^{C\backslash N\backslash G}$
Administrative$^{C(1)}$	Deducting$^{G\backslash C}$	Foreign $^{N(5)}$	Merger$^{C(3)}$	Risks^{G}
Administration$^{C(1)}$	Deduction$^{G\backslash C}$	Geographic $^{N(5)}$	Mergers$^{C(3)}$	Risky^{G}
Advertising$^{C(1)}$	Default^{G}	Geographical $^{N(5)}$	Netherlands $^{N(5)}$	Sales $^{C(1)/C(2)}$
Allocate$^{N(1)}$	Demerger$^{C(3)/N(5)}$	Geographically$^{N(5)}$	Outsource $^{C(1)/N(5)}$	Selling $^{C(1)}$
Allocation$^{N(1)}$	Depreciated$^{N(1)}$	Geographies $^{N(5)}$	Outsourced $^{C(1)/N(5)}$	Subsidiary $^{N(5)}$
Allowable$^{N(1)}$	Depreciating$^{N(1)}$	Global $^{N(5)}$	Outsourcing$^{C(1)/N(5)}$	Subsidiaries $^{N(5)}$
Allowance$^{N(1)}$	Depreciation$^{N(1)}$	Globally $^{N(5)}$	Outstanding $^{C(5)}$	Switzerland $^{N(5)}$
Allowances$^{N(1)}$	Derivative$^{C(1)}$	Goodwill $^{N(5)}$	Overhead $^{C(1)}$	Tax^{G}
Appreciation$^{N(5)}$	Derivatives$^{C(1)}$	Group$^{N(2)}$	Overseas $^{N(5)}$	Taxable^{G}
Bermuda$^{N(5)}$	Destruction$^{C(3)}$	Headquarters $^{N(2)/N(5)}$	Patent $^{C(1)}$	Taxation^{G}
Borrowing$^{C(5)}$	Deteriorate^{G}	Heaven $^{N(5)}$	Patents $^{C(1)}$	Taxed^{G}
Borrowings$^{C(5)}$	Deterioration^{G}	Impaired $^{N(1)}$	Payment^{G}	Taxes^{G}
Branch$^{N(2)/N(5)}$	Devaluate$^{N(5)}$	Impairment $^{N(1)}$	Profit^{G}	Taxing^{G}
Breach$^{G(1)}$	Devaluation$^{N(5)}$	Impairments $^{N(1)}$	Pricing^{G}	Taxpayers^{G}
Breached$^{G(1)}$	Discontinue$^{C(3)}$	Improvement $^{N(1)}$	Recapitalization$^{C(3)}$	Terminate $^{C(3)}$
Breaches$^{G(10)}$	Discontinued$^{C(3)}$	Improvements $^{N(1)}$	Recognition^{G}	Terminated $^{C(3)}$
Cash^{G}	Discount$^{N/G}$	Inadequate ^{G}	Reduce^{G}	Terminates $^{C(3)}$
CarryforwardN$^{(6)}$	Discounted$^{N/G}$	Income ^{G}	Reduced^{G}	Termination $^{C(3)}$
Carryforwards$^{N(6)}$	Discounting$^{N/G}$	Indebtedness $^{C(5)}$	Reducing^{G}	Transaction^{G}
cayman islands$^{N(5)}$	Discounts$^{N/G}$	Installment $^{N(7)}$	Region $^{N(5)}$	Transactions^{G}
Challenge^{G}	Disposal$^{C(2)}$	Insurance $^{N(6)}$	Regional $^{N(5)}$	Translated $^{N(5)}$
Challenges^{G}	Disposed$^{C(2)}$	Intangible $^{N(1)}$	Regions $^{N(5)}$	Translating $^{N(5)}$
Close$^{C(2)/C(3)}$	Disposition$^{C(2)}$	Intangibles $^{N(1)}$	Reinvestment $^{C(3);\ N(5)}$	Translation $^{N(5)}$
Closed$^{C(2)/C(3)}$	Dispositions$^{C(2)}$	Intellectual $^{N(1)}$	Reinvested $^{C(3);\ N(5)}$	Valuation $^{N(1)}$
Compensation$^{C(1)}$	Disrupt^{G}	Interest $^{C(5)/\ N(4)}$	Remove $^{C(2)}$	Valuations $^{N(1)}$
Competition^{G}	Disruption^{G}	International $^{N(5)}$	Renewable $^{N(1)}$	Value$^{G/N/C}$
Cost$^{C/N/G}$	Disruptions^{G}	Internationally $^{N(5)}$	Renewal $^{N(1)}$	Values$^{G/N/C}$
Costs$^{C/N/G}$	Divestments$^{C(2)/C(3)}$	Ireland $^{N(5)}$	Rent$^{C(4)}$	Valuing$^{G/N/C}$
Criminal$^{G(1)}$	Employee$^{C(1)}$	Jurisdiction $^{N(5)}$	Rental$^{C(4)}$	Vanuatu $^{N(5)}$
Currency$^{N(5)}$	Employees$^{C(1)}$	Lawsuit ^{G}	Repair $^{C(1)/N(1)}$	
Damage$^{C(1)}$	Employer$^{C(1)}$	Lawsuits ^{G}	Repatriate $^{N(5)}$	

