Effective Tax Planning

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Abstract: This study develops a measure of effective tax planning that is not only theoretically aligned with the Scholes-Wolfson paradigm but also reflects recent shifts in corporate tax behavior. We use data envelopment analysis (DEA) to measure how efficiently a firm maximizes its after-tax return and minimizes tax risk given first-order operating, investing and financing decisions. We then (1) document that the measure is associated with higher after-tax returns and lower tax risk to provide assurance that DEA achieves its objective in our setting, (2) demonstrate that the measure is distinct from cash effective tax rates, (3) validate the measure by showing it is associated with lower tax and non-tax costs, and (4) provide evidence that our measure captures something unique about taxes and not just the overall firm effectiveness. To our knowledge, our measure is the first to consider multiple aspects of tax planning simultaneously – maximizing returns and minimizing tax risk. This measure is useful to tax planning research, particularly in light of studies highlighting the limitations of effective tax rates as a measure of tax planning.

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1. INTRODUCTION

The objective of this study is to develop a firm-year measure that captures how effectively firms maximize their after-tax returns and minimize tax risk given their operating, investing and financing decisions. The Scholes-Wolfson (SW) paradigm provides a framework for understanding the role of taxes in organizations and is widely-regarded as the foundation for empirical tax research in accounting (Shackelford and Shevlin 2001). This paradigm defines effective tax planning as the consideration of all taxes, all parties, and all costs when implementing the decision rule of maximizing after-tax returns (Scholes and Wolfson 1992, p. 2). In recent years, firms increasingly emphasize managing tax risk as another key element of an effective internal tax department (PwC 2004; E&Y 2014; KPMG 2018). Although a generally accepted definition of tax risk does not exist, practitioners suggest it encompasses things such as unexpected audit outcomes and potential harm to corporate reputation or brands (KPMG 2018). In developing our measure, we recognize that effective corporate tax departments are routinely being called upon to balance value creation with tax risk.

To construct a measure of effective tax planning, we follow the methodology in Demerjian, Lev and McVay (2012) and use data envelopment analysis (DEA). DEA offers four features that are advantageous in our setting. First, DEA allows firms to simultaneously optimize multiple outcomes. Because we define effective tax planning as the joint outcome of maximizing after-tax returns and minimizing tax risk, this feature is critical. Second, DEA estimates how efficiently a firm converts inputs into outputs. This concept of efficiency aligns well with what Scholes-Wolfson describe as the "the tax planner's problem" of maximizing after-tax returns "given the history of decisions and outcomes that brought the firm to where it is today" (p.176). Third, DEA does not impose any linear, on-average assumptions and instead allows firms to use inputs differentially when maximizing after-tax returns and minimizing tax risk. We believe this feature reflects the reality that some firms can extract more tax benefits from operating, investing and financing decisions than others. Fourth, DEA produces a firm-year measure that can be used in second-stage analysis, allowing future studies to further our understanding of the determinants and consequences of effective tax planning.

We implement DEA by measuring how efficiently a firm maximizes its after-tax return on equity while minimizing the volatility of its cash taxes paid given its research and development (R&D) expenditures, gross property, plant and equipment (PP&E), tax haven operations, intangible assets, inventory and leverage. We choose these "inputs" because they are associated with first-order, firm-level decisions that offer opportunities to further enhance after-tax returns through tax planning but can impose tax risk on the firm.[1] These inputs capture not only the level of assets but also the types of assets, the location of those assets and the financing decisions to acquire those assets. Because tax planning opportunities vary across industries, we estimate firms' tax effectiveness relative to their industry peers. We measure all inputs and outputs over five-years to achieve a long-run measure of tax planning that smooths volatility in annual inputs and outputs.

After constructing our measure of effective tax planning, we conduct several analyses to (1) show the measure is associated with outputs in expected ways, (2) demonstrate that the measure is distinct from cash effective tax rates, (3) validate the measure by showing it is associated with lower tax and non-tax costs, and (4) provide evidence that our measure captures something unique about taxes and not just the overall firm effectiveness.

[1] For example, firms engage in R&D to increase sales and/or reduce costs – both of which can increase after-tax returns. Consideration of taxes when engaging in R&D activities can further enhance the after-tax returns to R&D activity via increased R&D tax credits. Because DEA optimizes across all inputs, we limit the number of inputs for tractability.

First, we demonstrate that our measure is associated with both higher after-tax returns on equity and lower tax risk, controlling for the inputs. DEA is most commonly used in operations research examining the production of physical outputs. Because DEA is not widely used in accounting literature and because of its non-parametric, optimization approach can appear to be somewhat of a "black box", it is useful to verify that DEA achieves its objective in our setting. Finding that our measure is significantly associated with *both* outcomes, as we intended it, also verifies that DEA allows us to identify firms that maximize after-tax returns *and* minimize tax risk. Moreover, this analysis allows us to gauge the economic effects of effective tax planning on outcomes. A one standard deviation increase in our measure is associated with a 19 percent increase in after-tax returns and a 31 percent decrease in tax risk.

Second, we show our measure is distinct from one- and five-year cash ETRs. Cash ETRs are a commonly-used measure of tax *minimization* but they do not necessarily capture either dimension of effective tax planning as we define it.[2] The correlations range from 17.4 with the one-year cash ETR to 40.6 percent with the five-year cash ETR. A closer analysis of firm-specific observations indicates that equally effective tax planners often report very different cash ETRs. For example, our measure classifies Apple and 3M as highly effective tax planners in 2014, yet 3M reports a cash ETR over 11 percentage points higher than Apple (i.e., 26.9 vs. 15.5 percent). To provide more robust evidence of the difference between cash ETR and our measure of effective tax planning, we separately estimate after-tax return and tax risk as a function of cash ETRs and tax effectiveness. We find low cash ETRs are associated with *lower* after-tax returns. In contrast, effective tax planners report both higher after-tax returns and lower tax risk.

[2] Strictly speaking, cash ETR is a measure of tax minimization because a lower cash ETR reflects fewer explicit taxes per dollar of pretax income. For parsimony, we refer to cash ETR as a measure of tax minimization, but acknowledge that it also captures tax planning with noise.

Collectively, this evidence suggests that although there is some overlapping information between cash ETRs and our measure of tax effectiveness, they are distinct, and the portion of our measure that is orthogonal to cash ETR is associated with the elements of effective tax planning.

Third, we provide evidence that our measure reflects the "all taxes, all costs" feature of effective tax planning. In particular, we examine whether tax effective firms (1) reduce current tax cash outflows and (2) retain a greater portion of their uncertain tax benefits, thereby lowering the agency and other non-tax costs associated with cash flow uncertainty (Hanlon et al. 2017). After controlling for pretax income and other standard determinants of tax avoidance, we find that a one standard deviation in tax effectiveness is associated with a 13 percent decrease in current cash taxes paid and a five percent decrease in future cash taxes paid. Further, tax effective firms have lower future settlements with tax authorities. Collectively, these results suggest that tax effective firms consider both the tax and non-tax costs of tax avoidance. As such, these results demonstrate that our measure is theoretically aligned with the SW definition of effective tax planning while also illustrating an empirical application of our measure.

Finally, we perform a falsification test to alleviate concerns that our measure primarily identifies firms with better overall performance – firms that are just "better" or more effective on all dimensions. We modify the DEA estimation so that *pre-tax* return on equity is the output of the production function and use the same inputs described above. This estimation produces a firm-year measure of pre-tax effectiveness. We then examine the relation between pre-tax effectiveness and both current and future tax payments, and future settlements. We find that pre-tax return effectiveness is *positively* associated with future tax payments and *unassociated* with current tax payments and future settlements. Moreover, our measure of tax effectiveness continues to be negatively associated with both current and future tax payments and future settlements even after controlling for pre-tax return effectiveness. The contrasting results obtained when we focus on our measure of tax effectiveness versus a measure of pre-tax effectiveness provides comfort that our measure reflects firms' decisions related to taxes. That is, our measure of tax effectiveness captures the role of tax planning in maximizing after-tax returns while minimizing tax risk.

Our contribution is developing a firm-year measure of effective tax planning that is theoretically aligned with the SW paradigm and reflects corporate tax departments' increased focus on tax risk. To our knowledge, our measure is the first to consider multiple aspects of tax planning simultaneously – maximizing returns and minimizing tax risk. Given firms' increased focus on mitigating tax risk while also returning value to the firm, we believe this feature of our measure is timely and important. Our measure considers both explicit and implicit taxes as well as tax and non-tax costs that firms must contemplate when tax planning. Researchers can use our measure to address new questions about the tax risk-reward tradeoff and revisit questions about tax planning that were tested using measures of tax avoidance. We expect studies using our measure in lieu of tax avoidance measures to yield new insights. For example, prior studies provide mixed evidence on how governance affects corporate taxes using measures of tax minimization (e.g., Desai and Dharmapala 2006; McGuire et al. 2014, etc.). These mixed results are not surprising because the theoretical link between governance and tax minimization is ambiguous (Armstrong, Blouin, Jagolinzer and Larcker 2015). In contrast, the theoretical link between effective tax planning and corporate governance is clear; firms should undertake investments aimed at maximizing after-tax returns while minimizing risk. Future studies can also examine the determinants and consequences of effective (or ineffective) corporate tax planning. We also anticipate opportunities for future research to use our measure in concert with measures of tax avoidance to compare (contrast) firms that fall within similar (different) parts of the distribution of each measure.

Our measure is subject to potential limitations. First, DEA is computationally demanding, which requires us to select a parsimonious and non-exhaustive list of inputs. Although we select inputs that summarize important operating, investing and financing decisions that also offer opportunities for tax planning, we likely omit other inputs to tax planning. Second, our measure is based only on a firm's *current levels* of inputs. Although this is appropriate because taxes are often a second-order consideration, it means our measure cannot speak to whether a firm could increase its after-tax returns and reduce its tax risk by changing the levels of its inputs. Finally, although our measure is associated with lower tax risk, lower current and future cash taxes paid, and lower future settlements *on average,* we cannot know for certain that *every* firm we classify as tax effective (or not) is classified as such because of their tax decisions. We do not believe these limitations systematically bias our results or dramatically limit the usefulness of our measure.

