# ASSET SUBSTITUTION INCENTIVES AND UNCERTAIN TAX CHOICES

by

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*To Allison*

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# ABSTRACT

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The equity holders of a firm typically control investment choices but enjoy limited liability, since the value of equity is the firm's value in excess of the value of debt and other fixed claims. The asset substitution problem allows equity holders to expropriate value from other claimants by shifting downside risk from failed projects. To do so, equity holders substitute riskier investments for those with less risk. In the context of tax choices, firms pursue uncertain tax projects to reduce their current or future tax payments. Given the negative consequences of tax uncertainty documented by prior studies, understanding why firms pursue more uncertain tax projects is important for both internal and external stakeholders. In this study, I construct a model of the firm that highlights how asset substitution incentives influence the adoption of uncertain tax projects. I confirm the inferences from this model empirically to illustrate when firms are more likely to prefer more uncertain tax projects due to the investment distortion created by asset substitution incentives. Specifically, I find that firms in financial distress, firms with high growth potential, and loss firms adopt more uncertain tax projects than other firms. These results provide relevant insight for debt holders, regulators, and enforcement bodies.

# CHAPTER 1. INTRODUCTION

## 1.1 Introduction

This study investigates the relationship between asset substitution incentives and uncertain tax choices. Under the assumption that the goal of the firm is to maximize the wealth of its equity holders, Jensen and Meckling (1976) highlight the agency issues that result from the fact that equity holders typically control a firm's investment decisions but have limited liability in the event that payoffs of the firm's investments do not go well. The asset substitution problem arises when the equity holders of a firm can expropriate value from other claimants by substituting riskier investments for investments with less risk. The expropriation occurs because the value of equity is the firm's value in excess of the face value of debt and other fixed claims, which means the payoff of unsuccessful projects accrues to the equity holders until the value of equity reaches zero. From that point onward, the remainder of a negative payoff is borne by the debt holders and other claimants. This asymmetric payoff structure distorts the firm's investment decisions and causes it to adopt projects with more risk when the equity holders can shift downside risk. Although this problem has been well-examined in analytical literature, empirical evidence of the preference for riskier projects has been limited, particularly because measuring managers' choices prior to the realization of project payoffs has proven difficult (Eisdorfer 2008; Gilje 2016).

I employ firms' tax choices as a setting to examine the preference for riskier projects when asset substitution incentives exist and provide unique evidence into both the existence and magnitude of the asset substitution problem. Firms adopt uncertain tax projects to increase expected value by reducing current or future tax payments[1]. Uncertain tax projects provide one of

[1] These projects can vary considerably in their relative levels of uncertainty and investment risk. For example, a firm may choose to reduce its current period tax liability by choosing to take bonus depreciation on new assets in place

several avenues where the equity holders of a firm can shift downside risk to both the debt holders (Jensen and Meckling 1976) and the government (Desai et al. 2007; Hanlon et al. 2014), since both of these groups have claims against a firm's pre-tax value.

Considering the asset substitution problem in the context of uncertain tax project choices is a particularly appropriate approach for two reasons. First, the payoff of uncertain tax projects is dependent upon the payoff of other pre-tax operating projects. This feature implies that observable firm characteristics guide the adoption of uncertain tax projects in the context of the asset substitution problem and allows for better identification of asset substitution incentives[2]. Second, Financial Interpretation Number 48 (FIN 48) outlines a uniform set of rules applicable to all large public corporations, for the determination and disclosure of uncertain tax projects undertaken by a firm. This disclosure is a unique, required quantification of uncertainty in the income tax footnote through the reserve for Unrecognized Tax Benefits (UTBs). The reserve provides an observable measure for the firm's uncertain tax choices that cannot include the probability of detection by an enforcement agency (Financial Accounting Standards Board 2006). Importantly, this figure provides insight into the manager's ex ante preference for risky investment as the reserve is required to be recorded prior to the revelation of whether the tax project is successful. Although managers may have discretion over the amount included in the reserve, prior literature has consistently shown that the investment risk associated with uncertain tax projects is increasing in the total reserve balance (Robinson et al. 2016; Ciconte et al. 2016). This approach provides understanding specifically into how the asset substitution problem impacts managers' choices

during the year. However, a firm could achieve the same expected mean tax savings by pursuing more uncertain tax planning opportunities like increasing a tax credit claim by including costs that are not likely to be sustained upon examination by an enforcement agency.

[2] The fact that the payoff of tax projects depends on the payoff of pre-tax operating projects is why this application differs from the standard asset substitution problem studied in prior finance literature.

without using measures that rely on adverse outcomes for identification. Examining this problem through a firm's tax choices provides useful evidence for both the existence and magnitude of the asset substitution problem.

To analyze the impact of the asset substitution problem on uncertain tax choices, I construct a model of a firm that shows the role of asset substitution incentives in the context of uncertain tax project decisions. The model highlights firm characteristics that increase the firm's expectation of shifting risk from uncertain tax projects to debt holders and the government. Using a sample of 13,360 observations from 2007 to 2016, I confirm the inferences from the model empirically by using information from firms' UTB reserve disclosures to measure their adoption of uncertain tax projects. Specifically, from inferences generated by the model, I anticipate asset substitution incentives should be present among firms in financial distress, firms with high growth potential, and firms with current period pre-tax losses. I find that each of these firm characteristics is associated with a greater magnitude of uncertain tax projects adopted. My results indicate that firms in financial distress adopt 63 percent more uncertain tax projects cumulatively (13 percent more annually) than other firms and that firms with high growth potential adopt 15 percent more uncertain tax projects cumulatively (42 percent more annually). In addition to these characteristics, since the payoffs of uncertain tax projects depend on the payoffs of other risky operating projects, I also analyze how contemporaneous changes in payoffs of operating projects influence adoption of uncertain tax projects. My results show that the relationship between uncertain tax project adoption and current year losses is increasing in the losses incurred, consistent with equity holders of loss firms having a greater expectation of shifting risk associated with uncertain tax projects. Also consistent with the reduction in downside risk significantly influencing project adoption decisions, I find that loss firms adopt 27 percent more uncertain tax projects than profit firms each

year on average. These results highlight how the asset substitution problem affects the choices of managers ex ante and quantify the magnitude of the asset substitution problem.

In supplemental analyses, I conduct a battery of additional analyses and robustness tests. To isolate that the increased adoption of uncertain tax projects is due to asset substitution incentives, I examine non-tax constraints to asset substitution incentives consistent with prior analytical research and find that features that should mitigate asset substitution incentives also reduce uncertain tax project adoption. These constraints include reputation concerns (Diamond 1989), executive ownership incentives (Brander and Poitevin 1992), and the ability of the firm to shift downside risk to debt holders. To address issues raised in prior literature concerning the discretion in the reserve for UTBs (Robinson et al. 2016; De Simone et al. 2014), I also consider an alternate proxy for uncertain tax project adoption and find my results are robust to that measure, which highlights that the real impact of these choices extends beyond financial reporting discretion. These results lend support to the model's inferences and illustrate the existence of the asset substitution problem. Collectively, this study highlights the role of the asset substitution problem in terms of a firm's tax choices. The results also emphasize that a firm's choice of adopting more uncertain tax projects is driven in part by a unique investment distortion not present in the majority of firms, but which has adverse consequences for debt holders and the government.

This study makes several contributions to both corporate finance and accounting literature. First, the results contribute to corporate finance literature by lending both analytical and empirical support that asset substitution incentives appear to cause firms to adopt more uncertain tax projects. Although many analytical studies have investigated both the mechanics and incentives of the asset substitution problem, empirical evidence that the problem actually exists has been scarce (Jensen and Meckling 1976; Barnea et al. 1980; Eisdorfer 2008). While other work relies on ex post

measures of investment risk, examining how asset substitution incentives impact a firm's tax choices is important since tax disclosures yield insight into managers' preference for risky investment ex ante. In particular, the tax disclosures provide evidence that managers' choices are distorted when asset substitution incentives exist. The results of this study also quantify the additional amount of uncertainty undertaken by firms with asset substitution incentives on an ex ante basis, indicating that it is an economically meaningful amount.

In addition to this line of literature, this paper also contributes to the extant literature on tax planning. The results of my study show that agency issues stemming from asset substitution incentives are a driving force behind the choice of more uncertain tax projects, and these incentives would induce firms to choose more uncertain projects even when more certain tax planning opportunities are available. Recent work has suggested that more uncertain tax planning often negatively impacts the firm, but the motivation of firms in pursuing these projects is much less clear (Dyreng et al. 2016; Austin and Wilson 2017). Given these negative consequences (Dyreng et al. 2019; Hanlon et al. 2017; Jacob et al. 2018), it is not immediately apparent why a firm would choose to adopt more uncertain tax projects in lieu of those with less uncertainty. Asset substitution incentives create an investment distortion that explains why certain firms pursue these more uncertain projects but are not present in the majority of firms. While uncertain tax projects are often not optimal for all stakeholders in the firm, they can add expected value for the equity holders at the expense of other claimants. The results also specifically highlight previously unconsidered incentives for uncertain tax planning among loss firms (i.e., when the equity holders bear reduced downside risk) (Hanlon and Heitzman 2010; Henry and Sansing 2018).

Finally, this study has relevant policy implications for other stakeholders including enforcement agencies, standard setters, and debt holders. The Office of the Treasury Inspector

General for Tax Administration (TIGTA) has noted that additional private disclosures to the Internal Revenue Service (IRS) in their current form do not appear to be helpful in the enforcement process. Given this lack of relevance, TIGTA has recommended the IRS reconsider the content of those disclosures (TIGTA 2018). The results of my study inform this decision by illustrating a situation when firms are likely to prefer more uncertain tax projects to those with more certainty and highlighting that some firms that choose more uncertain tax projects are doing so as a result of investment distortions created by asset substitution incentives. The findings also emphasize that a firm's tax choices provide relevant information to debt holders, consistent with prior work (Saavedra 2018). Although monitoring tax decisions is difficult for debt holders and debt covenants do not often limit future tax choices, my results suggest that debt holders can use a firm's tax choices to better understand the presence and magnitude of potential agency issues (Crocker and Slemrod 2005; Taylor and Sansone 2007).

The paper proceeds as follows. Chapter 2 reviews the relevant background and prior literature. Chapter 3 presents a model of the asset substitution problem and develops hypotheses. Chapter 4 outlines the sample selection and descriptive statistics. Chapter 5 explains the research design and empirical results. In Chapter 6, I conduct additional cross-sectional analyses and robustness tests. Chapter 7 concludes.