This table presents the entire wordlist of TSR words. The strategies are categorized into three major groups, conforming, nonconforming and general, mainly based on the studies in TABLE 2. In addition to their findings, I also use the real tax law cases to confirm the words. The Superscript of each word is defined as follows. C represents conforming tax avoidance. In detail, C(1): Timing of discretionary expense recognition; C(2): Timing of losses recognized on the sale of assets; C(3): Timing of restructuring charges recognized; C(4): Losses related to sale-and-leasebacks transactions; C(5): Prepayment of financing costs; C(6): Recurring item exceptions. N represents nonconforming tax avoidance. In detail, N(1): Different kinds of capital allowances; N(2): Group relief; N(3): Research and development recognition; N(4): Finance leases; N(5): Foreign income (Transfer pricing, Cross-border dividend capture); N(6): Loss carried forward; N(7): Corporate-owned life insurance deal; N(8): Contingent-payment installment sales. G represents general tax-related words. In detail, G(1) presents litigation risks; G(2) presents other general words.

Appendix 4.3 Additional Robustness Test with Other Linguistic Measures

Panel A: *TTA*

	Dependent Variable: *TTA*											
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
TAX_ABILITY	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.002***	-0.002***	-0.002***	-0.003***	
	(-4.76)	(-4.33)	(-4.32)	(-4.32)	(-4.32)	(-4.33)	(-4.32)	(-5.40)	(-5.41)	(-5.41)	(-4.04)	
NEGATIVE	-0.191***										-0.487***	-0.492***
	(-3.34)										(-4.15)	(-4.17)
POSITIVE		0.126**									-0.074	-0.094
		(1.99)									(-0.45)	(-0.58)
UNCERTAINTY			0.020								0.100	0.040
			(0.52)								(0.62)	(0.25)
LITIGIOUS				0.012							0.130**	0.143***
				(1.09)							(2.51)	(2.75)
CONSTRAIN					0.001						-0.524***	-0.545***
					(0.04)						(-3.32)	(-3.43)
STRONG						0.043					0.001	0.009
						(0.47)					(0.01)	(0.05)
NEGATION							0.058				0.264	0.379
							(0.21)				(0.27)	(0.39)
FOG								-0.000			-0.004*	-0.004*
								(-0.80)			(-1.93)	(-1.80)
FLESCH									0.000		-0.004**	-0.003
									(0.91)		(-1.98)	(-1.48)
KINCAID										-0.000	-0.030*	-0.022
										(-0.91)	(-1.80)	(-1.32)
Controls	Identical to TABLE 4.4											
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	26,561	23,712	23,712	23,712	23,712	23,712	23,712	26,892	26,892	26,892	26,892	26,892
Adjusted-R^2	0.743	0.754	0.754	0.754	0.754	0.754	0.754	0.742	0.742	0.742	0.764	0.764

(*continued on next page*)

Appendix 4.3 (continued)

Panel B: *CASH_ETR*

	Dependent Variable: *CASH_ETR*											
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
TAX_ABILITY	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.015***	-0.015***	-0.015***	-0.014***	
	(-4.78)	(-4.69)	(-4.67)	(-4.70)	(-4.70)	(-4.62)	(-4.69)	(-5.18)	(-5.20)	(-5.19)	(-4.23)	
NEGATIVE	-1.420***										-1.870***	-2.355***
	(-2.97)										(-3.54)	(-4.49)
POSITIVE		-0.927									-1.427	-1.454
		(-1.45)									(-1.36)	(-1.38)
UNCERTAINTY			-0.228								1.057	1.007
			(-0.49)								(1.60)	(1.52)
LITIGIOUS				0.180							0.893***	0.916***
				(1.19)							(3.02)	(3.10)
CONSTRAIN					0.115						-0.456	-1.056
					(0.25)						(-0.45)	(-1.04)
STRONG						-3.249***					-5.993***	-6.207***
						(-3.61)					(-4.48)	(-4.63)
NEGATION							0.346				0.480	4.592
							(0.10)				(0.07)	(0.68)
FOG								0.001			-0.011	-0.010
								(0.86)			(-1.57)	(-1.42)
FLESCH									-0.000		-0.025*	-0.009
									(-1.22)		(-1.78)	(-0.70)
KINCAID										0.001	-0.174*	-0.060
										(1.20)	(-1.68)	(-0.61)
Controls	Identical to TABLE 4.4											
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	18,801	16,646	16,646	16,646	16,646	16,646	16,646	19,036	19,036	19,036	16,646	16,646
Adjusted-R^2	0.101	0.100	0.099	0.099	0.099	0.099	0.099	0.100	0.100	0.100	0.102	0.101