II. RELATED LITERATURE ON EFFECTIVE TAX PLANNING

Given the magnitude of U.S. income taxes, shareholders, regulators, tax authorities, and academic researchers are interested in understanding the factors that enhance or inhibit firms' abilities to reduce their tax burdens. Scholes-Wolfson (1992) introduced a systematic framework for examining the role of taxes in organizations that is widely recognized as the foundation of modern tax accounting research (Shackelford and Shevlin 2001).[3] The SW framework defines effective tax planning as "considering not only the role of taxes when implementing the decision rule of maximizing after-tax returns, but also consideration of other costs that arise in a world of

[3] Scholes et al. (2014) is an updated, fifth edition of SW. Although the book has been updated and revised, the basic framework introduced in 1992 remains largely unchanged.

costly contracting where implementation of tax-minimizing strategies may introduce significant costs along non-tax dimensions." For example, effective tax planning requires the consideration of both explicit and implicit taxes as well as the non-tax costs of implementing tax planning strategies. The SW framework distinguishes effective tax planning from tax minimization, noting that tax minimization can be "undesirable" and potentially reduce after-tax returns to the extent the non-tax costs of tax minimization exceed the tax benefits of minimization strategies (Scholes and Wolfson 1992, p.3).

In recent years, firms increasingly emphasize managing tax risk and the threat of those risks to firm value (PwC 2004; E&Y 2014; KPMG 2018). Managers routinely rank tax risk metrics among the most important performance metrics for tax departments, with "tax risks managed appropriately", "accuracy of returns and avoidance of penalties", "tax risks consistent with the corporate risk profile", and "results of tax audits are as expected" all being ranked among the top ten most important performance metrics (KPMG 2018). In response to this increased focus on tax risk, practitioners have developed plans to help clients manage tax risk (Neuman, Omer and Schmdit 2019), and some companies develop and maintain internal policies for handling tax risks strategically.[4] Although a universal definition of tax risk does not exist, practitioners suggest it manifests in things such as unexpected audit outcomes and interest and penalties. Firms also express concerns over potential reputation risks and threats to brand value (Graham, Hanlon, Shevlin, and Shroff 2014). Neuman et al. (2019) synthesize information from multiple sources to conclude that tax risk stems from economic risk, tax law uncertainty, and inaccurate information processing. These factors create tax risk because they contribute to "uncertainty about future tax outcomes".

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[4] For example, see Vodafone's tax risk management policy here:
https://www.vodafone.com/content/dam/vodcom/sustainability/pdfs/tax-strategy-2018.pdf

Stakeholders and researchers have recently gained interest in understanding the interplay between tax planning and tax risk. Guenther et al. (2017) find no evidence that tax avoidance is associated with future tax rate volatility or future overall firm risk. Guenther, Wilson and Wu (2019) estimate a system of equations to demonstrate that incremental tax avoidance is not associated with higher levels of tax uncertainty. Somewhat in contrast, Dyreng, Hanlon and Maydew (2019) find that firms with lower cash effective tax rates face greater uncertainty about the portion of claimed tax benefits they will sustain upon audit. Thus the relation between tax avoidance and tax risk – while of increasing importance - is not yet fully understood.

Our ability to better understand firms' joint consideration of these factors has been limited by existing empirical measures and methods. Neuman (2014) was one of the first studies to simultaneously consider tax minimization and tax risk as two dimensions of a firm's tax strategy. She classifies a firm's strategy as "sustain" (those with low cash ETR volatility), "minimize" (those with three-year cash ETRs below twenty percent), or mixed. However, her study relies on one-dimensional measures of tax minimization or tax risk that she must set using potentially arbitrary cut-offs. We extend this line of work by using DEA to develop a measure that (1) encompasses both after-tax returns and risk simultaneously, (2) considers the tax department's endowment of inputs to tax planning to determine what level of effective tax planning is possible for the firm, (3) allows each firm to utilize these inputs differently, and (4) compares firms to their industry-peers. We elaborate on each of these factors below.

III. OVERVIEW OF DEA AND OUR ESTIMATION

Overview of DEA in Our Setting

This section provides an overview of our DEA estimation. Appendix B provides greater detail on the estimation process. DEA is a flexible nonparametric econometric technique originally developed to assess the efficiency of multiple output processes that other estimation methods could not evaluate (Rhodes 2003). Although DEA originated in the operations field, researchers have since used it to study efficiency in numerous disciplines including accounting (e.g. Demerjian et al. 2012; Knechel et al. 2009). DEA is well suited to constructing a measure of tax efficiency for several reasons.

First, DEA allows for decision-making units (in our case, firm-years) to optimize on multiple outcomes. Because we define effective tax planning as the joint objective of maximizing after-tax returns and minimizing tax risk, this feature of DEA is critical. Second, DEA takes inputs as fixed and estimates how efficiently a firm converts those inputs into specified outputs. In our setting, DEA accounts for the fact that tax planners are tasked with maximizing after-tax returns while minimizing tax risk subject to the operating, financing, and investing decisions made by the firm. This research design aligns with what SW describe as the "the tax planner's problem": the need to maximize after-tax returns and minimize tax risk given the "history of decisions and outcomes that brought the firm to where it is today" (p.176).

Third, the measure DEA generates can be used in subsequent analysis thereby allowing researchers to examine cross-sectional variation in effective tax planning (Rhodes 2003).

Fourth, DEA allows for each decision-making unit's optimal weights on their inputs to differ. This is conceptually appealing in our context because firms are unlikely to derive identical tax benefits or tax risks from a given input.

As with any estimation technique, DEA has limitations. First, there are many possible combinations of inputs to effective tax planning. Because DEA is computationally demanding due to its optimization across all inputs, we limit the number of inputs for tractability. Second, DEA measures efficiency given a firm's current levels of inputs and therefore cannot speak to whether or by how much a firm could increase its efficiency with a different level of inputs. Finally, as with most empirical measures, we cannot know for certain that every firm we classify as being tax effective (or not) is classified as such because of their tax behavior. [5] Although DEA has limitations in our setting, we nonetheless believe its advantages outweigh its limitations and that DEA is the best method for us to compute a dual-output measure of effective tax planning.

Our DEA estimation

We measure two outputs - after-tax returns and tax risk - over a five-year window. We choose long-run measures of each output to smooth volatility that can add noise (Dyreng et al. 2010). After-tax return (*After-tax Return*) equals the sum of pretax income less cash taxes paid from *t-4* to *t*, scaled by the sum of beginning owners' equity over the same period. We subtract cash taxes paid from pretax income so that our after-tax return measure includes both permanent and temporary tax planning strategies. To capture tax risk, we focus on the volatility of cash ETRs. We use this measure of tax risk because Guenther et al. (2017) show that volatile tax rates are associated with overall firm risk, and other accounting studies often use ETR volatility as a measure of tax risk.[6] All else equal, volatile cash ETRs can reflect unfavorable audit settlements, interest and penalties arising from information processing errors or misapplication of tax laws

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[5] Further, the DEA software we use requires all inputs to be positive. We therefore add a small constant value to any zero values reported for inputs in any firm year, which can add noise to the measure. Avkiran (2006) explains the positivity requirement of DEA by stating, "Basic DEA models are not capable of completing an analysis with negative numbers and all numbers must be non-negative and preferably strictly positive." The author suggests as a solution adding a constant to the values of the input or output that has a non-positive number. Similarly, the software we use to estimate DEA suggests adding constant values to ensure positivity. In untabulated analyses, we estimate that DEA considers true zero-value inputs to be valuable for about 11 percent of observations. Thus, we conclude this approach does not cause measurement issues for the vast majority of our sample.

[6] Other measures we considered were reserves for unrecognized tax benefits and the composite tax risk measure from Neuman et al. (2019). We did not choose reserves for unrecognized tax benefits because they are potentially more affected by managerial discretion and managers' perceptions of tax risk rather than actual tax risk. It is also an ex ante measure of expected audit settlements, etc. and we prefer an ex post, outcome-oriented measure. The composite measure from Neuman et al. (2019) is also an ex-ante measure and requires a substantial number of variables, which would result in sample loss. It also includes variables that could potentially be better viewed as inputs to tax planning rather than outcomes (e.g., we use tax havens as an input to tax planning and Neuman et al. (2019) view tax haven operations as an element of tax risk.)

(Neuman et al. 2019). Because DEA requires the maximization of outputs (Rhodes 2002), we cannot directly estimate tax risk *minimization*. Instead, we transform a common measure of tax risk — the standard deviation of the firm's cash ETR from *t-4* to *t* (Guenther et al. 2017) — into *Inverse Tax Risk*, which equals the maximum standard deviation of cash ETR in the firm's industry-year peer group less the firm's own standard deviation of cash ETR. As such, higher values of *Inverse Tax Risk* indicate lower tax risk, and we can use DEA to estimate how efficiently firms maximize *After-tax Returns* and *Inverse Tax Risk*.

DEA allows for a wide variety of inputs to the optimization problem including measures of labor, capital, and other expenditures. We select six inputs: *R&D, PP&E, Tax Havens, Intangible Assets, Inventory,* and *Total Debt.* We select these inputs because they capture the level of assets as well as the types of assets (e.g., *R&D*, *PP&E, Intangible Assets* and *Inventory*), the location of those assets (e.g., *Tax Havens*) and the financing decisions to acquire those assets (*Total Debt*). Importantly, these inputs not only relate to the firm's overall production function but also have key tax planning opportunities associated with them. As with outputs, we measure each input from *t-4* to *t*.

