What happens after the wedding? Debtholders' reaction to tax avoidance

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Abstract: Prior studies have analyzed tax avoidance and the cost of debt and found that firms get penalized for tax avoidance with a higher cost of debt upon issuance. We extend the examination of the cost of debt consequences of tax avoidance by using the cost of public, unsecured debt on the secondary markets. We find evidence suggesting that the relationship of tax avoidance and cost of debt is non-linear. More specifically, we find that firms are rewarded for greater tax avoidance with a lower bond yield up to an optimal point beyond which they incur a penalty for the risk associated with extreme tax avoidance.

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I. INTRODUCTION

What are the costs and benefits of tax avoidance? Prior research, focused on the equity market, suggests shareholders view tax avoidance as maximizing shareholder wealth. Goh, Lee, Lim and Shevlin (2016) show a negative relationship between cost of equity and tax avoidance. Debtholders may have different perspectives than stockholders as their returns are asymmetric. Hasan, Hoi, Wu and Zhang (2014) document a positive relationship between credit spreads and tax avoidance characteristics in a sample comprised of private loans. This negative reaction to tax avoidance by private lenders at loan issuance is consistent with loan issuers perceiving tax avoidance as costly, risky, and uncertain in nature.

The benefits of tax avoidance are greater cash flows available for operations, investment and distributions. However, the reaction of stakeholders may not be linear across degrees of tax avoidance as there are costs associated with tax avoidance. Negative effects can stem from reputational costs, increased risk of penalties and tax authority disciplinary actions, information asymmetry, and the potential for rent extraction. On one end of the spectrum of tax avoidance, firms can pursue perfectly legal, lower explicit tax options like municipal bond investments. At the other end of the spectrum, firms can engage in noncompliant, aggressive, or sheltering tax-avoidant activities (Hanlon and Heitzman 2010).

Our study addresses the costs of tax avoidance that firms face on the secondary bond market. We posit that debtholder reaction to tax avoidance will differ depending on the quality of the firm and the extent of tax avoidance. A debtholder's reaction to tax avoidance could be negative, as it may signal that a firm is in financial trouble and is cash constrained and in greater

need of monitoring.[1] Alternatively, the reaction can be positive, if the investors' valuation of the increased cash flows available to service debt payments outweighs the reaction the risks of tax avoidance.

We propose that firms are rewarded and enjoy lower bond yields for tax avoidance up to an optimum level. Beyond this level further increases in tax avoidance are considered high risk behavior, and will result in higher interest rates. Figure 1 presents a graphic depiction of the proposed relationship. On the far left of the curve are high-quality firms for which an increase in tax avoidance would be value-maximizing and rewarded by debtholders.[2] On the far right are the tax sheltering firms and other firms that are lower credit quality and require greater monitoring, for which greater tax avoidance would result in an increased cost of debt.

As stated previously, Hasan et al. (2014) find a positive relationship between cost of debt and tax avoidance in a sample comprised of private loans. Faulkender and Petersen (2006) have shown that firms that borrow in the private market and are not able to access the public debt markets are financially constrained. Denis and Mihov (2003) show that the highest quality credit firms access the public debt markets while the lowest credit quality firms access the private debt market. Rauh and Sufi (2010) show that even among firms with access to public debt markets, those that also choose to access private markets are lower credit quality firms. Thus, Hasan et al. (2014) may provide evidence that lower credit quality firms incur higher cost of debt when engaging in tax avoidance activities, and firms in their sample may be located to the right of the optimal minimum in the graph in Figure 1. Our sample of larger firms with publicly traded debt provides evidence that

[1] Edwards, Schwab and Shevlin (2016) point out that financially constrained firms are also more likely to engage in tax planning to conserve cash reserves.
[2] Depending on the borrower, debtholders could be comprised of a variety of lenders, from private banks in the Hasan et al. (2014) sample to the public senior unsecured bondholders in our sample.

debtholders react positively to tax avoidance as it increases free cash flows up to an optimal level beyond which the risk of tax avoidance outweighs the benefits.

Our sample consists of outstanding senior unsecured debt, the largest source of financing for publicly traded firms (Rauh and Sufi 2010) representing 23.8% of the capital structure and nearly half of all debt outstanding. At the end of 2017 there was approximately $9 trillion corporate bonds outstanding. In a record year 2017 roughly 1,200 companies issued $1.7 trillion in corporate bonds (Source: Securities Industry and Financial Markets Association). Understanding the drivers of credit spread is essential as management considers their tax strategy *vis a vis* cost of debt consequences.

We utilize bond buyer reactions to tax behavior. By considering the reaction of bondholders in the secondary market we have a measure of debtor reaction that is less likely to be influenced or manipulated by actions from the issuing firm. We use the bond trading data from TRACE to compare the reaction of bondholders to different tax strategies of firms. Our dependent variable is bond yield. Our tax avoidance variables are defined by Hasan et al. (2014). We find evidence of a negative and statistically significant relationship between tax avoidance and bond yield. We also analyze decile portfolios, sorted on three different measures of tax avoidance — Manzon and Plesko (2002) book-tax differences, Frank, Lynch, and Rego's (2009) *DTAX* measure, and Cash Effective Tax Rates (Dyreng, Hanlon, and Maydew 2008) — and plot their average cost of debt (see Figure 3). The most highly constrained firms (lower Z-score) are rewarded more for higher tax avoidance than firms with higher Z-scores. To control for the size and timing of the original bond issuance, we merge our dataset with Mergent Fixed Income Securities Database (FISD) and include controls for bond issuance characteristics. We find that the relationship confirms our predictions (among higher credit quality firms) that tax avoidance is rewarded by bondholders with lower cost of debt with the exception of the extreme high tax avoidance deciles. Subsequently we perform multivariate

analyses based on credit rating, bifurcating the sample on whether the firms are investment-grade or non-investment (speculative) grade. We find a non-linear relationship between cost of debt and tax avoidance, i.e., greater tax avoidance is associated with lower cost of debt up to an optimal point. Beyond that level, companies face an increase in yield.

This study makes several contributions to the literature. First, we expand the understanding of tax avoidance by evaluating the nonlinearity in perceptions of tax avoidance that is evident in the mixed results from prior research. In addition, we examine the issue within an area not previously explored, to the best of our knowledge—the secondary bond market. Both the debt/bond and financial constraints literatures may benefit from the greater understanding of the disparate implications of tax planning decisions in various conditions and markets.

II. BACKGROUND AND HYPOTHESES DEVELOPMENT

Tax Avoidance and Cost of Equity

A growing literature on the association between cost of equity capital and tax avoidance has reported mixed results depending upon where on the tax avoidance continuum behavior falls (Lisowsky, Robinson and Schmidt 2013). If investors value the potential future cash flows from tax savings, tax avoidance may lower the cost of equity capital. More aggressive tax avoidance will also increase the risk associated with those tax flows through higher variance and a greater risk of tax authority scrutiny. If investors perceive the costs due to the increased risk and uncertainty are too great, they may expect a higher return, increasing the cost of equity capital. Several studies suggest tax avoidance is associated with lower cost of equity capital, reflecting the potential cash tax savings. However, studies focusing on more aggressive tax positions, such as tax shelters and tax

havens, sometimes find a higher cost of equity. Studies using uncertain tax positions (or tax reserves) as proxies for tax avoidance have mixed results.

Early research demonstrates a link between variability in book-tax differences, one measure of tax avoidance, and cost of equity capital (Dhaliwal et al. 2009). Defining tax avoidance broadly, Goh et al. (2016) examine whether equity investors require a higher or lower return when firms are tax avoiders. Using an expected future cash flows model of cost of equity and book-tax differences and effective tax rates as proxies for tax avoidance, the authors find that tax avoidance is associated with lower cost of equity capital due to positive cash flow effects. Investors are found to value uncertain tax positions positively when future realization is likely (Koester 2011). Hutchens and Rego (2015) find tax proxies such as one-year change in tax reserves, discretionary book-tax differences, tax shelter prediction, and cash ETRs are not significantly associated with the implied cost of capital.

However, when firms engage in riskier tax avoidance behaviors, the risks may outweigh the potential positive cash tax savings resulting in an increased cost of equity due to uncertainty. Tax risk has been linked to several measures of firm risk in previous research, including equity risk incentives, stock return volatility, and the standard deviation of pretax income (Rego and Wilson 2012). This increased uncertainty about future cash flows through aggressive tax avoidance (specifically large tax reserves) is associated with an increased cost of equity capital (Hutchens and Rego 2015). A reduced information environment also increases uncertainty (Lambert, Leuz, and Verrecchia 2007). With tax avoidance, especially the use of tax shelters, financial reporting is less transparent, allowing managers to hide bad news (Desai and Dharmapala 2006, 2009). This type of behavior can increase the risk of a stock price crash when the bad news becomes public (Kim, Li, and Zhang 2011). Using tax shelters or having substantial unrecognized tax benefits as proxies for

tax avoidance resulted in higher cost of equity in the Goh et al. (2016) study. Negative abnormal returns are documented around a three-day window of a press announcement of a firm engaging in tax shelter activity (Hanlon and Slemrod 2009), though the abnormal returns are effectively zero when expanded to a 30 day window (Gallemore, Maydew, and Thornock 2014). Incorporation in tax havens is considered a more aggressive tax avoidance behavior and current research finds that cost of both debt and equity capital is higher in tax havens (Lewellen, Mauler, and Watson 2017).