# CHAPTER 2. BACKGROUND AND PRIOR LITERATURE

## 2.1 Agency Issues and Asset Substitution

Jensen and Meckling (1976) and Galai and Masulis (1976) introduce the problem of asset substitution, or risk shifting, through models that highlight the conflict of incentives between a firm's equity and debt holders. The asset substitution problem causes firms to overinvest in risky projects, since equity holders control a firm's investment choices but enjoy limited downside liability. As a result, if the projects are sufficiently risky, equity holders can realize expected gains by investing in risky projects even when the projects have a negative Net Present Value (NPV) for the firm as a whole. These incentives distort the firm's investment choices and induce the firm to choose riskier projects, even when faced with a choice between projects with the same expected mean payoff. While the riskier projects are not often optimal for the firm as a whole, they are rational choices for the equity holders in that they provide a higher NPV for the equity holders at the expense of other claimants.

Although finding suitable empirical proxies to study this problem has proven difficult, Eisdorfer (2008) empirically confirms the problem's existence among firms in financial distress by analyzing the relationship between investment and volatility using ex post measures of levels of investment and returns on investment. More recent evidence suggests that, within the oil and gas industry, lenders address the asset substitution problem and are sometimes able to eliminate its effects on overinvestment (Gilje 2016). Analytical work examining the asset substitution problem has also focused on firm characteristics that change the incentives to overinvest in risky projects, including debt structure (Barnea et al. 1980) and managerial compensation features (Brander and Poitevin 1992; John and John 1993). These studies have examined the mechanics of

the asset substitution problem, but empirical work that examines the existence and impact of the asset substitution problem has been limited.

While much of the prior work focuses exclusively on the risk shifting from the equity holders to the debt holders within a firm and only considers investment choices where the uncertain payoffs arise from the project itself, the government is also a large claimant of a firm's pre-tax value (Desai et al. 2007). Recent research shows that because profits and losses are treated asymmetrically under most international tax codes, firms are also able to share some of their investment risk stemming from pre-tax operating projects with the government (Ljungqvist et al. 2017; Langenmayr and Lester 2018). These studies highlight that taxes reduce the payoff of successful operating projects. However, the ability to use losses in one period to eliminate taxable income in another period (loss offset) enables firms to shift downside risk from operating projects to the government by producing valuable tax loss attributes when firms incur current period losses from operating projects. Uncertain tax projects provide an observable avenue for equity holders to shift risk to both debt holders and the government by increasing the variance of expected payoffs, and the payoffs of uncertain tax projects depend on the payoffs of other operating projects.

## 2.2 Tax Planning Activities and Tax Uncertainty

A substantial amount of prior research has been dedicated to understanding the determinants and outcomes of a firm's tax planning activities[3]. While many previous studies have focused exclusively on overall tax planning, recent work highlights the fact that additional risk associated with uncertain tax projects can have adverse consequences for the firm. Hanlon, Maydew, and Saavedra (2017) document that the adoption of uncertain tax projects causes firms to hold more

[3] Hanlon and Heitzman (2010) and Wilde and Wilson (2018) review this literature.

precautionary cash, and Jacob, Wentland, and Wentland (2018) show that tax uncertainty can induce firms to delay or even forego profitable investment decisions, potentially harming the value of the firm. Dyreng, Hanlon, and Maydew (2019) link specific tax planning projects with tax uncertainty and find that firms engaging in more tax planning on average bear more uncertainty with respect to those tax positions. Their results also show that certain activities generate more uncertainty for the firm (e.g., more patent filings, tax haven activity, and transfer pricing related to intangibles). While these firm characteristics help explain the types of activities that generate more uncertainty related to tax planning, the rationale behind why some firms choose more uncertain ways to achieve the same tax savings is not as apparent, especially because a variety of avenues for tax planning exist. The asset substitution problem provides a useful approach to understand why firms might prefer to choose more uncertain tax projects in lieu of more conforming strategies.

Since 2007, corporations have been required to disclose a tax reserve account in their financial statements that indicates the total dollar value of tax positions that may ultimately be reversed upon examination by a tax authority, which indicates the potential downside risk of uncertain tax positions ex ante (i.e., prior to any enforcement or the realization of pre-tax payoffs). The reserve amount is established using a two-step process based on (1) recognition and (2) measurement. A position must be recognized if it has a 50 percent or lower likelihood of being sustained upon examination. The measurement step requires that the amount of financial benefit that can be claimed is the greatest amount with a more than 50 percent probability of being sustained upon examination. That component of the position which does not meet this threshold must be recorded in the reserve account for UTBs[4]. To determine these probabilities under

[4] The disclosure of this tax reserve for Unrecognized Tax Benefits also includes an annual tabulation that details any increases and decreases to the total reserve account. Appendix B provides an example detailing the steps involved in

Financial Accounting Standard Number 109, FIN 48 requires that a firm may only consider a position's "technical merits," meaning that likelihood of detection cannot be factored into this disclosure (Financial Accounting Standards Board 2006).

However, prior literature indicates that managerial discretion and financial reporting incentives can influence the amounts firms record in their UTB reserves (De Simone et al. 2014). Despite these findings, even after considering these incentives, other work employing proprietary data shows that despite these incentives the UTB reserves are a reliable proxy for uncertain tax activities (Lisowsky et al. 2013; Ciconte et al. 2016)[5]. Although UTB reserves cannot perfectly capture the risk associated with uncertain tax projects, Robinson, Stomberg, and Towery (2016) are able to show that UTB reserves are positively associated with future cash tax settlements (24 to 39 cents for every dollar of UTB reserve). Their evidence suggests that many firms may over-reserve for UTBs or that enforcement actions may not reverse all uncertain positions, but the positive association illustrates that the investment risk associated with uncertain tax projects is increasing in the total UTB reserve balance, which extends beyond managerial discretion and financial reporting incentives.

Because of these uniform disclosure rules for uncertain tax projects, focusing on the asset substitution incentives to understand uncertain tax project adoption decisions offers a method to empirically identify the outcomes of the asset substitution problem through the choices of managers. An advantage of considering tax projects specifically is that cash flows to the tax projects are determined by the uncertain cash flows of other pre-tax operating projects since the

determining and the journal entries for recording these reserves in the financial statements as well as how it relates to an uncertain tax project.

[5] Consistent with prior work, I refer to this construct as uncertain tax projects (Dyreng et al. 2018; Hanlon et al. 2017). However, because these positions potentially come with positive or negative cash flows, they are also accompanied by investment risk.

firm must generate income at some point to use the tax projects. This feature means that the realized payoffs of other projects guide the payoffs of uncertain tax projects by reducing cash outflows in the form of tax payments. Importantly, these disclosures quantify the preference of managers in terms of investment risk before the realization of those payoffs. Prior work identifying the asset substitution problem has typically employed measures of investment risk that rely on adverse outcomes for identification and has provided limited evidence of the problem's existence.

# CHAPTER 3. MODEL AND HYPOTHESIS DEVELOPMENT

## 3.1 Model of the Asset Substitution Problem

To examine the asset substitution problem in a tax context, consider a model of a firm with a manager whose objective is to choose projects to maximize value for the equity holders of the firm. The firm consists of equity holders and debt holders. Let *V* be the present value of pre-tax cash flows composed of the firm's current income, $I_0$, and the present value of future pre-tax cash flows at the beginning of the year, *V**. *D* is the face value of debt and other claims. Absent taxes, the payoff to the equity holders of the firm (*E*) is:

$$E = \max \mathrm{E}[\{I_0 + V^* - D, 0\}] \quad (1)$$

where $V = I_0 + V^*$. Given this payoff structure, an increase in the riskiness of *V* with the same expected profit will increase *E* by shifting the downside risk associated with the potential payoffs below the value of *D* to the debt holders of the firm. The tendency of equity holders to substitute projects with less risk for those with more risk to increase their own payoff at the expense of other claimants is the fundamental concept behind why asset substitution occurs. This result follows from the nature of the limited liability represented as a zero bound for the payoff for the equity holders of the firm, with the other claimants of the firm bearing any risk below that bound.

Next, I introduce taxes into the model and assume a tax system with statutory tax rate *t* that permits loss offset between years consistent with the tax system of most major economies around the world (Langenmayr and Lester 2018). The payoff to the equity holders now becomes:

$$E = \max \mathrm{E}[\{I_0 + V^* - P[t(I_0 + V^* - u)] - D, 0\}] \quad (2)$$

where $P[t(I_0 + V^* - u)]$ equals the present value of current and future tax obligations and depends on the statutory tax rate (*t*) as well as the firm's income ($I_0$), the present value of future cash flows

($V^*$), and the reduction in taxes from the adoption of tax projects ($u$). A firm can change the present value of future tax obligations by adopting tax projects, $u$, that reduce current or future taxable income as a means to avoid tax payments. Tax projects that are more uncertain potentially generate higher benefits but come with greater potential costs that can reduce the value of $V$, meaning the investment risk associated with these projects is increasing in their uncertainty on average. Prior empirical literature has emphasized the significant costs that can accompany uncertain tax projects, including operational costs to facilitate the tax projects, litigation costs, IRS penalties, and reputational costs (Dyreng et al. 2016; Dhaliwal et al. 2016; Austin and Wilson 2017; Donelson et al. 2018). These costs illustrate that an unsuccessful uncertain tax project can reduce the value of the firm and result in a negative payoff for the firm.

Figure 1 depicts the value of the firm. The payoff to the debt holders is the value of the firm up to the face value of debt, $D$, and the payoff to the equity holders is any residual value above the face value of debt. In a system without taxation, the payoff for the firm changes dollar-for-dollar with the payoff of other risky operating projects along the solid black line. The pre-tax value of the firm at the threshold of bankruptcy in this case is $V_{B_1}^*$. Taxation transfers a part of the firm's value to the government, which reduces the payoffs enjoyed by the equity and debt holders at the statutory tax rate. The firm's after-tax payoff follows the path of the blue dashed line, which raises the pre-tax value threshold of bankruptcy to $V_{B_2}^*$. When a firm adopts an uncertain tax project, the payoff of the project depends on both the benefits and costs of that project as well as the underlying payoff of other risky operating projects. If successful, uncertain tax projects generate tax savings for the firm in current or future periods, but unsuccessful uncertain tax projects can lower the value of the firm by causing the firm to incur tax payments, tax penalties, and other costs. The payoff with the benefits of successful tax projects is represented by the green circles, and the payoff with

the costs of unsuccessful tax projects is illustrated by the red squares. Note that a successful uncertain tax project lowers the pre-tax bankruptcy threshold for the firm, since $V_{B_3}^* < V_{B_2}^*$. However, an unsuccessful uncertain tax project raises this threshold. This feature means that bankruptcy occurs at a lower pre-tax firm value when uncertain tax projects enable a firm to successfully avoid taxation. The downside risk from uncertain tax projects is that bankruptcy occurs at a higher pre-tax firm value when uncertain tax projects are not successful, due to their potential associated costs.