Our first input is *R&D*. R&D investments can increase profitability and pretax returns through revenue growth and/or process improvements that reduce operating expenses. Firms engaging in effective tax planning can also extract significant tax benefits from R&D spending by proactively claiming federal and state tax credits (instead of only deductions) and exploiting cost sharing agreements with affiliates. Tax effective firms can mitigate the risks associated with claiming R&D-related benefits by engaging outside consultants to ensure accuracy and maintaining appropriate documentation.

Our second input is *PP&E* (property, plant, and equipment). PP&E reflects capital assets that are essential to the generation of after-tax returns. As with R&D, consideration of taxes when acquiring PP&E can further enhance after-tax returns because firms can choose particular types of PP&E or depreciation methods. Firms can also strategically time expenditures to take advantage of bonus depreciation and engage in cost segregation studies to further maximize depreciation deductions (Leone 2008). Increasing the net present value of cash tax savings through depreciation shields increases the overall net present value of after-tax cash flows from PP&E. We expect tax benefits related to *PP&E* to generate lower tax risk, on average. However, firms can face uncertainty about whether tax authorities will respect allocations. Firms can manage this risk by engaging valuation specialists or obtaining cost segregation studies. Maintaining effective controls over compliance can also help reduce the risk of reporting errors.

Our third input is *Tax Havens.* Firms can extract tax benefits from operations in lower-tax jurisdictions through tax-efficient supply chain management, strategic transfer pricing, tax holidays, etc. (Rego 2003; Dyreng et al. 2010; Dyreng, Lindsey, Markle and Shackelford 2015; De Simone, Mills, and Stomberg 2019, etc.).[7] Any intercompany transfer pricing between U.S. parents and haven affiliates will likely be scrutinized by the IRS and other tax authorities. Firms can mitigate this risk by maintaining contemporaneous documentation of transfer pricing and selecting prices within a range the tax authority is most likely to respect. We obtain Exhibit 21 data from Scott Dyreng's website and measure *Tax Haven* as the natural log of one plus the number of disclosed subsidiaries in tax havens. Because firms sometimes cease disclosure of tax havens due to political pressure or for other reasons, we consider a firm to have operations in a tax haven in the first sample year material operations were disclosed and in all subsequent years.

Our fourth input is *Intangible Assets*. Intangible assets are an increasingly important

[7] *Tax Haven* can be viewed as a measure of investment in foreign operations. The correlation between *Tax Haven* and an analogous variable based on the number of material foreign subsidiaries disclosed in the Exhibit 21 is 0.####.

source of after-tax returns, and account for approximately 84 percent of S&P 500 firms' market value (Elsten and Hill 2017). Firms engaging in effective tax planning will strategically locate and price intellectual property to shift profits to affiliates in lower-tax jurisdictions both within and outside the U.S. These strategies allow firms to retain a larger portion of the pre-tax returns generated by intangible assets, but only if firms can adequately substantiate transfer prices.

Our fifth input is *Inventory*. Inventory costing methods such as FIFO and LIFO can lead to significant tax savings for certain industries. For example, Guenther and Sansing (2012) estimate the present value of tax on the oil industry's LIFO reserves in 2010 was $13 billion and the tax benefits of LIFO alone are large enough that the Obama administration targeted LIFO for repeal to raise an estimated $400 billion of revenue over a 10 year period (Pryzbyla 2011).[8] Further, multijurisdictional entities (both domestic and multinational) can strategically price inter-company inventory sales to increase after-tax returns. Such strategies can increase the tax risk associated with audits of intercompany transfer prices.

Our final input is *Total Debt*. Debt represents a substantial source of capital to fund operations and investments. Debt can also provide substantial tax shields; locating debt in high-tax jurisdictions or structuring debt to maximize foreign tax credits can increase the tax savings associated with interest payments and therefore maximize after-tax returns (Newberry 1998; Newberry and Dhaliwal 2001). As with other inputs, successfully retaining claimed tax benefits related to debt hinges on having proper procedures in place to ensure compliance with technical tax laws and retaining adequate documentation in support of claimed positions.

Given these inputs and outputs, we use DEA to solve the following optimization

[8] It is unclear how our measure is affected by pure accounting choices such as LIFO conformity that simultaneously affect outputs (after-tax returns) and inputs (levels of inventory).

problem:

$$\max_{v} \theta = (Pretax\ Income_{t-4,t}\ - Cash\ Taxes\ Paid_{t-4,t}) \mid (Inverse\ Tax\ Risk) \cdot (v_1 R\&D_{t-4,t} + v_2 PP\&E_{t-4,t} + v_3\ Tax\ Haven_{t-4,t} + v_4 Intangible\ Assets_{t-4,t}\ + v_5 Inventory_{t-4,t} +\ v_6 Total\ Debt_{t-4,t})^{-1} \qquad (2)$$

We estimate DEA using variable returns to scale to account for the possibility that after-tax returns and tax risk vary with the level of the input. We scale all variables other than $Inverse\ Tax\ Risk$ and *Tax Haven* by beginning owners' equity summed from *t-4* to *t*. See Appendix A for variable definitions. Henceforth, we omit subscripts for parsimony.

We estimate DEA by industry-year to compare firms that share similar tax planning opportunities. Because DEA estimates a decision-making unit's efficiency *relative to its comparison group,* the comparison group is important. However, although changing the comparison group can alter the value of the efficiency measure it does not necessarily alter inferences (Demerjian et al 2012; Demerjian 2018). We choose firm-year observations in the same year and Fama-French 5 industry as the comparison group because a firm's tax planning opportunities, as well as its fundamental operating, investing and financing decisions, vary over time and by industry (Demerjian 2018; Dyreng, Hanlon, Maydew 2008; Dyreng, Hanlon, Maydew, and Thornock 2017; Scholes et al. 2014). We choose Fama-French 5 as our industry classification grouping to mitigate issues that arise when estimating DEA on a small comparison group (Demerjian 2018); small estimation group size limits the detection of variation in efficiency within the estimation group. We thus measure a firm's efficiency in maximizing its after-tax return on equity and minimizing tax risk given specified inputs, relative to other firms in the same industry-year. This approach aligns with the definition of effective tax planning in the SW framework. We term the efficiency scores generated by DEA after estimating equation (2) by industry-year peer group *Tax Effectiveness (Raw Score).* In our analyses, we rank these scores by industry-year because Demerjian (2018) notes that different size estimation groups can affect raw values with firm-years in smaller estimation groups having mechanically higher scores. *Tax Effectiveness* is the ranked firm-year measure of effective tax planning that we use in our analysis. This approach leads to average scores around 0.5.

IV. SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

Sample Selection

Our sample begins with all observations in Compustat from 1994 to 2016. We start in 1994 to ensure our entire sample period is under the same income tax reporting regime (ASC 740). We require firms to be incorporated in the U.S. to keep the applicable tax laws and legal systems consistent. We require the sum of after-tax returns over the five-year measurement period to be positive. This sample restriction allows us to retain firms that experience transitory losses while simultaneously removing firms that have persistent losses and therefore face fundamentally different tax planning incentives relative to profitable firms (e.g., Manzon and Plesko 2002). Finally, we exclude firm-year observations without the necessary data to calculate variables of interest. This results in a final sample of 41,764 firm-year observations.

Summary Statistics

Table 1 presents descriptive statistics for the DEA inputs and outputs as well as for variables used in our empirical analyses. Panel A presents descriptive statistics for the full sample. Because we rank scores, the mean value of *Tax Effectiveness* is 0.524 – close to 0.50 by construction. For completeness, we also present raw scores. *Tax Effectiveness (Raw Score)* has an average value of 0.749 indicating that on-average firms are about 75% as effective at tax planning as the best firms in their industry-year peer group.

By construction, the sample is profitable, with mean (median) after-tax return on equity equal to 16.8 (13.2) percent. The average firm has five-year standard deviation of cash ETR, *σ(Cash ETR)*, of 0.149, which aligns closely with a sample average of 0.143 from Guenther et al. (2017). Our measure of tax risk has an average value of 0.326. Thus, the average firm in our sample has a five-year standard deviation of cash ETR that is 0.326 lower than the maximum standard deviation of five-year cash ETR in their industry-year.

[Insert Table 1 here.]

Panel B presents descriptive statistics related to the DEA estimation process by industry. The group size varies substantially by industry, ranging from an average estimation group of 152 for the Healthcare, Medical Equipment, and Drugs ("Healthcare") industry to 646 observations for the Manufacturing, Energy, and Utilities ("Manufacturing") industry. Across industries, *After-tax Return* is highest for Consumer Durables whereas *Inverse Tax Risk* is highest for Other. Average *R&D* and *Intangible Assets* are the largest for firms in the Healthcare and Business Equipment industries. *PP&E* is the highest for firms in the Manufacturing industry, while *Inventory* is the highest for firms in the Consumer Durables Industry. The highest usage of *Tax Havens* occurs for firms in the Business Equipment industry. Finally, *Total Debt* is largest for firms in the Other, which includes financial firms. *Tax Effectiveness (Raw Score)* is highest on average for firms in the Healthcare industry. The value of 0.820 suggests the average firm in this industry is about 82 percent as effective (efficient) as the most effective (efficient) firm in the same industry at simultaneously maximizing after-tax returns and minimizing tax risk given its input mix. Average values are lowest for firms in the 'Other' industry (0.741). Because some of the variation in *Tax Effectiveness (Raw Score)* is driven by differences in estimation group size, we utilize a ranked measure, *Tax Effectiveness*, in subsequent analyses. As expected, *Tax Effectiveness* is approximately 0.5 in all industries.

