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Abstract

The paper studies the effect of uncertainty in tax avoidance on firm value. We first show in a clean surplus valuation model that expected tax rates interact with expectations about future profitability. This paper builds and tests a valuation framework that incorporates two outcome dimensions of corporate tax avoidance strategies: the stability and the level of expected tax rates. We develop a tax planning score that captures these two dimensions. The measure improves the prediction of future tax avoidance. We finally show that the tax planning score strengthens the effect of pre-tax earnings on firm value. Firms with effective and persistent tax planning have a stronger effect of pre-tax earnings on firm value while firms with poor tax planning or volatile effective tax rates receive a discount on their earnings.

Keywords: Firm valuation, tax avoidance, tax uncertainty

JEL Classification: M41, G12, H25

1 Introduction

Given the ongoing public and political debate about corporate tax avoidance (OECD, 2013), the question naturally arises whether tax avoidance positively affects firm value. Indeed, the topic has recently generated significant interest in the literature (Wang, 2010; De Simone and Stomberg, 2013; Inger, 2013). We contribute to this debate by building and testing a valuation framework that incorporates two outcome dimensions of corporate tax avoidance strategies: the stability and the level of expected tax rates. We argue that both dimensions matter for firm valuation. For any given level of tax avoidance, investors value pre-tax earnings more positively if a firm has less variation in effective tax rates over time. Likewise, for a given level of variation in tax rates, investors value pre-tax earnings more positively if a firm has a lower effective tax rate.

While there is a large body of research on the determinants of corporate tax avoidance (see, e.g., Mills, 1998; Dyreng, Hanlon, and Maydew, 2008, 2010), firm value implications of tax avoidance have only recently attracted academic interest (Desai and Dharmapala, 2009; Wang, 2010; De Simone and Stomberg, 2013; Inger, 2013). The classic theoretical literature on firm valuation (e.g. Feltham and Ohlson, 1995; Ohlson, 1995) and their empirical applications (e.g. Dechow, Hutton, and Sloan, 1999; Barth, Elliott, and Finn, 1999; Kothari, 2001) typically use after-tax earnings and do not address any firm value implications of corporate tax avoidance.[1]

In order to address such tax effects, we decompose the Feltham and Ohlson (1995) and Ohlson (1995) valuation model into expected tax rates and pre-tax numbers. First of all, the decomposition illustrates that the level of expected tax avoidance has a multiplicative effect on expected pre-tax profitability. Second, it affects growth in expected book value of equity. The uncertainty embedded in the expectations about future tax avoidance enters the valuation model via the expected rate of return. Assuming that historic tax rates are a noisy signal of future cash flows from tax avoidance strategies, volatility in historic tax rates can be interpreted as measurement error in the spirit of Lambert, Leuz, and Verrecchia (2007). A reduction in volatility yields a more precise signal, reduces the assessed covariance of a firm's cash flows, and thereby lowers the cost of capital. Taken together, the framework shows that the expected level of corporate tax avoidance is a multiplier of expected pre-tax earnings, and that both the expected level of corporate tax avoidance as well as the uncertainty embedded in those expectations matter for valuation.

The second part of this study develops a measure of past tax avoidance information that captures the level of tax avoidance and the variation in tax rates. The level of tax planning is defined as the after-tax income of USD 1 where past tax payments are proxied by the 10-year long-

[1]Based on the Feltham and Ohlson (1995) and Ohlson (1995) valuation model Collins and Kemsley (2000) and Harris and Kemsley (1999) test the capitalization of dividend as well as capital gains taxes in equity prices. However, these results are found implausible (Shackelford and Shevlin, 2001; Dhaliwal, Erickson, Frank, and Banyi, 2003; Hanlon, Myers, and Shevlin, 2003; Hanlon and Heitzman, 2010). A recent exception is the paper by Thomas and Zhang (2013) who study the value relevance of current tax expense.

term cash effective tax rate (Dyreng, Hanlon, and Maydew, 2008). The variation of tax planning is defined as the standard deviation of annual cash effective tax rates over 10 years. Our tax planning measure is then defined as the ratio of level to variation of tax planning. Firms can increase the tax planning score either by lowering the average effective tax rate or by lowering the variation in effective tax rates. We hypothesize and show that higher tax planning scores are associated with higher serial correlation coefficients of long-term cash effective tax rates. This implies that historical tax planning activities should be a more appropriate signal for future tax avoidance outcomes. Conversely, low tax planning scores suggest a lower association between historical and future tax avoidance. If this creates more uncertainty about future tax planning activities, and ultimately future cash-flows, investors should demand a higher expected return.

Third, we test the implications of our model and the tax planning score using the market-to-book framework used in prior studies (Desai and Dharmapala, 2009; Wang, 2010; De Simone and Stomberg, 2013; Inger, 2013). Our results show that the tax planning score has a positive effect on the relation between pre-tax earnings and market-to-book value. The combined impact of tax planning score on cash flow expectations and discount rate is substantial. For the mid tercile of the tax planning score, a one-standard deviation increase in pre-tax earnings leads to an increase in the market-to-book ratio of 35.6% of the unconditional mean. For firms in the top tercile, i.e. firms with effective tax planning, the effect increases to 44.9%. If pre-tax earnings of firms with poor tax management increases by one standard deviation, the effect on market-to-book ratio is only 25.0%.

We test the robustness of our results in several ways. First, we use the level of long-term effective tax rates as measure of tax planning (Desai and Dharmapala, 2009; Wang, 2010; De Simone and Stomberg, 2013; Inger, 2013) and find insignificant results. When controlling for the volatility in tax rates, the level of the tax rate remains insignificant and the volatility is significant. Overall, the tax planning score explains more of the variation of market-to-book ratios. Second, we include other firm-level control variables and the effect of the tax planning score remains significant. Finally, our results are robust to the inclusion of firm-level determinants in tax planning such as size, leverage, foreign operations, or profitability.

This paper contributes to the literature in three ways. The first part proposes a theoretical valuation framework to provide a structure for the fledgling literature on tax avoidance implications. Second, the tax planning score captures two important valuation dimensions in one simple ratio, the level and uncertainty of tax avoidance. Third, our results point towards the importance of controlling for the variation in tax rates. Prior studies show that tax planning has positive firm valuation implications (e.g. Wang, 2010; De Simone and Stomberg, 2013; Goh, Lee, Lim, and Shevlin, 2013; Inger, 2013). However, our results indicate that this result becomes insignificant when controlling for the variation in effective tax rates. The explanatory power of the model increases when we use the tax planning score instead of long-term effective tax rate measures.

2 Literature Review

The purpose of this study is to inform the growing literature on the valuation implications of corporate tax avoidance strategies. Prior studies test the relation between various tax avoidance (or tax planning) measures and measures of firm value to better understand how investors value the effects of tax strategies. The basic hypothesis is that successful tax avoidance reduces the amount of cash outflow from the firm. The retained cash can be reinvested, which ultimately leads to higher cash flows to equity holders. Tax avoidance should therefore be valued positively, all else equal. For instance, De Simone and Stomberg (2013) document a positive relation between cash effective tax rates and market-to-book ratios. They show that this relation becomes stronger for income mobile firms. Their argument is that tax avoidance strategies involving more mobile income are likely to be more sustainable and therefore will be valued more positively by investors. Similarly, Inger (2013) tests whether investors distinguish between different methods of tax reduction, arguing that the value of tax avoidance should be a function of how risky the avoidance strategy is. Other papers have investigated intermediating factors. For instance, Desai and Dharmapala (2009) argue that managers can use tax shelters and similar tax avoidance mechanisms to hide management's attempts to extract rents. They find that the relation between book-tax differences and a firm's market-to-book value is a function of a firm's corporate governance structure. A similar line of argument is followed by Wang (2010), who argues that high corporate transparency may hinder opportunistic managers to exploit the obfuscatory nature of tax avoidance measures. She finds that the value premium associated with corporate tax avoidance measures is decreasing with corporate opacity. A different intermediating factor is examined by McGuire, Neumann, and Omer (2013). They argue in the vein of Scholes, Wolfson, Erickson, Maydew, and Shevlin (2008) that a management's tax planning strategy is closely aligned with its financial reporting strategy. A more sustainable tax strategy might therefore be indicative of more persistent pre-tax earnings. They test and find that firms with less volatile tax rates have more persistent pre-tax earnings and earnings components. They also find that investors are able to use the sustainability of a firm's tax strategy as a signal to assess pre-tax earnings persistence. Their argument is that strict tax minimization is not the sole purpose of a corporate tax strategy. It is instead part of a bigger financial reporting policy. We, on the other hand, are interested in whether investors value both dimensions of a tax minimization strategy: a consistent and a low tax rate.

In its ambition, this paper is related to Thomas and Zhang (2013), who use the Liu and Thomas (2000) framework to interpret the range of coefficient estimates found in the literature on the value relevance of current tax expense. They argue that current tax expense is fundamentally a cost that represents value lost to current and future tax payments. Second, it can contain value relevant information incremental to that in GAAP earnings. Thomas and Zhang (2013) draw a framework, using the residual income model, in which they structure the results of the value relevance literature on tax expense. In contrast, the purpose of the paper at hand is to draw a similarly helpful framework to inform the growing literature on the value implications of corporate tax avoidance strategies. To do this we do not look at the value relevance of current tax expense, but rather at how historical levels and volatility of tax avoidance outcomes will affect expectations about future tax avoidance effects.