Such research suggests there is a tradeoff between tax savings produced by some tax avoidance behaviors and the increased risk incurred with more aggressive behaviors. Consistent with this tradeoff, *ex ante* cost of equity capital is associated with variation, either below or above, investors' expectations of tax avoidance (Cook, Moser, and Omer 2017).

Tax Avoidance and Cost of Debt Issuance

There has been less focus on tax avoidance and the cost of debt, probably due to the paucity of readily available data. With new data sources becoming available, an emerging literature has developed focusing on both private debt issuance and bond issuance. Research in this area focuses on contracting costs, managerial opportunism, and the debt-substitution effect of tax avoidance. Debtholders, receiving fixed payments, focus more on the risks associated with tax avoidance (Mills 1998; Desai and Dharmapala 2006) rather than increased cash tax savings (Mills 1998) or reduced leverage (Graham and Tucker 2006). In an examination of broad tax avoidance behaviors in US public firms, bank loan spreads are found to be positively related to aggressive tax avoidance (Hasan et al. 2014). In addition, collateral and covenant requirements are stricter for firms with greater tax avoidance. Banks increase loan spreads for firms reporting tax reserves under FIN 48 and following news events announcing tax shelter activity (Hasan et al. 2014). Similar results were reported in relation to firms incorporating in tax havens (Lewellen, Mauler, and Watson 2017) and

syndicate loan markets (Isin 2018). In tests of bond-issuing firms, higher yield spreads are observed suggesting tax avoidance is perceived to heighten risk exposure (Hasan et al. 2014; Shevlin, Urcan, and Vasvari 2013).

Association between Tax Avoidance and Cost of Bonds after Issuance

To the best of our knowledge, no study exists examining the relationship between market price in the secondary bond market and tax avoidance. This paper uses bond yield as a measure of cost of debt and examines the association between cost/return and tax avoidance in the secondary bond market.

The investors in bonds and stocks are similar across the markets and include individuals, institutional investors, pension funds, and governments. Prior research shows that the risk premium on corporate bonds varies systematically for many of the same reasons returns on common stock vary (Elton et al. 2001). Thus bondholders and stockholders both require a return premium to compensate for risk. And, while investors in the secondary market would not experience increased interest or principal payments as a direct result of tax avoidance, they would expect a greater return based on changing market value of the bonds. Equity values are shown to be influenced by tax avoidance (Dhaliwal et al. 2009; Goh et al. 2016; Cook, Moser, and Omer 2017; Hutchens and Rego 2015) and bond values are associated with earnings (Easton, Monahan, and Vasvari 2009), which may be higher as a result of tax avoidance.

We propose to model and test the response of bond investors to an expected probability of default as a function of tax avoidance.

$$y = a_1 e^{-k_1 x} + a_2 e^{k_2 x} \quad (1)$$

Where y is the bond yield, x is tax avoidance, a_1 and k_1 are parameters when a company's tax actions are viewed as decreasing probability of default by the bond buyers and a_2 and k_2 are

parameters when a company's tax actions are viewed as increasing probability of default. Figure 1 represents parameters a_1 and k_1 equal to 0.25 and a_2 and k_2 equal to 2, these are subject to change. Our prior is that past a certain level of rational tax avoidance, the bond investor reaction will change signs and aggressive measures will generate a steep negative response (an increase in interest rate). Therefore, we propose the following hypothesis:

H1: Higher levels of tax avoidance are associated with lower cost of debt.

If the bondholders view themselves as creditors rather than investors, tax avoidance activities should not influence the value of bonds beyond their initial issuance and we should expect no association. Due to the asymmetric payoffs for bonds, there is, essentially, a limited impact of earnings for holding bonds (Easton, Monahan, and Vasvari 2009). In addition, the goals for holding bonds may differ from those for holding stocks, either in expected return, level of risk, or timing of return. For example, a pension fund may be holding bonds expected to mature in the long-term to meet particular obligations while holding stocks for short-term returns and income. Therefore, there may be little to no bondholder reaction to tax avoidance in the secondary market.

III. RESEARCH DESIGN

Empirical Model

We begin by testing Hypothesis 1 for the association between tax avoidance and bond yield at the issuance of the bonds that form our secondary market sample, controlling for firm and bond characteristics. For each bond trade in our secondary market sample, we acquire detailed issuance information including offering yield, term premium, credit rating, maturity, and amount of bonds issued. In Equation (2), TA represents one of our three tax avoidance measures [(1) book tax

difference, (2) discretionary permanent tax differential, or (3) cash effective tax rate]. Higher bond yields imply investors require a greater return.

$$\textit{Offering Bond Yield} = \alpha + \beta_1 TA + \text{Controls} + \text{industry fixed effects} + \text{year fixed effects} \quad (2)$$

We then calculate the significance of levels of tax avoidance with respect to yields in the secondary bond market, controlling for firm- and bond-level characteristics associated with cost of debt (Equation 3). We measure bond yield for each individual bond type, using the yield on the last trade of each day. Companies may have multiple bonds outstanding. Our bond yield measures are calculated three days following the annual report filing and thirty days following the annual report filing.

$$\textit{Yield} = \alpha + \beta_1 TA + \text{Controls} + \text{industry fixed effects} + \text{year fixed effects} \quad (3)$$

As our expectation of response to tax avoidance is curved (Figure 1), we add a quadratic term to equation (3), as follows:

$$\textit{Yield} = \alpha + \beta_1 TA + \beta_2 TA^2 + \text{Controls} + \text{industry fixed effects} + \text{year fixed effects} \quad (4)$$

Industry and year fixed effects are used to control for time- and industry-invariant factors that may affect investor expectations and bond yield.

Measures of Tax Avoidance

We follow current literature (e.g. Dyreng et al. 2008; Frank et al. 2009; Goh et al. 2016; Cook et al. 2017; Hasan et al. 2014) in using several measures of tax avoidance to adjust for limitations in each type of measure (Hanlon and Heitzman 2010). Hasan et al. (2014) use three measures to capture a broad spectrum of tax avoidance, including but not limited to more aggressive tax avoidance that "pushes the envelope of the law" (Hasan et al. 2014 (p. 113), quoting Hanlon and Heitzman 2010 (p. 137)). For comparability, we mirror this choice of measures as we mirrored the firm and bond characteristic measures used by Hasan et al. (2014).

First, we measure book-tax differences (*BT*) using the Manzon and Plesko (2002) measure. This measure is calculated as the US domestic financial income (pidom) less US domestic taxable income (txfed) divided by the US statutory tax rate of 35%. From this amount we also subtract state income taxes (txs), other income taxes (txo), and equity in earnings (esub) before scaling by lagged total assets (at). Prior literature shows that large book-tax differences are associated with IRS audits and adjustments (Mills 1998), tax shelter usage (Wilson 2009), and managerial aggressiveness (Frank, Lynch, and Rego 2009).

Book-tax differences reflect only non-conforming tax avoidance, where book or GAAP income does not equal taxable income. This limitation restricts the usefulness of this measure to firms that place similar importance on book/GAAP earnings (Hanlon and Heitzman 2010). As our sample consists of public firms trading on a public market, this concern is of more limited importance than if comparing public and private firms. If bondholders are concerned about strategies that affect the overall difference in reported book and tax income, they should respond by adjusting their required rate of return.

The second measure is discretionary permanent book-tax differences (*DTAX*), as developed by Frank et al. (2009). Their measure is calculated as the residual term from the regression of the current year's permanent book-tax differences (PERM) on intangibles (INTAN), equity in earnings (UNCON), minority interest income (MII), current state income tax expense (CSTE), net operating loss carryforwards (ΔNOL), and the prior year's PERM.[3] Hanlon and Heitzman (2010) refer to this permanent book-tax difference as an "ETR differential", the difference between the statutory tax rate and the GAAP ETR and believe it captures more than just permanent differences. The residual from the regression captures the discretionary portion of permanent book-tax differences. This discretionary portion of permanent book-tax differences is comparable to discretionary accruals in that they allow firms to manage book income upward and add the benefit of decreasing taxable income by reducing GAAP ETR. If bondholders are concerned about the use of strategies that primarily affect the book effective tax rate, then the required rate of return on the bonds should reflect that.

The cash effective tax rate (*TA_CETR*) is widely available and easily calculable from the financial statements. It is defined as cash taxes paid (txpd) divided by pretax book income (pi) less special items (spi), reflecting the average tax dollar paid on book income. Hanlon and Heitzman (2010) note that tax deferral strategies are impounded in the Cash ETR measure, but changes in tax accounting accruals are not. Due to the nature of GAAP reporting, the cash taxes paid will not necessarily reflect current year taxes so the numerator (cash taxes paid) may be mismatched with denominator (pre-tax GAAP income). The pre-tax GAAP income captures non-conforming tax avoidance (Hanlon and Heitzman 2010), so *TA_CETR* picks up tax deferral strategies that affect cash tax savings but do not impact GAAP net income. If bondholders are concerned about cash tax

[3] For complete details of the regression to calculate *DTAX*, see Frank, Lynch, and Rego (2009); Hasan et al. (2014).

savings, then levels of Cash ETR should affect their required rate of return. We multiply *TA_CETR* by -1 so that tax avoidance is increasing in the value of *TA_CETR*. See Appendix 1 for detailed variable definitions.