(*continued on next page*)

Appendix 4.3 (continued)

Panel C: *UTB*

	Dependent Variable: *UTB*											
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
TAX_ABILITY	0.002***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.002***	
	(4.40)	(5.45)	(5.35)	(5.43)	(5.28)	(5.45)	(5.56)	(5.10)	(5.13)	(5.13)	(4.24)	
NEGATIVE	0.469***										0.422***	0.483***
	(6.00)										(5.25)	(5.96)
POSITIVE		0.050									-0.021	-0.006
		(0.64)									(-0.14)	(-0.04)
UNCERTAINTY			0.136**								0.010	0.000
			(2.14)								(0.11)	(0.00)
LITIGIOUS				0.032**							-0.042	-0.046
				(2.09)							(-1.02)	(-1.12)
CONSTRAIN					0.126**						0.122	0.213
					(2.45)						(0.87)	(1.55)
STRONG						0.065					-0.249	-0.257
						(0.53)					(-1.41)	(-1.46)
NEGATION							1.272***				1.355	0.768
							(2.75)				(1.23)	(0.70)
FOG								0.000			-0.002**	-0.003**
								(0.39)			(-2.19)	(-2.39)
FLESCH									-0.000		0.003	0.002
									(-1.10)		(1.54)	(0.88)
KINCAID										0.000	0.022*	0.013
										(1.12)	(1.65)	(1.01)
Controls	Identical to TABLE 4.4											
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	6,110	6,110	6,110	6,110	6,110	6,110	6,110	6,215	6,215	6,215	6,110	6,110
Adjusted-R^2	0.162	0.148	0.149	0.149	0.149	0.148	0.150	0.147	0.147	0.147	0.166	0.161

(*continued on next page*)

Appendix 4.3 (continued)

Panel D: *CONFORM_TAX*

Independent Variables	Dependent Variable: *CONFORM_TAX*											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
TAX_ABILITY	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	
	(-5.77)	(-6.68)	(-6.56)	(-6.65)	(-6.57)	(-6.58)	(-6.64)	(-6.74)	(-6.73)	(-6.73)	(-6.05)	
NEGATIVE	-0.262***										-0.293***	-0.365***
	(-4.97)										(-5.07)	(-6.21)
POSITIVE		-0.217**									-0.253**	-0.266**
		(-2.44)									(-2.10)	(-2.19)
UNCERTAINTY			-0.115**								0.102	0.101
			(-2.21)								(1.40)	(1.36)
LITIGIOUS				-0.002							0.021	0.023
				(-0.11)							(0.60)	(0.65)
CONSTRAIN					-0.098*						-0.270***	-0.330***
					(-1.78)						(-2.74)	(-3.28)
STRONG						-0.385***					-0.397**	-0.422***
						(-2.89)					(-2.53)	(-2.67)
NEGATION							0.526				2.720***	3.162***
							(1.42)				(3.53)	(4.08)
FOG								-0.000			0.000	0.000
								(-1.63)			(0.26)	(0.41)
FLESCH									0.000*		-0.006***	-0.004***
									(1.80)		(-4.66)	(-3.08)
KINCAID										-0.000*	-0.042***	-0.027***
										(-1.85)	(-4.66)	(-3.09)
Controls	Identical to TABLE 4.4											
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	23,346	21,079	21,079	21,079	21,079	21,079	21,079	23,346	23,346	23,346	21,079	21,079
Adjusted-R^2	0.056	0.053	0.053	0.053	0.053	0.053	0.053	0.052	0.052	0.052	0.062	0.061

*, **, *** Indicate significant differences at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed t-test. This table reports the regression results of the relation between other quantitative measures and tax avoidance. The regression includes year and industry fixed effects. Industry Fixed Effects are fixed effects based on Fama–French 12 industry classifications. Robust standard errors are clustered at the firm level, and two-tailed t-statistics are reported in parentheses. All variables are as defined in Appendix 5.

Appendix 4.4 Computation of Optimal Threshold Levels

Generally, I divide the total sample of each quantitative tax avoidance measure, including *TTA* and *UTB*, into different years as a separate cluster to eliminate the impact of macroeconomic factors and compute the optimal threshold levels (both right and left tails) for each tax avoidance measure in each cluster to identify the extreme values. I then combine the extreme values of *TTA* or *UTB* in each year to generate a large sample with extreme values. The critical step in this method is to compute the optimal threshold levels. I follow the steps used by Longin and Solnik (2001). The basic logic is that pursuing Jansen and De Vries (1991), based on the tail index, the distribution of each tax avoidance measure in each year can be matched with a similar Student-t distribution with a certain degree of freedom. The optimal threshold levels of the distribution of tax avoidance measure can be obtained from the Monte Carlo Simulation results under the matched student-t distribution by optimizing the trade-off between bias and efficiency (Theil 1971; Francois and Bruno 2001).