A similarly related paper is the work by Goh, Lee, Lim, and Shevlin (2013) who examine the link between corporate tax avoidance and cost of equity. Their argument is based on the disclosure framework by Lambert, Leuz, and Verrecchia (2007) which links the quality of accounting disclosures to expectations about cash flow variance and covariance. Their argument is that tax avoidance increases the opacity of the firm's information environment and also might affect investor's expectations about future cash flows. The last argument is akin to ours. We add that it is not only the level of expected future cash flows, but also the conviction behind these expectations that matter. Furthermore, so far the growing literature on tax avoidance has used valuation premia regressions mainly based on the market-to-book ratio. Our framework is geared towards providing structure for such valuation regressions. We therefore try to model the overall valuation impact rather than the cost of capital impact.

3 A Model of Firm Valuation and Tax Avoidance

The following model illustrates the link between firm valuation and effective tax planning. Intuitively, if two companies are equal, except for its management's tax planning capabilities, the company which manages to consistently pay lower taxes will retain more cash from operations than the other one. The company with more retained cash is to reinvest higher amounts, has a higher growth rate at the same rate of return and therefore has a higher firm value.

This relationship becomes apparent when looking at common measures of market premia, such as the price-earnings ratio or the market-to-book ratio. Starting from the dividend discount model, one can readily derive a valuation model that is based on earnings and book values. The only requirement is clean surplus accounting. This is basically the requirement that all non-dividend changes in equity must go through the income statement (formally: $BV_t = BV_{t-1} + E_t - D_t$). If this is the case the residual income model in equation (1) follows.

$$P_t = B_t + \mathbb{E}_t\left(\sum_{i=0}^{\infty} \frac{RI_{i+1}}{(1+r)^i}\right) \tag{1}$$

where P_t is the price at time t, BV_t is the book value of equity and RI_t is residual income, defined as: $\Delta RI_{i+1} = \Delta E_t - r \cdot \Delta BV_{t-1}$. E_t is net income (after tax) and r the cost of equity capital. Since we are interested in the effect of a firm's past tax avoidance history on expectation about future tax avoidance, the next steps serve to build an empirically testable model and to illustrate the influence of the effective tax rate on the market-to-book ratio. Assuming a constant expected return on equity ($\widetilde{RoE}$), equation (1) can be rearranged to express the market-to-book ratio as a function of (after-tax) expectations about return on equity ($\widetilde{RoE}$), the cost of equity capital (r), and the expected growth rate in residual income ($\tilde{g}$), where $\mathbb{E}_t\,(\tilde{\ })$ denotes expectations at time t.

$$\frac{M_t}{B_t} = 1 + \mathbb{E}_t\left(\frac{\widetilde{RoE} - r}{r - \tilde{g}}\right) \tag{2}$$

We focus on the market-to-book ratio because it is commonly used in the growing literature on the valuation implications of tax avoidance to proxy for Tobin's Q. Define $\delta_t = (1 - \tau_t)$ with τ_t being the effective tax rate in period t. Then RoE_t can be rewritten as $\delta_t \cdot RoE_t^{pretax}$. The effect of expected future tax avoidance will then be captured by expected future pre-tax earnings multiplied by $\tilde{\delta}$. Rewriting the market-to-book ratio to incorporate $\tilde{\delta}$ yields:

$$\frac{M_t}{B_t} = 1 + \mathbb{E}_t\left(\frac{(\tilde{\delta} \cdot \widetilde{RoE}^{pretax}) - r}{r - \tilde{g}[\tilde{\delta}]}\right) \tag{3}$$

Intuitively, a lower effective tax rate will cause the firm to be more profitable after taxes. The formula serves to highlight that the effect of expected future tax avoidance is an interaction effect. It depends on the level of expected pre-tax profitability. Second, it is important to note that the expected long-term growth rate is also a function of future tax avoidance activity ($\tilde{g} = \tilde{g}[\tilde{\delta}]$). Again, intuitively, lower taxes will retain more cash in the firm. Instead of paying cash out in the form of taxes, this cash can be reinvested and increases growth.[2] To see this more formally, note that in the case of constant expected future profitability, $\tilde{g}$ can be rewritten as a function of growth in book value:

$$\begin{aligned} \tilde{g}_{t+i} &= \frac{\Delta RI_{t+i}}{RI_{t+i-1}} \\ &= \frac{(RoE - r)B_{t+i-1} - (RoE - r)B_{t+i-2}}{(RoE - r)B_{t+i-2}} \\ &= \frac{B_{t+i-1}}{B_{t+i-2}} - 1 \end{aligned} \tag{4}$$

Book value itself can be viewed as a function of past book value and the sum of retained earnings that have not yet been distributed. If one assumes a constant dividend payout policy as a percentage of earnings, then one can rewrite changes in book value $\Delta B_{t+1} = B_{t+1} - B_t = E_{t+1} - Div_{t+1} = \tilde{\delta}_{t+1} \cdot E_{t+1}^{pretx} - \alpha \cdot E_{t+1}$, where α is the dividend yield. Then book value at any

[2]Of course this assumes that the additional cash retained is indeed reinvested into the company. As for instance, Desai and Dharmapala (2009) note, depending on the agency conflicts inside the firm, manages could also use the obfuscatory nature of tax avoidance activities and try to expropriate funds.

time $t + i$ is:

$$B_{t+i} = B_t + \sum_{k=1}^{i} \tilde{\delta} \cdot (1 - \alpha) \cdot E_{t+k}^{pretax} \quad (5)$$

Consistent with our intuition, some tedious but straight forward algebra confirms that the derivative of $\frac{B_{t+i}}{B_{t+i-1}}$ is positive and decreasing in $\tilde{\delta}$ (the detailed derivation can be found in the appendix):

$$\frac{\partial \frac{B_{t+i}}{B_{t+i-1}}}{\partial \tilde{\delta}} = \frac{(1 - \tilde{\delta})(1 - \alpha) E_{t+i}^{pretax} B_t}{(B_{t+i-1})^2} \geq 0, \ \forall \ E_{t+i}^{pretax} \geq 0 \quad (6)$$

As long as the book value of equity is growing, i.e expected pre-tax earnings are positive, there is a positive effect of tax avoidance on the expected growth rate.[3] This again highlights the multiplicative nature of the effect of expected future tax avoidance with pre-tax earnings. Hence, the main driver in our model is the multiple of tax on pre-tax earnings.

The preceding discussion models the level effect of expected future tax avoidance $\tilde{\delta}$. The second dimension, investor's conviction behind their expectations of future tax avoidance, will also affect valuation. However, in contrast to the level of expected future tax savings, the uncertainty in these forecasts affects valuation via a cost of capital channel. The rationale can be illustrated via the model by Lambert, Leuz, and Verrecchia (2007). If one assumes the historical tax planning score to be a signal with measurement error about future retained tax cash outflows, then a decrease in the measurement error component will decrease the assessed covariance between a firm's cash flows and other firms' cash flows (Proposition 2 in Lambert, Leuz, and Verrecchia, 2007). Thereby, the expected return is lowered. We interpret a highly volatile historical cash tax rate to be a very noisy measure of future cash tax rates. Lower volatility should therefore lead to lower expected returns.

To incorporate both dimensions, the resulting reduced form empirical model necessarily involves interaction terms to account for the multiplicative nature of $\tilde{\delta}$. Apart from that, the market-to-book ratio is a function of the cost of capital r, expectations about (pre-tax) return on equity ($\widetilde{RoE}^{pretax}$), and the expected growth rate in residual income ($\tilde{g}[\tilde{\delta}]$), which is also a function of expected future tax avoidance. Thus, we need proxys for all three expectations as well as the firm's cost of capital to operationalize equation (3). In accordance with prior literature, we assume that investors extrapolate future growth rates from currently observed growth rates (Barth, Elliott, and Finn, 1999). We use our measure of past tax planning—the Tax Planning Score (TPS)—to proxy for expectations about future tax avoidance. This measure is derived in Section 5.1 below. We then use past pre-tax return on equity (RoE^{pretax}) to control for expected future pre-tax return on

[3] In this simple model, valuation is actually a function purely of pre-tax operating profitability, past book value, and future tax rates, as there is no external funding in this model. However, the rationale still applies if one would extend the model to allow for external funding.

equity. Cost-of-equity capital are computed using the three-factor Fama-French model over rolling 24-month windows (CoC). Lastly, we proxy for expected future growth using annualized sales growth over the last five years (SGr).[4] We further include industry fixed effects (α_{ind}) and year fixed effects (α_t). Our statistical inference is based on robust standard errors clustered at the firm level and by years. Table 1 summarizes information about variables. This results in the following regression.

$$\begin{aligned} \text{M-to-B}_{i,t} = \alpha_1 &+ \beta_1 \cdot RoE_{i,t}^{pretax} + \beta_2 \cdot RoE_{i,t}^{pretax} \cdot TPS_{i,t} \\ &+ \beta_3 \cdot TPS_{i,t} + \beta_4 \cdot SGr_{i,t} + \beta_5 \cdot SGr_{i,t} \cdot TPS_{i,t} \\ &+ \beta_6 \cdot CoC_{i,t} + \alpha_{ind} + \alpha_t + \epsilon_{i,t} \end{aligned} \quad (7)$$

Our main expectation is that β_2 is positive. Better tax management will increase the effect of return on equity on the market-to-book ratio. From our model, we also expect β_5 to be positive. As discussed before, the net effect of a lower expected tax rate (higher $\tilde{\delta}$) on value will be positive as long as a firm's RoE is greater than its cost of capital. While it is possible that firms are expected to destroy value in the long-term by consistently having a long-term return on equity below its cost of capital, this should not be true on average in the cross-section.