In Panel C, we sort observations into quintiles of *Tax Effectiveness* and provide mean values of variables used in our DEA analysis as well as other outcome variables. Variables are winsorized at the 1st and 99th percentiles. In untabulated analyses, we test for mean differences between the top and bottom quintile and find all are statistically significant at the 10 percent level or better. Values for both outputs *After-tax Return* and *Inverse Tax Risk* are increasing across the columns providing evidence that more tax effective firms have higher returns and lower risk. Other than *Inventory*, the DEA inputs (*R&D*, *Total Debt*, *Intangible Assets*, *PP&E*, and *Tax Haven*) exhibit no monotonic trend across the *Tax Effectiveness* quintiles. This provides assurance that *Tax Effectiveness* is not simply capturing increasing levels of the inputs. When we focus on tax outcomes, firms in the top quintile have *higher* ratios of cash taxes paid to equity (*CTP*). This relation could be explained by the fact that tax effective firms are more profitable. Top quintile firms also report *Settlements* that are lower than firms in most other quartiles. We further explore these relations in multivariate analysis to draw more robust conclusions about the relation between *Tax Effectiveness* and tax outcomes. Finally, neither *Log(MVE)* nor *Book Value of Equity* – two measures of size - are monotonically increasing in *Tax Effectiveness*, which suggests our measure is not only capturing firm size.

In Panel D, we examine the "stickiness" of effective tax planning within firms by independently sorting all observations into quintiles of *Tax Effectiveness* in *t* and *t*+5 and documenting the overlap. Examining *Tax Effectiveness* scores in *t* and *t+5* ensures that any observed 'stickiness' is not due to overlapping years during the measurement period. Observations along the diagonal are ranked in the same quintile of *Tax Effectiveness* each year whereas observations in the off-diagonals are ranked in different quintiles. Random probability would assign 20 percent of the sample to each cell. A perfect correlation between the two measures would assign 100 percent of observations to each of the cells along the diagonal. Percentages along the diagonal are all greater than 20 percent with the greatest overlap occurring in the top and bottom quintiles. Specifically, 30 (48) percent of observations in Q1 (Q5) in *t* are in Q1 (Q5) in *t+5* as well. These results suggest that *Tax Effectiveness* is somewhat "sticky" over time, particularly among the most (Q5) tax effective firms.

To better understand the types of firms that exhibit high versus low *Tax Effectiveness*, we present four firms' 2014 *Tax Effectiveness* score in Figure 1. We also present each firm's five-year cash ETR, ATROE, and standard deviation of cash ETR. The first firm is Apple, is widely viewed as an effective tax planner, and has a *Tax Effectiveness* score of one, which means it is highly effective given its inputs relative to its peer firms. Apple achieves a high ATROE (0.451) and exhibits low tax risk (*σ(Cash ETR)* = 0.050). The second firm, 3M Corp., also has a high *Tax Effectiveness* score of 0.893 and relatively high ATROE (0.294) and low tax risk (0.068). Although 3M has both a lower ATROE and higher tax risk *compared to Apple without regard to inputs,* 3M's high tax effectiveness score suggests that it did about as well as could be reasonably expected *given its inputs.* 3M also exhibits a relatively higher Cash ETR (26.9%) suggesting that, consistent with the Scholes-Wolfson framework, *Tax Effectiveness* and tax minimization are distinct.

The third and fourth examples, Electronic Arts and Avon, focus on firms with lower *Tax Effectiveness* scores. Both Electronic Arts and Avon exhibit relatively low ATROE, 0.059 and 0.083 respectively, and relatively high tax risk, 0.392 and 0.323 respectively. Interestingly, Electronic Arts exhibits a much lower *Tax Effectiveness* score relative to Avon (24.3 vs. 26.3

percent) despite reporting a much lower cash ETR (5.9 percent vs. 74.5 percent). Again, this emphasizes the distinction between tax effectiveness and tax minimization.

V. ANALYSIS OF *TAX EFFECTIVENESS*

In this section, we conduct analyses to (1) show that *Tax Effectiveness* is associated with outputs in expected ways, (2) demonstrate that *Tax Effectiveness* is distinct from cash ETR, a commonly-used measure of tax avoidance or tax minimization, (3) validate *Tax Effectiveness* by showing it is associated with better tax and non-tax outcomes, and (4) provide evidence that *Tax Effectiveness* captures something distinct from overall firm-year effectiveness or profitability.

Is *Tax Effectiveness* associated with outputs in expected ways?

Recall that DEA measures efficiency, or how much of a firm's optimal outputs it achieves given its inputs. Because DEA is not widely used in the accounting literature and because its non-parametric, optimization approach can appear to be somewhat of a "black box", we begin our analysis by verifying that DEA achieves its objective in our setting. To formally test this relation, we estimate the following OLS regressions:

$$Output_{i,t\text{-}4,t} \quad = \quad \beta_0 + \beta_1 Tax\ Effectiveness + Inputs + Industry\ FE + Year\ FE + \varepsilon_{it} \qquad (3)$$

where *Output* equals either *After-tax Return* or *Inverse Tax Risk.* We follow Leone, Minutti-Meza and Wasley (2019) and estimate robust regression to account for influential observations and reduce the possibility of reporting spurious results or drawing incorrect inferences. Including the DEA inputs as control variables also tests whether *Tax Effectiveness* is incrementally predictive of after-tax returns and tax risk above and beyond the firm's first order operational, financing, and investing decisions. Finally, this analysis allows us to observe whether *Tax Effectiveness* is associated with both outputs (not just one or the other), which is what we intend it to be.

We report the results of estimating equation (3) in Table 2. We estimate equation (3) with and without controlling for the DEA inputs. The coefficients on *Tax Effectiveness* are positive and significant in all specifications, indicating that *Tax Effectiveness* is associated with higher after-tax returns and lower tax risk, as intended. To gauge economic significance, we focus on specifications with inputs as control variables. Relative to the mean firm, we estimate that a one standard deviation increase in *Tax Effectiveness* is associated with a 19.9 percent increase in *After-tax Return* and a 26.3 percent reduction in *Tax Risk*.[9]

[Insert Table 2 here.]

Is *Tax Effectiveness* distinct from Cash ETR?

Despite the distinction between effective tax planning and tax minimization, several existing studies rely on measures of tax minimization to capture tax planning (e.g., Mills, Erickson and Maydew 1998; Phillips 2003; Rego 2003; Armstrong Blouin and Larcker 2010; Robinson, Sikes and Weaver 2010; Powers, Robinson and Stomberg 2016; Edwards, Schwab and Shevlin 2016; Chen, Cheng, Chow and Liu 2017). Although these researchers acknowledge the limitation of measures like cash ETR to capture tax planning, they are forced to rely on this second-best choice because no empirical proxy for effective tax planning has existed.[10] Furthermore, as researchers gain interest in understanding the interplay between tax minimization and tax risk, it is unclear how well measures like cash ETR reflect increased tax risk. Some studies find little evidence that more tax avoidance leads to more risk (e.g., Guenther et al. 2017; Guenther et al. 2019) while others suggest a positive association does exist (e.g,

[9] To compute economic magnitudes throughout, we multiply the standard deviation of the variable of interest by the estimated coefficient on that variable and scale by the sample mean of the dependent variable. If we re-estimate equation (3) using *σ(Cash ETR)* rather than *Tax Risk*, inferences are unchanged; the coefficient on *Tax Effectiveness* is negative and significant, indicating higher *Tax Effectiveness* is associated with lower tax risk.

[10] Rego (2003) notes that "measuring effective tax planning is a difficult task" (p.808). Further, Phillips (2003) cautions that "ETR minimization does not imply a firm has engaged in effective tax planning" (p.848) and provides as an extreme example a firm investing solely in municipal bonds that achieves a zero percent ETR yet generates lower after-tax returns relative to investments in taxable assets.

Dyreng et al. 2019).

To provide evidence on how our measure differs from cash ETRs, we report correlations between *Tax Effectiveness* and one- and five-year cash ETR measures in Table 3. In Panel A, we find Pearson (Spearman) correlations of -0.269 (-0.174) for *Cash ETR* and -0.406 (-0.382) for *Cash ETR5*. We also evaluate the distribution of observations using a two-way sort based on quintiles of *Tax Effectiveness* and one- and five-year cash ETRs, similar to Frank et al. (2009). That is, we independently sort all observations into cash ETR and *Tax Effectiveness* quintiles and document the overlap. The results based on one-year (five-year) cash ETR sorts are in Table 3, Panel B (Panel C). Observations along the diagonal are ranked in the same quintile of both measures whereas observations in the off-diagonals are ranked in different quintiles. Random probability would assign 20 percent of the sample to each cell. A perfect correlation between the two measures would assign 100 percent of observations to each of the cells along the diagonal and no observations in the off-diagonals. We observe far less than 100 percent of observations along the diagonals and approximately 20 percent of observations in many cells. We do observe some overlap in the top and bottom quintiles. Specifically, 37 percent of observations fall in both the top *Cash ETR* quintile and the bottom *Tax Effectiveness* quintile, and 35 percent of observations fall in both the bottom *Cash ETR* quintile and top *Tax Effectiveness* quintile. The overlap is largely unchanged if we focus on *Cash ETR5.* This overlap is more than we would expect based on random assignment but substantially less than the amount we would find if the measures were perfectly correlated. Collectively, these results suggest that although there is some overlapping information between cash ETRs and *Tax Effectiveness,* they are distinct constructs.

[Insert Table 3 here.]