Specifically, the following steps present the computation of optimal threshold levels.

First, to calculate different estimators of the tail index under different thresholds (for each simulation, I try different thresholds from 1 to 500), I simulate S times (S=1000) of Student-t distributions with k (from 1 to 1000) degrees of freedom, based on the sample in each year with N observations where N is varied with a different sample size of tax avoidance measures in each year from 2004 to 2016. The estimator of the tail index is based on Jansen and De Vries (1991):

$$\hat{\xi} = 1/k = \frac{1}{n}\sum_{i=1}^{n}[lnX_{\mathrm{N}+1-i} - lnX_{N-n}],$$

Where k is the degree of freedom; n is the threshold level; N is the sample size in each year.
Second, to identify the optimal threshold levels under each degree of freedom among different thresholds from 1 to 500, according to Francois and Bruno (2001), an optimal level can be obtained when the MSE as follows is minimal:

$$MSE(\xi(n,k)_{s=1,S}) = (\overline{\xi(n,k)_{s=1,S}} - \xi(n,k)_{s=1,S})^2 + \frac{1}{S}\sum_{s=1}^{S}(\xi(n,k)_{s=1,S} - \xi(n,k)_{s=1,S})^2,$$

Where $\overline{\xi(n,k)_{s=1,S}}$ is the mean of ξ from S simulated observations based on the estimator of the tail index of a certain threshold (n) and degree of freedom (k), as calculated in the first step.

Accordingly, I can obtain the optimal threshold levels under each degree of freedom from 1 to 1000.

TABLE 4.20 *Optimal Threshold Level Per Year by Monte Carlo Simulation*

Panel A: ***TTA***

	Left Tail	Est. Tail Index	1/k	Right Tail	Est. Tail Index	1/k
2003	16	0.0023	0.0026	12	0.0031	0.0031
2004	19	0.0037	0.0036	23	0.0013	0.0014
2005	10	0.0072	0.0070	84	0.0011	0.0011
2006	21	0.0029	0.0030	34	0.0015	0.0015
2007	21	0.0014	0.0014	59	0.0011	0.0011
2008	29	0.0018	0.0018	24	0.0079	0.0079
2009	14	0.0063	0.0063	18	0.0015	0.0015
2010	24	0.0012	0.0012	4	0.0312	0.0313
2011	18	0.0030	0.0029	41	0.0010	0.0011
2012	12	0.0058	0.0058	23	0.0032	0.0032
2013	17	0.0050	0.0052	9	0.0094	0.0094
2014	19	0.0015	0.0015	21	0.0019	0.0019
2015	22	0.0038	0.0040	14	0.0075	0.0075
2016	20	0.0029	0.0028	19	0.0037	0.0038
Total	262			385		

Panel B: ***UTB***

	Left Tail	Est. Tail Index	1/k	Right Tail	Est. Tail Index	1/k
2007	11	0.0048	0.0048	22	0.0023	0.0023
2008	25	0.0012	0.0012	30	0.0010	0.0011
2009	11	0.0020	0.0020	15	0.0026	0.0026
2010	27	0.0014	0.0015	18	0.0018	0.0018
2011	12	0.0100	0.0100	42	0.0015	0.0015
2012	20	0.0014	0.0014	30	0.0015	0.0015
2013	28	0.0017	0.0018	19	0.0020	0.0019
2014	14	0.0055	0.0056	25	0.0011	0.0011
2015	22	0.0040	0.0043	19	0.0010	0.0011
2016	17	0.0028	0.0029	28	0.0018	0.0019
Total	187			248		

This table presents the Monte Carlo simulation results based on the distribution of *TTA* and *UTB*. Panel A shows the optimal threshold levels in both tails of *TTA* in each year from 2004 to 2016. Panel B presents the optimal threshold levels in both tails of *UTB* in each year from 2004 to 2016. Est. Tail Index is the closest estimated tail index computed by the optimal threshold level (under k) based on the samples of *TTA* or *UTB*, compared to 1/k.

Third, I compute the tail index estimates of each sample using the actual sample data based on the optimal threshold level of each degree of freedom in the second step. I select the optimal threshold levels for which the corresponding tail index estimate is statistically the closest to the tail index defined in the simulation procedure, 1/k.

The extreme values obtained are presented in TABLE 4.20.