4 Data and Summary Statistics

We use data from Compustat and CRSP over the 1975–2011 period. We exclude financial firms with SIC codes 6789 (REITs) and investment trusts (firms having the word "Trust" in the company name). Our firms selection criteria follow Dyreng, Hanlon, and Maydew (2008) to ensure comparability of results. We further truncate variables at the 1% and the 99% level to control for outliers and exclude firms with total assets less than USD 10 million. To compute long-term corporate tax avoidance measures, firms are required to exist at least 10 years. This returns our final sample of 2,820 firms and 14,921 observations. Table 2 presents summary statistics of our main variables. The average market-to-book ratio MtB is 2.472 and varies considerably from 1.302 (25th percentile) to 3.088 (75th percentile). Pre-tax return on equity averages 24.9%. The average sales growth from $t-4$ to t is 10.4%. Panel A of Table 2 summarizes our tax variables which are discussed in detail below.

[Insert Table 2 about here]

[4] The more obvious choice would be to use annualized 5-year growth in book value of equity. However, growth in equity is negatively correlated with the Market-to-Book ratio. One explanation for this puzzling find is that extreme growth in equity is usually a sign of significant share issuances. For example, firms with seasoned equity offerings yield lower returns than comparable firms without equity issuances (Loughran and Ritter, 1995). Untabulated results show that the results are qualitatively similar using earnings growth. We pick sales growth in order to be consistent with prior literature.

5 Level and Uncertainty of Tax Planning

5.1 Measuring Level and Uncertainty of Tax Planning

Tax planning of corporations is typically evaluated by the GAAP effective tax rate which is the relation of tax expenses and pre-tax income in one year. Dyreng, Hanlon, and Maydew (2008) develop a new measure of tax avoidance that differs in two ways from the standard approach of measuring tax avoidance. First, they use cash taxes paid instead of tax expenses and they control for special items when assessing pre-tax income. Second and most importantly, they measure tax avoidance in a multi-period instead of a single-period context. The resulting measure for the level of tax avoidance for firm i can be summarized as follows.

$$\text{CashETR}_i = \frac{\sum_{t=1}^{N} \text{Cash Taxes Paid}_{i,t}}{\sum_{t=1}^{N} \left(\text{Pretax Income}_{i,t} - \text{Special Items}_{i,t}\right)} \tag{8}$$

This tax avoidance measure has the advantage that it measures tax avoidance in a long-term context. Dyreng, Hanlon, and Maydew (2008) show that annual effective tax rates are not a good predictor of long-run tax avoidance rates. In particular, high effective annual tax rates are less persistent than low annual effective tax rates. Hence, for any level of long-run corporate tax avoidance, there is some time-series variation in annual effective tax rates. For example, McGuire, Neumann, and Omer (2013) develop a measure of sustainable tax strategies. Instead of using the level of long-run corporate tax avoidance, they use the ratio of the standard deviation of annual effective tax rates to the absolute level of long-run corporate tax avoidance.

We argue that both elements matter, the level of tax avoidance and the time-series variation in annual tax rates. The factor $\tilde{\delta}$ in our model captures these two dimensions. First, the level of $\tilde{\delta}$ depends on the long-run effective tax rate. A higher tax rate results in lower $\tilde{\delta}$. Second, the variation of $\tilde{\delta}$ depends on the reliability or sustainability of a firm's tax avoidance strategies. Let us consider two firms with the same expected level of long-run corporate tax avoidance of 20%. In this case, the expected $\tilde{\delta}$ is 0.8. However, if one firm has more volatile annual effective tax rates than the other, investors are more uncertain about future $\tilde{\delta}$.

We define a *Tax Planning Score* which captures these two dimensions. The nominator is the net-of-tax income of USD 1 gross income. We use the ten-year CashETR as defined in equation (8) as the measure of long-run corporate tax avoidance. As the denominator and the measure for the reliability of the level of tax avoidance, we use the standard deviation of the annual CashETR from $t-9$ to t. This returns the following *Tax Planning Score*.

$$\text{Tax Planning Score}_i = TPS_i = \frac{1 - CashETR}{Vol(CashETR)} \tag{9}$$

with

$$Vol(CashETR) = \sqrt{\sum_{t=1}^{N} (\text{CashETR}_{i,t} - \text{Mean(CashETR)})^2}.$$

Our definition of the Tax Planning Score (TPS) follows the logic of the Sharpe-Ratio for stock returns (Sharpe, 1966). Firms can increase TPS in two ways. First, they could maximize the net-of-tax return given a level of variability in annual effective tax rates ($\frac{\partial TPS}{\partial \delta} > 0$). That is, they minimize the long-term effective tax rate. Second, firms could reduce noise in annual effective tax rates to increase predictability of future effective tax rates ($\frac{\partial TPS}{\partial Vol(CashETR)} > 0$). Better tax planning can thus either be obtained by lowering the $CashETR$ or by reducing the volatility of $CashETR$.

5.2 Descriptive Statistics

Table 3 summarizes the average Tax Planning Score (TPS), the average net-of-tax income of USD 1 gross income (δ), and the standard deviation of the annual CashETR ($Vol(CashETR)$). The average TPS amounts to 6.122. The average net-of-tax income is 0.720 which is equivalent to a CashETR of 28.0%. The average standard deviation of annual ETRs over 10 years is 20.3%. We also sort the data according to quintiles of the CashETR and the Vol(CashETR) distribution. This returns a matrix of 25 portfolios which differ in the level of tax avoidance and the variation in tax avoidance. For example, the upper left group comprises firms with lowest effective tax rates (δ close to 1) and with very little variation in annual effective tax rates. The resulting average tax plannign score is 15.765. In contrast, the bottom right group comprises firm with high effective tax rates that also vary considerably. These firms average a tax planning score of 0.382. Overall, we observe increasing (decreasing) tax planning score (standard deviations) from the bottom left to the top right.

[Insert Table 3 about here]

In Figure 1 and 2, we present scatter plots with TPS on the y-axis and net-of-tax income (δ) on the x-axis. The figures indicate that there is considerable variation in TPS across firms. For example, at a 10-year cash effective tax rate between 34.5% and 35.5%, TPS ranges from 0.02 over 2.78 (10th percentile) and 13.33 (90th percentile) to about 35. Panel A of Figure 2 illustrates the variation of TPS around a long-term CashETR of 35% (δ=0.65). Panel B of Figure 2 illustrates the distribution around a CashETR of 0%. The circles highlight firms that are in the portfolio with the lowest CashETR and the lowest standard deviation of CashETR. These firms form the right tail of the scatter plot and are responsible for the large values in TPS around δ=1.

[Insert Figure 1 about here]
[Insert Figure 2 about here]

5.3 Predictability of Future CashETRs and the Tax Planning Score

Our theoretical model includes future tax avoidance. We are therefore interested in the properties of TPS as a predictor of future cash effective tax rates vis-à-vis existing measures, for example, the long-term cash effective tax rate. We test these properties is two ways. First, higher serial correlation of $CashETR$ indicates higher persistence of $CashETRs$ over time. If more efficient tax management, as indicated by higher tax planning scores, lead to higher predictability of future $CashETR$, we would expect higher serial correlation coefficients for firms with high TPS. We therefore regress future $CashETR$ in $t+5$ on current $CashETR$. We allow the serial correlation coefficient to vary across quintiles of the TPS distribution. That is, the effect of current $CashETR$ on future $CashETR$ is estimated for each quintile. To test the predictive abilities of TPS relative to the long-term cash effective tax rate, we additionally sort firms into quintiles of $CashETR$. If our measure of tax avoidance leads to a higher predictability of future $CashETRs$, we expect the effect of current $CashETR$ on future $CashETR$ to be higher for higher quintiles of TPS distribution.

[Insert Figure 3 about here]

Figure 3 plots the resulting serial correlation coefficients for each quintile of the TPS distribution (black bars) and the $CashETR$ distribution (gray bars). We find that the effect of current $CashETR$ on future $CashETR$ increases with each quintile of the TPS distribution. Firm with better tax planning have a higher serial correlation of $CashETR$. The coefficient estimates are significantly different from each other in each pairwise comparison ($p<0.01$) except for the bottom two quintiles. The results displayed in the gray bars indicate that the level of current $CashETR$ does not affect the serial correlation coefficient. That is, the level of $CashETR$ alone does not alter the predictability of future $CashETR$ with current $CashETR$.

We additionally use simple OLS regressions of future $CashETR$ and future TPS as dependent variables. Both are measured in $t+10$. Table 5 presents coefficient estimates with $CashETR$, $Vol(CashETR)$, and TPS measured in t as independent variables. We additionally include industry fixed and year fixed effects. Current $CashETR$ has a significant effect on future $CashETR$ while $Vol(CashETR)$ has no effect on future $CashETR$. We find that current TPS has an incremental effect on future $CashETR$.

When using future TPS as dependent variable, we find that current $CashETR$ has no explanatory power. The adjusted R^2 is 0%. The volatility of $CashETR$ has a significant effect on future TPS. Most importantly for our study, current TPS explains future levels of TPS. The coefficient estimates are significant and current TPS has the largest influence on the adjusted R^2 of the model.