Measure of Cost of Debt

We measure cost of debt through *offering bond yield* at issuance and bond yield (*Yield*) for secondary market transactions. A higher bond yield indicates a higher cost of debt, suggesting bondholders require a greater rate of return. For secondary market trades, we utilize two measures, $Yield_{t+3}$, yield (yld_pt) from most recent trade after 3 (not to exceed 30) filing days after filing date (Source: TRACE) and $Yield_{t+30}$, yield (yld_pt) from most recent trade after 30 (not to exceed 40) filing days after filing date (Source: TRACE). Our motivation for choosing the three-day yield is based on prior equity literature that addresses three-day abnormal return. However, given that tax avoidance information may take longer to process and disseminate we also include a 30-day yield.

The secondary bond market differs from the equity market in that the offered trades are not listed on a central exchange but are traded through dealers, commonly referred to as over the counter (OTC). The data set used in academic literature to study bond returns has predominantly been Lehman Brothers Fixed Income (LBFI) database, which provides month end returns. In 2004 TRACE was expanded to include trade information on all publicly traded bonds. Financial Industry Regulatory Authority's (FINRA) TRACE data set, introduced in 2002, is a result of a regulatory initiative to increase price transparency in the secondary corporate bond market and provide a consolidated “tape” of transactions. FINRA oversees the reporting and dissemination for OTC corporate bond trades. Trade reports are time stamped and include information on the clean price and par value traded, although the par value traded is truncated at $1 million for non-investment

grade bonds and at $5 million for investment-grade bonds.[4] Researchers have since used TRACE data mostly to examine bond market dynamics such as transparency (Edwards et al. 2007; Bessembinder and Maxwell 2008), liquidity (Lin et al. 2011; Dick-Nielsen et al. 2012; Nieto 2018), price discovery (Bittlingmayer and Moser 2014), and momentum of returns (Jostova et al. 2013). More recently, Ederington et al. (2015) analyze bond market event study methodology and Tsai and Wu (2015) analyze bond and stock market response to unexpected news. Tsai and Wu (2015) use eight- and ten-day windows around the announcement date in their study.[5] Despite the over-the-counter nature of the bond market, several studies have shown that informational efficiency is similar for the general stock market and the corporate bond market, and that reaction to news is within a day for both markets (Hotchkiss and Ronen 2002; Ronen and Zhou 2013).

Control Variables

We follow Hasan et al. (2014) for control variables related to firm specific characteristics. We control for size (*Log(Assets)*), financial burden (*Leverage*), tangibility of assets (*Tangibility*), cash holdings (*Cash Holding*), profitability (*ROA*), growth opportunities (*MTB*), sales growth *(Sales Growth*), earnings volatility (*Earnings Volatility*), and financial health (*Z-score*). We expect leverage (Minton and Schrand 1999; Graham, Li, and Qiu 2008) to increase risk and cost of capital, thereby exhibiting a positive association with bond yield. Return on assets, sales growth, financial health, and size of firm should have a negative association with cost of capital, measured as bond yield. Earnings volatility is associated with greater uncertainty of future cash flows and higher cost of capital (Merton 1974; Hanlon 2005; Shevlin et al. 2013), so we expect a positive association with bond yield. Growth opportunities[6] and tangibility of assets[7] have a mixed association with cost of

[4] For a full overview of the bond market please see Bao, Pan, and Wang (2011).
[5] May (2010) studies the effect of rating changes on bond prices and uses a one-day event window.
[6] Fama and French (1995); Bhojraj and Sengupta (2003); Graham et al. (2008)
[7] Huang and Petkevich (2016) and Kim (2016)

capital (Fama and French 1995; Bhojraj and Sengupta 2003; Graham et al. 2008); thus, we make no prediction for direction of association.

We control for bond characteristics that are traditionally associated with default risk and required return from investors (as previously documented by studies including but not limited to Boardman and McEnally 1981; Datta et al. 1999; Bagnani et al. 1994). We control for term premium at the filing date or trade date (*Term Premium*), credit rating (*Credit Rating*), time to maturity (*Bond Life*), size of the bond issue (*Issue Amount*), and whether the bond is subordinated, callable, putable, and has a sinking fund. Consistent with prior studies, bond yields are expected to be higher for smaller, lower credit rated (higher value in our sample) longer term bonds. See Appendix A for definitions and calculation of variables.

Sample

Table 1, Panel A shows our sample selection process. Bond-year observations are compiled using data from TRACE (Trade Reporting and Compliance Engine) for the available period, July 1, 2002 through September 29, 2017. The data include investment-grade, high yield, and convertible debt and consist of individual daily bond trades. For each bond, we use the selling price on the last trade of the day to measure yield for that day. The initial sample of unique bond-year observations contains 78,173 observations. For our analysis, we calculate the bond's yield three and thirty days subsequent to the 10-K filing date. We eliminate 24,456 bond-year observations that lack either the trade volume or the trade frequency to calculate the bond's yield around the information release (10-K filing date). We lose another 5,235 observations in matching our dataset to Compustat. Finally, we lose 25,417 bond-year observations that do not contain the full set of control variables required by our regression analysis. The resulting final sample size is 23,065 unique bond-year

observations among 880 unique firms. For each of the 5,042 individual bonds in our dataset, we collect bond-specific information from the Mergent Fixed Income Securities Database (FISD).

Table 1, Panel B shows the distribution of our bond-year observations by calendar year. While our sample begins as early as 2002, 96 percent of our observations come from the years 2005 through 2017. The limitation in data from earlier years is a feature of the TRACE database. The distribution of bond-year observations shows an increasing trend in bond trades over time.

Table 1, Panel C shows our bond-year observations by the issuer firm's industry. We utilize the Fama-French 12 categories to identify these classifications. The most highly represented industries are manufacturing (14%), business equipment (14%), and retail (13%), while the least represented industries are consumer durables (1%) and financials (3%).

<Insert Table 1 here>

IV. RESULTS

Univariate Analysis at Issuance

Table 2 provides descriptive statistics (Panel A) for the bonds at issuance. The data are based on 5,042 individual bonds. Our measure of *Offering Bond Yield* represents the yield to maturity at bond issuance. Figure 2 shows the yield across tax avoidance measure decile portfolios, reflecting the "U" shape predicted in Figure 1. As credit ratings are an important measure of risk and value for bonds, we bifurcate the sample using investment-grade (*Investment Grade* = 1) and non-investment-grade (*Investment Grade* = 0) credit ratings. Investment-grade ratings include Moody's, S&P, or Fitch ratings at or above the equivalent of S&P's "BBB-" or above credit rating, with everything below classified as non-investment-grade. The majority of the sample (3,499, or 69.4%) has an investment-grade credit rating. The difference in *Offering Bond Yield* between non-

investment- (mean of 6.68) and investment-grade (mean of 4.57) bonds is statistically significant. The mean tax avoidance measures are also significantly different, with investment-grade bond firms exhibiting more tax avoidance. The non-investment-grade bonds are also from smaller firms than the investment-grade based on both log of asset size and market to book ratio. The Z-score indicates investment-grade bonds are, on average, less financially constrained. These results are consistent with higher credit rating firms considered less risky by investors. Our variables of interest—*BT*, *DTAX*, and *TA_CETR*—share substantially similar distributions with those shown by Hasan et al. (2014), though our mean *TA_CETR* is over 3 percentage points lower (Panel B). The mean (median) *BT* and *DTAX* are 0.01 (0.01) and 0.03 (0.01), respectively. *TA_CETR* is an average (median) cash effective tax rate of 22% (20%). There are however differences between both the firms and the debt instruments in our sample vs Hasan et al. (2014). The firms in our sample are larger ($13.359 billion vs $674 million), more profitable (ROA of 14% vs 6.7%), with higher cash holdings (10% vs 8.1%) and higher leverage (51% vs 27%), all of which we would expect given that the firms in our sample have access to the public debt market (Rauh and Sufi 2010). The borrowings in our sample are longer term (10.6 years vs 3.6 years) and unsecured, whereas the Hasan et al. (2014) sample is largely comprised of collateralized loans.

<Insert Table 2 here>

Univariate Analysis of Bonds Yields

Table 2 provides descriptive statistics (Panel B) and Univariate Tests of Means (Panel C) for secondary bond market transactions of the bonds reported in Panel A. Pairwise Pearson correlations for our sample are shown in Table 3. The data are based on 23,065 bond-year observations. The variable of interest sample sizes are lower due to data requirements. Our measures of bond yield—$Yield_{t+3}$ and $Yield_{t+30}$—capture the most recent trades three and thirty days after the 10-K filing,

respectively. In cases where no bonds trade on the designated date, we expand the window until the 30th or 40th day after the filing date, respectively. As such, the distributions of the two measures are similar, mean of 4.78 and 4.79, respectively, and the two measures are positively correlated (*p*-value < 0.01).

<Insert Table 3 here>

The difference in means between the investment and non-investment-grade bonds is statistically significant. The spread in yields between investment-grade and non-investment grade bonds has widened from 2.11 points at issuance to 3.5 points in the secondary market. This widening could be a function of either deterioration in fundamentals or changes in investor preferences. For *BT*, non-investment-grade is 2 percentage points lower and a different sign. *DTAX* and *TA_CETR* are 1 percent and 4 percent lower, respectively. These results suggest lower tax avoidance among investment-grade bonds based on effective tax rate, but higher based on BT and DTAX.