In order to monetize its uncertain tax projects, a firm must have sufficient pre-tax income in current or future periods, since the payoff of an uncertain tax project is a reduction in tax liability rather than independent cash inflow for the firm. The payoff of other operating projects guides the expected payoff of uncertain tax projects, because the maximum potential benefits depend on the value of $V$ for a given tax rate[6]. As the variance of potential payoffs of uncertain tax projects increases, the investment risk associated with these projects does as well. Ultimately, uncertain tax projects provide firms the ability to change the probability distribution and variance of the payoffs of their tax planning activities. These projects enable equity holders to shift risk associated with more uncertain tax projects to both the debt holders and the government. With respect to the downside risk for the firm of an uncertain tax project, the equity holders of a firm bear that risk until the value of equity reaches zero and their limited liability becomes applicable. The debt holders bear any additional risk associated with an uncertain tax project below the face value of debt, since their claims are subordinate to those of the equity holders. Because a government enforcement agency must examine and overturn uncertain tax projects to prevent the firm from

[6] For example, the maximum tax savings a firm can realize is all the taxes it would owe in current and future periods (i.e., a tax liability of zero). This amount varies with the amount of income/loss produced by the firm's other operating projects.

realizing the benefits associated with a successful uncertain tax project, the government bears risk as well. This risk is associated with the likelihood that a firm will escape enforcement for a position that should not be sustained and the likelihood that a firm is unable to pay its tax liability due to bankruptcy.

Although more certain tax projects may be available, the asset substitution problem suggests that the incentives to shift risk distort a firm's tax project choices. Firms that are capable of shifting risk will choose more uncertain tax projects, since the equity holders do not bear additional risk from these projects[7]. This risk transfer from equity holders to debt holders and the government yields a higher expected payoff to the equity holders but a lower expected payoff to the debt holders and the government. As the risk associated with uncertain tax projects increases, the ability of the equity holders to shift risk to the debt holders and government also increases. Even when the firms expects to realize the cash savings with a low probability or in the distant future (i.e., the present value of the maximum payoff is small), the limited downside risk enjoyed by the equity holders can induce the firm to choose more uncertain tax projects.

## 3.2 Hypothesis Development

A firm considers adopting an uncertain tax project in order to reduce the present value of future tax obligations given a distribution of outcomes. The upside of these projects is reduced tax payments, but the downside is the possibility that an enforcement agency will not approve of the position and that the firm may incur additional costs. Since the upside relies on the cash flows of the firm's operating projects, the characteristics of the firm's other underlying projects play a crucial role in the firm's decisions with respect to uncertain tax projects.

[7] Appendix C provides a numerical example of risk shifting between a firm's equity and debt holders and the government.

As a result, I first examine firm characteristics that should influence the level of uncertain tax projects adopted by the firm in the context of an asset substitution problem. Jensen and Meckling (1976) and Eisdorfer (2008) indicate that the problem of asset substitution should be more apparent among firms in financial distress, since they are nearing bankruptcy. In the model, when the firm is in financial distress and approaches the bankruptcy threshold ($V_B^*$), it can shift more risk associated with uncertain tax projects from the equity holders to the debt holders and the government in expectation since the value of equity is closer to the zero bound. The debt holders assume any risk from payoffs below that bound, and the government bears risk since an enforcement agency must overturn an uncertain tax project to avoid lost tax revenue. The higher expectation of risk shifting for firms in financial distress should increase the uncertain tax projects adopted by the firm in both past and current periods.

Though the tax choices of firms in financial distress have not been directly examined, prior studies find that financial constraints are positively associated with tax planning activities as a means to produce additional funds when the supply of credit tightens (Law and Mills 2015; Edwards et al. 2016). However, Guenther, Wilson, and Wu (2019) show that financially constrained firms do not choose more uncertain tax activities incrementally than the average profitable firm. Financial constraints increase the difficulty of obtaining financing for investment, which causes the firm to either rely more heavily on internal financing for new projects or forego new investment. This literature suggests these financing frictions could lead to the firm preferring sustainable strategies to generate cash flows from tax planning activities to attempt to alleviate the constraints (Guenther et al. 2019). Whited and Wu (2006) suggest a typical instance of financial constraints occurs when a firm cannot raise funds externally to fund additional investment in the future, which means the firm must turn to internal financing more heavily for investment. They

posit that while such a firm may have constraints that limit its investment opportunities, these constraints do not mean the firm is distressed. Financial distress, on the other hand, implies that the face value of claims of existing creditors may not be satisfied and that the firm is nearing bankruptcy (Whited and Wu 2006; Senbet and Wang 2012). A crucial difference between the construct of financial constraints and financial distress is the firm's ability to honor its payments to current creditors. Although these two constructs are related, financial distress captures the feature that the existing creditors' claims may not be satisfied due to bankruptcy, rather than focusing mainly on internal capital market pressures. Firms facing increased financial constraints have incentives to use tax projects as a means to generate additional cash internally, but in order to ensure the tax savings are sustained upon examination, financially constrained firms should prefer more certain tax projects, consistent with prior empirical evidence. When a firm is in financial distress, however, the asset substitution problem suggests that the equity holders of a firm can expect to shift a substantial portion of the risk associated with more uncertain tax projects to the debt holders and government, meaning these firms should adopt more uncertain tax projects. Based on the above discussion, I hypothesize the following:

***$H_{1a}$:*** *Firms in financial distress adopt more uncertain tax projects than other firms.*

In addition to financial distress, a firm's potential growth opportunities provide another channel through which the incentives to adopt more uncertain tax projects can manifest. Prior literature finds that high growth prospects can distort the weights investors assign to different payoffs (Baker and Wurgler 2006, 2007). Riedl, Sun, and Wang (2017) study the positive implications that high growth potential has for firms by showing that investors place less emphasis on negative events for firms with high growth potential, since investors have positive future expectations for these firms. Their results illustrate that while equity holders of growth firms

consider future earnings potential in their current investment decisions, these equity holders assign a lower probability to negative outcomes than they should. This approach can contribute to investment distortions, since the firm has not yet realized its future growth, and ultimately can cause firms to adopt projects that are more uncertain at the expense of debt holders and other claimants. Taken together, these studies suggest that the expectation of future growth can provide greater incentives for the firm to pursue uncertain tax projects.

When a firm expects large future growth, it places a higher probability on large future values of *V* relative to its current value. An expectation of higher pre-tax value generates incentives for the firm to pursue tax projects to reduce its expected future tax payments. However, since this type of firm has not yet realized its expected future value, the payoff of any tax projects adopted to reduce future tax payments depends on the ability of the firm to realize a higher future pre-tax value. Because of this dependence, a firm with high growth potential can use uncertain tax projects to shift risk to debt holders and other claimants in expectation. If the firm's anticipated growth is not realized, the equity holders can shift the downside risk of the more uncertain tax projects to the debt holders and other claimants since unsuccessful uncertain tax projects result in a reduction to the value of the firm. Ultimately, this set of attributes leads to greater incentives associated with asset substitution for the firm to adopt more uncertain tax projects. With respect to Figure 1, the increase in variance results in a larger wedge between the green circles and red squares. The wedge shields the value of equity from taxes for higher values of *V* but also increases the likelihood that the red squares will fall below the face value of debt. This feature means that equity holders of growth firms are more likely to have the ability to shift risk from uncertain tax projects to both debt holders and the government. Accordingly, I predict that firms with high growth potential will be associated with higher levels of uncertain tax projects.

***$H_{1b}$:*** *Firms with high growth potential adopt more uncertain tax projects than other firms.*

Next, because the payoff of an uncertain tax project is dependent upon the payoff of pre-tax operating projects, the contemporaneous realization of payoffs from operating projects also provides an incentive to adopt incremental uncertain tax projects. When a firm generates profits in the current period, taxation reduces that payoff at the statutory tax rate. Since profitable firms are able to monetize their uncertain tax projects immediately, prior work has acknowledged that the total tax projects adopted by the firm increase with the magnitude of the firm's income to protect the value of the firm from tax payments (Klassen et al. 2016). When a firm realizes losses in the current period, it is often unable to immediately monetize the benefits of uncertain tax projects. However, incentives to adopt uncertain tax projects can still exist particularly if the downside risk of equity holders is limited, since losses generate valuable tax attributes to offset tax payments in another period. Many studies emphasize that losses and their associated tax attributes are economically important to firms and other stakeholders (Altshuler and Auerbach 1990; Altshuler et al. 2009). Both Maydew (1997) and Erickson, Heitzman, and Zhang (2013) show that these attributes can motivate a firm to change its behavior by managing earnings between years to be able to maximize the benefits associated with losses. Other work highlights that loss attributes are so important to firms that many even adopt poison pill provisions to preserve the ability to offset future income (Erickson and Heitzman 2010; Sikes et al. 2014)[8].

[8] While prior literature also suggests that loss firms without carry back opportunities may have lower marginal tax rates (Graham 1996a, 1996b; Graham and Mills 2008), firms are able to accumulate the tax benefits of losses and carry them to other periods to offset income. Despite the fact that the marginal tax rate is theoretically the correct rate to use to evaluate incremental tax choices, recent survey evidence indicates that only 10.8% of public firms use the marginal tax rate when making incremental tax choices. The majority of firms use the GAAP effective tax rate or statutory tax rate when choosing tax projects (Graham et al. 2016). If the firm anticipates income far in the future, the limited downside risk from more uncertain tax projects also suggests that these firms have incentives to adopt uncertain tax projects, even when the expected present value of these benefits is very small for the equity holders.

More recently, Langenmayr and Lester (2018) have demonstrated that the tax attributes associated with losses actually increase the expected value of risky operating projects by creating future expected tax savings. Figure 2 presents the incremental payoff of uncertain tax activities and reflects this feature with the blue dashed line and illustrates that current period losses increase the value of equity relative to the no-tax state, since they can be used to offset income in another period. Ultimately, losses from operating projects still shift the value of equity down the blue dashed line towards zero, albeit at a slower rate because of the ability to use the losses in another period. Because a firm can generate current or future tax savings with uncertain tax projects, incremental tax choices provide an additional channel through which firms can increase the expected value of equity. Figure 2 illustrates that firms can use uncertain tax projects to increase the expected value of equity both when the firm realizes current year profits and when it realizes current year losses. Given similar expectations of future value, equity holders of a firm with a loss in the current period have a higher probability of shifting risk to other claimants, since losses move the value of equity towards zero. The risk shifting incentives raise the expected value of uncertain tax projects for equity holders, which encourages the adoption of such projects.