[Insert Table 5 about here]

6 Effect of Tax Planning on Firm Valuation

6.1 Graphical Evidence

We next turn to our main analysis. After having established the result that higher TPS are associated with better predictability of future levels of effective tax rates, we test our theoretical model. The simplest way of testing our main expectation is to sort the data into quintiles of $CashETR$ and $Vol(CashETR)$. This returns a matrix of 25 portfolios (see Table 3) which differ in the level of TPS. We then regress the following equation separately for each portfolio.

$$MtB_{i,t} = \alpha_1 + \beta_1 \cdot RoE^{pretax}_{i,t} + \beta_2 \cdot SGr_{i,t} + \beta_3 \cdot CoC_{i,t} + \alpha_{ind} + \alpha_t + \epsilon \tag{10}$$

where MtB is the market to book ratio, RoE^{pretax} is the pre-tax return on equity, SGr is sales growth, CoC denotes the cost of capital, α_{ind} are industry fixed effects, and α_t are year fixed effects. We are interested in the β_1 coefficients in each of the 25 portfolios. Our model predicts that the β_1 coefficient should be positively related to the average TPS in a portfolio. Figure 4 presents a scatter plot of the average tax planning score and the corresponding β_1 coefficient for each portfolio. In line with our expectation that better tax planning leads to a stronger effect of pre-tax earnings on market value, we find a positive relation between the average tax planning score and the RoE^{pretax}-coefficient. A linear regression of the RoE^{pretax}-coefficient on TPS yields a positive and significant coefficient of 0.21 (t-stat = 2.69) and a constant of 3.36 (t-stat = 8.71). The r-squared of this regression is 34.74%.[5] This result supports our main hypothesis that good tax planning increases the effect of pre-tax earnings on the market-to-book ratio.

[Insert Figure 4 about here]

6.2 OLS regression of firm valuation model

We next test our main model from equation (7). We expect that better tax management leads to a stronger effect of earnings on the market-to book value. Table 6 presents the regressions results from estimating our baseline specification. We use the TPS as defined in equation (9) in Column (1) and (2). In Column (3) and (4), we use indicator variables for good and poor tax management. The group of good tax planners ($GoodTax$) comprises the top tercile of the TPS distribution. The bottom tercile forms the group of bad tax planners ($BadTax$).

[Insert Table 6 about here]

[5] To address concerns that our results are driven by the low number of observations, we sort firms into 100 groups that result from 10 deciles of CashETR and 10 deciles of SD(CashETR). We observe a similar pattern. Using all 100 portfolios, we obtain a positive and significant coefficient of TRR on the RoE^{pretax}-coeffcient of 0.14 (t-stat = 2.84).

We find a positive effect of RoE^{pretax} on the market-to-book ratio. The coefficient estimate in Column (2) indicates that a one-standard deviation increase in the pre-tax return on equity (22.0%) is associated with an increase in the market-to-book ratio by 0.737—29.8% of the unconditional mean. We further find a positive effect of sales growth (SGr) on the market-to-book value. The main effect is, however, insignificant when we include the tercile dummy variables for good and bad tax planning. The cost of equity measure is not significant in both specifications.

In line with our expectations, we also find a positive and significant coefficient for the interaction term between RoE^{pretax} and TPS of 0.332 (t-stat = 3.49). This indicates that a better tax management increases the positive effect of earnings on the market-to-book ratio. The economic effects we find are substantial. If a firm goes from the 25th percentile (2.175) to the 75th percentile (8.293) of the TPS distribution, the effective coefficient of RoE^{pretax} on the market-to-book ratio increases by 0.6057 (0.099 × [8.293-2.175])—about 15.31% of the baseline estimate of RoE^{pretax}. Hence, if a firm goes from the 25th to the 75th percentile of TPS, the effect of a one-standard deviation increase in RoE^{pretax} on the market-to-book ratio increases from 29.8% to 34.4% (=29.8% × [1+15.31%]). Further, the main effect of TPS is positive and significant.

In Columns 3 and 4 of Table 6, we use an alternative definition of our TPS measure to address concerns about a potential non-linear effect of TPS on the earnings coefficient. We sort firms according to terciles of TPS. Instead of using the level of TPS, we include dummy variables for the top tercile and for the bottom tercile. In line with our expectations, we find that firms in the top tercile of TPS, i.e. firms with good tax planning, have a higher effect of RoE^{pretax} on the market-to-book ratio. The interaction $RoE^{pretax} \times GoodTax$ is positive and significant. At the same time, we find that firms in the bottom tercile of TPS, i.e. firms with bad tax planning, have a lower effect of RoE^{pretax} on the market-to-book ratio. The interaction $RoE^{pretax} \times BadTax$ is negative and significant. Again, the economic effects are substantial. If a firm is in the top (bottom) tercile of the TPS distribution, the effect of RoE^{pretax} increases (decreases) by 1.413 (1.200), or about 26.1% (30.0%) of the baseline RoE^{pretax} effect. The advantage of the tercile split is that we can compute the effect of a one-standard deviation increase in RoE^{pretax} on MtB for each group. For the mid tercile, a one-standard deviation increase in RoE^{pretax} leads to an increase in MtB of 4.005—35.6% of the unconditional mean. For firms in the top tercile, the effect increases to 44.9% (= 35.6% × [1+26.1%]). If RoE^{pretax} of firms with poor tax management increases by one standard deviation, the effect on MtB is only 25.0% (= 35.6% × [1-30.0%]) of the unconditional mean.

6.3 CashETR and Vol(CashETR) as Measures of Future Tax Planning

The question remains if our measure adds anything to existing measures of tax avoidance. Prior studies show that tax planning has positive effects on firm valuation (e.g. Wang, 2010; De Simone and Stomberg, 2013; Goh, Lee, Lim, and Shevlin, 2013; Inger, 2013). One implication of our TPS

is that both, the level and the variability of tax planning has firm value implications. Therefore, we test whether long-term CashETRs as a proxy for tax avoidance and whether the variation in tax planning (e.g., McGuire, Neumann, and Omer, 2013) have a similar explanatory power. Table 7 reports coefficient estimates where we replicate our main model. Instead of using the TPS, we use the 10-year cash effective tax rate and standard deviation of annual $CashETRs$ as tax variables.

[Insert Table 7 about here]

In contrast to our prediction, we find no significant effect of $CashETR$. The interaction between RoE^{pretax} and $CashETR$ is negative but insignificant. The direct effect of $CashETR$ is only borderline significant (t-stat = 1.65). In Column (3) and (4), we use a measure for the sustainability of tax avoidance. The negative coefficient of $RoE^{pretax} \times Vol(CashETR)$ indicates that more volatile effective tax rates reduce the effect of earnings on the market-to-book value. We observe in Column (3) that after controlling for the variation in tax avoidance, the interaction between RoE^{pretax} and CashETR is still insignificant. Overall, the results indicate that it is necessary to control for both, the level of tax avoidance and the uncertainty of tax planning in firm valuation. Most importantly, the adjusted R-squared increases by more than 2 percentage points when using terciles of TPS as a measure for the quality of tax planning. This makes us confident that TPS is a better proxy of future tax avoidance than the level of $CashETR$.

6.4 Robustness Tests

6.4.1 Adding firm-level control variables

We next test the sensitivity of our results and include further control variables (see, e.g., De Simone and Stomberg, 2013). We extend the baseline model and regress the following equation.

$$\begin{aligned} \text{M-to-B}_{i,t} &= \alpha_1 + \beta_1 \cdot RoE^{pretax}_{i,t} + \beta_2 \cdot RoE^{pretax}_{i,t} \cdot TPS_{i,t} + \beta_3 \cdot TPS_{i,t} + \beta_4 \cdot SGr_{i,t} \\ &+ \beta_5 \cdot SGr_{i,t} \cdot TPS_{i,t} + \beta_6 \cdot CoC_{i,t} + \beta_6 \cdot Log\_sales_{i,t} + \beta_7 \cdot CapEx_{i,t} + \beta_8 \cdot RD_{i,t} \\ &+ \beta_9 \cdot Volatility_{i,t} + \beta_10 \cdot TotAccruals_{i,t} + \beta_11 \cdot ForOper_{i,t} + \beta_12 \cdot LT\text{-}Debt_{i,t} \\ &+ \alpha_{ind} + \alpha_t + \epsilon_{i,t} \end{aligned} \tag{11}$$

where Log_sales is the natural logarithm of sales, $CapEx$ are capital expenditures over total assets in $t-1$, RD denotes research and development expenditures over prior year total assets, $Volatility$ is the standard deviation of monthly stock returns over the past 60 months, $TotAccruals$ is measure of accruals, $ForOper$ is a dummy variable indicating the firm generates foreign income, and $LT\text{-}Debt$ is the ratio of long-term debt to prior year total assets.

We include Log_sales as a measure of firm size. There is mixed evidence on the effect of firm size. Smaller firms tend to have better growth opportunities and should thus have higher market-to-book ratios (Morck, Shleifer, and Vishny, 1988). Conversely, larger firms have better and more tax planning opportunites. This could result in higher market-to-book ratios (Rego, 2003; Armstrong, Blouin, and Larcker, 2012). We additionally control for investment opportunities by including capital expenditures and R&D investments (Lang and Stulz, 1994). We additionally control for volatility in stock returns and total accruals (De Simone and Stomberg, 2013). Finally, we include a dummy variable equal to 1 if the firm has income from foreign operations ($ForOper$) and long-term debt to control for profit shifting activities. Table 8 uses TPS as our tax planning measure. Table 9 uses the terciles of TPS as tax measure. We subsequently add control variables. All models include industry fixed and year fixed effects.