Although Table 3 provides evidence that *Tax Effectiveness* is not perfectly correlated with cash ETRs, it provides no evidence as to whether the part of *Tax Effectiveness* that is orthogonal to cash ETR captures tax planning instead of noise. To examine this issue, we estimate our outputs of *After-tax Return* and *Tax Risk* as a function of *Low Cash ETR* (an indicator equal to one for firms in the bottom quintile of *Cash ETR5*) and *High Tax Effectiveness* (an indicator equal to one for firms in the top quintile of *Tax Effectiveness*). We estimate the regression both with and without controls and present the results in Table 4. In both specifications, *Low Cash ETR* is associated with lower *After-tax Returns,* which is inconsistent with the Scholes-Wolfson definition of effective tax planning as maximizing after-tax returns.[11] In contrast, *High Tax Effectiveness* is associated with both higher *After-tax Returns* and lower *Tax Risk.* F-tests reveal the sum of the coefficients on *Low Cash ETR* and *High Tax Effectiveness* are significantly different from zero. Thus, while firms with *Low Cash ETR* that are not also tax effective report lower *After-tax* Returns, firms with Low Cash ETR that are tax effective report higher After-tax Returns. Collectively, this analysis indicates that the portion of tax planning identified by the *Tax Effectiveness* score that is orthogonal to *Low Cash ETR* is not just noise. Rather it is systematically associated with the theoretical objectives of effective tax planning: increased ATROE and lower tax risk.

[Insert Table 4 here.]

Do *Tax Effective* firms consider both tax and non-tax costs?

According to the SW framework, effective tax planners consider both the tax and non-tax costs associated with tax planning decisions. In the next set of analyses, we examine whether our measure reflects the consideration of both costs. In particular, we examine whether tax effective

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[11] This finding is consistent with recent evidence in Schwab, Stomberg and Xia. (2019) that some firms report low GAAP ETRs because of poor performance and not because of tax planning activities.

firms are able to (1) reduce current tax cash outflows (i.e., reduce immediate tax costs) and (2) retain a greater portion of their uncertain tax benefits, thereby lowering the non-tax costs of cash flow uncertainty. Prior studies provide evidence that the cash flow uncertainty associated with uncertain tax avoidance is related to increased precautionary cash holdings (Hanlon et al. 2017). Precautionary cash holdings are costly because of agency problems (Faulkender and Wang 2006) and because retaining cash can erode firm value if it prevents or delays investment in positive net present value projects. Although we acknowledge there are multiple non-tax costs that effective tax planners manage (e.g., reputational costs), we nonetheless believe observing a positive relation between *Tax Effectiveness* and lower tax and non-tax costs would be consistent with the "all taxes, all costs" perspective of the SW framework.

To conduct these analyses, we select a parsimonious set of controls to maximize the extent to which the sample on which we estimate DEA overlaps with our sample on which we conduct our subsequent estimations.[12] We also include firm size (*LogMVE*) and growth opportunities (*Market-to-Book*) because prior studies have shown them to be significant predictors both firm performance and future tax outcomes (e.g., Akamah, Omer and Shu 2019, Core, Guay and Rusticus 2006, Guenther et al. 2017, Himmelberg, Hubbard and Palia 1999;). If *LogMVE* is missing, we include a missing indicator to preserve sample size (e.g., Hanlon and Slemrod 2009; Himmelberg et al. 1999). We include an indicator variable to capture the presence of net operating losses (*NOL*) or losses in general (*Loss)* because the availability of NOLs and losses will influence tax outcomes. We include the firm's level of cash (*Cash*), capital expenditures (*CAPX*) and the percent of foreign sales (*% Foreign Sales*) as these items can each directly influence the firm's performance and their tax outcomes. We include industry and year fixed effects and cluster

[12] Demerjian (2018) cautions researchers when drawing subsamples of efficiency scores calculated from a broader population of firms

standard errors by firm.

Columns (1) and (2) of Table 5 present the results of our analysis examining the relation between *Tax Effectiveness* and current and future cash taxes paid (*CTP*). In column (1), the dependent variable is $CTP_{t-4,t}$, which equals cash taxes paid scaled by beginning owner's equity measured concurrently with *Tax Effectiveness*. We find that *Tax Effectiveness* is associated with lower current cash taxes paid. Thus even though cash taxes paid are not an output of tax planning in our DEA model, *Tax Effectiveness* still identifies firms that pay lower taxes on average, after controlling for pre-tax income and other determinants of tax avoidance. In terms of economic significance, these results suggest that a one standard deviation increase in *Tax Effectiveness* is associated with a 13.6 percent decrease in current cash taxes paid. In column (2), the dependent variable is $CTP_{t+1,t+5}$, which is future cash taxes paid, scaled by beginning owner's equity over the same period. We find that *Tax Effectiveness* is also associated with lower *future* cash taxes paid, with a one standard deviation increase in *Tax Effectiveness* being associated with a 6.1 percent decrease in future cash taxes paid. This suggests that effective tax planning yields both current and long-run benefits. This result is also consistent with the conclusion from Dyreng et al. (2008) that some firms can achieve favorable tax outcomes over long windows.

Columns (3) and (4) of Table 5 present the results examining the relation between *Tax Effectiveness* and future settlements with the tax authority. Because Gleason and Mills (2011) estimate the average time to completion for IRS audits is approximately 5 years, we estimate *Settlements* as the sum of settlements with tax authorities reported in firms' FIN 48 rollforwards from *t+1* through *t+5,* scaled by beginning owners' equity. This specification allows us to test whether cash tax savings in earlier years are essentially paid back in the future. In column (3), we simply replace *CTP* with *Settlements.* In column (4), we control for the firm's level of cash taxes paid in year *t* (*CTP)* in an attempt to hold constant the firm's underlying tax avoidance activities. In both estimations we multiply *Settlements* by 100 to ease interpretation. We estimate a negative and significant relation between *Tax Effectiveness* and *Settlements* in both estimations, suggesting that firms engaging in effective tax planning do not pay out higher future settlements to the tax authority. In terms of economic significance, a one standard deviation increase in *Tax Effectiveness* is associated with a 1.68 to 2.02 percent decline in future *Settlements*.

Collectively, these results validate our measure by documenting that *Tax Effectiveness* identifies firms that on average exhibit lower tax and non-tax costs related to tax planning. Moreover, these analyses illustrate an empirical application of our measure.

[Insert Table 5 here.]

Does *Tax Effectiveness* just capture efficient firms?

In our final analysis, we address the important question of whether our measure simply captures firms that are good along all dimensions. In other words, we attempt to more robustly document that *Tax Effectiveness* captures something specific about firm's *tax* functions and not the overall ability or effectiveness of the firm.

To that end, we re-estimate DEA using *Pre-tax return* as the sole output. Thus, we allow firms to maximize pre-tax return on equity given the same set of inputs as in equation (2). Following the methodology outlined in Section 3, we construct a score of *Pre-tax Return Effectiveness*. We then re-examine the relation between *Tax Effectiveness* and current and future cash taxes paid and future tax settlements, after controlling for *Pre-tax Return Effectiveness.* We report the results in Table 6. We note two important findings. First, in both specifications, the coefficient on *Tax Effectiveness* remains negative and significant, suggesting that firms we classify as more effective tax planners pay lower current and future taxes holding both the level (*Pre-tax*

Return) and effectiveness of achieving pre-tax returns constant. Second, *Pretax Return Effectiveness* is either not associated with tax outcomes or associated with *worse* tax outcomes. This result could reflect the fact tax payments increase with profitability *absent tax planning*. We find similar results (untabulated) when we examine the association between revenue efficiency from Demrjian et al. (2012) and tax outcomes. Collectively, these results provide additional evidence that our measure of *Tax Effectiveness* captures something distinct from overall firm effectiveness or profitability.

[Insert Table 6 here.]

VII. CONCLUSION

The goal of this study is to develop a measure of effective tax planning that is not only theoretically aligned with the Scholes-Wolfson paradigm but also reflects recent shifts in corporate tax behavior. To that end, we use data envelopment analysis (DEA) to measure how efficiently a firm maximizes its after-tax return and minimizes tax risk given its research and development (R&D) expenditures, gross property, plant and equipment (PP&E), tax haven operations, intangible assets, inventory and leverage. These "inputs" are associated with first-order, firm-level decisions that offer opportunities to further enhance after-tax returns through tax planning but can impose tax risk on the firm. We label our measure *Tax Effectiveness*.

After constructing our measure, we first demonstrate that *Tax Effectiveness* is associated with both higher after-tax returns on equity and lower tax risk, controlling for the inputs. Because DEA can appear to be somewhat of a "black box" and is not widely used in accounting literature, these tests provide assurance that DEA achieves its objective in our setting.

Second, we show our measure is distinct from commonly-used measures of *tax minimization* (one- and five-year cash ETRs). Moreover, we provide evidence that the portion of tax planning identified by *Tax Effectiveness* that is orthogonal to cash ETRs is not just noise, but rather is systematically associated with the theoretical objectives of effective tax planning: higher after-tax returns and lower tax risk.

Third, we provide evidence that our measure reflects the "all taxes, all costs" feature of effective tax planning. We find that *Tax Effectiveness* is associated with lower current and future cash tax outflows which are indicative of low tax costs. We also find that *Tax Effectiveness* is associated with lower future settlements, thereby lowering agency and other non-tax costs associated with cash flow uncertainty (Hanlon et al. 2017).

Finally, we perform a falsification test to alleviate concerns that our measure primarily identifies firms with better overall performance – firms that are just "better" or more effective on all dimensions. We separately develop a measure of pre-tax return effectiveness and then examine the relation between pre-tax return effectiveness and both current and future tax payments as well as future settlements. We find that pre-tax return effectiveness is associated with higher future tax payments and *unassociated* with current tax payments and future settlements. Moreover, we find that *Tax Effectiveness* continues to be negatively associated with both current and future tax payments and future settlements even after controlling for pre-tax return effectiveness. The contrasting results obtained when we focus on our measure of tax effectiveness versus a measure of pre-tax return effectiveness provides comfort that our measure of tax effectiveness captures the role of tax planning in maximizing after-tax returns while minimizing tax risk.