Appendix 4.5 Qualitative Taxation Disclosures and Links with Real Law Cases

Legal Case 1: Amazon.com, Inc. (148 T.C. 108)

In Amazon's 10-K in 2005, it discussed its tax planning in detail as follows:

"I recorded a tax benefit in 2005 of $90 million, representing $0.22 and $0.21 of basic and diluted earnings per share, as I determined at year end that certain of my deferred tax assets were more likely than not realizable. Excluding this $90 million benefit, my effective tax rate would have been significantly higher than the 35% statutory rate, resulting from steps I initiated to establish my European headquarters in Luxembourg, which I expect will benefit my effective tax rate over time. Associated with the establishment of my European headquarters, I transferred certain of my operating assets in 2005 from the U.S. to international locations which resulted in taxable income and an increase in my effective tax rate. I will initiate similar asset transfers in 2006 to finalize my European headquarters transition, and I expect this will result in an effective tax rate for financial reporting purposes significantly higher than the statutory rate for 2006. There is potential for significant volatility of my 2006 effective tax rate due to several factors, including from variability in accurately predicting my taxable income and the taxable jurisdictions to which it relates. Since I have deferred tax assets related to my NOLs, these asset transfers will not have a significant impact on my cash taxes paid in 2006, which I expect to be approximately $25 million, compared with $12 million in 2005 and $4 million in 2004. we are not endeavoring to optimize our global taxes on a financial reporting basis, instead I endeavor to optimize my global taxes on a cash basis".

Tax authorities, based on this kind of disclosure, can easily capture the potential tax avoidance activities. In this case, Allen et al.'s (2020) dictionaries cannot provide incremental information on tax avoidance as the important information has already been discussed in the tax discussion section. In most cases, especially for small firms, they are not likely to discuss their tax planning in detail. Thus, my dictionary is focused on the entire 10-K to detect the transactions that may be related to tax planning. I take other real tax shelter cases as examples.

Legal Case 2: Hewlett-Packard Company (875 F.3d 494)

Hewlett-Packard Company (HP) engaged in tax shelter by claiming millions in foreign tax credits between 1997 and 2003. The firm also claimed capital loss in 2003 and 2007 of more than $16 million by exercising its put options from AIG, a firm that sold preferred stock to HP in 1996. Based on this background, I checked the corresponding 10-Ks during this period. In the 10-Ks during this period, the following disclosures can be found:

"HP had a deferred *tax* asset of $416 million relating to *foreign* net operating *loss carryforwards*. A large portion of the *foreign* net operating *loss carryforwards* has no expiration date. HP has provided a full *valuation allowance* on that portion of the *foreign* net operating *losses* which will expire between 2004 and 2012. *Foreign tax credit carryforwards* of approximately $351 million will expire in 2006 and the remaining $221 million will expire in 2007. Alternative minimum *tax credit carryforwards* of approximately $439 million have an unlimited *carryforward* period. Of the $230 million of general business *credit carryforwards*, approximately $207 million will *expire* between 2019 and 2023. All *carryforwards expire* as of October of the year indicated." (HP 2003)

"My *effective tax* rate differs from the U.S. federal statutory rate of 35% generally due to *tax* rate *benefits* of certain earnings from operations in lower-*tax jurisdictions* throughout the world for which no U.S. *taxes* have been provided because such earnings are planned to be *reinvested* indefinitely outside the U.S. These benefits were partially offset in these years by non-deductible charges for *amortization* of *goodwill*, IPR&D and certain other *acquisition*-related charges. For a reconciliation of my *effective tax* rate to the *federal statutory rate*, see Note 11 to the Consolidated Financial Statements in Item 8. HP's *effective tax benefit* rate from continuing operations was 12% in fiscal 2002. HP's effective *tax provision* rates from continuing operations were 11% in fiscal 2001 and 23% in fiscal 2000. In addition to the impact of benefits from lower-*tax jurisdictions*, the *effective tax benefit* rate in fiscal 2002 was below the statutory rate because of the impact of non-deductible items, primarily IPR&D, *goodwill* and *acquisition* costs. The effective tax rates in fiscal 2001 and fiscal 2000 were below the statutory rate primarily because of the mix of earnings in lower-*tax rate jurisdictions*, partially offset by non-deductible goodwill and, in fiscal 2001, non-deductible *acquisition*-related costs and IPR& D."

These disclosures can directly increase the raw word counts of TSR words (highlighted in italic).

Legal Case 3: Exelon Corporation (906 F.3d 513)

Exelon Corporation engaged in six sale-and-leaseback transactions in 1999 and 2001 to transfer tax benefits to a tax-exempt entity. This kind of transaction cannot be detected directly from the tax discussion section. However, if the unique word counts of the word "lease" are considered, then it can be found that the raw word counts of "lease" in 1999 and 2001 are twice larger than those in 2000. This pattern exactly matches the determinations of the tax court that "Exelon is liable for a deficiency of $431,174,592 for the 1999 tax year and

$5,534,611 for the 2001 tax year." This indicates that the raw word counts of "lease" can reflect the potential increase of related transactions. However, suppose I use the word, "sale-leaseback" identified by Allen et al. (2020). In that case, sale-leaseback appears only two or three times in all three years, which provides limited information related to these kinds of conforming tax avoidance activities. An abnormal decrease or increase of some TSR words is also informative to be analyzed in future research. Tax authorities can also monitor the change of a particular TSR word to detect tax avoidance.