[Insert Table 8 about here]
[Insert Table 9 about here]

Our estimates show that larger firms, firms with foreign operations, and firms with high research and development expenses have higher market-to-book ratios. In contrast, firms with highly volatile stock returns and with high accruals have lower market-book-ratios. Most importantly for our study, we consistently find a positive effect of RoE^{pretax} on the market-to-book ratio and a positive interaction of RoE^{pretax} and TPS. The coefficient estimate in the full model is 0.084 (t-stat = 1.91). When using the tercile spilt variables, we obtain a positive and significant coefficient of 0.800 (t-stat = 1.88) for $RoE^{pretax} \times GoodTax$ and a negative coefficient of 1.480 (t-stat = 3.61) for $RoE^{pretax} \times BadTax$. Hence, our results are not driven by other factors that affect the market-to-book ratio.

6.4.2 Determinants of the Tax Planning Score

We next turn to an alternative empirical approach that controls for determinants in tax planning. We first estimate the TPS on its main determinants. We then use the residual from this determinants model as our measure of TPS. There is extensive research on the determinants of effective tax rates (see, among others, Gupta and Newberry, 1997; Mills, 1998; Rego, 2003; Richardson and Lanis, 2007; Dyreng, Hanlon, and Maydew, 2008). We test if the determinants developed in the literature also explain the variation in TPS. We therefore estimate the following model.

$$
\begin{aligned}
\mathrm{TPS}_{i,t} = {} & \alpha_1 + \beta_1 \cdot RoE^{pretax}_{i,t} + \beta_2 \cdot Log\_sales_{i,t} + \beta_3 \cdot LT-Debt_{i,t} \\
& + \beta_4 \cdot Cash_{i,t} + \beta_5 \cdot CapEx_{i,t} + \beta_6 \cdot CapInt_{i,t} + \beta_7 \cdot ForOper_{i,t} \\
& + \alpha_t + \alpha_{ind} + \alpha_i + \epsilon_{i,t}
\end{aligned}
\tag{12}
$$

where TPS is the dependent variable. We include seven control variables. First, we include RoE^{pretax} to control for the profitability of operations (Gupta and Newberry, 1997; Richardson and Lanis, 2007; Dyreng, Hanlon, and Maydew, 2008). Dyreng, Hanlon, and Maydew (2008) document that more profitable firms have lower effective tax rates. If this relation also holds for TPS, we would obtain a positive coefficient. Second, we control for size (Log_sales). Empirical research shows ambiguous effects of firm size. While some studies document a positive effect on effective tax rates in line with the political cost hypothesis (Gupta and Newberry, 1997; Rego, 2003), others find a negative effect (Richardson and Lanis, 2007; Dyreng, Hanlon, and Maydew, 2008). That is, larger firms have lower effective tax rates. If this results holds, we would obtain a positive sign for size as better tax management is associated with a higher TPS. Third, we include leverage (Stickney and McGee, 1982; Dyreng, Hanlon, and Maydew, 2008). Highly leveraged firms can reduce effective tax rates through the deductibility of interest expenses. Therefore, we expect that TPS is higher for highly leveraged firms. Fourth, we include $Cash$ which is defined as the cash holdings to assets ratio. Fifth, we include investments ($CapEx$) and capital intensity ($CapInt$) (Stickney and McGee, 1982; Richardson and Lanis, 2007). These variables capture the depreciation tax shield of fixed assets and capital expenditures. Finally, we include a dummy variable equal to 1 if the firm has income from foreign operations ($ForOper$). Dyreng and Lindsey (2009) show that firms with tax haven and foreign operations face lower effective tax rates. We subsequently include year fixed effects (α_t), industry fixed effects (α_{ind}), and firm fixed effects (α_i).

[Insert Table 10 about here]

Table 10 presents regression results. We find that more profitable firms and larger firms have higher tax planning scores. This suggests that, in line with earlier evidence, larger firms have a better tax management, either through lower long-term cash effective tax rates or more sustainable tax management. We further find that firms with a higher capital intensity have higher tax planning scores. In contrast to results for levels of $CashETR$, our results suggest that highly leveraged firms and firm with foreign operations have lower tax planning scores. One possible explanation is the uncertainty of international profit shifting that arises from changes to tax codes around the world, for example, from the introduction of thin capitalization rules to prevent debt shifting (OECD, 2013). We find no significant effects for capital expenditures and cash holdings.

Table 10 shows that firm-level characteristics explain about 4.8% of the variation in TPS. Some 3% of the variation is explained by industry fixed effects. Column (4) of Table 10 additionally includes firm fixed effects and the adjusted R-squared amounts to 70.33%. Hence, most of the variation in tax planning is explained by firm fixed effects. This makes us confident that the variation we pick up in our main specification stems from cross-sectional differences across firms that are not based on industry effects.

To address remaining concerns that the interaction of RoE^{pretax} and TPS in our main model is driven by the positive effect of RoE^{pretax} on TPS, we use the residual from the regression in Column (1) of Table 10 as an alternative measure of TPS. This measure is orthogonal to RoE^{pretax} and other firm-level characteristics. It captures variation in level and uncertainty of tax planning that is not explained by cross-sectional variation in observable firm characteristics. We denote this variable as $Residual(TPS)$. Our baseline result from Table 6 is robust to using the residual of TPS as measure of tax planning. Coefficient estimates are presented in Table 11. The interaction of RoE^{pretax} and $Residual(TPS)$ is significant and yields a positive coefficient of 0.232 (t-stat = 4.22). Column (3) and (4) uses terciles of $Residual(TPS)$ as tax measure. Consistent with our baseline results, the $RoE^{pretax} \times GoodTax$ coefficient is positive (1.684) and significant (t-stat = 3.63). The corresponding coefficient for the group of poor tax planners ($RoE^{pretax} \times BadTax$) is -1.150 and significant (t-stat = 4.21). Our results are therefore robust the controlling for firm-level determinants of tax planning.

[Insert Table 11 about here]

7 Conclusion

This paper studies the firm value implications of tax avoidance. We decompose the Feltham and Ohlson (1995) and Ohlson (1995) valuation model into expected future tax rates and pre-tax numbers. First of all, the level of expected tax avoidance has a multiplicative effect on expected pre-tax profitability. This paper builds and tests a valuation framework that incorporates two outcome dimensions of corporate tax avoidance strategies: the stability and the level of expected tax rates. We develop a measure of tax planning that captures two dimensions relevant for tax planning: level and variation of tax rates. The combined measure—the tax planning score—improves the predictability of future levels of tax avoidance. The empirical application of the tax planning score in the theoretical model shows that good (poor) tax management increases (decreases) the effect of pre-tax earnings on the market-to-book ratio.

The considerable variation in the tax planning score leaves a number of unanswered questions. Why can some firms manage their tax positions better than others? Dyreng, Hanlon, and Maydew (2010) show that CEOs have a large impact on the level of tax avoidance. Do they also improve the second dimension of tax planning, the variation in effective tax rates to obtain a better overall tax management. As the capital market apparently responds to the quality of tax management, the question remains as to why not all firms increase their tax planning score. Finally, how does the institutional setting affect tax planning? A cross-country comparison of tax planning and firm value implications would shed more light on the role of tax avoidance in firms.

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A Proofs

Given the assumptions of a constant expected future return on equity and clean surplus accounting the proof is straight forward. Starting from our definition of book value at time $t+i$ as the sum of book value at time t plus retained and not distributed earnings ($B_{t+i} = B_t + \sum_{k=1}^{i} \tilde{\delta} \cdot (1-\alpha) \cdot E_{t+k}^{pretx}$), we can write growth in book value as:

$$\frac{B_{t+i}}{B_{t+i-1}} = \frac{B_t + \sum_{k=1}^{i} \tilde{\delta} \cdot (1-\alpha) \cdot E_{t+k}^{pretx}}{B_t + \sum_{k=1}^{i-1} \tilde{\delta} \cdot (1-\alpha) \cdot E_{t+k}^{pretx}}$$

Denote, retained earnings before tax as $REB_t = \cdot(1-\alpha) \cdot E_t^{pretx}$. Taking the derivative with respect to $\tilde{\delta}$ then yields:

$$\begin{aligned}
\frac{\partial \frac{B_{t+i}}{B_{t+i-1}}}{\partial \tilde{\delta}} &= \frac{\left[B_t + \sum_{k=1}^{i} REB_{t+k}\right]\left[B_t + \tilde{\delta} \sum_{k=1}^{i-1} REB_{t+k}\right] - \left[B_t + \tilde{\delta} \sum_{k=1}^{i} REB_{t+k}\right]\left[B_t + \sum_{k=1}^{i-1} REB_{t+k}\right]}{(B_{t+i-1})^2} \\
&= \frac{(B_t)^2 + \sum_{k=1}^{i} REB_{t+k} \cdot B_t + B_t \cdot \tilde{\delta} \sum_{k=1}^{i-1} REB_{t+k} + \tilde{\delta} \sum_{k=1}^{i} REB_{t+k} \cdot \sum_{k=1}^{i-1} REB_{t+k}}{(B_{t+i-1})^2} \\
&- \frac{(B_t)^2 + \tilde{\delta} \sum_{k=1}^{i} REB_{t+k} \cdot B_t + B_t \cdot \sum_{k=1}^{i-1} REB_{t+k} + \tilde{\delta} \sum_{k=1}^{i} REB_{t+k} \cdot \sum_{k=1}^{i-1} REB_{t+k}}{(B_{t+i-1})^2} \\
&= \frac{REB_{t+i} \cdot B_t - B_t \cdot \tilde{\delta} REB_{t+i}}{(B_{t+i-1})^2} \\
&= \frac{(1-\tilde{\delta}) REB_{t+i} \cdot B_t}{(B_{t+i-1})^2} \\
&= \frac{(1-\tilde{\delta})(1-\alpha) E_{t+i}^{pretx} B_t}{(B_{t+i-1})^2} \geq 0, \ \forall \ E_{t+i}^{pretx} \geq 0
\end{aligned}$$

the effect of lower expected tax rates (higher $\tilde{\delta}$) is therefore positive and decreasing in magnitude with increasing $\tilde{\delta}$, as long as pre-tax earnings are positive.