In Figure 2, given the same beginning expectations of firm value ($V^*$), firms with current year income ($I_0 > 0$) are able to monetize more uncertain tax projects as their income increases, which encourages the adoption of more uncertain tax projects. However, as firms incur greater losses ($I_0 < 0$), the expectation of shifting downside risk to the debt holders and government is increasing as well, since the value of equity is declining, which provides an incentive to adopt more uncertain tax projects through a different avenue. As the firm's value before uncertain tax projects decreases along the blue dashed line (potentially below the face value of debt), it is capable of shifting even more downside risk to other claimants of the firm. This feature means that equity

holders of a firm with a greater current period loss expect to shift more risk associated with uncertain tax projects to other claimants. This feature also suggests that the adoption of uncertain tax projects should be increasing as pre-tax losses grow. Even when the firm expects to realize only a small portion of the benefits of uncertain tax projects under losses, the limited downside risk enjoyed by the equity holders can yield expected benefits from more uncertain tax projects. Because the equity holders have limited downside risk when asset substitution incentives exist, the incentives for loss firms to adopt uncertain tax projects are perhaps even stronger than when the firm is able to immediately reap tax savings by offsetting income[9]. Therefore, I predict that, consistent with these incentives, the adoption of uncertain tax projects increases as pre-tax losses increase for the firm in the same period. Since the asset substitution problem distorts investment decisions and protects equity holders from some or all downside risk from failed uncertain tax projects, I also anticipate that such a problem will induce loss firms to adopt more uncertain tax projects than profitable firms on average, or formally:

> ***$H_{2a}$:*** *Uncertain tax project adoption is increasing in the magnitude of contemporaneous operating losses.*
>
> ***$H_{2b}$:*** *Loss firms adopt more uncertain tax projects incrementally than profitable firms.*

[9] For example, a firm may choose to adopt an uncertain tax project when there is little to gain but a lot to lose, since asset substitution incentives imply that the zero bound protects equity holders from some or all of the downside risk associated with an uncertain tax project.

# CHAPTER 4. SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

## 4.1 Sample Selection

To investigate these hypotheses, I collect firm-year observations from the Compustat Fundamentals Annual and Execucomp databases for fiscal years ending 2007 to 2016. The sample begins in 2007 because that is the first year subject to disclosure rules under FIN 48 for which UTB data are available for most firms. I exclude firms in regulated utility and financial services industries (SIC 4900-4999 and 6000-6999) consistent with prior studies, because the tax laws and reporting environments within these industries are substantially different from other industries. I also eliminate firms with total assets of less than $10 million and firms with a negative or missing ending balance for UTB reserves to ensure that all firms in the sample are large public firms with similar reporting requirements (Dyreng et al. 2019). Further, I require that each observation has sufficient data to calculate all variables in regression models for the main analyses. All variables are winsorized at the 1% and 99% levels to mitigate the influence of outliers[10].

Although many prior tax studies exclude loss firms due to data requirements, I retain loss firms in my sample, since both profit and loss firms can adopt uncertain tax projects and are subject to the same rules under FIN 48. Since loss firms comprise over one-third of annual observations in the Compustat universe in many years, including these firms in the analysis is important to examine a more complete picture of all firms. Prior literature stresses the need to better understand the choices of loss firms and emphasizes the bias that excluding these firms can introduce into analysis (Hanlon and Heitzman 2010; Henry and Sansing 2018). Recent work by Christensen, Kenchington, and Laux (2018) also highlights the important role that losses play in affecting

[10] I also trim the sample at the 1% and 99% levels for UTB measures and find qualitatively similar results.

common proxies for tax avoidance, but common measures used to study tax avoidance require positive income to be interpretable. After imposing data requirements, my main sample for analysis consists of 13,360 firm-year observations corresponding to 2,472 different firms. I conduct additional analyses that require executive ownership data from Execucomp, and in these analyses, the sample consists of 6,431 firm-year observations corresponding to 1,050 different firms.

## 4.2 Descriptive Statistics

Table 1 presents univariate descriptive statistics of the sample. Because the firm characteristics of interest can develop over the course of several years and because uncertain tax choices are often persistent (Saavedra 2018), I measure uncertain tax activities first using the total balance of UTB reserves. *UTBend* is the ending balance of all UTB reserves scaled by total assets and multiplied by 100 for interpretability (Dyreng et al. 2019). To capture incremental uncertain tax choices, I measure the uncertain tax activities by using the additions relating to current year positions scaled by total assets and multiplied by 100 for interpretability to construct the variable *UTBadd*. The mean values of *UTBend* and *UTBadd* indicate that the sample has an average ending balance of UTB reserves of 1.340 percent of assets and average annual additions relating to current year positions of 0.157 percent of assets (median values of 0.612 percent and 0.043 percent respectively). These values correspond to an annual increase of the ending UTB balance of approximately 12% per year. Both UTB variables are positively skewed, which is anticipated from prior literature (Dyreng et al. 2019), and I conduct a battery of robustness tests to ensure that the results are unaffected by this skewness.

The mean value of *Loss*, an indicator variable equal to one when pre-tax income is negative, is 0.333, indicating that a substantial portion (33.3 percent) of the sample firm-years are loss

observations. This value emphasizes the prevalence of loss firms in the universe of public companies and stresses the importance of specifically studying how their incentives differ from profitable firms (Henry and Sansing 2018). Consistent with the inclusion of loss firms in the sample, the natural logarithm of assets, *Size*, has a mean of 6.59 (median 6.525), which illustrates that the sample firms are large ($730 million in assets on average) but smaller than in studies including only profitable firms. Other firm characteristics and control variable values are consistent with prior studies and indicate that the sample consists of large public U.S.-based firms with significant international activity. The correlations among variables used in the main analyses are presented in Table 2. The correlations among these variables are consistent with prior studies that include both profit and loss firms.

# CHAPTER 5. RESEARCH DESIGN AND MAIN RESULTS

## 5.1 Tests of Hypothesis 1

In order to test the first hypotheses, I estimate the following Ordinary Least Squares (OLS) regression model[11] with robust standard errors clustered by firm (Petersen 2009):

$$UTBvar_{it} = \beta_0 + \beta_1 FinDistress_{it-1} + \beta_2 Growth_{it-1} + \beta_j Controls_j + \sum \beta_k Year_k + \sum \beta_l Industry_l \quad (3)$$

To investigate how firms choose uncertain tax projects in the context of an asset substitution problem, I use the information contained in the income tax footnote relating to reserves for uncertain tax projects, or UTB reserves. Recall that the rules under FIN 48 establish a standard for determining and reporting these amounts on the financial statements. These rules outline that amounts recorded as tax reserves are those the firm perceives as more uncertain positions that may not be sustained if challenged by a tax authority.

For the dependent variable, *UTBvar*, I employ both *UTBend* and *UTBadd* to measure both the total value and incremental additions to the UTB reserves. The variables of interest in this model are *FinDistress* and *Growth*. *FinDistress* is an indicator variable equal to one if the firm's Altman (1968) Z-score is in the bottom quintile for its year and industry to identify when firms are most likely to be financially distressed. *Growth* is an indicator variable equal to one if the firm's market-to-book ratio is within the top quintile among each year and industry to identify when firms have high expectations of future growth. The values of these variables measured at the beginning of the year in order to measure the preference of the firm ex ante (i.e., the realization of payoffs during the year do not influence the choice of uncertain tax projects). I determine these values at

[11] In untabulated robustness tests, I also delete firms that record no increases to UTB reserves for current year activities to address potential issues from firms choosing not to report UTB reserves and find similar results to the main tests.

the industry-year level since prior literature shows that a firm's peers affect its own tax project choices (Bird et al. 2018). Additionally, distinct tax incentives are available only for certain subsets of firms within specific industries and years[12].

I control for other factors that could influence the choice and reporting of uncertain tax activities consistent with prior literature. Specifically, I control for firm return on assets (*ROA*), age (*Age*), size (*Size*), long-term debt levels (*Leverage*), and current debt levels (*CDebt*), because these features may create different incentives and restrictions associated with adopting uncertain tax projects (Lisowsky et al. 2013; Law and Mills 2015). *Big4* is an indicator variable equal to one if the firm employs a Big Four auditor, which has been shown to affect the quality of estimates and tax planning decisions (Klassen et al. 2016). I also control for specific activities that can contribute differently to the amount of tax uncertainty for a firm, consistent with inferences drawn from prior literature (Dyreng et al. 2019). These additional control variables include foreign income (*ForeignInc*), research and development expenses (*R&D*), and levels of intangible assets (*Intang*). Lastly, because the payoffs of tax projects depend on the payoffs of operating projects, I control for firm risk-taking preferences by using the standard deviation of ROA over the prior three years, *STDROA* (Langenmayr and Lester 2018; Yost 2018). I include fixed effects for year and industry to control for variation between years and industries.

The results of estimating Equation 3 are presented in Table 3, and these findings are consistent with the predictions made for H1a and H1b. Since observable financial distress often plays out over the course of several years, I anticipate that the cumulative uncertain tax projects adopted should be substantially higher for firms in distress and that the incremental uncertain tax

[12] For example, a service firm may not be able to take advantage of tax incentives aimed at promoting capital expenditures or domestic manufacturing. All inferences are robust to constructing these variables by conditioning on year alone or by not conditioning on either industry or year.

projects adopted should also be higher. Columns 1-2 show the results for firms in financial distress and indicate a positive and significant coefficient for both models. Specifically, the coefficient in column 1 on *FinDistress* ($\beta = 0.8395$, $p < 0.001$) indicates that firms in financial distress adopt 63 percent more uncertain tax projects cumulatively than the average sample firm. The coefficient in column 2 on *FinDistress* ($\beta = 0.0200$, $p = 0.020$) indicates that firms in financial distress adopt 13 percent more uncertain tax projects incrementally.

Next, columns 3-4 of Table 3 present the results for firms with high growth potential. These results are consistent with the prediction made in H1b. The coefficient in column 3 on *Growth* ($\beta = 0.2058$, $p = 0.004$) illustrates that firms with high growth potential adopt 15 percent more uncertain tax projects cumulatively. Consistent with the future expectations shaping current choices for these firms, the coefficient in column 4 ($\beta = 0.0656$, $p < 0.001$) indicates that firms with high growth potential adopt 42 percent more uncertain tax projects incrementally than the average sample firm. These results highlight that growth firms adopt substantially more uncertain tax projects in the current period since they can shift risk to the debt holders in expectation. To ensure that financial distress and growth potential are separate channels affecting uncertain tax project adoption decisions, columns 5-6 report results including both *FinDistress* and *Growth*. The results in these columns remain consistent with inferences drawn from columns 1-4, which underscores that each of these channels creates unique incentives for equity holders to shift risk and for firms to adopt more uncertain tax projects.