To examine variability in the relationship between tax avoidance and bond yield across our sample, we conduct univariate tests of means for decile, quartile, and tercile portfolios (Panel C). The sample size (N) represents bond-year observations, meaning that firms may be represented more than once. All differences are statistically significant except *TA_CETR* in the decile analysis. The complete distribution of decile portfolios based on the three measures is provided in Figure 3. It is evident that the relationship is non-linear. The "U" shape predicted by our graph in Figure 1 comes through with varying clarity for all definitions of tax avoidance with the least aggressive and the most aggressive tax-avoidant firms facing the highest yields in the bond market. At the extremes in both low and high tax avoidance, investors require a greater return to compensate for undersheltering (Shackelford and Shevlin 2001; Weisbach 2002; Hanlon and Heitzman 2010) at the

low end and the increased risk of IRS audits, lack of transparency, and managerial opportunism at the high end of avoidance. Table 2 Panel C shows that the highest decile of tax avoiders have a three (thirty) day bond yield that is 3.1% (2.87%) percentage points lower than the lowest decile of tax avoiders using the *BT* measure. Using the *DTAX* measure, the highest decile of tax avoiders shows three (thirty) day bond yield that is 1.57% (1.53%) lower than the lowest decile. All differences are statistically significant. The *TA_CETR* measure, while showing significance in tercile and quartile portfolios, is not significant in the decile portfolios.

Our three variables of interest—*BT*, *DTAX*, and *TA_CETR*— are, similar to Hasan et al. (2014), positively correlated with each other (p-value < 0.01) (Table 3). Consistent with prior literature (e.g. (Graham et al. 2008; Hasan et al. 2014), we find that size (*Log(Assets)*), return on assets (*ROA*), growth opportunities (*MTB*), and financial health (*Z-score*) are negatively correlated with our measures of the cost of debt. Conversely, financial burden (*Leverage*) and tangibility of assets (*Tangibility*) are positively associated with the cost of debt.

Multivariate Analysis at Issuance

Table 4 presents results for the bond issuance yield analysis, an OLS regression with industry and year fixed effects. We estimate equation (2) using offering bond yield and our three separate tax avoidance measures. The coefficient on *BT* (Column 1) is negative and significant (p<0.01), consistent with higher levels of book-tax difference associated with lower cost of debt. In economics terms the coefficient signifies a 15 basis point lower interest rate. The coefficients for *DTAX* (Column 2) and *TA_CETR* (Column 3) are not statistically significant.

<Insert Table 4 here>

We estimate equation (2) again within subsamples of investment-grade and non-investment-grade bond issuances (Table 5). Results are similar to the full sample for both subsamples, however

the magnitude of the *BT* coefficient is greater for non-investment grade bonds (in economic terms, 18.9 basis points vs 9.45 basis points).

<Insert Table 5 here>

Multivariate Analysis for Secondary Trades

Table 6 (Panel A) presents results for our tests of Hypothesis 1, an OLS regression with industry and year fixed effects. We estimate equation (3) using our two different information processing dates (3 and 30 days after the 10-K filing date) and three separate tax avoidance measures. The estimate for *BT* has the largest impact on yield, both in magnitude and significance, out of our three measures. Columns (1) and (4) use book-tax differences (*BT*) as our proxy for tax avoidance. In both specifications, the coefficient on *BT* is negative and significant ($p < 0.01$), consistent with higher levels of book-tax differences being associated with lower levels of a firm's cost of debt. For three (thirty) day bond yield, the -10.89 (-9.93) coefficient is statistically significant at the 1% level. Columns (2) and (5) estimate the equation using permanent discretionary book-tax differences (*DTAX*) as our proxy for tax avoidance. The coefficient on DTAX is negative and statistically significant ($p < 0.05$). Finally, columns (3) and (6) show the results of estimating equation (1) using *TA_CETR* as the variable of interest. The resulting coefficients on *TA_CETR* in both specifications are both statistically significantly negative at the 5% level, consistent with higher levels of cash tax avoidance being associated with lower costs of debt after controlling for firm attributes. The findings for *DTAX* and *TA_CETR* deviate from our analysis at issuance, presented in Table 5. For some measures, the relationship between tax avoidance and bond yield differs between the secondary and primary bond markets.

<Insert Table 6 here>

As expected, firm size, Z-score, and ROA are primarily negatively significantly associated with bond yield at the 1% level: larger, more financially healthy, and more profitable firms are less risky and tend to require lower returns from investors. Leverage and earnings volatility are generally positively significantly associated with bond yield: as financial burden and uncertainty increases, investors require greater returns. Sales growth and market-to-book ratio are generally not significant. The exceptions are earnings volatility not being significant and sales growth with the cash effective tax rate. This difference may be related to the ease of availability and calculation of the *TA_CETR*.

We consider the non-linear effect of tax avoidance on cost of corporate publicly traded debt. We graph a quadratic function for all three tax avoidance measures, as shown in Figure 4. The regression results including the quadratic term for each tax measure (Table 6 Panel B) show that regardless of tax measure used, the relationship of yield and tax avoidance is non-linear. The coefficients on all quadratic terms are positive and statistically significant ($p < 0.01$ for *BT* and *TA_CETR*; $p < 0.05$ for *DTAX*).

When bifurcating our sample by credit rating (investment versus non-investment-grade), we find that the *BT* tax measure confirms our nonlinear relationship for both investment-grade and non-investment-grade bonds grade bonds (Table 7). The *DTAX* and *TA_CETR* measures are only significant for the non-investment-grade bonds.

<Insert Table 7 here>

Overall, our results show that the relationship between tax avoidance and corporate bond yields is non-linear. Investors in the secondary bond market value the cash tax savings provided by tax avoidance, thus requiring a lower return when tax avoidance is higher up to an optimal point of tax avoidance, beyond which firms incur a risk premium. We estimate the optimal points for all of

our three measures after estimating the regression reported in Table 6, using $Yield_{t+3}$ as the dependent variable. The optimal values (lowest point on the graphs presented in Figure 4) are 0.0875 for *BT*, 0.17 for *DTAX*, and -0.27 for *TA_CETR*. Future research will investigate this "optimal" level of tax avoidance more fully.

V. CONCLUSION

Prior studies have analyzed the cost of equity and the cost of new debt issuances. If the firm is debt free, then the equity response is of sole importance. As debt becomes a higher proportion of a firm's balance sheet, the reaction of bondholders grows in significance. We contribute to the current debate by evaluating the relationship between levels of tax avoidance and bond yield both at issuance and on the secondary market.

Previous research has shown that private lenders demand a risk premium for firms that are more aggressive tax avoiders. We propose that the relationship of tax avoidance and cost of debt is non-linear and depends on the level of tax avoidance, the quality of the bonds, and the financial constraints of the firm. Using a dataset of secondary market bond trades where the underlying firms have no control over the timing of the trades, we show that for this sample of large firms with publicly traded corporate debt, tax avoidance can be rewarded by debtholders for the majority of the firms and penalized for those at the extreme levels of aggressive tax avoidance. These results, however, vary depending on the tax avoidance measure used. The *BT* tax measure shows a significant non-linear relationship both at issuance and in the secondary market for investment-grade and non-investment-grade bonds. The other measures are only significant in the secondary market and are limited to non-investment-grade bonds.

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APPENDIX A
Variable definitions

Variable	Definition
Dependent Variables	
$Yield_{t+3}$	Yield (yld_pt) from most recent trade after 3 (not to exceed 30) filing days after filing date (Source: TRACE).
$Yield_{t+30}$	Yield (yld_pt) from most recent trade after 30 (not to exceed 40) filing days after filing date (Source: TRACE).
Variables of Interest	
BT_y	Manzon and Plesko (2002) book-tax differences for firm *i* in year *y*, scaled by lagged total assets (pidom - txfed/0.35 - txs - txo - esub).
$DTAX_y$	Frank, Lynch, and Rego (2009) discretionary permanent book-tax difference for firm *i* in year *y* ($\varepsilon_{i,y}$ from the following regression estimated by two-digit SIC code and fiscal year: $PERM_{i,y} = \beta 0 + \beta 1\ INTANG_{i,y} + \beta 2\ UNCON_{i,y} + \beta 3\ MI_{i,y} + \beta 4\ CSTE_{i,y} + \beta 5\ \Delta NOL_{i,y} + \beta 6\ PERM_{i,y-1} + \varepsilon_{i,y}$)
TA_CETR_y	(-1) times cash effective tax rate for firm *i* in year *y*. Cash effective tax rate is defined as cash tax paid (txpd) divided by pre-tax book income (pi) less special items (spi). *TA_CETR* is set as missing when the denominator is zero or negative. We truncate *TA_CETR* to the range [0,1].
Control Variables	
Firm-Level:	
$Log(Assets_y)$	Natural log of total assets (at) for firm *i* in year *y*.
$Leverage_y$	Long-term debt (dltt) + debt in current liabilities (lct), scaled by total assets ($at_{i,t}$).
$Tangibility_y$	Net property, plant, and equipment (ppent) scaled by total assets ($at_{i,t}$).
$Cash\ Holding_y$	Cash and market securities (che) scaled by total assets ($at_{i,t}$).
ROA_y	Operating income before depreciation (oibdp) scaled by total assets ($at_{i,t}$).
MTB_y	Market to Book Ratio for firm *i* in year *y*: ((prcc_f * csho) / ceq).
$Sales\ Growth_y$	Percentage growth rate of sales (revt) from *y-1* to *y* for firm.
$Earnings\ Volatility_y$	*S*tandard deviation of quarterly earnings (Source: IBES) in the previous five years.
$Z\text{-}score_y$	Modified Altman's (1968) Z-score from Graham, Li, and Qiu (2008) in year *y*: ((1.2*WCAP) + (1.4*RE) + (3.3*PI) + (0.999*SALE)) / at_{y-1}.
Bond-Level:	
Offering Bond Yield	Yield to maturity (if missing, coupon rate) at issuance (Source: Mergent FISD).
Term Premium	10-year less 1-month T-Bill yields at trade date (Source: fred.stlouisfed.org).
Credit Rating	Composite S&P, Moody's, and Fitch rating at trade date (Source: Mergent FISD). Where 1 (13) is the highest (lowest) credit rating.
Bond Life	(Source: Mergent FISD).
Issue Amount (millions)	Total dollar face value of bond issue (Source: Mergent FISD).
Subordinated	1 if bond is subordinated to other debt, and zero otherwise (Source: Mergent FISD).
Callable	1 if bond is callable, and zero otherwise (Source: Mergent FISD).
Putable	1 if bond is putable, and zero otherwise (Source: Mergent FISD).
Sinking Fund	1 if bond has a sinking fund feature, and zero otherwise (Source: Mergent FISD).