B Variable Definitions

Table 1: Description of Variables

TPS	TPS is the tax planning score from equation (9). TPS is defined as the ratio of $(1 - CashETR)$ to $Vol(CashETR)$.
$CashETR$	$CashETR$ is the long-term cash effective tax rate according to Dyreng, Hanlon, and Maydew (2008) over 10 years. We compute the $CashETR$ as $\frac{\sum_{t=1}^{N} \text{Cash Taxes Paid}_{i,t}}{\sum_{t=1}^{N} (\text{Pretax Income}_{i,t} - \text{Special Items}_{i,t})}$.
$Vol(CashETR)$	$Vol(CashETR)$ is the standard deviation of annual cash effective tax rates from $t-9$ to t.
MtB	MtB is the market-to-book ratio and is computed as MV_t/BV_t.
RoE^{pretax}	RoE^{pretax} is the ratio of pre-tax earnings to equity.
SGr	SGr denotes the growth in sales from $t-4$ to t.
CoC	CoC is the cost of equity calculated as $R_i - R_f = \delta_0 + \delta_1(R_m - R_f) + \delta_2(SMB) + \epsilon$ using CRSP monthly returns from t to $t-3$.
Log_sales	Log_sales is defined as the logarithm of sales.
$CapEx$	$CapEx$ is the ratio of capital expenditures to total assets in $t-1$.
RD	RD is the ratio of R&D Expenditures to total assets in $t-1$.
LT-Debt	*LT-Debt* is the ratio of Long-Term Debt to total assets in $t-1$.
$Volatility$	$Volatility$ is the standard deviation of monthly stock returns over the past 60 months.
$TotAccruals$	$TotAccruals$ is a measure of accruals. It is defined as operating activities net cash flow scaled by assets in $t-1$ times -1.
$ForOper$	$ForOper$ is a dummy variable for foreign operations equal to 1 if the firm has foreign income different from 0.

C Tables and Figures

Figure 1: Tax Planning Score and Effective Tax Rates

This figure presents a scatter plot with the Tax Planning Score on the y-axis and the income after corporate taxes on the x-axis. The Tax Planning Score is defined as the ratio of (1-CashETR) over the standard deviation of annual cash effective tax rates. CashETR is the 10-year cash effective tax rate. Income after corporate taxes (*Net-of-Tax Income*) is defined as 1-CashETR.

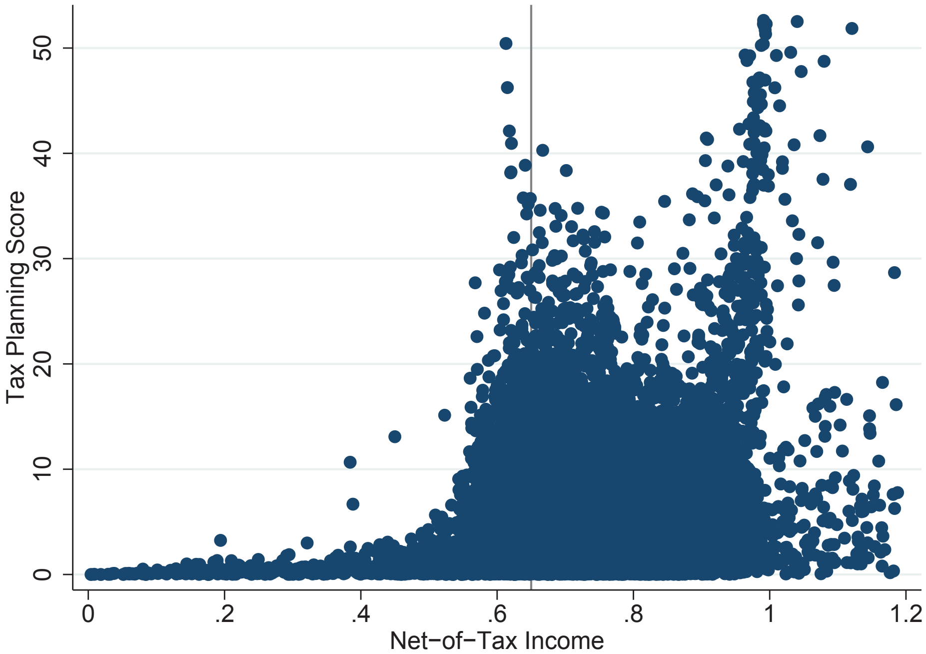

Figure 2: Tax Planning Score and Effective Tax Rates—Breakdown by Tax Rates

This figure presents a scatter plot with the Tax Planning Score on the y-axis and the income after corporate taxes on the x-axis. The Tax Planning Score is defined as the ratio of (1-CashETR) over the standard deviation of annual cash effective tax rates ($Vol(CashETR)$). CashETR is the 10-year cash effective tax rate. Income after corporate taxes (*Net-of-Tax Income*) is defined as 1-CashETR. Panel A uses firms with CashETRs between 20% and 50%. Panel B uses firms with CashETRs below 20%. The circles indicate firms that are in the bottom CashETR quintile and the bottom Vol(CashETR) quintile.

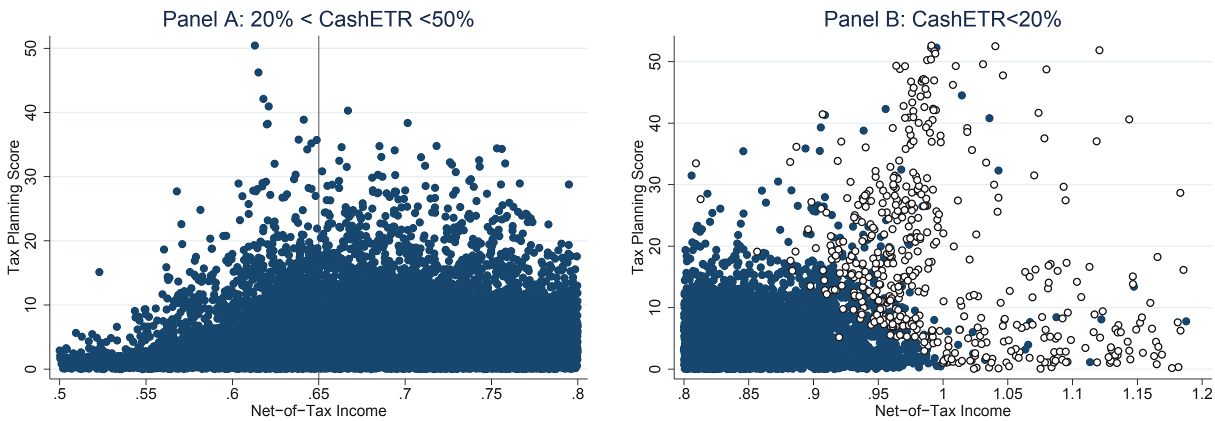

Figure 3: Serial Correlation of CashETR and the Tax Planning Score

This figure plots CashETR coefficients from regressions with future CashETR (t+5) as the dependent variable. The serial correlation coefficient is estimated for different quintiles. The black bars represent coefficient estimates for each quintile of the Tax Planning Score distribution. Coefficient estimates are significantly different from each other except for the lowest two quintiles. The gray bars represent quintiles of the CashETR distribution. Estimates are not significantly different from each other.

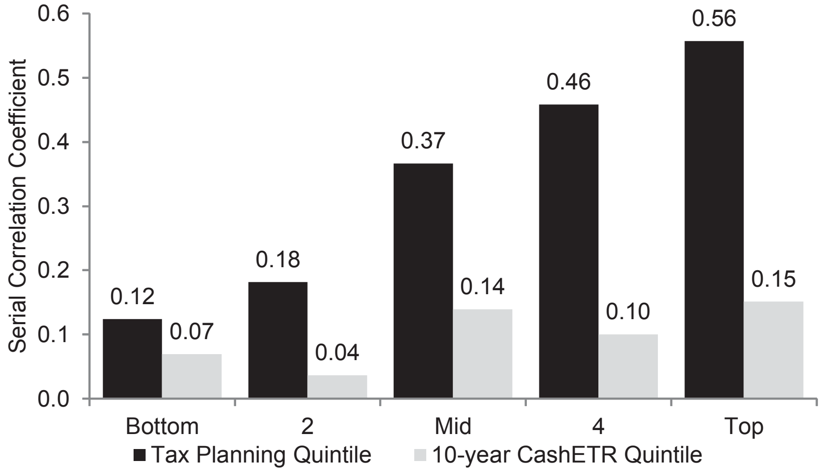

Figure 4: Tax Planning Score and Pre-Tax Earnings Coefficient

This figure plots RoE^{pretax} coefficients from regressing the market-to-book ratio (MtB) on RoE^{pretax}, SGr, and CoC (y-axis) and the average Tax Planning Score TPS (x-axis). Means and coefficients are computed for 25 portfolios from sorting firms into quintiles of the CashETR distribution and quintiles the Vol(CashETR) distribution. The fitted line is the OLS regression of RoE^{pretax} coefficients on TPS. The circle denotes the portfolio of firms in the bottom CashETR and the bottom Vol(CashETR) quintile.