To our knowledge, our measure is the first to consider multiple aspects of tax planning simultaneously – maximizing returns and minimizing tax risk. Given firms' increased focus on mitigating tax risk while also returning value to the firm, we believe this feature of our measure is timely and important. Our measure considers both explicit and implicit taxes as well as tax and non-tax costs that firms must contemplate when tax planning. Researchers can use our measure to address new questions about the tax risk-reward tradeoff and revisit questions about tax planning that were tested using measures of tax avoidance. We expect studies using our measure in lieu of tax avoidance measures to yield new insights. Future studies can also examine the determinants and consequences of effective (or ineffective) corporate tax planning. We also anticipate opportunities for future research to use our measure in concert with measures of tax avoidance to compare (contrast) firms that fall within similar (different) parts of the distribution of each measure.

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Appendix A: Variable Definitions

Variable	**Definition** – All variables from Compustat unless otherwise noted.
After-tax Return	= the sum of after-tax income [pretax income (PI), less cash taxes paid (TXPD)] from *t*-4 to *t,* scaled by the sum of book value of equity (CEQ) from *t-5* to *t-1*
$\sigma(CETR)_{t-4,t}$	= the standard deviation of *Cash ETR,* measured from *t-4* to *t.*
Inverse Tax Risk	= the maximum $\sigma(CETR)_{t-4,t}$ in the firm's industry-year peer group less the firm's own $\sigma(CETR)_{t-4,t}$. Higher values of *Inverse Tax Risk* indicate lower tax risk.
% Foreign Sales	= the sum of foreign sales from *t-4* to *t* divided by the sum of total sales from *t-4* to *t.* Foreign Sales information is obtained from the Compustat Segment database, and foreign sales are rest to zero if missing. We reset values greater than one to one and values less than zero to zero.
Cash	= the sum of cash and equivalents (CHE) from *t-4* to *t,* scaled by the sum of book value of equity (CEQ) from *t-5* to *t-1*.
Cash ETR	= cash taxes paid (TXPD), scaled by pretax income (PI) in year *t.* We reset values greater than one to one and values less than zero to zero.
Cash ETR5	= the sum of cash taxes paid (TXPD) from *t*-4 to *t*, scaled by the sum of pretax income (PI) from *t*-4 to t. We reset values greater than one to one and values less than zero to zero.
CAPX	= the sum of capital expenditures (CAPX) from *t-4* to *t*, scaled by the sum of book value of equity (CEQ) from *t-5* to *t-1*. If CAPX is missing, we reset CAPX to zero.
CTP_{t-4-t}	= the sum of cash taxes paid (TXPD) from *t-4* to *t,* scaled by the sum of book value of equity (CEQ) from *t-5* to *t-1*.
$CTP_{t+1,t+5}$	= the sum of cash taxes paid (TXPD) from *t*+1 to *t*+5*,* scaled by the sum of book value of equity (CEQ) from *t* to *t*+4.
PP&E	= the sum of gross property plant and equipment (PPEGT) from *t-4* to *t*, scaled by the sum of book value of equity (CEQ) from *t-5* to *t-1*. If PPEGT is missing, we reset PPEGT to zero.
Intangible Assets	= the sum of intangible assets (INTAN) from *t-4* to *t*, scaled by the sum of book value of equity (CEQ) from *t-5* to *t-1*. If INTAN is missing, we reset INTAN to zero.
Inventory	= the sum of inventory (INVT) from *t-4* to *t*, scaled by the sum of book value of equity (CEQ) from *t-5* to *t-1*. If INVT is missing, we reset INTAN to zero.
Log(MVE)	= the logarithm of 1 plus: the sum of market value of equity from *t-4* to *t*, where the market value of equity is defined as price per share (PRCC_F) times common shares outstanding (CSHO). The sum of market value of equity is set to zero if missing.
Loss	= an indicator variable equal to one if the firm has negative pr) in any of the years *t-4* to *t* and zero otherwise.

Market-to-Book	= the sum of market value of equity from *t-4* to *t* divided by the sum of the book value of equity (CEQ) from *t-4* to *t*. The market value of equity is defined as price per share (PRCC_F) times common shares outstanding (CSHO). The sum of market value of equity is set to zero if missing.
Missing MVE	= an indicator variable equal to one if the firm is missing the data necessary to calculate the market value of equity any of the years *t-4* to *t* and zero otherwise.
NOL	= an indicator variable equal to one if the firm has a net operating loss carryforward (TLCF) in any of the years *t-4* to *t* and zero otherwise.
Pretax Return Effectiveness	= firm-level measure of pretax return effectiveness. We use the same methodology used to calculate *Tax Effectiveness* except we replace the dual output of (*Pretax Income – Cash Taxes Paid*) and *σ(CETR Difference)* with *Pretax Income (PI)*.
Pre-tax Return	= the sum of pretax income (PI) from *t-4* to *t*, scaled by the sum of book value of equity (CEQ) from *t-5* to *t-1*.
R&D	= the sum of research and development expenditures (XRD) from *t-4* to *t*, scaled by the sum of book value of equity (CEQ) from *t-5* to *t-1*. If XRD is missing, we reset XRD to zero.
Settlements$_{t+1,t+5}$	= the firm's settlements with tax authorities as reported in the FIN 48 rollforward (TXTUBSETTLE) from *t+1* through *t+5*, scaled by book value of equity from *t* to *t+4* (CEQ).
Tax Effectiveness	= the ranked firm-level tax effectiveness from DEA. Raw scores range from zero to one and are increasing in tax effectiveness. We estimate DEA by industry-year, where industries are defined using the Fama-French 5 classification. $$\max_{v} \theta\ (Pretax\ Income_{t-4,t} - Cash\ Taxes\ Paid_t)\ \&\ (\sigma CETR\_Difference_{t-4,t}) \cdot (v_1 R\&D_{t-4,t} + v_2 Gross\ PPE_{t-4,t} + v_3\ Tax\ Haven_{t-4,t} + v_4 Intangible\ Assets_{t-4,t} + v_5 Inventory_{t-4,t} + v_6 Total\ Debt_{t-4,t})^{-1}$$
Tax Havens	= the log of (1+the number of tax haven countries a firm reports material operations in per Exhibit 21). Exhibit 21 data is obtained from Scott Dyreng's website. Because firms sometimes cease disclosure of their tax haven activities, we consider a firm to have operations in a tax haven in the year the material operations were disclosed and all subsequent years.
Total Debt	= the sum of total debt (DLC+DLTT) from *t-4* to *t*, scaled by the sum of book value of equity (CEQ) from *t-5* to *t-1*. *DLC* and *DLTT* are reset to zero if missing.

Appendix B: Details on DEA Estimation

This appendix outlines our methodological approach in our data envelopment analysis (DEA) estimation. We borrow heavily in both methodology and explanation from Demerjian et al. (2012), who were the first to adapt DEA to an accounting setting. Our estimation is also informed by the advice and results in Demerjian (2018), which outlines "best practices" in estimating DEA using financial accounting data.

DEA is a statistical procedure that measures an entity's relative efficiency in generating a specific output given a set of inputs. Specifically, DEA efficiency is the ratio of outputs to inputs:

$$\frac{\sum_{i=1}^{s} u_i y_{ik}}{\sum_{j=1}^{m} v_i x_{jk}} \quad k = 1, \dots, n \tag{A}$$

There are *s* outputs, *m* inputs, and *n* decision-making units within the firm. DEA assigns each input and output a certain weight in calculating the efficiency score. The weights are defined as *v* for the inputs and *u* for the outputs. The variables *y* and *x* correspond to the actual quantities of outputs and inputs, respectively.

In our setting we are interested in effective tax planning — defined as maximizing after-tax returns while minimizing tax risk we utilize the firm's after-tax return and a measure of minimizing tax risk as our dual outputs. The firm's after-tax return is defined as the ratio of pretax income less cash taxes paid (PI-TXPD) over the five year period t-4,t to beginning owners' equity (CEQ) over the same time period. We subtract cash taxes paid from pretax income so that our after-tax return measure includes both permanent and temporary as well as conforming and non-conforming tax planning strategies. Our next output involves minimizing tax risk. Although our software can accommodate multiple outputs, a limitation is that we must maximize across both outputs. In other words we cannot simultaneously maximize one output while minimizing the other. We address this limitation by creating a measure of tax risk such that a higher value indicates lower tax risk. Specifically we measure create $\sigma CETR\ Difference_{t-4,t}$ which is equivalent to the maximum $\sigma CETR_{t-4,t}$ in the firm's industry-year peer group less the firm's own $\sigma CETR_{t-4,t}$. Thus as firm's decrease the volatility of their own cash ETR, $\sigma CETR_{t-4,t}$ increases such that maximizing $\sigma CETR_{t-4,t}$ occurs when a firm minimizes their own $\sigma CETR_{t-4,t}$.

We consider six inputs to maximizing after-tax return on equity (i.e., *m*=6): *R&D, PP&E, Tax Haven, Intangible Assets, Inventory, and Total Debt.* We choose these as "inputs" to the production function because they represent first-order firm-level decisions that offer opportunities to further enhance after-tax returns through tax planning while minimizing tax risk. We estimate DEA using variable returns to scale to account for the possibility that the after-tax return generated by an input may vary with the level of the input. For example, the first million dollars of *R&D* could provide a greater after-tax return than the next million dollars. We conduct DEA using firm-year observations as the decision-making units.

We conduct DEA comparing firm-year observations to other firm-year observations in the same year and Fama-French 5 industry given that a firm's tax planning opportunities, as well as fundamental operating, investing and financing decisions, vary dramatically both over time and by industry. This estimation measures a firm's efficiency in maximizing its after-tax return on equity while minimizing its tax risk based on inputs, relative to other firms in the same industry and year. This approach aligns with the definition of effective tax planning provided in the SW framework.