TABLE 1
Sample selection and summary

Panel A: Sample selection

Unique bond-year observations compiled from TRACE data (trades between Jul 1, 2002 and Sep 29, 2017)	78,173
Less: Insufficient trade volume to calculate yield around 10-K filing date	(24,456)
Unable to match to Compustat data	(5,235)
Missing data for control variables	(25,417)
Total secondary market sample size	23,065
Bond issuance sample size	5,042
Unique firms issuing bonds	880

Panel B: Secondary market observations by year

Year	Total	
Of Trade	N	%
2002	11	0%
2003	370	2%
2004	503	4%
2005	1,333	6%
2006	1,283	5%
2007	1,254	5%
2008	1,281	5%
2009	1,384	6%
2010	1,481	6%
2011	1,555	6%
2012	1,703	7%
2013	1,885	8%
2014	2,029	9%
2015	2,257	10%
2016	2,447	11%
2017	2,289	10%
Total	23,065	100%

TABLE 1 (continued)

Panel C: Industry composition

	Total	
Issuer Firm Industry	N	%
Consumer Non-Durables	2,086	9%
Consumer Durables	347	1%
Manufacturing	3,248	14%
Energy	2,140	9%
Chemicals	1,247	6%
Business Equipment	2,831	12%
Telecommunications	1,267	6%
Utilities	1,487	6%
Retail	3,133	14%
Health	2,164	9%
Financial	681	3%
Other	2,434	11%
Total	23,065	100%

TABLE 2
Descriptive statistics and univariate tests of means

Panel A: Descriptive Statistics at Bond Issuance (bifurcated by *Investment Grade)*

	Full Sample (N = 5,042)			*Investment Grade* = 0 (N = 1,543)			*Investment Grade* = 1 (N = 3,499)		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Offering Bond Yield	5.22	5.16	2.29	**6.68**	**6.90**	2.34	4.57	4.54	1.95
BT_y	0.01	0.01	0.06	**0.00**	**0.00**	0.07	0.01	0.01	0.05
$DTAX_y$	0.03	0.01	0.13	**0.03**	**0.01**	0.15	0.04	0.01	0.13
TA_CETR_y	-0.22	-0.20	0.16	**-0.19**	**-0.14**	0.20	-0.23	-0.22	0.15
$Log(Assets_y)$	9.50	9.63	1.40	**8.37**	**8.44**	1.17	10.00	10.08	1.19
$Leverage_y$	0.51	0.50	0.16	**0.58**	**0.57**	0.18	0.48	0.47	0.14
$Tangibility_y$	0.35	0.28	0.26	**0.40**	**0.36**	0.27	0.32	0.24	0.25
$Cash\ Holding_y$	0.1	0.06	0.11	**0.09**	0.06	0.10	0.10	0.06	0.12
ROA_y	0.14	0.13	0.07	**0.11**	**0.11**	0.06	0.16	0.15	0.06
MTB_y	3.60	2.64	5.41	**2.34**	**1.93**	5.38	4.16	2.98	5.33
$Sales\ Growth_y$	0.08	0.06	0.20	**0.13**	**0.08**	0.26	0.06	0.05	0.16
$Earnings\ Volatility_y$	1.03	0.80	0.84	**0.90**	**0.60**	1.00	1.09	0.88	0.75
$Z\text{-}score_y$	1.65	1.61	1.05	**1.17**	**1.10**	1.07	1.86	1.78	0.97
Term Premium	2.03	1.94	0.90	**1.89**	**1.87**	0.98	2.10	1.97	0.86
Credit Rating	7.58	8.00	1.98	**9.56**	**9.50**	0.78	6.70	7.50	1.70
Bond Life	10.66	8.79	8.55	**8.64**	**7.23**	5.81	11.55	9.23	9.37
*Issue Amount (*millions*)*	593.7	499.0	482.7	**432.6**	**346.5**	334.2	664.81	500	519.64
Subordinated	0.06	0.00	0.24	**0.19**	**0.00**	0.39	0.01	0.00	0.07
Callable	0.88	1.00	0.32	**0.87**	1.00	0.34	0.89	1.00	0.32
Putable	0.04	0.00	0.19	**0.08**	**0.00**	0.27	0.02	0.00	0.14
Sinking Fund	0.00	0.00	0.04	0.00	0.00	0.04	0.00	0.00	0.03

Bold if results of T-test of means or non-parametric equality of medians is significant at the 0.10 level, or better (2-tailed) partitioned by *Investment Grade*.
Variables are as defined in Appendix A. All continuous variables are winsorized at 1%/99%.

TABLE 2 (continued)

Panel B: Descriptive Statistics in Secondary Market (bifurcated by *Investment Grade)*

	Full Sample (N = 23,065)			*Investment Grade* = 0 (N = 6,295)			*Investment Grade* = 1 (N = 16,770)		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
$Yield_{t+3}$	4.78	4.26	3.93	**7.32**	**6.12**	5.67	3.82	3.76	2.42
$Yield_{t+30}$	4.79	4.27	3.98	**7.32**	**6.18**	5.7	3.84	3.76	2.51
BT_y	0.01	0.01	0.05	**-0.01**	**0.00**	0.07	0.01	0.01	0.04
$DTAX_y$	0.03	0.01	0.13	**0.02**	**0.00**	0.14	0.03	0.01	0.12
TA_CETR_y	-0.23	-0.22	0.16	**-0.20**	**-0.16**	0.21	-0.24	-0.23	0.15
$Log(Assets_y)$	9.65	9.75	1.33	**8.51**	**8.61**	1.14	10.08	10.14	1.13
$Leverage_y$	0.51	0.49	0.17	**0.58**	**0.55**	0.19	0.49	0.47	0.15
$Tangibility_y$	0.35	0.27	0.26	**0.41**	**0.38**	0.27	0.33	0.24	0.25
$Cash\ Holding_y$	0.10	0.06	0.11	**0.09**	0.06	0.09	0.10	0.06	0.11
ROA_y	0.14	0.14	0.07	**0.11**	**0.11**	0.07	0.15	0.15	0.06
MTB_y	3.69	2.68	5.86	**2.43**	**1.80**	5.74	4.16	3.04	5.84
$Sales\ Growth_y$	0.05	0.04	0.16	**0.06**	**0.04**	0.21	0.05	0.04	0.14
$Earnings\ Volatility_y$	1.13	0.9	0.85	**0.94**	**0.65**	0.97	1.20	0.99	0.79
$Z\text{-}score_y$	1.68	1.64	1.05	**1.14**	**1.04**	1.08	1.88	1.79	0.97
Offering Bond Yield	5.49	5.69	2.04	**6.58**	**6.89**	2.15	5.08	5.22	1.84
Term Premium	1.97	1.94	0.99	**1.90**	**1.92**	1.09	2.00	1.95	0.95
Credit Rating	7.52	8.00	1.89	**9.54**	**9.50**	0.74	6.76	7.50	1.61
Bond Life	9.57	6.5	8.54	**7.62**	**6.07**	6.08	10.30	6.89	9.19
*Issue Amount (*millions*)*	567.4	450.0	444.3	**426.0**	**345.0**	311.0	620.4	500.0	474.2
Subordinated	0.05	0.00	0.22	**0.18**	**0.00**	0.39	0.00	0.00	0.06
Callable	0.87	1.00	0.33	**0.86**	1.00	0.35	0.88	1.00	0.33
Putable	0.03	0.00	0.18	**0.08**	**0.00**	0.28	0.02	0.00	0.13
Sinking Fund	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.02

Bold if results of T-test of means or non-parametric equality of medians is significant at the 0.10 level, or better (2-tailed) partitioned by *Investment Grade*.
Variables are as defined in Appendix A. All continuous variables are winsorized at 1%/99%.