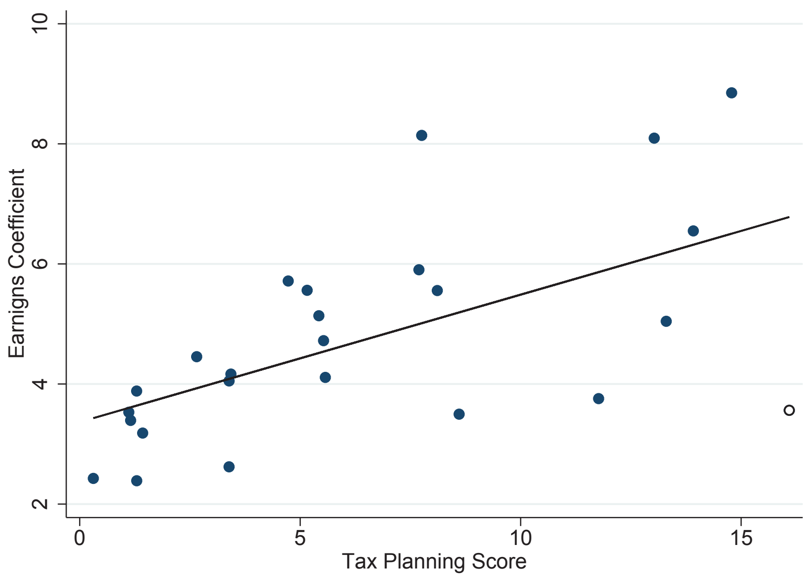

Table 2: Descriptive Statistics for Model Variables

Variable	Mean	St.Dev	P25	Median	P75	NrObs
Panel A: Tax Variables						
TPS	6.122	5.603	2.175	4.931	8.293	14,921
CashETR	0.280	0.127	0.208	0.288	0.349	14,798
Vol(CashETR)	0.115	0.046	0.082	0.106	0.139	14,423
Panel B: Main Firm Variables						
MtB	2.472	1.797	1.302	1.954	3.038	14,921
RoE^{pretax}	0.249	0.220	0.125	0.206	0.313	14,921
SGr	0.104	0.121	0.029	0.086	0.160	14,921
CoC	0.170	0.147	0.100	0.100	0.211	14,921
Panel C: Additional Control Variables						
Log_sales	6.602	1.617	5.454	6.647	7.729	14,528
CapEx	0.052	0.049	0.020	0.038	0.068	14,446
RD	0.021	0.036	0.000	0.000	0.026	12,956
LT-Debt	0.199	0.143	0.080	0.188	0.293	12,316
Volatility	0.115	0.046	0.082	0.106	0.139	14,423
TotAccruals	-0.047	0.066	-0.080	-0.045	-0.015	14,832
ForOper	0.441	0.496	0.000	0.000	1.000	14,921

This table presents summary statistics for our main variables. Panel A summarize tax variables. Panel B uses our main firm level variables. In Panel C, we use additional firm level control variables. TPS is the tax planning score from equation (9). $CashETR$ is the long-term cash effective tax rate from equation (8) over ten years as defined by Dyreng, Hanlon, and Maydew (2008). $Vol(CashETR)$ is the standard deviation of annual cash effective tax rates between $t-9$ and t. MtB is the market-to-book ratio. RoE^{pretax} denotes pre-tax earnings over prior year total assets. SGr is the growth in sales from $t-4$ to t. CoC denotes the cost of equity. *Log_sales* is the logarithm of total sales. $CapEx$ denote capital expenditures over total assets in $t-1$. RD are research and development expenditures over total assets in $t-1$. *LT-Debt* is the ratio of long-term debt to total assets. $Volatility$ is the standard deviation of monthly stock returns over the past 60 months. $TotAccruals$ is operating activities net cash flow scaled by assets in $t-1$ times -1. $ForOper$ is a dummy variable equal to 1 if the firm has foreign income different from 0.

Table 3: Descriptive Statistics on Tax Planning—Breakdown by Variability and Level of Tax Avoidance

Quintile CashETR	**Variable**	**Quintile of Vol(CashETR)** Bottom	2	3	4	Top	**Total**
Bottom	TPS	15.765	13.038	8.348	4.674	1.404	8.686
	Delta	1.006	0.918	0.886	0.875	0.877	0.907
	Vol(CashETR)	-0.016	0.007	0.014	0.029	0.307	0.072
2	TPS	12.913	7.679	5.555	3.401	1.170	6.187
	Delta	0.796	0.789	0.786	0.784	0.785	0.788
	VOl(CashETR)	0.017	0.028	0.039	0.067	0.570	0.141
3	TPS	13.949	7.753	5.405	3.377	1.116	6.365
	Delta	0.722	0.721	0.719	0.718	0.718	0.720
	Vol(CashETR)	0.022	0.036	0.053	0.088	0.622	0.161
4	TPS	14.770	8.104	5.509	3.371	1.291	6.655
	Delta	0.670	0.669	0.668	0.669	0.666	0.668
	Vol(CashETR)	0.024	0.041	0.061	0.103	0.522	0.148
Top	TPS	11.428	5.140	2.629	1.294	0.382	4.394
	Delta	0.620	0.613	0.600	0.563	0.478	0.578
	Vol(CashETR)	0.036	0.079	0.160	0.379	2.007	0.481
Total	TPS	17.678	8.159	5.382	3.174	1.090	6.122
	Delta	0.743	0.735	0.726	0.716	0.706	0.720
	Vol(CashETR)	0.019	0.039	0.067	0.136	0.778	0.115

This table presents average tax planning scores (TPS), net-of-tax return (Delta), and the standard deviation of the cash ETR between $t-9$ and t (Vol(CashETR)). We split the sample split into 25 portfolios. We use quintiles of CashETR distribution and Vol(CashETR) distribution.

Table 4: **Correlation Matrix for Model Variables**

Variable	ETR	CashETR	TPS	SGr	MtB	Size	RoE^{pretax}	CoC
ETR		0.01	-0.01	**0.07**	0.01	0.00	**0.04**	**-0.06**
CashETR	**0.25**		0.01	0.02	0.01	0.00	0.01	0.00
TPS	**-0.03**	0.01		**0.07**	**0.21**	**0.16**	**0.11**	**-0.04**
SGr	**0.09**	**0.05**	**0.10**		**0.14**	**0.10**	**0.19**	**-0.05**
MtB	**-0.05**	0.00	**0.26**	**0.20**		**0.16**	**0.51**	0.02
Size	**-0.10**	**-0.08**	**0.21**	**0.09**	**0.20**		**0.09**	-0.01
RoE^{pretax}	**0.07**	**0.09**	**0.21**	**0.29**	**0.58**	**0.15**		0.00
CoC	**-0.03**	**-0.06**	**-0.04**	**-0.04**	**0.05**	0.02	-0.01	

This table reports the Pearson correlation coefficients (below the diagonal) and Spearman correlation coefficients (above the diagonal). Correlations in bold are significant at the 5% level.

Table 5: Predicting Future Tax Avoidance

	Panel A: CashETR t+10			Panel B: TPS t+10		
CashETR	0.228***	0.240***	0.262***	-1.05	-2.23	0.225
	(0.039)	(0.038)	(0.038)	(1.839)	(1.975)	(2.174)
Vol(CashETR)		0.000	0.001		-0.128***	-0.048***
		(0.001)	(0.001)		(0.026)	(0.016)
TPS			0.002***			0.246***
			(0.001)			(0.045)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	4.16%	4.58%	5.30%	-0.01%	1.21%	6.91%
Observations	1,505	1,486	1,486	1,494	1,476	1,476

This table reports regression results on future tax planning. Panel A uses $CashETR$ in $t+10$ as dependent variable. Panel B uses TPS in $t+10$ as dependent variable. Independent variables $CashETR$, $Vol(CashETR)$ and TPS are based on a ten-year horizon. All regressions include year and industry fixed-effects. Standard errors (reported in parentheses) are clustered at the firm level and by years. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 6: Tax Avoidance and Firm Valuation

	(1)	(2)	(3)	(4)
RoE^{pretax}	3.354***	3.351***	4.013***	4.005***
	(0.236)	(0.236)	(0.312)	(0.313)
SGr	0.550*	0.581**	0.372	0.401
	(0.289)	(0.290)	(0.290)	(0.290)
$RoE^{pretax}\times$TPS	0.099**	0.099**		
	(0.039)	(0.039)		
SGr$\times$TPS	0.022	0.020		
	(0.039)	(0.038)		
TPS	0.021**	0.021**		
	(0.009)	(0.009)		
$RoE^{pretax}\times$GoodTax			1.407***	1.413***
			(0.448)	(0.452)
$RoE^{pretax}\times$BadTax			-1.210***	-1.200***
			(0.415)	(0.414)
SGr$\times$GoodTax			0.713	0.692
			(0.495)	(0.494)
SGr$\times$BadTax			0.234	0.227
			(0.392)	(0.392)
GoodTax			0.000	0.004
			(0.113)	(0.111)
BadTax			0.033	0.027
			(0.073)	(0.074)
CoC		0.374		0.377
		(0.311)		(0.311)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Adjusted R^2	29.45%	29.54%	30.56%	30.65%
Observations	14,921	14,921	14,921	14,921

This table presents regressions results for the market-to-book ratio. Independent variables are described in Table 1. We report robust standard errors clustered at the firm level and by years in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Tax Avoidance and Firm Valuation—CashETR and Sustainability