Legal Case 4: BMC Software Inc. (780 F.3d 669)

BMC Software Inc. deducted $603 million under Sec. 965 through the repatriation of dividends of its foreign subsidiaries during the tax year ended March 31. It is partially disallowed by the Commissioner of Internal Revenue on the ground of the existence of indebtedness between BMC and its foreign subsidiaries from 2004 to 2006. When I compare BMC's 10-Ks around 2006, I find that the raw word counts of words including *repatriation, foreign, subsidiaries* in 2006 are much higher than 2007 but similar to 2004 and 2005. This indicates that the raw word counts of TSR words are correlated with the transactions. Even though I cannot conclude whether they are engaged in the tax shelters, the raw word count of TSR words can help tax authorities detect potential tax avoidance activities more effectively.

Legal Case 5: WFC Holdings Corp. (728 F.3d 736)

WFC is held that it is not entitled to claim a tax refund for a capital loss related to its lease restructuring transactions in the 1996 tax year. The principal transactions involving tax avoidance are the acquisitions of First Interstate Bancorp with an unexpectedly large number of leased properties. Comparing the unique word count of words around 1996 in its 10-Ks, I find that the number of three words, *rental, acquisition, lease* is higher in 1996 and 1997 compared to 1998 and 1999.

Appendix 4.6 Variable Definitions

Variable		Definition
ADV	=	advertising expense (XAD)S divided by net sales (SALE); when missing, reset to 0.
BTD	=	book income less taxable income scaled by lagged total assets;
CAPEXP	=	reported CAPEXP (CAPX) divided by gross property, plant, and equipment (PPEGT).
CASH	=	cash and cash equivalents (CHE) divided by total assets (AT).
CASH_ETR_1Y	=	firm i's cash effective tax rate, which equals cash taxes paid (TXPD) in year t scaled by pretax net income (PI) in year t. I require pretax income to be positive. I truncate CASH_ETR_1Y to the range [0,1].
CASH_ETR_3Y	=	a firm i's total cash taxes paid (TXPD) over a three-year period and divide that by the sum of its total pretax income (PI) before special items (SPI) over the same three-year period. I require pretax income to be positive. I truncate *CASH_ETR_3Y* to the range [0,1].
CONFORM_TAX	=	firm i's conforming tax avoidance in year t is calculated as the residual (ε) from the following regression by three-digit NAICS and fiscal year combinations: $TAXESPAID\_TO\_ASSETS_{it} = \beta_0 + \beta_1 CASH\_ETR_{it} + \beta_2 NOL_{it} + \beta_3 \Delta NOL_{it} + \varepsilon_{it}$.
CONSTRAIN	=	the number of constraining words divided by the number of total words in 10-K.
DEFREV	=	indicator equal to 1 if deferred revenue (DRC + DRLT) is non-zero.
EIEA	=	Absolute of EIEA/loss (EIEA) divided by absolute of income (IB).
FIN_48	=	1 if year>2006, and 0 otherwise.
FLESCH	=	[206.835 − (1.015 × Average number of word per sentence) − (84.6 × Average number of syllable per word)]. Higher FLESCH indicates the textual content is easier to read.
FOG	=	[(Average number of words per sentence + Percentage of complex words) × 0.4]. Complex words are the words with three or more syllables. Textual content with higher Gunning Fog Index is more difficult to read.
FOR	=	1 if foreign income for firm i at year t is not equal to 0, and 0 otherwise.
FOREIGN	=	income from foreign operations (PIFO) divided by lagged assets (AT).
GAAP_ETR	=	Income taxes, divided by pre-tax income minus special items (TXT/(PI − SPI)). I truncate GAAP_ETR to the range [0,1].
GROSSPPE	=	gross property, plant, and equipment (PPEGT) divided by total assets (AT).
INTANG	=	the ratio of intangible assets (INTANG) to total assets (AT).
IO	=	the number of shares owned by institutional investors from Thomas-Reuters 13F database divided by the total shares (CSHO). I truncate IO to the range [0,1].
JUMP_TAXESPAID	=	1 (0) if the observation is below (beyond) the threshold of the left (right) tails in the distribution of TTA
JUMP_UTB	=	1 (0) if the observation is below (beyond) the threshold of the right (left) tails in the distribution of UTB.
KINCAID	=	[(11.8 × Average syllable per word) + (0.39 × Average word per sentence) − 15.59]. Textual content with higher KINCAID is more difficult to read.
LENGTH	=	the natural log of total words in 10-K.