TABLE 2 (continued)
Panel C: Univariate Tests of Means

		High Tax Avoiders	Low Tax Avoiders	t-test of Mean Differences 2-tailed *p*-value	High Tax Avoiders	Low Tax Avoiders	t-test of Mean Differences 2-tailed *p*-value
Dependent Variable:			$Yield_{t+3}$			$Yield_{t+30}$	
Decile Analysis							
Tax Avoiders Variable							
BT_y	N =	2,279	2,290		2,279	2,290	
		4.61	7.71	0.001	4.67	7.54	0.001
$DTAX_y$	N =	2,202	2,204		2,202	2,204	
		4.44	6.01	0.001	4.45	5.98	0.001
TA_CETR_y	N =	2,129	2,132		2,129	2,132	
		5.07	4.97	0.330	5.11	5.00	0.281
Quartile Analysis							
Tax Avoiders Variable							
BT_y	N =	5,681	5,735		5,681	5,735	
		4.39	6.07	0.001	4.44	6.01	0.001
$DTAX_y$	N =	5,502	5,509		5,502	5,509	
		4.47	5.40	0.001	4.49	5.41	0.001
TA_CETR_y	N =	5,315	5,330		5,315	5,330	
		4.70	4.56	0.010	4.74	4.56	0.002
Tercile Analysis							
Tax Avoiders Variable							
BT_y	N =	7,626	7,636		7,626	7,636	
		4.34	5.72	0.001	4.39	5.67	0.001
$DTAX_y$	N =	7,335	7,343		7,335	7,343	
		4.56	5.20	0.001	4.56	5.19	0.001
TA_CETR_y	N =	7,097	7,099		7,097	7,099	
		4.57	4.44	0.007	4.61	4.45	0.001

This table presents the results of t-tests of means of *Yield* using the extreme quantiles (deciles, quartiles, and terciles) of each of the three tax avoidance measures (*BT*, *DTAX*, and *TA_CETR*).
Variables are as defined in Appendix A. *Yield* is winsorized at 1%/99%.

TABLE 3
Pairwise Pearson correlations

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*	*(19)*	*(20)*	*(21)*	*(22)*	*(23)*
(1) $Yield_{t+3}$																							
(2) $Yield_{t+30}$	**0.92**																						
(3) BT_y	**-0.25**	**-0.23**																					
(4) $DTAX_y$	**-0.08**	**-0.07**	**0.06**																				
(5) TA_CETR_y	**-0.05**	**-0.04**	**0.29**	**0.05**																			
(6) $Log(Assets_y)$	**-0.31**	**-0.30**	**0.09**	**0.06**	-0.01																		
(7) $Leverage_y$	**0.17**	**0.16**	**-0.11**	**-0.05**	**-0.05**	**-0.23**																	
(8) $Tangibility_y$	**0.15**	**0.14**	**0.05**	**-0.17**	**0.09**	**-0.02**	**-0.10**																
(9) $Cash\ Holding_y$	**-0.06**	**-0.06**	**-0.13**	**0.07**	**0.02**	**0.04**	**-0.03**	**-0.42**															
(10) ROA_y	**-0.22**	**-0.21**	**0.36**	**0.06**	**-0.08**	**0.04**	**0.11**	**-0.08**	**0.09**														
(11) MTB_y	**-0.11**	**-0.11**	**-0.01**	**0.03**	**-0.04**	**0.07**	**0.06**	**-0.10**	**0.07**	**0.20**													
(12) $Sales\ Growth_y$	**-0.03**	-0.01	**0.22**	**0.05**	**0.16**	**-0.04**	**-0.03**	**-0.03**	**-0.02**	**0.19**	**0.04**												
(13) $Earnings\ Volatility_y$	**-0.02**	**-0.03**	**-0.02**	**0.01**	**-0.06**	**0.23**	**0.07**	-0.01	0.01	**0.06**	**0.03**	**-0.10**											
(14) $Z\text{-}score_y$	**-0.19**	**-0.19**	**0.17**	0.00	**-0.24**	**0.02**	**0.07**	**-0.23**	**0.11**	**0.52**	**0.16**	**0.06**	**0.03**										
(15) Offering Bond Yield	**0.32**	**0.31**	**-0.03**	**-0.06**	**0.03**	**-0.27**	**0.12**	**0.19**	**-0.19**	**-0.13**	**-0.10**	**0.02**	**-0.11**	**-0.11**									
(16) Term Premium	**-0.06**	**-0.07**	**0.03**	**-0.02**	**0.06**	**0.05**	**-0.04**	0.00	**0.02**	-0.01	**-0.03**	**-0.12**	**0.05**	0.01	0.00								
(17) Credit Rating	**0.37**	**0.36**	**-0.14**	**-0.08**	**0.06**	**-0.62**	**0.24**	**0.17**	**-0.20**	**-0.37**	**-0.16**	**0.05**	**-0.13**	**-0.35**	**0.32**	**-0.04**							
(18) Bond Life	**0.12**	**0.12**	**0.05**	0.01	-0.01	**0.17**	**-0.08**	0.01	**0.02**	**0.04**	**0.03**	0.00	**0.02**	**0.02**	**0.08**	0.00	**-0.13**						
(19) Issue Amount	**-0.14**	**-0.14**	**-0.04**	**0.06**	**-0.02**	**0.53**	**-0.05**	**-0.10**	**0.17**	**0.05**	**0.06**	**-0.04**	**0.15**	**-0.06**	**-0.22**	**0.05**	**-0.30**	**0.08**					
(20) Subordinated	**0.17**	**0.18**	**-0.03**	**0.01**	**0.04**	**-0.31**	**0.08**	0.00	0.00	**-0.08**	**-0.05**	**0.07**	**-0.08**	**-0.08**	**0.06**	**-0.07**	**0.28**	**-0.04**	**-0.13**				
(21) Callable	**-0.09**	**-0.09**	0.01	**-0.01**	**0.03**	**-0.04**	**-0.02**	**0.03**	**-0.07**	**-0.04**	0.00	0.00	**0.03**	**-0.07**	**-0.05**	**0.02**	**0.12**	**0.03**	**0.06**	**-0.04**			
(22) Putable	**0.08**	**0.09**	**-0.02**	**0.03**	0.01	**-0.13**	0.01	**-0.03**	**0.04**	**-0.06**	**-0.02**	**0.04**	**-0.07**	**-0.04**	**-0.17**	**-0.04**	**0.12**	**0.21**	**-0.06**	**0.17**	0.00		
(23) Sinking Fund	**0.03**	**0.03**	-0.01	-0.01	0.01	0.00	0.01	**0.02**	0.00	**-0.01**	-0.01	0.00	**0.01**	-0.01	**0.03**	0.00	0.01	0.01	**-0.02**	0.01	**-0.03**	0.00	

Variables are as defined in Appendix A.
Bold if p-value < 0.10 (2-tailed).

TABLE 4
Bond Issuance Yield Analysis

	(1)	(2)	(3)
Dependent Variable:		*Offering Bond Yield*	
Variable of Interest			
BT_y	-2.52***		
	(0.00)		
$DTAX_y$		0.04	
		(0.86)	
TA_CETR_y			0.18
			(0.38)
Firm-Level Control Variables			
$Log(Assets_y)$	-0.27***	-0.27***	-0.30***
	(0.00)	(0.00)	(0.00)
$Leverage_y$	1.66***	2.01***	1.39***
	(0.00)	(0.00)	(0.00)
$Tangibility_y$	0.84***	0.78**	0.81**
	(0.01)	(0.02)	(0.01)
$CashHolding_y$	-0.51	-0.45	0.06
	(0.31)	(0.39)	(0.89)
ROA_y	-3.02***	-3.56***	-3.87***
	(0.00)	(0.00)	(0.00)
MTB_y	-0.02***	-0.02***	-0.01**
	(0.01)	(0.01)	(0.02)
$Sales\ Growth_y$	0.25	0.24	0.29
	(0.22)	(0.22)	(0.15)
$Earnings\ Volatility_y$	-0.00	-0.01	-0.01
	(0.93)	(0.89)	(0.84)
$Z\text{-}score_y$	0.02	-0.01	-0.01
	(0.78)	(0.94)	(0.89)

TABLE 4 (continued)

Bond-Level Control Variables			
Term Premium	0.07	0.05	-0.02
	(0.64)	(0.74)	(0.87)
Credit Rating	0.27***	0.26***	0.26***
	(0.00)	(0.00)	(0.00)
Bond Life	0.06***	0.06***	0.06***
	(0.00)	(0.00)	(0.00)
Issue Amount	0.00*	0.00*	0.00***
	(0.05)	(0.05)	(0.01)
Subordinated	-0.70***	-0.69***	-0.44***
	(0.00)	(0.00)	(0.01)
Callable	0.44***	0.45***	0.25*
	(0.00)	(0.00)	(0.10)
Putable	-4.27***	-4.24***	-4.41***
	(0.00)	(0.00)	(0.00)
Sinking Fund	1.62***	1.66***	1.90***
	(0.00)	(0.00)	(0.00)
Constant	4.20***	4.16***	5.20***
	(0.00)	(0.00)	(0.00)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	4,994	4,815	4,672
Adjusted R-squared	0.59	0.59	0.60

This table presents the results of OLS regressions used to estimate equation (2). Columns (1) through (3) are estimated using the yield to maturity at bond issuance (Mergent FISD: offering_yield) as the dependent variable.
Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1 (two-tailed).
Variables are as defined in Appendix A. All continuous variables are winsorized at 1%/99%.
Firm- and bond-level control variables are from the fiscal year just completed prior to the bond issuance date.