Specifically, we utilize the following steps in DEA:

1. Each year, we sort firms into their respective Fama-French 5 industries to enable relative comparison. To DEA then calculates a firm's efficiency in maximizing its after-tax return while minimizing tax risk given its inputs relative to its industry peers

each year.

2. We presume that each input and output is valuable. Thus, weights *u* and *v* are constrained to be positive. This results in the raw scores having a lower bound of zero because the quantity of each input and output is also non-negative. Further, because DEA cannot be estimated with non-zero numbers (Banxia, NA) we follow the Banxia User Guide add to all input and output values the smallest possible constant the software can accommodate (0.0001).
3. We then use DEA to identify the weights in *u* and *v* that maximize equation (A) for each firm. Using all firms in the same industry-year, this calculation identifies the weights that maximize equation (A) for each firm relative to its peers. This analysis generates firm-specific optimal weights.
4. The firm-specific optimal weights are then multiplied by the firm's output and input quantities and summed across inputs (in the denominator). The resulting ratio is our raw tax effectiveness score for each firm-year observation. We report this variable in our paper as *Tax Effectiveness (Raw Score)*. We rank these scores by industry-year such that the most efficient firm receives the highest ranking. We then divide each firm's rank by the maximum rank in the industry-year; the most efficient firms obtains a score of one. This ranked measure *Tax Effectiveness* is what we use in our analysis.

We plan on making the firm-year measure of *Tax Effectiveness* available to other researchers.

Figure 1: *Tax Effectiveness* Scores for Selected Firms

Apple (Lower ETR, High Tax Effectiveness)

Tax Effectiveness	*Cash ETR5*	*After-tax Return*	*σ(Cash ETR)$_{t-4,t}$*
100.0%	15.5%	0.451	0.050

3M (Higher ETR, High Tax Effectiveness)

Tax Effectiveness	*Cash ETR5*	*After-tax Return*	*σ(Cash ETR)$_{t-4,t}$*
99.3%	26.9%	0.294	0.068

Electronic Arts (Lower ETR, Low Tax Effectiveness)

Tax Effectiveness	*Cash ETR5*	*After-tax Return*	*σ(Cash ETR)$_{t-4,t}$*
24.3%	5.9%	*0.059*	0.392

Avon (Higher ETR, Low Tax Effectiveness)

Tax Effectiveness	*Cash ETR5*	*After-tax Return*	*σ(Cash ETR)$_{t-4,t}$*
46.3%	74.5%	*0.083*	0.323

This figure presents data on four firms' 2014 values of *Tax Effectiveness*, *Cash ETR5, After-tax Return*, and *σ(Cash ETR)*. *Tax Effectiveness* for 2014 is computed using inputs and outputs measured from 2010 through 2014.

Table 1: Descriptive Statistics
Panel A: Full Sample

Variable	No Obs.	Mean	Std. Dev	P25	P50	P75
Tax Effectiveness	41,764	0.524	0.303	0.262	0.524	0.785
Tax Effectiveness (Raw Score)	41,764	0.749	0.229	0.634	0.810	0.927
DEA Inputs and Outputs						
After-tax Return	41,764	0.168	0.161	0.077	0.132	0.202
Inverse Tax Risk	41,764	0.326	0.107	0.271	0.352	0.406
R&D	41,764	0.038	0.079	0.000	0.000	0.037
PP&E	41,764	1.547	1.796	0.334	0.915	2.146
Tax Havens	41,764	0.865	1.237	0.000	0.000	1.792
Intangible Assets	41,764	0.398	0.639	0.006	0.141	0.515
Inventory	41,764	0.311	0.479	0.016	0.140	0.405
Total Debt	41,764	0.250	0.445	0.023	0.124	0.274
Tax Outcome variables						
$CTP_{t-4,t}$	41,764	0.058	0.058	0.018	0.045	0.080
$CTP_{t+1,t+5}$	23,341	0.050	0.053	0.013	0.038	0.071
$Settlements_{t+1,t+5}$ * 100	6,210	0.180	0.370	0.000	0.043	0.178
Controls						
Log(MVE)	41,764	7.163	3.160	5.790	7.767	9.234
Market-to-Book	41,764	2.462	2.498	1.137	1.830	2.975
Missing MVE	41,764	0.103	0.304	0.000	0.000	0.000
NOL	41,764	0.420	0.494	0.000	0.000	1.000
Cash	41,764	0.342	0.405	0.074	0.215	0.459
CAPX	41,764	0.151	0.190	0.037	0.091	0.193
% Foreign Sales	41,764	0.163	0.246	0.000	0.000	0.291
Loss	41,764	0.305	0.461	0.000	0.000	1.000
Additional Variables						
$Pre\text{-}tax\ Return_{t-4,t}$	41,764	0.226	0.207	0.107	0.178	0.275
$\sigma(Cash\ ETR)_{t-4,t}$	41,764	0.149	0.102	0.083	0.121	0.195
$Tax\ Savings_{t-4,t}$	41,764	0.020	0.040	-0.001	0.013	0.033
$Book\ Value\ of\ Equity_{t-5,t-1}$	41,764	6,630.7	16,137.7	363.0	1,359.1	4,932.1

This panel presents descriptive statistics for *Tax Effectiveness* as well as other variables used in analyses. All variables are defined in Appendix A. The sample is 41,962 firm-year observations from 1994-2016 from Compustat. We require firms to be incorporated in the U.S. (FIC=USA) and require all observations to report positive after-tax return (pretax income [PI] less cash taxes paid [TXPD]) over a five year period. Continuous variables are winsorized at one and 99 percent.

Table 1 (continued): Descriptive Statistics

Panel B: Descriptive Statistics by Industry

	N		*Inputs (All Measured t-4,t)*								*Output*
Industry	Total	Average Per Estimation Group	*After-tax Return*	*Inverse Tax Risk*	*R&D*	*PP&E*	*Tax Haven*	*Intangible Assets*	*Inventory*	*Total Debt*	*Tax Effectiveness*
Consumer Durables	8,743	492	0.181	0.320	0.016	1.492	0.955	0.475	0.599	0.218	0.777
Manufacturing	11,612	646	0.168	0.335	0.027	2.619	1.066	0.329	0.318	0.251	0.757
Business Equipment	7,146	399	0.155	0.307	0.115	0.938	1.222	0.497	0.184	0.128	0.760
Healthcare	2,728	152	0.180	0.305	0.092	0.864	1.166	0.552	0.216	0.144	0.820
Other	11,733	652	0.163	0.339	0.005	1.036	0.888	0.339	0.172	0.369	0.741

This panel provides average values of firm-years, inputs and outputs across all Fama-French 5 Industries. The "Consumer Durables" industry includes firms operating in consumer durables, non-durables, wholesale, retail and some service sectors. The "Manufacturing" industry includes firms operating in the manufacturing, energy and utility sectors. The "Business Equipment" industry includes firms operating in the business equipment, telephone and TV transmission sectors. The "Healthcare" industry includes firms operating in the healthcare, medical equipment and drug sectors. The "Other" industry includes firms operating in the mines, construction, building materials, transportation, hotels, business services, entertainment and finance sectors. We average values each year by industry and present the overall average of those yearly means here. All variables are defined in Appendix A.

Table 1 (Continued): Descriptive Statistics
Panel C: Descriptive Statistics by Quintile of *Tax Effectiveness*

	1 (Low)	2	3	4	5 (High)
Tax Effectiveness (Raw Score)	0.370	0.677	0.808	0.911	0.984
DEA Inputs and Outputs					
After-tax Return	0.094	0.134	0.163	0.194	0.259
Inverse Tax Risk	0.311	0.170	0.115	0.084	0.062
R&D	0.041	0.039	0.037	0.038	0.035
PP&E	1.540	1.541	1.516	1.454	1.700
Tax Haven	0.899	0.884	0.944	0.945	0.630
Intangible Assets	0.413	0.403	0.415	0.406	0.351
Inventory	0.345	0.326	0.311	0.288	0.283
Total Debt	0.237	0.230	0.236	0.211	0.345
Tax Outcome Variables					
$CTP_{t-4,t}$	0.051	0.057	0.057	0.063	0.061
$Settlements_{t+1,t+5}$	0.201	0.189	0.161	0.180	0.171
Controls					
Log(MVE)	6.599	6.919	7.395	7.635	7.243
Market-to-Book	1.903	2.118	2.376	2.825	3.114
Missing MVE	0.121	0.116	0.104	0.086	0.089
NOL	0.455	0.436	0.422	0.405	0.380
Cash	0.328	0.324	0.315	0.336	0.413
CAPX	0.137	0.142	0.148	0.147	0.182
% Foreign Sales	0.180	0.158	0.169	0.170	0.136
Loss	0.454	0.391	0.242	0.181	0.264
Additional Variables					
$Pre\text{-}tax\ Return_{t-4,t}$	0.145	0.191	0.220	0.258	0.323
$Book\ Value\ of\ Equity_{t-4,t}$	5,204	5,953	7,728	8,234	5,863

This panel provides average values of respective variables across quintiles of *Tax Effectiveness*. All variables are defined in Appendix A. All continuous variables are winsorized at one and 99 percent.

Table 1 (continued): Descriptive Statistics

Panel D: Overlap between current (*t*) and future (*t*+5) *Tax Effectiveness*

		Tax Effectiveness				
		Q1 (Low)	**Q2**	**Q3**	**Q4**	**Q5 (High)**
Tax Effectiveness$_{t+5}$	**Q1 (Low)**	30%	25%	19%	16%	9%
	Q2	27%	24%	21%	18%	10%
	Q3	19%	22%	25%	20%	13%
	Q4	15%	18%	22%	26%	19%
	Q5 (High)	10%	11%	12%	19%	48%

This panel plots the percentage of observations that are in the same quintile of *Tax Effectiveness* in both year *t* and *t+5*. Rows and columns sum to 100%. For example, 30% of observations in the lowest quintile of *Tax Effectiveness* in year *t* are also in the lowest quintile in *t+1*. Random probability would assign 20% of firm-years to each cell. Perfect correlation would assign 100% of observations along the diagonal, and zero elsewhere.