(*continued on next page*)

Appendix 4.6 (continued)

Variable		Definition
LEV	=	the sum of long-term debt (DLTT) and long-term debt in current liabilities (DLC) divided by total assets (AT).
LITIGIOUS	=	the number of litigious words divided by the number of total words in 10-K.
LTDEBT	=	long-term debt (DLTT) divided by lagged asset (AT).
MASCORE	=	managerial ability score (MA_SCORE_2018). I use the updated 2018 dataset provided on Peter Demerjian's website at: http://faculty.washington.edu/pdemerj/data.html
NEGATION	=	the number of negation words divided by the number of total words in 10-K.
NEGATIVE	=	the number of negative words divided by the number of total words in 10-K.
NOL	=	Indicator equal to 1 if NOL (TLCF) is non-zero.
OCI	=	Absolute value of accumulated other comprehensive income (|AOCI|) divided by total assets (AT).
POSITIVE	=	the number of positive words divided by the number of total words in 10-K.
QUINTILE SCORE	=	five quintiles (from 1to 5) based on *TAX_ABILITY*.
RD	=	research and development expense (XRD) divided by net sales (SALE); when missing, reset to 0.
ROA	=	pre-tax income divided by total assets for firm i at year t-1;
ROE	=	pretax income (PI) before extraordinary items (XI) divided by lagged common equity (CEO_{t-1}).
SALE	=	total sales (SALE) divided by lagged assts (AT)
SGA	=	selling, general, and administrative expense (XSGA) divided by net sales (SALE); missing values of SGA are set to 0.
SIZE	=	the natural log of total assets (AT).
STDEBT	=	short-term debt (DLC) divided by lagged asset (AT).
STRONG	=	the number of strong modal words divided by the number of total words in 10-K.
TACC	=	total accruals for firm j in year t, which is defined as income before extraordinary items (IBC) minus net cash flow from operating activities, adjusted to extraordinary items and discontinued operations (OANCF-XIDOC).
TAX_ABILITY	=	the natural logarithm of number of TSR words. I drop TSR words less than 100.
TEM_BTD	=	deferred tax expense (TXDI) divided by the statutory rate of 35 percent, which is then scaled by lagged assets (AT)
Tobin's q	=	the market value of equity (PRCC_F*CSHO) plus the book value of debt (DLTT + DLC) and scaling that amount by the book value of assets (AT).
TS	=	1 if a firm is identified as having tax shelter activity, and 0 otherwise.
TTA	=	cash taxes paid (TXPD) divided by total assets at the beginning of year t. I drop firms with negative TXPD.
UNCERTAINTY	=	the number of uncertainty words divided by the number of total words in 10-K.
UTB	=	the balance of unrecognized tax benefits balance at the end of year (TXTUBEND) scaled by total assets (AT).
VOL	=	rolling standard deviation of pretax income (PI) using 3 window in previous year.
ΔSALES	=	the annual percentage change in net sales (SALEt / SALEt−1) – 1.

All continuous variables are winsorized at the 1st and 99th percentiles.

Chapter 5 Summary, Future Research, and Limitations

In this thesis, I investigate three less exploited research questions related to tax avoidance detection. Specifically, I examine: (i) conforming tax avoidance and its applications in implicit taxes and undersheltering puzzle; (ii) the association between management's tone change and tax avoidance; (iii) the association between tax-strategy-related (TSR) words and tax avoidance.

1. Summary and Future Research

In Chapter 2, I discuss and refine a newly-developed conforming tax avoidance measure by Badertscher et al. (2019). I identify two major issues related to their measures. One is the inconsistency of the coefficient on the nonconforming tax measure in their regression to derive a conforming tax avoidance measure. The other is the mixture issue of poor performers and conforming tax avoiders. I solve these two issues by replacing the existing nonconforming tax measure with another widely used measure and setting a threshold based on the change of short-term investments to separate poor performers and conforming tax avoiders. I then apply the refined measure to investigate the alternative explanation of implicit taxes and undersheltering puzzles. I find that by considering conforming tax avoidance, implicit taxes are still robust to explain the change of pretax return. This mitigates the concerns that pretax returns could be reduced simply due to more tax avoidance activities (Jennings et al. 2012). I also find that conforming tax avoidance can explain the undersheltering puzzle. Firms showing less tax avoidance activities under nonconforming tax avoidance are simply engaged in conforming tax avoidance instead. More future research can be conducted using the conforming tax avoidance measure to investigate the extent, determinants, and consequences in the conforming tax avoidance context. Badertscher et al. (2019) finds the relationship between capital market pressure and conforming tax avoidance. Besides, there is no literature giving other explanations about why firms engage in tax avoidance. The consequences of conforming tax avoidance are also in mist. For example, related research questions can be how tax-induced earnings management can impact the firm value or through what kind of mechanism investors can recognize a firm's tax-induced earnings management. In addition, even though in my research I assume the correlation between conforming and nonconforming tax avoidance is zero, in practice, a complementary relationship between these two tax avoidance strategies could exist. Further research can put more emphasis on investigating this relationship.