TABLE 5
Bond Issuance Yield Analysis (bifurcated by *Investment Grade*)

	(1)	(2)	(3)	(4)	(5)	(6)
		Investment Grade = 0			*Investment Grade* = 1	
Dependent Variable:		*Offering Bond Yield*			*Offering Bond Yield*	
Variable of Interest						
BT_y	-2.69***			-1.89***		
	(0.00)			(0.00)		
$DTAX_y$		-0.32			0.14	
		(0.31)			(0.55)	
TA_CETR_y			-0.22			-0.14
			(0.43)			(0.44)
Firm-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bond-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,519	1,489	1,240	3,475	3,326	3,432
Adjusted R-squared	0.56	0.55	0.56	0.68	0.68	0.68

This table presents the results of OLS regressions used to estimate equation (2) after bifurcating the sample by *Investment Grade*. Columns (1) through (6) are estimated using the yield to maturity at bond issuance (Mergent FISD: offering_yield) as the dependent variable.
Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1 (two-tailed).
Variables are as defined in Appendix A. All continuous variables are winsorized at 1%/99%.
Firm- and bond-level control variables are from the fiscal year just completed prior to the bond issuance date.

TABLE 6
Secondary Market Yield Analysis

Panel A: Baseline Levels

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:		$Yield_{t+3}$			$Yield_{t+30}$	
Variables of Interest						
BT_y	-10.89***			-9.93***		
	(0.00)			(0.00)		
$DTAX_y$		-0.57**			-0.67**	
		(0.03)			(0.02)	
TA_CETR_y			-0.58**			-0.55**
			(0.01)			(0.02)
Firm-Level Control Variables						
$Log(Assets_y)$	-0.40***	-0.46***	-0.27***	-0.39***	-0.44***	-0.27***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Leverage_y$	2.86***	3.51***	1.03***	2.74***	3.35***	0.92***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$Tangibility_y$	1.78***	1.59***	0.99***	1.67***	1.45***	0.87**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
$CashHolding_y$	1.14**	1.58**	1.19***	1.12**	1.49**	0.94**
	(0.04)	(0.01)	(0.00)	(0.04)	(0.02)	(0.01)
ROA_y	-4.33***	-7.51***	-1.58	-3.96***	-6.81***	-1.37
	(0.00)	(0.00)	(0.11)	(0.00)	(0.00)	(0.16)
MTB_y	-0.02**	-0.02*	-0.00	-0.02***	-0.02**	-0.01
	(0.01)	(0.06)	(0.33)	(0.01)	(0.03)	(0.22)
$Sales\ Growth_y$	-0.66**	-1.18***	-0.08	-0.41	-0.89***	-0.07
	(0.02)	(0.00)	(0.72)	(0.14)	(0.00)	(0.75)
$Earnings\ Volatility_y$	0.25***	0.25**	-0.01	0.28***	0.27***	0.02
	(0.01)	(0.02)	(0.85)	(0.00)	(0.01)	(0.78)
$Z\text{-}score_y$	-0.13	-0.18**	-0.11	-0.14*	-0.19**	-0.12*
	(0.12)	(0.04)	(0.11)	(0.10)	(0.04)	(0.07)

TABLE 6 (continued)

Bond-Level Control Variables						
Offering Bond Yield	0.18***	0.18***	0.18***	0.18***	0.18***	0.18***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Term Premium	0.22*	0.18	0.18**	0.23*	0.18	0.16*
	(0.09)	(0.19)	(0.04)	(0.08)	(0.19)	(0.09)
Credit Rating	0.33***	0.31***	0.29***	0.33***	0.31***	0.27***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Bond Life	0.08***	0.08***	0.09***	0.08***	0.08***	0.09***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Issue Amount	0.00**	0.00***	0.00**	0.00***	0.00***	0.00***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
Subordinated	0.41	0.35	0.33	0.59*	0.54*	0.47**
	(0.16)	(0.24)	(0.12)	(0.05)	(0.09)	(0.03)
Callable	-1.10***	-1.21***	-0.67***	-1.11***	-1.23***	-0.69***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Putable	-0.50	-0.49	-0.82***	-0.24	-0.26	-0.75**
	(0.24)	(0.26)	(0.01)	(0.59)	(0.56)	(0.02)
Sinking Fund	2.79	2.98	0.67	3.47	3.77	0.29
	(0.18)	(0.18)	(0.36)	(0.25)	(0.25)	(0.51)
Constant	4.36***	4.68***	3.54***	3.69***	3.98***	3.21***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	22,899	22,025	21,295	22,899	22,025	21,295
Adjusted R-squared	0.39	0.37	0.46	0.37	0.35	0.45

This table presents the results of OLS regressions used to estimate equation (3). Columns (1) through (3) are estimated using the yield (yld_pt) from the most recent trade after 3 (not to exceed 30) filing days after filing date ($Yield_{t+3}$) as the dependent variable. Columns (4) through (6) are estimated using the yield (yld_pt) from the most recent trade after 30 (not to exceed 40) filing days after filing date ($Yield_{t+30}$) as the dependent variable.
Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1 (two-tailed).
Variables are as defined in Appendix A. All continuous variables are winsorized at 1%/99%.
Firm- and bond-level control variables are from the fiscal year just completed prior to the 10-K filing date.

TABLE 6 (continued)

Panel B: Levels Plus Quadratic Function

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:		$Yield_{t+3}$			$Yield_{t+30}$	
Variables of Interest						
BT_y	-9.72***			-8.96***		
	(0.00)			(0.00)		
BT^2_y	37.11***			30.73***		
	(0.00)			(0.00)		
$DTAX_y$		-0.98***			-1.09***	
		(0.01)			(0.00)	
$DTAX^2_y$		2.28**			2.38***	
		(0.01)			(0.01)	
TA_CETR_y			1.30**			1.31**
			(0.01)			(0.01)
$TA\_CETR^2_y$			2.41***			2.38***
			(0.00)			(0.00)
Firm-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bond-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,899	22,025	21,295	22,899	22,025	21,295
Adjusted R-squared	0.40	0.37	0.46	0.38	0.35	0.45

This table presents the results of OLS regressions used to estimate equation (4). Columns (1) through (3) are estimated using the yield (yld_pt) from the most recent trade after 3 (not to exceed 30) filing days after filing date ($Yield_{t+3}$) as the dependent variable. Columns (4) through (6) are estimated using the yield (yld_pt) from the most recent trade after 30 (not to exceed 40) filing days after filing date ($Yield_{t+30}$) as the dependent variable.
Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1 (two-tailed).
Variables are as defined in Appendix A. All continuous variables are winsorized at 1%/99%.
Firm- and bond-level control variables are from the fiscal year just completed prior to the 10-K filing date.

TABLE 7
Secondary Market Yield Analysis (bifurcated by *Investment Grade*)

	(1)	(2)	(3)	(4)	(5)	(6)
		Investment Grade = 0			*Investment Grade* = 1	
Dependent Variable:		$Yield_{t+3}$			$Yield_{t+3}$	
Variables of Interest						
BT_y	-5.69**			-2.44***		
	(0.03)			(0.00)		
BT^2_y	47.19***			7.95*		
	(0.00)			(0.05)		
$DTAX_y$		-2.92***			0.18	
		(0.00)			(0.11)	
$DTAX^2_y$		1.54			-0.12	
		(0.47)			(0.63)	
TA_CETR_y			2.35*			0.10
			(0.10)			(0.77)
$TA\_CETR^2_y$			6.28***			0.32
			(0.01)			(0.43)
Firm-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bond-Level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,199	6,096	4,905	16,700	15,929	16,390
Adjusted R-squared	0.28	0.28	0.19	0.66	0.65	0.66

This table presents the results of OLS regressions used to estimate equation (4) after bifurcating the sample by *Investment Grade*. Columns (1) through (6) are estimated using the yield (yld_pt) from the most recent trade after 3 (not to exceed 30) filing days after filing date ($Yield_{t+3}$) as the dependent variable.
Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1 (two-tailed).
Variables are as defined in Appendix A. All continuous variables are winsorized at 1%/99%.
Firm- and bond-level control variables are from the fiscal year just completed prior to the 10-K filing date.