Table 2: Is *Tax Effectiveness* Associated with Outputs in Expected Ways?

	(1)	(2)	(3)	(4)
VARIABLES	***ATROE***		***Inverse Tax Risk***	
Tax Effectiveness	0.099***	0.110***	0.285***	0.283***
	(0.002)	(0.002)	(0.001)	(0.001)
R&D		0.064***		-0.038***
		(0.010)		(0.004)
Total Debt		0.012***		0.001
		(0.002)		(0.001)
Intangible Assets		0.020***		-0.001*
		(0.001)		(0.000)
Inventory		0.021***		0.000
		(0.002)		(0.001)
PP&E		0.011***		0.001***
		(0.000)		(0.000)
Tax Havens		0.007***		0.002***
		(0.001)		(0.000)
Industry and Year FE?	Yes	Yes	Yes	Yes
Observations	41,764	41,764	41,764	41,764

This table presents results of estimating concurrent *After-tax Returns* and *Inverse Tax Risk* as a function of *Tax Effectiveness* and controls. All variables are defined in Appendix A. Robust standard errors in parenthesis, clustered by firm. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Is *Tax Effectiveness* Distinct from Cash ETR? Correlations

Panel A: Correlations with Cash ETR

Variable	Pearson Correlations	Spearman Correlations
Cash ETR	-0.269	-0.174
Cash ETR5	-0.406	-0.382

Relations that are significant at the 10% level or better are bold.

Panel B: Overlapping *Cash ETR* Quintiles

		Cash ETR				
		Q5 (High)	**Q4**	**Q3**	**Q2**	**Q1 (Low)**
Tax Effectiveness	**Q1 (Low)**	37%	12%	14%	16%	21%
	Q2	26%	19%	18%	17%	20%
	Q3	16%	23%	28%	20%	13%
	Q4	12%	26%	26%	25%	11%
	Q5 (High)	10%	20%	13%	22%	35%

Random probability would assign 4% of firm-years to each cell. Perfect correlation would assign 100% of observations along the diagonal, and zero elsewhere.

Panel C: Overlapping *Cash ETR5* Quintiles

		Cash ETR5				
		Q5 (High)	**Q4**	**Q3**	**Q2**	**Q1 (Low)**
Tax Effectiveness	**Q1 (Low)**	33%	13%	12%	10%	6%
	Q2	20%	16%	17%	16%	6%
	Q3	9%	15%	19%	22%	9%
	Q4	7%	17%	17%	17%	17%
	Q5 (High)	6%	13%	11%	10%	36%

Random probability would assign 4% of firm-years to each cell. Perfect correlation would assign 100% of observations along the diagonal, and zero elsewhere.

Panel A presents Pearson and Spearman correlations between *Tax Effectiveness* and one- and five-year cash effective tax rates. *Tax Effectiveness* is the firm-level measure of tax effectiveness from DEA analysis. All other variables are defined in Appendix A. Panel B presents the two-way distribution of observations among quintiles of *Cash ETR* and *Tax Effectiveness.* Panel C presents the two-way distribution for *Cash ETR5* and *Tax Effectiveness.* Observations along the diagonal are ranked in the same quintile of both measures. Observations in the off-diagonals are ranked in different quintiles of the two measures. Percentages aggregated across rows and columns may not sum to 100% due to rounding.

Table 4: Is *Tax Effectiveness* Distinct from Cash ETR? Regression Analysis

Variables	(1)	(2)	(3)	(4)
	ATROE		***Inverse Tax Risk***	
Low Cash ETR	-0.008***	-0.012***	0.032***	0.033***
	(0.002)	(0.002)	(0.001)	(0.001)
High Tax Effectiveness	0.033***	0.043***	0.075***	0.075***
	(0.002)	(0.002)	(0.001)	(0.001)
R&D		0.036***		-0.036***
		(0.011)		(0.007)
Total Debt		0.015***		-0.001
		(0.002)		(0.001)
Intangible Assets		0.018***		-0.001
		(0.001)		(0.001)
PP&E		0.009***		-0.000
		(0.001)		(0.000)
Tax Havens		0.007***		0.005***
		(0.001)		(0.000)
Inventory		0.013***		-0.007***
		(0.002)		(0.001)
F-test *Low Cash ETR + High Tax Effectiveness = 0*	F=166.18	F=268.22		
	p<0.001	p<0.001		
Industry and Year FE?	Yes	Yes	Yes	Yes
Observations	41,764	41,764	41,764	41,764

This table presents results of estimating concurrent *After-tax Returns* and *Inverse Tax Risk* as a function of *High Tax Effectiveness*, *Low Cash ETR,* and controls. *High Tax Effectiveness* is an indicator variable equal to one for firm-years in the top quintile of *Tax Effectiveness. Low Cash ETR* is an indicator variable equal to one for firm-years in the bottom quintile of *Cash ETR.* All variables are defined in Appendix A. Robust standard errors in parenthesis, clustered by firm. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Do *Tax Effective* Firms Consider Both Tax and Non-Tax Costs?

VARIABLES	(1) $CTP_{t-4,t}$	(2) $CTP_{t+1,t+5}$	(3) $Settlements_{t+1,t+5}$	(4) $Settlements_{t+1,t+5}$
Tax Effectiveness	-0.026***	-0.010***	-0.012***	-0.010***
	(0.001)	(0.001)	(0.003)	(0.003)
CTP				0.062***
				(0.020)
PTROE	0.343***	0.144***	0.006***	-0.016**
	(0.001)	(0.003)	(0.002)	(0.007)
R&D	-0.044***	-0.047***	-0.002	0.001
	(0.003)	(0.005)	(0.012)	(0.012)
Total Debt	-0.010***	-0.011***	0.001	0.001
	(0.001)	(0.001)	(0.003)	(0.003)
Intangible Assets	0.001***	0.001**	0.003*	0.003**
	(0.000)	(0.001)	(0.002)	(0.002)
Log(MVE)	-0.001***	0.001***	0.010***	0.010***
	(0.000)	(0.000)	(0.001)	(0.001)
Market-to-Book	-0.000***	0.000***	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Missing Market-to-Book	-0.009***	0.001	0.076***	0.077***
	(0.001)	(0.002)	(0.006)	(0.006)
NOL	-0.004***	0.000	0.004**	0.004**
	(0.000)	(0.001)	(0.002)	(0.002)
Cash	0.002***	-0.000	0.001	0.002*
	(0.000)	(0.001)	(0.002)	(0.001)
Capital Expenditures	-0.035***	-0.023***	-0.010***	-0.008**
	(0.001)	(0.002)	(0.004)	(0.004)
% For. Sales	0.000	0.009***	0.017***	0.016***
	(0.001)	(0.002)	(0.004)	(0.004)
Loss	0.008***	-0.001	-0.006***	-0.007***
	(0.000)	(0.001)	(0.002)	(0.002)
Industry and Year FE?	Yes	Yes	Yes	Yes
Observations	41,764	23,341	6,210	6,210

This table presents results of estimating concurrent and future cash taxes paid, as well as future settlements with tax authorities, as a function of *Tax Effectiveness* and controls. All variables are defined in Appendix A. Robust standard errors in parenthesis, clustered by firm. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6: Does *Tax Effectiveness* Just Capture Efficient Firms?

VARIABLES	(1) $CTP_{t-4,t}$	(2) $CTP_{t+1,t+5}$	(3) $Settlements_{t+1,t+5}$	(4) $Settlements_{t+1,t+5}$
Tax Effectiveness	-0.026***	-0.011***	-0.012***	-0.010***
	(0.001)	(0.001)	(0.003)	(0.003)
Pre-tax Return Effectiveness	0.001	0.007***	0.002	0.002
	(0.001)	(0.002)	(0.003)	(0.003)
CTP				0.062***
				(0.020)
PTROE	0.341***	0.130***	0.005**	-0.016**
	(0.002)	(0.004)	(0.002)	(0.007)
R&D	-0.044***	-0.044***	-0.002	0.001
	(0.003)	(0.005)	(0.012)	(0.012)
Total Debt	-0.010***	-0.012***	0.001	0.001
	(0.001)	(0.001)	(0.003)	(0.003)
Intangible Assets	0.001***	0.002***	0.003*	0.003**
	(0.000)	(0.001)	(0.002)	(0.002)
Log(MVE)	-0.001***	0.001***	0.010***	0.010***
	(0.000)	(0.000)	(0.001)	(0.001)
Market-to-Book	-0.000***	0.000***	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Missing Market-to-Book	-0.009***	0.001	0.076***	0.077***
	(0.001)	(0.002)	(0.006)	(0.006)
NOL	-0.004***	0.000	0.004**	0.004**
	(0.000)	(0.001)	(0.002)	(0.002)
Cash	0.002***	0.000	0.000	0.002*
	(0.000)	(0.001)	(0.002)	(0.001)
Capital Expenditures	-0.035***	-0.016***	-0.010***	-0.008**
	(0.001)	(0.001)	(0.004)	(0.004)
% For. Sales	0.000	0.009***	0.017***	0.017***
	(0.001)	(0.002)	(0.004)	(0.004)
Loss	0.008***	-0.001	-0.005***	-0.006***
	(0.000)	(0.001)	(0.002)	(0.002)
Industry and Year FE?	Yes	Yes	Yes	Yes
Observations	41,764	23,341	6,210	6,210

This table presents results of estimating concurrent and future cash taxes paid, as well as future settlements with tax authorities, as a function of *Tax Effectiveness, Pre-tax Return Effectiveness,* and controls. All variables are defined in Appendix A. Robust standard errors in parenthesis, clustered by firm. *** p<0.01, ** p<0.05, * p<0.1