Chapter 3 examines the relationship between management's tone change and tax avoidance. I use Fin-Neg to measure management's tone change and find significant and economically large results. When the management's tone change increases, firms would be

less willing to engage in more tax avoidance. This indicates that firms treat tax avoidance as a risky and costly corporate policy complementary to other firm performance drivers. This paper provides incremental information to the limited prior literature such as Law and Mills (2015). Future research can explore the internal mechanism of what exact information is captured based on different dictionaries. The other word lists, such as tax-strategy-related words I construct in Chapter 4, can be used in MD&A for more information. The determinants of management's tone related to tax avoidance are worth investigating. For example, different organizational cultures would have impacts. The MD&A section analysis can be further compared based on country level by including country cultures (Hope 2003) such as country uncertainty avoidance index and country individualism index (Hofstede 1980).

Chapter 4 constructs a tax-related word list based on commonly identified tax avoidance strategies. These words are related to the ability and propensity of firms to engage in tax avoidance. Generally, except for the most aggressive tax shelter firms, which deliberately conceal tax avoidance information, I find that these words have the explanatory power on tax avoidance measured by multiple tax avoidance measures in different samples and sample periods. I also find that investors negatively value these words in well-governed firms with less tax avoidance. In future research, instead of developing tax-related words based on already recognized tax avoidance strategies, a sample of actual tax shelters can be analyzed to find the highly frequent tax-related words through machine learning. In addition, the determinants of the disclosure of tax-related words are still in the mist. Corporate governance or capital market pressure could be two potential factors to consider. My word list can also be applied in other countries such as China after a translation. China is a less-regulated market of corporate disclosure. Thus, if there are fewer compulsory disclosure requirements of a firm's business activities, the association between tax-related words and tax avoidance could be another story.

Overall, three papers aim to provide more approaches for researchers, investors, and tax authorities to detect tax avoidance comprehensively and efficiently. Firms engage in tax avoidance in various ways, not only in nonconforming tax avoidance captured by *ETRs* and *BTD*. Simply using the current existing measures would fail to capture many potential tax avoiders, mainly when we have limited public resources related to firms. Using methodologies in three papers of this thesis, tax authorities can have a higher possibility to capture tax avoiders. The second and third papers also shed light on the power of textual information in tax context and the relation between tax avoidance behavior and textual financial reporting behavior. If we ignore textual information in firms' most important disclosure, financial reports (10-Ks), we would lose many valuable cues to detect tax avoidance. These papers treat accounting as a language, not only mathematics, following the argument of Loughran and

McDonald (2016) that understanding the art is of equal importance to understanding the science.

More generally, investors, firms, and regulation setters have argued that corporate disclosure is becoming longer, less readable, less specific, and more redundant (Li 2008; Dyer et al. 2017). Thus, in addition to quantitative analysis, textual analysis is becoming more important in future research to organize the "chaotic" information provided by firms. We could use more linguistic cues to make the actual narratives of firms emerging from the water. The textual analysis can be further developed systematically like ratio analysis in accounting and finance to provide more objectively categorized information to users of corporate disclosures. Future research can also focus on tax avoidance detection through more alternative data or externalities which firms cannot control, for example, the geographic proximity of tax authorities (Kubick et al. 2017) and emission data (Liu et al. 2021).

2. Limitations

There remain some limitations in my thesis. First, in Chapter 2, when measuring conforming tax avoidance, I strongly assume that nonconforming tax avoidance and conforming tax avoidance are orthogonal. However, nonconforming tax avoidance and conforming tax avoidance are likely correlated. A firm can use conforming tax avoidance first by lowering pretax income to a threshold, and then beyond that level, the firm may further engage in nonconforming tax avoidance. Second, in Chapter 2, the sample period selected in implicit tax analysis is short, from 2015 to 2020. The post-TCJA period is only three years which may not capture the full impact of TCJA, especially for some long-term business changes such as tax planning related to corporate investment. Third, in Chapters 3 and 4, the text-based indicators cannot separate conforming tax avoidance and nonconforming tax avoidance. These indicators mixture these two typical tax avoidance behaviors. In future research, this limitation would restrict their explanatory power of tax avoidance in more detail. Last, Chapter 3 and Chapter 4, although they shed light on the power of textual information to detect tax avoidance, still use mandatory financial disclosure. I cannot eliminate the possibility that firms already manipulate the textual information in 10-Ks before my investigation[83].

[83] That's the reason I use different readability measures to control disclosure quality in Chapter 3 and Chapter 4. However, it is still not adequate to eliminate this possibility.

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