## 5.2 Tests of Hypothesis 2

To analyze how contemporaneously realized payoffs affect the decision to adopt uncertain tax projects, I estimate Equation 3 as well as the following OLS regression model with robust standard errors clustered by firm:

$$UTBadd_{it} = \beta_0 + \beta_1 Loss_{it} + \beta_j Controls_j + \sum \beta_k Year_k + \sum \beta_l Industry_l \quad (4)$$

In these models, I employ only the dependent variable *UTBadd*, since I am interested in analyzing the firm's incremental choices with respect to its uncertain tax projects. Since the first set of hypotheses shows that certain ex ante attributes influence the uncertain tax projects adopted by the firm, I also include *FinDistress* and *Growth* to control for asset substitution incentives created through these channels. In order to assess how the magnitude of the firm's current period losses influences the choice of uncertain tax projects, I first estimate Equation 3 in subsamples of profit and loss firms. Findings from prior work suggest that the adoption of more uncertain tax projects should be increasing as pre-tax profits increase (Klassen et al. 2016), but asset substitution incentives should only affect the contemporaneous adoption of uncertain tax projects under losses. After considering these subsamples, I estimate Equation 4 using the full sample and the variable Loss to compare how profit and loss firms differ.

Table 4 presents the results of estimating Equation 3 in subsamples and Equation 4 in the full sample. In columns 1-2, I test Hypothesis 2a by dividing the sample between profit and loss firms. Consistent with prior literature, I find that the adoption of uncertain tax projects is increasing as contemporaneous pre-tax profits increase. In the profit firms subsample, column 1 indicates a positive and significant coefficient of *ROA* ($\beta = 0.1121$, $p = 0.046$), which is expected given findings of prior studies that exclude loss firms. I interpret this result as consistent with the notion that profit firms are able to reap the benefits of uncertain tax projects immediately and that firms with greater income can monetize more uncertain tax projects in the current year. Consistent with my predictions, I find that the adoption of uncertain tax projects is also increasing as contemporaneous pre-tax losses increase. The negative coefficient of *ROA* in column 2 ($\beta = -0.1284$, $p < 0.001$) indicates that, for loss firms, the magnitude of the loss is positively associated

with the adoption of more uncertain tax projects[13]. This result is also anticipated, because as a firm incurs greater losses, it can accrue valuable tax loss attributes to monetize in another period. Additionally, a firm with losses is able to shift more downside risk from uncertain tax projects to the debt holders in expectation, which generates stronger asset substitution incentives. In certain cases, uncertain tax projects accompanied by more investment risk are required for the equity holders to realize a positive payoff in expectation. The stark contrast between profit and loss firms emphasizes how the asset substitution problem alters the incentives for loss firms to adopt more uncertain tax projects. To compare these incentives, Column 3 shows the results of Equation 4, and the coefficient of *Loss* ($\beta = 0.0419$, $p < 0.001$) is positive and significant. The economic magnitude of this result is quite substantial, since it shows that loss firms on average adopt 27 percent more uncertain tax projects than profit firms, indicating that the asset substitution incentives under losses influence the firm to choose even more uncertain tax projects than when the firm has profits. Since the firm can potentially have little to no downside risk from very uncertain tax projects when incurring losses, the increasing expectation of risk shifting under losses induces the firm to choose more uncertain tax projects than when the firm is generating income.

[13] In untabulated tests, I confirm these findings by using a spline regression model to allow for non-linearity in the distribution, which shows that the relation between uncertain tax projects and income is increasing in both profits and losses.

# CHAPTER 6. ADDITIONAL ANALYSES AND ROBUSTNESS TESTS

## 6.1 Other Characteristics Restricting Asset Substitution Incentives

In order to confirm that the results observed are in fact due to the asset substitution problem, I conduct additional analyses to confirm that the results are consistent with prior analytical literature on the asset substitution problem. Diamond (1989, 1991) examines firm risk incentives and finds that younger firms have an incentive to build their reputations, leading to more bank borrowing to help monitor the firm's risky activities. The resulting enhanced monitoring by banks of these firms reduces their capability and incentive to adopt riskier projects. These firms often choose to subject themselves to better monitoring as a means to build a better reputation for themselves for future lenders. This additional monitoring should be most apparent among younger firms with high debt levels, since these firms are more likely to turn to bank lending, and because lenders have a greater incentive to monitor when debt levels are high. Accordingly, I predict that younger firms with high debt levels will be less likely to adopt more uncertain tax projects and that older firms will not necessarily exhibit the same behavior impelled by any incentive to build a reputation, because they have likely already established their reputation, whether good or bad, with lenders. Formally, I expect that younger firms with high debt levels will adopt fewer uncertain tax projects as a means to build their reputations, if asset substitution incentives are a driving force behind these decisions.

In addition to the firm's age, Brander and Poitevin (1992) derive an optimal managerial contract that illustrates that manager compensation and ownership structure influence the incentive to adopt risky projects. Managers who own more of the firm have greater incentives to engage in uncertain tax projects, since their interests are often more aligned with equity holders (Chen et al. 2010). However, debt contracts often account for these types of agency conflicts and include

restrictions that limit the firm's ability to adopt risky projects when the level of executive ownership is high. Given that these restrictions can cause firms to adopt fewer risky operating and tax projects, I also expect that firms with higher executive ownership will adopt fewer uncertain tax projects when debt levels are high, since debt holders are most likely to identify and restrict risky investment when they have more at stake and a greater ability to do so.

To investigate these two questions, I estimate the following OLS regression model:

$$UTBadd_{it} = \beta_0 + \beta_1 HighDebt_{it-1} + \beta_2 FirmChar + \beta_3 HighDebt_{it-1} * FirmChar + \beta_j Controls_j + \sum \beta_k Year_k + \sum \beta_l Industry_l \quad (5)$$

For these tests, I employ a similar control vector and methodology from Equation 3. In the place of *FirmChar*, I test relevant characteristics that may interact with high debt levels to moderate the adoption of uncertain tax projects.

Table 5 presents the results of estimating Equation 5 for age levels as well as executive ownership levels. The variable *Old* (*Young*) is an indicator variable equal to one if the firm is in the top (bottom) quintile for its age among each industry and year. Columns 1-2 show the results of these models. For older firms, the coefficient of the interaction term is not significant, indicating that high debt levels do not incrementally influence uncertain tax project adoption decisions for older firms. However, column 2 indicates a negative and significant coefficient of *Young*HighDebt* ($\beta = -0.0537$, $p = 0.008$), consistent with Diamond's (1989, 1991) prediction that these firms have increased monitoring from bank lenders to build their reputations and reduce the riskiness of projects adopted.

Columns 3-4 present results of the executive ownership tests. *HighOwn* (*LowOwn*) is an indicator variable equal to one if the firm falls in the top (bottom) quintile with respect to shares owned by its CEO for each year. Column 3 shows a negative and significant coefficient of the

interaction term ($\beta$ = -0.0434, p = 0.049), consistent with the notion of increased monitoring from debt holders for firms with high levels of executive ownership. Column 4 shows no significant coefficient for the interaction term, which emphasizes that this relationship is concentrated among firms with higher executive ownership levels.

### 6.2 Firms with a Lower Ability to Shift Risk

While debt holders may wish to restrict risky investment due to the potential of risk shifting, they also provide an additional claimant to whom equity holders can shift risk. In the absence of debt holders, the equity holders bear more downside risk from uncertain tax projects. If internal financial constraints rather than risk-shifting incentives cause the firm to adopt more uncertain projects, firms with low debt levels should behave in a similar manner to other firms with respect to tax projects. To confirm that the asset substitution problem is a driving force behind the adoption of more uncertain tax projects, I investigate the interaction between the features of the firm in Hypotheses 1 and 2 and an indicator variable, *LowDebt*, equal to one if the firm's total debt level falls within the bottom quintile among each industry and year. If equity holders have less ability to shift risk to debt holders because of low debt levels, I expect that these firms should adopt significantly less uncertain tax projects.

Table 6 presents the results from estimating Equation 3 with an interaction term for firm features with *LowDebt*. Columns 1-3 show that the coefficients of the interaction terms are negative and significant across all three specifications[14]. While low debt levels presumably come with fewer restrictions on the firm's risky activities on average, firms still adopt less uncertain tax projects in the absence of debt holders to bear the bulk of the downside risk. Tests of the combined

[14] Although debt levels are a component of the measure used for financial distress, the other firm characteristics between distressed firms without low debt and distressed firms with low debt are similar.

coefficients of the firm characteristic of interest and the interaction term show that, for firms with asset substitution incentives, low debt levels completely eliminate any impact on uncertain tax project adoption decisions, since the combined coefficient is not significantly different than zero. These results underscore that firms are not necessarily engaging in more uncertain tax projects as a means to generate more value for the equity holders if the ability to shift risk to the debt holders is reduced.

### 6.3 Assessing Different Costs of Uncertain Tax Projects

To address an additional alternative explanation of why loss firms may pursue more uncertain tax projects, I conduct analyses to assess the possibility of different costs of uncertain tax projects between profit and loss firms. Because loss firms do not typically pay tax in the year the loss is generated, an alternative reason for why loss firms may adopt more uncertain tax projects than others is that these firms may simply have a lower cost of uncertain tax projects. For example, when the IRS examines and overturns an uncertain tax project of a loss firm, the result is often a reduction of a tax loss carryforward attribute rather than a cash tax payment. Since the result of a failed uncertain tax project does not result in an immediate cash payment or reduction in cash refund, these firms may discount the potential costs of uncertain tax projects because any payment would occur in a future period. If this argument is true, loss firms may not need to shift risk to debt holders to realize a higher expected payoff from more uncertain tax projects, provided that the costs are sufficiently low. In order to investigate this possibility, I identify firms with the ability to carry back Net Operating Losses (NOLs) to reap immediate cash tax savings and create an indicator variable, *NOLCB*, equal to one if the firm has negative cash taxes paid and negative income in the current period. These firms differ from other loss firms in that they will owe cash payments if an uncertain tax project is disallowed in a similar manner to a firm with positive

income. If loss firms perceive lower costs from unsuccessful uncertain tax projects, firms carrying back an NOL should adopt fewer uncertain tax projects than other loss firms. To analyze this question, I modify Equation 5 to add the indicator variable *NOLCB* interacted with *Loss*.