Figure 1: Cost of Debt and Tax Avoidance

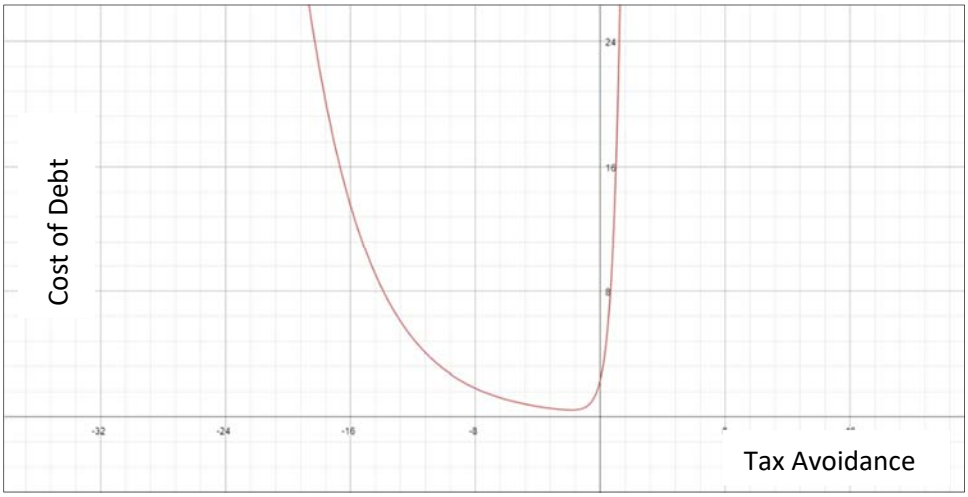
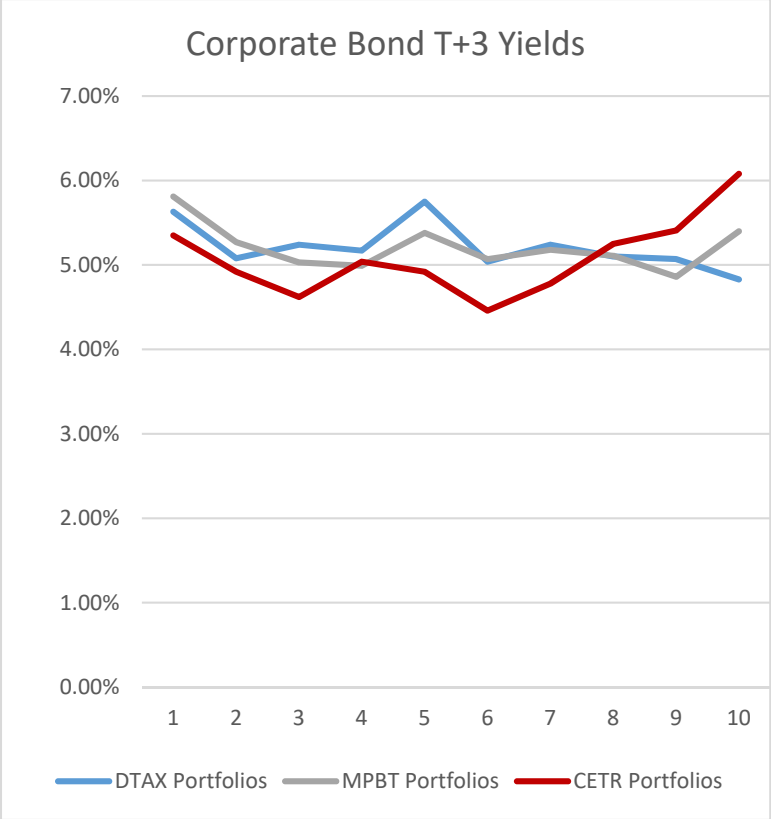
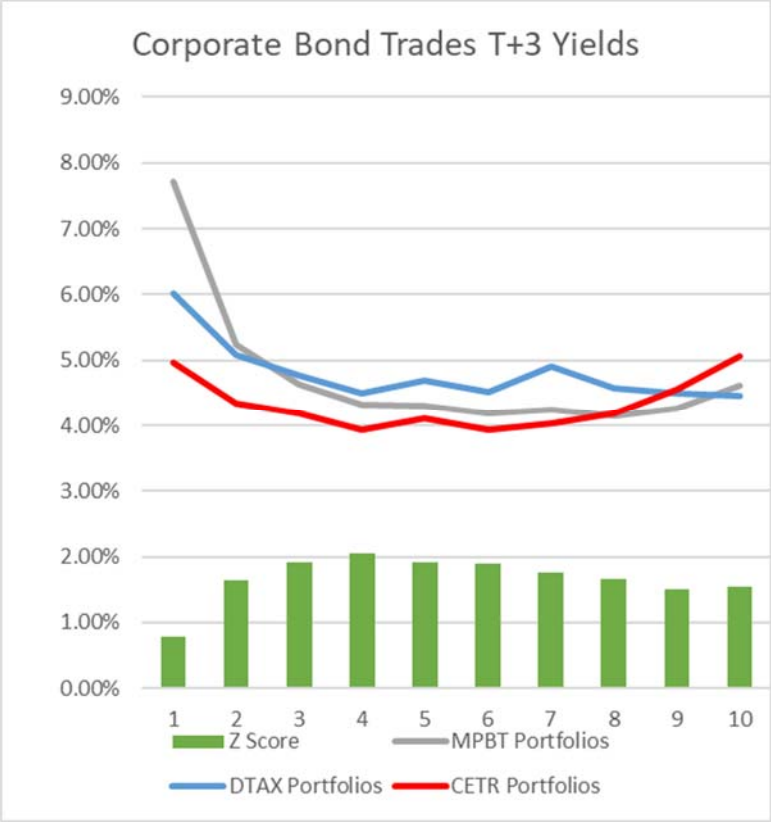


Figure 2: Corporate Bond Issuance Yields and Tax Avoidance Decile Portfolios



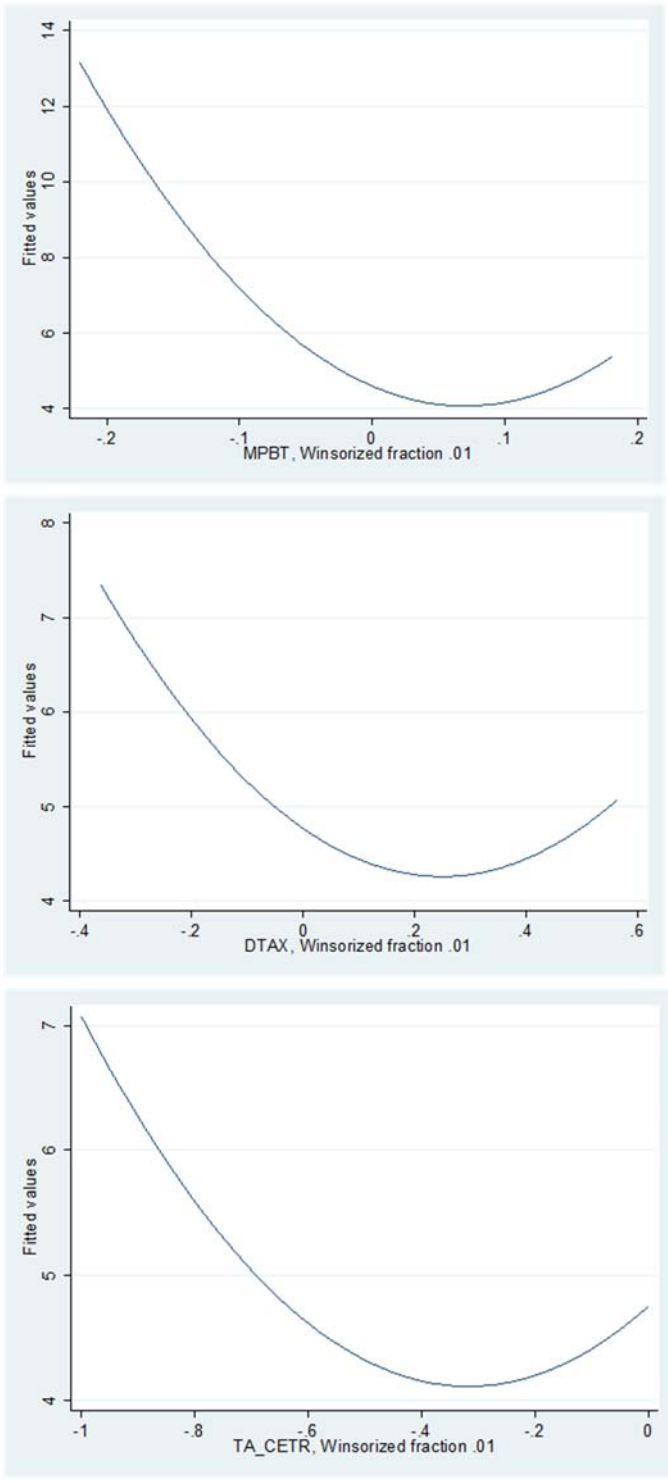
The graph shows a plot of 2002 to 2017 corporate bond yields ($Yield_{t+3}$) for decile portfolios formed on the Manzon and Plesko (2002) book-tax differences measure, the Frank, Lynch, and Rego (2009) DTAX measure and the Cash Effective Tax Rate measure of tax avoidance. Bond data are obtained from *Mergent.* Variable definitions are provided in the Appendix.

Figure 3: Corporate Bond Secondary Market Trade Yields and Tax Avoidance Decile Portfolios



The graph shows a plot of 2002 to 2017 corporate bond yields ($Yield_{t+3}$) for decile portfolios formed on the Manzon and Plesko (2002) book-tax differences measure, the Frank, Lynch, and Rego (2009) DTAX measure and the Cash Effective Tax Rate measure of tax avoidance. The Z-score is based on MPBT portfolios. Bond data are obtained from *TRACE*. Variable definitions are provided in the Appendix.

Figure 4: Corporate Tax Avoidance Measures and $Yield_{t+3}$



The graph shows a quadratic fit of the relationship of ($Yield_{t+3}$) and Manzon and Plesko (2002) book-tax differences measure, the Frank, Lynch, and Rego (2009) DTAX measure and the Cash Effective Tax Rate measure of tax avoidance. Bond data are obtained from *TRACE*. Variable definitions are provided in Appendix A.