	Effective Tax Rate	**Sustainability of ETR**	**Both Measures**
RoE^{pretax}	4.359***	4.385***	4.790***
	(0.766)	(0.229)	(0.736)
SGr	0.781*	0.563**	0.669
	(0.421)	(0.281)	(0.424)
RoE^{pretax}×CashETR	-0.431		-1.380
	(2.332)		(2.192)
SGr×CashETR	-0.779		-0.744
	(1.202)		(1.252)
CashETR	-0.775*		-0.674
	(0.471)		(0.415)
RoE^{pretax}×Vol(CashETR)		-0.051***	-0.057***
		(0.008)	(0.014)
SGr×Vol(CashETR)		0.036***	0.038***
		(0.010)	(0.013)
Vol(CashETR)		0.002***	0.002**
		(0.001)	(0.001)
CoC	0.269	0.292	0.278
	(0.317)	(0.310)	(0.316)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Adjusted R^2	27.54%	27.58%	28.17%
Observations	14,798	14,668	14,668

This table presents regressions results for the market-to-book ratio. As tax measures, we use the 10-year $CashETR$, the volatility of the annual CashETR over 10 years ($Vol(CashETR)$), and finally both measures. Independent variables are explained in Table 1. We report robust standard errors clustered at the firm level and by years in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 8: Firm Valuation and Tax Planning Score—Control for Other Firm Characteristics

	(1)	(2)	(3)	(4)	(5)
RoE^{pretax}	3.220***	3.376***	3.672***	3.675***	3.501***
	(0.261)	(0.284)	(0.319)	(0.322)	(0.360)
SGr	0.281	0.387	0.383	0.409	0.216
	(0.303)	(0.323)	(0.341)	(0.342)	(0.310)
$RoE^{pretax}\times$TPS	0.103**	0.106**	0.105**	0.105**	0.084*
	(0.041)	(0.044)	(0.045)	(0.045)	(0.044)
SGr$\times$TPS	0.008	0.013	0.018	0.023	-0.005
	(0.041)	(0.042)	(0.043)	(0.043)	(0.044)
TPS	0.017*	0.012	0.011	0.010	0.013
	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)
CoC	0.105	0.256	0.250	0.233	0.181
	(0.275)	(0.292)	(0.310)	(0.320)	(0.344)
Log_sales	0.133***	0.110***	0.099***	0.078***	0.090***
	(0.026)	(0.029)	(0.028)	(0.029)	(0.029)
CapEx	1.347**	1.133**	0.291	0.476	0.723
	(0.541)	(0.555)	(0.582)	(0.600)	(0.630)
RD	11.710***	12.280***	11.910***	11.040***	12.650***
	(1.243)	(1.272)	(1.241)	(1.215)	(1.257)
Volatility		-2.320***	-2.250***	-2.370***	-2.740***
		(0.801)	(0.805)	(0.802)	(0.776)
TotAccrual			-2.050***	-2.030***	-1.950***
			(0.393)	(0.393)	(0.425)
ForOper				0.214***	0.212***
				(0.055)	(0.057)
LT-Debt					-0.007
					(0.261)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	35.48%	36.43%	38.36%	38.64%	38.01%
Observations	12,220	11,827	11,763	11,763	9,699

This table presents regressions results for the market-to-book ratio. Independent variables are described in Table 1. We subsequently add controls for firm size (*Log_sales*), investments (*CapEX* and *RD*), volatitily of profits (*Volatility*), total accruals (*TotAccruals*), foreign operations (*ForOper*), and long-term debt (*LT-Debt*). We report robust standard errors clustered at the firm level and by years in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 9: Firm Valuation and Terciles of TPS—Control for Other Firm Characteristics

	(1)	(2)	(3)	(4)	(5)
RoE^{pretax}	3.950***	4.089***	4.477***	4.496***	4.345***
	(0.364)	(0.339)	(0.309)	(0.312)	(0.345)
SGr	-0.053	-0.024	0.078	0.134	-0.360
	(0.260)	(0.262)	(0.263)	(0.258)	(0.282)
$RoE^{pretax}\times$GoodTax	1.331**	1.354**	1.180**	1.164**	0.800*
	(0.568)	(0.527)	(0.465)	(0.465)	(0.425)
$RoE^{pretax}\times$BadTax	-1.230***	-1.200***	-1.370***	-1.390***	-1.480***
	(0.459)	(0.407)	(0.358)	(0.359)	(0.410)
SGr×GoodTax	0.860	0.997*	0.896*	0.929*	0.964*
	(0.582)	(0.588)	(0.539)	(0.536)	(0.553)
SGr×BadTax	0.440	0.598*	0.471	0.438	0.809**
	(0.375)	(0.346)	(0.347)	(0.339)	(0.328)
GoodTax	-0.053	-0.090	-0.053	-0.059	-0.019
	(0.133)	(0.133)	(0.117)	(0.116)	(0.120)
BadTax	0.037	0.051	0.111	0.110	0.125
	(0.087)	(0.089)	(0.080)	(0.080)	(0.090)
CoC	0.103	0.234	0.227	0.210	0.172
	(0.274)	(0.292)	(0.309)	(0.319)	(0.349)
Log_sales	0.125***	0.106***	0.096***	0.075**	0.086***
	(0.027)	(0.029)	(0.029)	(0.030)	(0.030)
CapEx	1.248**	1.039*	0.254	0.437	0.723
	(0.553)	(0.562)	(0.585)	(0.604)	(0.634)
RD	11.630***	12.140***	11.790***	10.940***	12.520***
	(1.192)	(1.222)	(1.204)	(1.178)	(1.213)
Volatility		-2.060**	-2.030**	-2.140***	-2.590***
		(0.823)	(0.828)	(0.826)	(0.804)
TotAccruals			-1.920***	-1.900***	-1.870***
			(0.383)	(0.382)	(0.407)
ForOper				0.211***	0.212***
				(0.054)	(0.056)
LT-Debt					-0.025
					(0.255)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	36.37%	37.23%	39.06%	39.33%	38.77%
Observations	12,220	11,827	11,763	11,763	9,699

This table presents regressions results for the market-to-book ratio. Independent variables are described in Table 1. We subsequently add controls for firm size (*Log_sales*), investments (*CapEX* and *RD*), volatitily of profits (*Volatility*), total accruals (*TotAccruals*), foreign operations (*ForOper*), and long-term debt (*LT-Debt*). We report robust standard errors clustered at the firm level and by years in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 10: Determinants of the Tax Planning Score

	(1)	(2)	(3)	(4)
RoE^{pretax}	2.548***	2.534***	2.559***	0.250
	(0.407)	(0.408)	(0.395)	(0.311)
Log_Sales	0.638***	0.655***	0.766***	1.731***
	(0.067)	(0.068)	(0.071)	(0.368)
Leverage	-0.696***	-0.708***	-0.653***	-0.490***
	(0.161)	(0.162)	(0.160)	(0.185)
Cash	1.002	1.147	1.517*	-0.655
	(0.759)	(0.761)	(0.778)	(0.829)
ForOper	-0.359*	-0.348	-0.762***	-0.191
	(0.214)	(0.215)	(0.229)	(0.315)
CapEx	-0.024	-0.022	-0.007	0.019
	(0.036)	(0.037)	(0.038)	(0.046)
CapInt	1.217**	1.122**	3.173***	2.670**
	(0.488)	(0.492)	(0.712)	(1.188)
Year FE	No	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Firm FE	No	No	No	Yes
Adjusted R^2	4.78%	5.02%	8.05%	70.33%
Observations	13,761	13,761	13,714	13,714

This table presents regressions results with the 10-year tax planning score as dependent variable. We include pre-tax earnings (RoE^{pretax}), firm size (*log_sales*), debt-to-assets ratio (*Leverage*), cash-to-assets ratio (*Cash*), foreign operations (*ForOper*), investments (*CapEX*), and the capital intensity (*CapInt*). We report robust standard errors clustered at the firm level in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 11: Tax Avoidance and Firm Valuation—Alternative Tax Planning Score Measure

	(1)	(2)	(3)	(4)
RoE^{pretax}	5.159***	5.155***	4.463***	4.462***
	(0.268)	(0.266)	(0.234)	(0.233)
SGr	0.541*	0.554**	0.615**	0.636**
	(0.279)	(0.279)	(0.267)	(0.266)
RoE^{pretax}×Residual(TPS)	0.232***	0.232***		
	(0.055)	(0.055)		
SGr×Residual(TPS)	0.016	0.014		
	(0.044)	(0.044)		
Residual(TPS)	-0.021	-0.020		
	(0.013)	(0.013)		
RoE^{pretax}×GoodTax			1.688***	1.684***
			(0.464)	(0.464)
RoE^{pretax}×BadTax			-1.150***	-1.150***
			(0.274)	(0.273)
SGr×GoodTax			0.357	0.338
			(0.537)	(0.540)
SGr×BadTax			-0.415	-0.418
			(0.397)	(0.398)
GoodTax			-0.057	-0.051
			(0.105)	(0.103)
BadTax			0.070	0.066
			(0.058)	(0.057)
CoC		0.411		0.428
		(0.301)		(0.310)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Adjusted R^2	34.34%	34.43%	34.00%	34.11%
Observations	13,204	13,204	13,204	13,204

This table presents regressions results for the market-to-book ratio. Independent variables are described in Table 1. The residuals are the ϵ from the following regression: $TPS_{i,t} = \alpha_1 + \beta_1 \cdot ROA_{i,t} + \beta_2 \cdot SIZE_{i,t} + \beta_3 \cdot Leverage_{i,t} + \beta_4 \cdot Cash_{i,t} + \beta_5 \cdot Investment_{i,t} + \beta_6 \cdot CapInt_{i,t} + \beta_7 \cdot ForOp_{i,t} + \epsilon$. We report robust standard errors clustered at the firm level and by years in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

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