Table 7 presents the results from these falsification tests. Column 2 shows that, among loss firms, firms carrying back NOLs do not adopt more uncertain tax projects than other loss firms, as illustrated by the non-significant coefficient of *Loss*NOLCB*. In order to support this result, I also employ a subsample of only loss firms in column 3. Again, the coefficient of *NOLCB* is not significant, which indicates that loss firms do not behave differently when the nature of the costs of uncertain tax projects is different. These results support the idea that loss firms are not on average adopting more uncertain tax projects due to differential costs of unsuccessful projects.

### 6.4 Robustness Tests and Alternate Proxy

Finally, I conduct a battery of robustness tests to ensure my results are unchanged by using alternative model specifications and measurement variables. In untabulated tests, I modify my sample, variables of interest, and regression model specifications to ensure that inferences remain unchanged from the main results. With respect to the sample, I conduct tests that trim by the variables of interest rather than winsorizing and delete observations with zero values of *UTBadd*. I also scale *UTBadd* by sales rather than assets and employ firm fixed effects across all main tests to ensure the results are robust to these specifications. Since the amount of uncertain tax projects is theoretically bounded at zero (i.e., a firm could choose no uncertain tax projects), I run the main analyses using a Tobit specification to ensure that the main results are qualitatively unchanged.

In addition to these untabulated tests, I consider an alternative measure of uncertain tax projects. Because the sample includes loss firms and prior literature underscores that effective tax rates are not meaningful for these firms, I adapt a measure from Henry and Sansing (2018) that

captures the differences between a firm's actual cash taxes paid (or refunded) and the expected value. This measure is calculated by scaling the firm's tax conformity, Δ [(cash taxes paid adjusted for tax refunds) minus (pre-tax income times the statutory tax rate)], by the book value of assets[15]. This measure provides a validated way to capture the tax planning activities of firms with profits or losses, which enables me to include loss firms in this analysis. I use the standard deviation of this measure over the following three-year period to measure the future consequences of the firm's tax projects to construct an additional variable, *STDHS*, to measure the risk of the tax projects adopted[16]. Employing this measure also removes potential managerial discretion contained in the tax reserves, since the variable relies on the cash taxes paid by the firm. The results of these tests are presented in Table 8, and all main inferences remain unchanged using this alternative measure for uncertain tax projects. Across columns 1-4, the coefficients of the variables of interest are positive and significant. Together, these results illustrate that the results are also robust to an alternative measure for uncertain tax projects. The results in Table 8 also emphasize the real consequences of adoption of more uncertain tax projects for firms with asset substitution incentives, as the coefficients illustrate more future volatility related to uncertain tax projects[17].

[15] I scale by book value of assets rather than market value of assets as in Henry and Sansing (2018) because growth firms are inherently more likely to have a larger market value of assets than other firms, so scaling by market value of assets reduces interpretability for these firms. However, using market value of assets as a scaling factor, I find that inferences are unchanged for financially distressed firms or loss firms. Henry and Sansing (2018) note that while they choose to scale by the market value of assets, other measures like book value of assets are appropriate for this measure when studying different research questions.

[16] This measure also enables expanding the sample period to before 2007, since it does not require UTB data.

[17] I conduct untabulated tests including this measure in all regression models to control for the overall level of tax planning across all main analyses as well as interacted with the variables of interest to control for the mean tax savings. In these tests, I again find that the results are qualitatively unchanged, which shows that the increased tax project adoption is not simply due to higher overall tax planning activities by firms with asset substitution incentives.

# CHAPTER 7. CONCLUSION

This study investigates the influence of asset substitution incentives on uncertain tax choices. The value of equity is the firm's value in excess of the value of debt and other fixed claims. This hierarchical structure of equity and debt within a firm gives rise to the asset substitution problem that allows equity holders of a firm to expropriate value from the debt holders and other claimants by shifting risk associated with payoffs below the value of equity. The risk-shifting incentives distort the investment decisions of the firm and cause the equity holders to prefer riskier investments, even among projects with the same mean payoff to the firm. Though empirical evidence of the asset substitution problem has been sparse in prior literature, uncertain tax choices provide an appropriate way to identify the outcomes of the problem. To assess the impact of these incentives on uncertain tax choices, I construct a model that highlights the role of uncertain tax projects in the context of the asset substitution problem. To confirm the inferences from the model, I employ several empirical analyses and show that firms in financial distress and firms with high growth potential adopt significantly more uncertain tax projects than other firms. With respect to projects adopted contemporaneously, I find that uncertain tax project adoption is increasing as both pre-tax profits and losses increase and that loss firms adopt significantly more uncertain tax projects than profit firms due to asset substitution incentives. These results highlight how the asset substitution problem influences the choice of tax projects within a firm. I conduct additional analyses and robustness test to ensure that the results are due to the problem of asset substitution.

The results of this study are relevant for both accounting and finance literature as well as firms' internal and external stakeholders. The findings yield insight into why some firms choose more uncertain tax projects, despite the negative consequences of carrying more tax uncertainty, as documented in prior accounting literature. They also show that firms' decision to choose more

uncertain tax planning activities is partially a result of an investment distortion that is not present in the majority of firms or necessarily optimal for the firm as a whole. This finding suggests that many firms with a higher incentive to adopt uncertain tax projects are not those with incentive sets similar to the majority of profitable firms studied in much of the prior tax literature. Outside academic literature, this study has important implications for regulators and standard setters to better understand the types of firms that engage in more uncertain tax projects, illustrating that the same incentives that can cause equity holders to seek risky investment at the expense of debt holders can also pose significant risk for the government. Particularly at a time when enforcement resources are scarce, the results of this study provide relevant and timely implications for standard setters as they seek to improve the corporate tax reporting and enforcement process, which may also enhance debt holders' ability to identify when asset substitution is likely to exist.

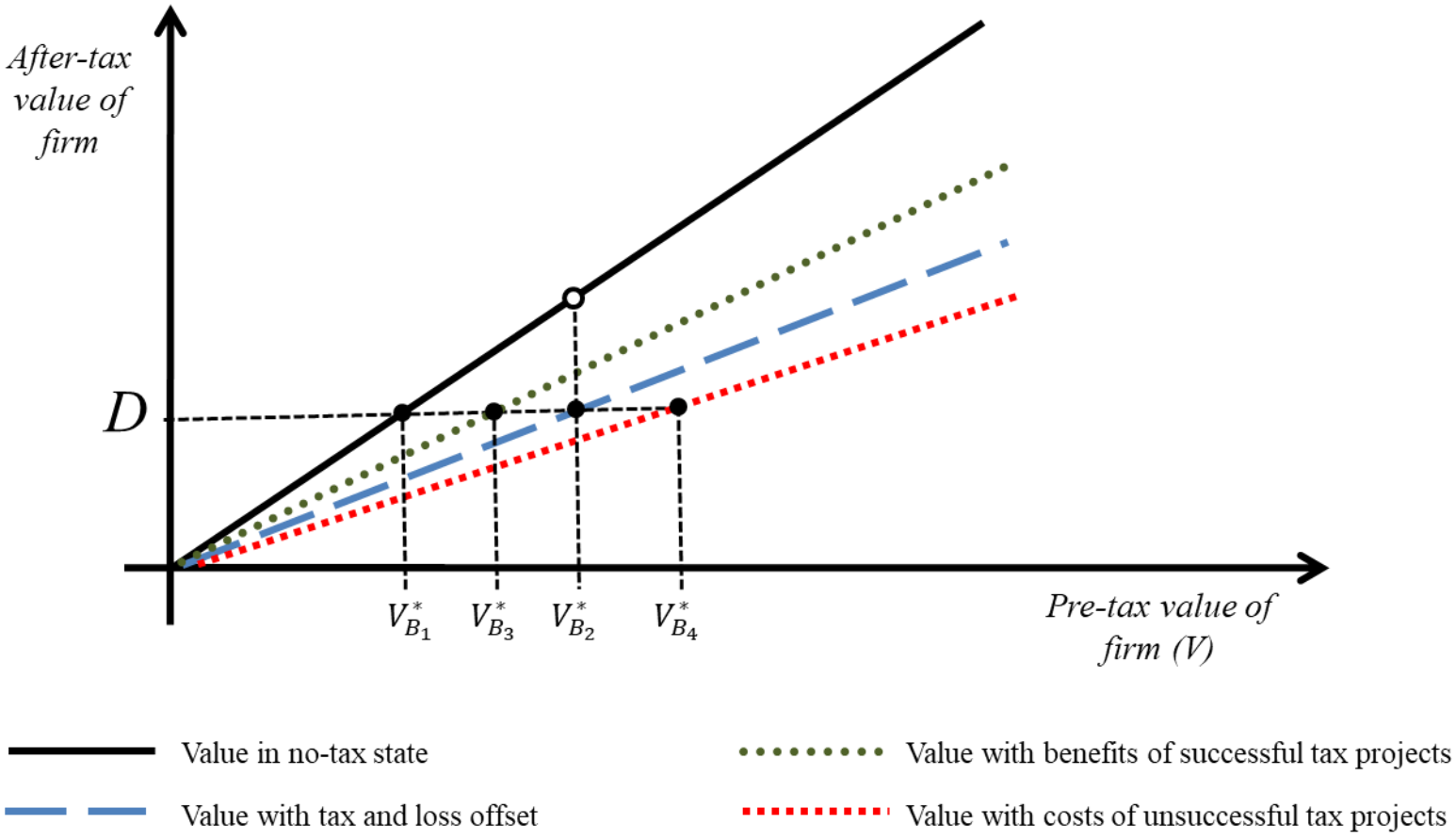


Figure 1 Value of the Firm

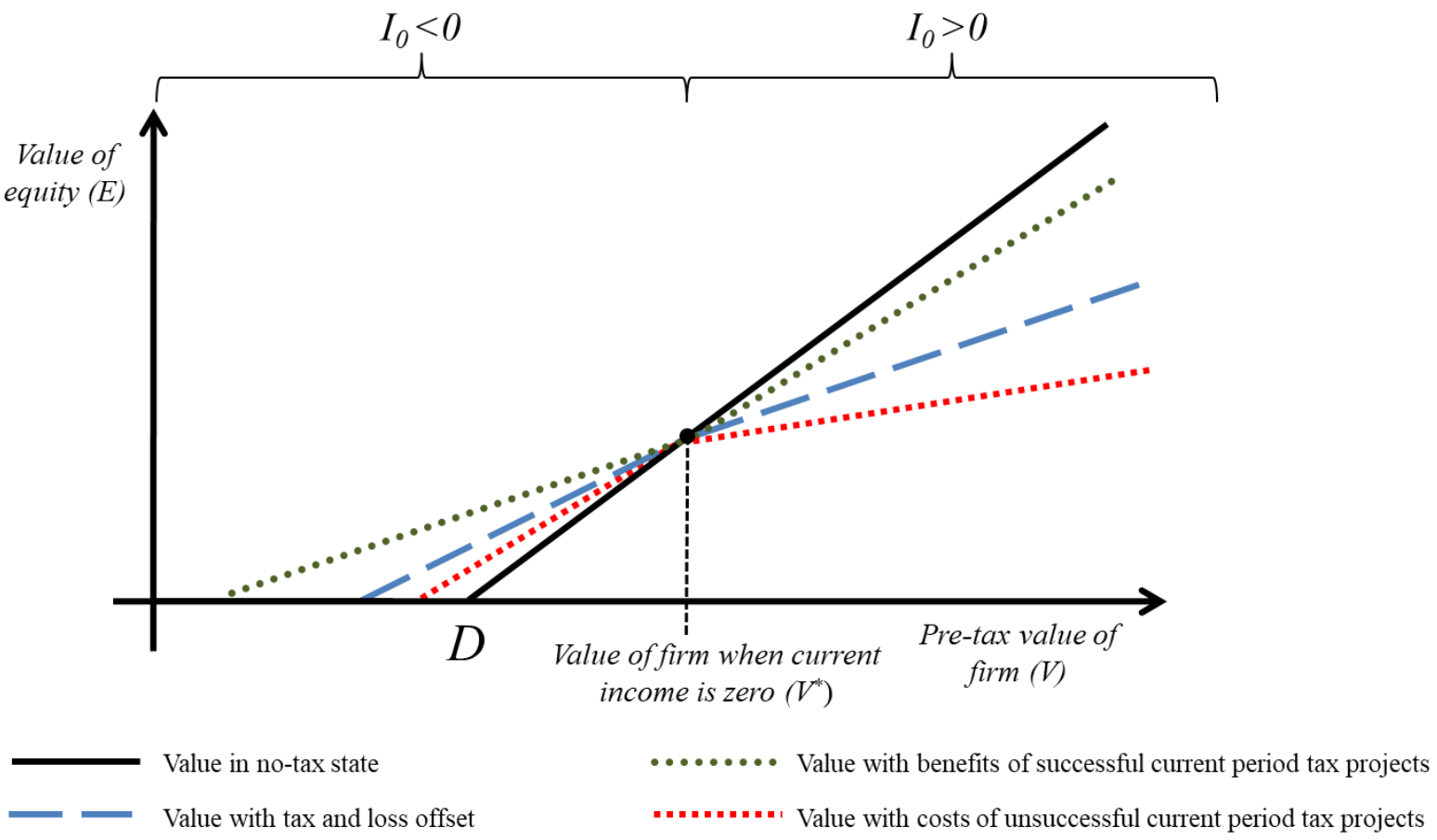


Figure 2 Incremental Payoff to Equity Holders from Current Year Tax Activities

Table 1 Univariate Descriptive Statistics

| Variable | n | Mean | Q1 | Median | Q3 | Std Dev |
|---|---|---|---|---|---|---|
| *UTBend* | 13,360 | 1.3395 | 0.1354 | 0.6122 | 1.6030 | 2.0355 |
| *UTBadd* | 13,360 | 0.1569 | 0.0000 | 0.0426 | 0.1787 | 0.2860 |
| *FinDistress* | 13,360 | 0.1987 | 0.0000 | 0.0000 | 0.0000 | 0.3990 |
| *Growth* | 13,360 | 0.1987 | 0.0000 | 0.0000 | 0.0000 | 0.3990 |
| *Loss* | 13,360 | 0.3332 | 0.0000 | 0.0000 | 1.0000 | 0.4714 |
| *Z-Score* | 13,360 | 3.8878 | 1.7372 | 3.2040 | 5.2207 | 6.0941 |
| *MtB* | 13,360 | 3.0825 | 1.2954 | 2.2310 | 3.8094 | 5.6016 |
| *ROA* | 13,360 | -0.0131 | -0.0445 | 0.0465 | 0.1042 | 0.2291 |
| *Age* | 13,360 | 24.3617 | 13.0000 | 19.0000 | 31.0000 | 16.1492 |
| *Size* | 13,360 | 6.5929 | 5.1446 | 6.5246 | 8.0225 | 2.0330 |
| *Big4* | 13,360 | 0.7908 | 1.0000 | 1.0000 | 1.0000 | 0.4068 |
| *ForeignInc* | 13,360 | 0.0152 | 0.0000 | 0.0009 | 0.0351 | 0.0741 |
| *R&D* | 13,360 | 0.6158 | 0.0074 | 0.0397 | 0.1455 | 3.3174 |
| *Intang* | 13,360 | 0.2077 | 0.0290 | 0.1461 | 0.3406 | 0.2045 |
| *Leverage* | 13,360 | 0.1697 | 0.0000 | 0.1213 | 0.2692 | 0.1911 |
| *CDebt* | 13,360 | 0.0323 | 0.0000 | 0.0053 | 0.0324 | 0.0663 |
| *STDROA* | 13,360 | 0.1505 | 0.0204 | 0.0470 | 0.1230 | 0.3815 |

All variables are winsorized at the 1 percentile and 99 percentile levels. Appendix A contains complete variable definitions.

Table 2 Pearson Correlation Coefficients

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** *UTBend* | 1.00 | | | | | | | | | | | | | | |
| **2** *UTBadd* | 0.57 | 1.00 | | | | | | | | | | | | | |
| **3** *FinDistress* | 0.16 | 0.00 | 1.00 | | | | | | | | | | | | |
| **4** *Growth* | 0.04 | 0.10 | -0.02 | 1.00 | | | | | | | | | | | |
| **5** *Loss* | 0.13 | 0.02 | 0.39 | -0.01 | 1.00 | | | | | | | | | | |
| **6** *ROA* | -0.15 | -0.04 | -0.40 | 0.03 | -0.69 | 1.00 | | | | | | | | | |
| **7** *Age* | -0.02 | -0.04 | -0.15 | -0.06 | -0.26 | 0.24 | 1.00 | | | | | | | | |
| **8** *Size* | -0.01 | 0.09 | -0.27 | 0.01 | -0.42 | 0.43 | 0.42 | 1.00 | | | | | | | |
| **9** *Big4* | 0.06 | 0.11 | -0.14 | 0.05 | -0.17 | 0.17 | 0.10 | 0.50 | 1.00 | | | | | | |
| **10** *ForeignInc* | 0.06 | 0.09 | -0.18 | 0.02 | -0.36 | 0.35 | 0.18 | 0.28 | 0.10 | 1.00 | | | | | |
| **11** *R&D* | 0.03 | 0.01 | 0.10 | 0.04 | 0.24 | -0.45 | -0.12 | -0.20 | -0.08 | -0.12 | 1.00 | | | | |
| **12** *Intang* | -0.05 | -0.03 | -0.07 | -0.07 | -0.13 | 0.14 | 0.06 | 0.29 | 0.11 | 0.10 | -0.11 | 1.00 | | | |
| **13** *Leverage* | -0.02 | -0.02 | 0.18 | 0.05 | 0.00 | -0.03 | 0.08 | 0.32 | 0.17 | 0.01 | -0.06 | 0.23 | 1.00 | | |
| **14** *CDebt* | -0.01 | -0.03 | 0.20 | -0.02 | 0.12 | -0.14 | -0.04 | -0.06 | -0.10 | -0.07 | -0.02 | -0.06 | 0.00 | 1.00 | |
| **15** *STDROA* | 0.04 | 0.04 | 0.12 | 0.04 | 0.16 | -0.23 | -0.22 | -0.20 | -0.08 | -0.09 | 0.16 | -0.09 | -0.04 | 0.03 | 1.00 |

Coefficients with an absolute value greater than 0.02 are significant at the 5% level or better. All continuous variables are winsorized at the 1 percentile and 99 percentile levels. Appendix A contains complete variable definitions.

Table 3 Ex Ante Firm Characteristics and Uncertain Tax Activities

| | | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dependent Variable:** | | *UTBend* | | *UTBadd* | | *UTBend* | | *UTBadd* | | *UTBend* | | *UTBadd* | |
| | **Pred** | **Coefficient** | | **Coefficient** | | **Coefficient** | | **Coefficient** | | **Coefficient** | | **Coefficient** | |
| **Variable** | **Sign** | **(Std Error)** | | **(Std Error)** | | **(Std Error)** | | **(Std Error)** | | **(Std Error)** | | **(Std Error)** | |
| *FinDistress* | ( + ) | 0.8395 | *** | 0.0200 | ** | | | | | 0.8440 | *** | 0.0213 | ** |
| | | *(0.1126)* | | *(0.0097)* | | | | | | *(0.1126)* | | *(0.0096)* | |
| *Growth* | ( + ) | | | | | 0.2058 | *** | 0.0656 | *** | 0.2191 | *** | 0.0659 | *** |
| | | | | | | *(0.0715)* | | *(0.0096)* | | *(0.0702)* | | *(0.0096)* | |
| *ROA* | | (1.6015) | *** | (0.1269) | *** | (2.0852) | *** | (0.1472) | *** | (1.6306) | *** | (0.1357) | *** |
| | | (0.2075) | | (0.0242) | | *(0.2208)* | | (0.0242) | | (0.2101) | | (0.0243) | |
| *Age* | | (0.0019) | | (0.0015) | *** | (0.0015) | | (0.0014) | *** | (0.0014) | | (0.0014) | *** |
| | | *(0.0022)* | | *(0.0003)* | | *(0.0022)* | | *(0.0003)* | | *(0.0022)* | | *(0.0003)* | |
| *Size* | | 0.1040 | *** | 0.0236 | *** | 0.0694 | *** | 0.0227 | *** | 0.1039 | *** | 0.0236 | *** |
| | | *(0.0269)* | | *(0.0031)* | | *(0.0267)* | | *(0.0031)* | | *(0.0268)* | | *(0.0031)* | |
| *Big4* | | 0.3390 | *** | 0.0498 | *** | 0.3263 | *** | 0.0470 | *** | 0.3302 | *** | 0.0471 | *** |
| | | *(0.0998)* | | *(0.0106)* | | *(0.1019)* | | *(0.0106)* | | *(0.0999)* | | *(0.0106)* | |
| *ForeignInc* | | 2.9018 | *** | 0.3309 | *** | 2.8256 | *** | 0.3239 | *** | 2.8832 | *** | 0.3253 | *** |
| | | *(0.4775)* | | *(0.0729)* | | *(0.4828)* | | *(0.0717)* | | *(0.4746)* | | *(0.0717)* | |
| *R&D* | | (0.0313) | ** | (0.0018) | | (0.0379) | *** | (0.0024) | | (0.0329) | ** | (0.0023) | |
| | | *(0.0138)* | | *(0.0015)* | | *(0.0139)* | | *(0.0015)* | | *(0.0139)* | | *(0.0015)* | |
| *Intang* | | (0.6331) | *** | (0.1022) | *** | (0.6103) | *** | (0.0895) | *** | (0.5891) | *** | (0.0890) | *** |
| | | *(0.1670)* | | *(0.0198)* | | *(0.1704)* | | *(0.0194)* | | *(0.1681)* | | *(0.0194)* | |
| *Leverage* | | (0.7569) | *** | (0.0976) | *** | (0.3500) | | (0.0984) | *** | (0.7969) | *** | (0.1097) | *** |
| | | *(0.2425)* | | *(0.0278)* | | *(0.2407)* | | *(0.0280)* | | *(0.2451)* | | *(0.0279)* | |
| *CDebt* | | (1.7712) | *** | (0.1319) | ** | (1.0400) | ** | (0.1110) | ** | (1.7626) | *** | (0.1293) | *** |
| | | *(0.4822)* | | *(0.0521)* | | *(0.4649)* | | *(0.0507)* | | *(0.4817)* | | *(0.0513)* | |
| *STDROA* | | 0.0106 | | 0.0182 | * | 0.0257 | | 0.0161 | | 0.0014 | | 0.0155 | |
| | | *(0.0747)* | | *(0.0102)* | | *(0.0750)* | | *(0.0101)* | | *(0.0750)* | | *(0.0101)* | |
| Intercept | | 0.1237 | | 0.0020 | | 0.3228 | | 0.0034 | | 0.1107 | | (0.0019) | |
| | | *(0.6040)* | | *(0.0849)* | | *(0.6297)* | | *(0.0855)* | | *(0.6040)* | | *(0.0849)* | |
| *Year Fixed Effects* | | YES | | YES | | YES | | YES | | YES | | YES | |
| *Industry Fixed Effects* | | YES | | YES | | YES | | YES | | YES | | YES | |
| *Adjusted* $R^2$ | | 0.09 | | 0.06 | | 0.07 | | 0.07 | | 0.09 | | 0.07 | |
| *Observations* | | 13,360 | | 13,360 | | 13,360 | | 13,360 | | 13,360 | | 13,360 | |

All variables are winsorized at the 1 percentile and 99 percentile levels. Significance levels at the p < 0.10, 0.05, and 0.01 levels are indicated by *, **, and *** respectively (one-tailed where a prediction is made and two-tailed for all other variables). All models cluster standard errors by firm. Appendix A contains complete variable definitions.

Table 4 Current Year Income and Contemporaneous Uncertain Tax Activities

| | | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|---|
| **Dependent Variable:** | | *UTBadd* | | *UTBadd* | | *UTBadd* | |
| **Sample:** | | *Only Profit Firms* | | *Only Loss Firms* | | *Full Sample* | |
| | **Pred** | **Coefficient** | | **Coefficient** | | **Coefficient** | |
| **Variable** | **Sign** | **(Std Error)** | | **(Std Error)** | | **(Std Error)** | |
| *Loss* | ( + ) | | | | | 0.0419 | *** |
| | | | | | | *(0.0080)* | |
| *ROA* | ( + / - ) | 0.1121 | ** | (0.1284) | *** | | |
| | | (0.0666) | | *(0.0330)* | | | |
| *Age* | | (0.0011) | *** | (0.0017) | *** | (0.0013) | *** |
| | | (0.0003) | | (0.0005) | | (0.0003) | |
| *Size* | | 0.0194 | *** | 0.0202 | *** | 0.0219 | *** |
| | | *(0.0034)* | | *(0.0051)* | | *(0.0031)* | |
| *Big4* | | 0.0313 | *** | 0.0683 | *** | 0.0487 | *** |
| | | *(0.0118)* | | *(0.0168)* | | *(0.0106)* | |
| *ForeignInc* | | 0.9939 | *** | (0.0581) | | 0.3063 | *** |
| | | *(0.1204)* | | *(0.0852)* | | *(0.0724)* | |
| *R&D* | | 0.0230 | | (0.0032) | ** | 0.0001 | |
| | | *(0.0232)* | | *(0.0016)* | | *(0.0014)* | |
| *Intang* | | (0.0667) | *** | (0.0900) | *** | (0.0894) | *** |
| | | *(0.0214)* | | *(0.0302)* | | *(0.0194)* | |
| *Leverage* | | (0.1307) | *** | (0.0397) | | (0.0992) | *** |
| | | *(0.0332)* | | *(0.0405)* | | *(0.0280)* | |
| *CDebt* | | (0.1365) | ** | (0.1075) | | (0.1084) | *** |
| | | *(0.0568)* | | *(0.0766)* | | *(0.0511)* | |
| *STDROA* | | (0.0022) | | 0.0286 | | 0.0206 | ** |
| | | *(0.0087)* | | *(0.0177)* | | *(0.0105)* | |
| *FinDistress* | ( + ) | 0.0219 | * | 0.0155 | | 0.0265 | *** |
| | | *(0.0126)* | | *(0.0131)* | | *(0.0098)* | |
| *Growth* | ( + ) | 0.0485 | *** | 0.0553 | *** | 0.0635 | *** |
| | | *(0.0108)* | | *(0.0172)* | | *(0.0095)* | |
| Intercept | | (0.0027) | | (0.1080) | ** | (0.0093) | |
| | | *(0.0700)* | | *(0.0453)* | | *(0.0831)* | |
| *Year Fixed Effects* | | YES | | YES | | YES | |
| *Industry Fixed Effects* | | YES | | YES | | YES | |
| *Adjusted* $R^2$ | | 0.12 | | 0.05 | | 0.06 | |
| *Observations* | | 8,908 | | 4,452 | | 13,360 | |

All variables are winsorized at the 1 percentile and 99 percentile levels. Significance levels at the p < 0.10, 0.05, and 0.01 levels are indicated by *, **, and *** respectively (one-tailed where a prediction is made and two-tailed for all other variables). All models cluster standard errors by firm. Appendix A contains complete variable definitions.

Table 5 Age, Ownership, Debt, and Uncertain Tax Activities

| **Dependent Variable:** | | (1) *UTBadd* | | (2) *UTBadd* | | (3) *UTBadd* | | (4) *UTBadd* | |
|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **Pred Sign** | **Coefficient (Std Error)** | | **Coefficient (Std Error)** | | **Coefficient (Std Error)** | | **Coefficient (Std Error)** | |
| *HighDebt* | | (0.0448) | *** | (0.0324) | *** | (0.0263) | *** | (0.0302) | *** |
| | | *(0.0108)* | | *(0.0107)* | | *(0.0142)* | | *(0.0131)* | |
| *Old* | | (0.0377) | *** | | | | | | |
| | | *(0.0109)* | | | | | | | |
| *Old*HighDebt* | | 0.0018 | | | | | | | |
| | | *(0.0212)* | | | | | | | |
| *Young* | | | | 0.0472 | *** | | | | |
| | | | | *(0.0129)* | | | | | |
| *Young*HighDebt* | ( - ) | | | (0.0537) | *** | | | | |
| | | | | *(0.0203)* | | | | | |
| *HighOwn* | | | | | | 0.0186 | | | |
| | | | | | | *(0.0149)* | | | |
| *HighOwn*HighDebt* | ( - ) | | | | | (0.0434) | ** | | |
| | | | | | | *(0.0261)* | | | |
| *LowOwn* | | | | | | | | 0.0161 | |
| | | | | | | | | *(0.0154)* | |
| *LowOwn*HighDebt* | | | | | | | | (0.0113) | |
| | | | | | | | | *(0.0318)* | |
| *Controls* | | YES | | YES | | YES | | YES | |
| *Year Fixed Effects* | | YES | | YES | | YES | | YES | |
| *Industry Fixed Effects* | | YES | | YES | | YES | | YES | |
| *Adjusted* $R^2$ | | 0.06 | | 0.06 | | 0.10 | | 0.10 | |
| *Observations* | | 13,360 | | 13,360 | | 6,431 | | 6,431 | |

All variables are winsorized at the 1 percentile and 99 percentile levels. Significance levels at the $p < 0.10$, 0.05, and 0.01 levels are indicated by *, **, and *** respectively (one-tailed where a prediction is made and two-tailed for all other variables). All models cluster standard errors by firm. Appendix A contains complete variable definitions.

Table 6 Low Debt Firms and Uncertain Tax Activities

| **Dependent Variable:** | | (1) *UTBadd* | | (2) *UTBadd* | | (3) *UTBadd* | |
|---|---|---|---|---|---|---|---|
| **Variable** | **Pred Sign** | **Coefficient (Std Error)** | | **Coefficient (Std Error)** | | **Coefficient (Std Error)** | |
| *FinDistress* | ( + ) | 0.0357 | *** | | | | |
| | | *(0.0109)* | | | | | |
| *Growth* | ( + ) | | | 0.0682 | *** | | |
| | | | | *(0.0101)* | | | |
| *Loss* | ( + ) | | | | | 0.0545 | *** |
| | | | | | | *(0.0090)* | |
| *LowDebt* | | 0.0503 | *** | 0.0471 | *** | 0.0603 | *** |
| | | *(0.0116)* | | *(0.0113)* | | *(0.0133)* | |
| *FinDistress*LowDebt* | ( - ) | (0.0380) | * | | | | |
| | | *(0.0256)* | | | | | |
| *Growth*LowDebt* | ( - ) | | | (0.0388) | ** | | |
| | | | | *(0.0231)* | | | |
| *Loss*LowDebt* | ( - ) | | | | | (0.0445) | ** |
| | | | | | | *(0.0196)* | |
| *Controls* | | YES | | YES | | YES | |
| *Year Fixed Effects* | | YES | | YES | | YES | |
| *Industry Fixed Effects* | | YES | | YES | | YES | |
| *Adjusted* $R^2$ | | 0.05 | | 0.06 | | 0.06 | |
| *Observations* | | 13,360 | | 13,360 | | 13,360 | |

All variables are winsorized at the 1 percentile and 99 percentile levels. Significance levels at the p < 0.10, 0.05, and 0.01 levels are indicated by *, **, and *** respectively (one-tailed where a prediction is made and two-tailed for all other variables). All models cluster standard errors by firm. Appendix A contains complete variable definitions.

Table 7 Differential Costs and Uncertain Tax Activities

| | | (1) | | (2) | | (3) |
|---|---|---|---|---|---|---|
| **Dependent Variable:** | | *UTBadd* | | *UTBadd* | | *UTBadd* |
| **Sample:** | | *Full Sample* | | *Full Sample* | | *Only Loss Firms* |
| **Variable** | **Pred Sign** | **Coefficient (Std Error)** | | **Coefficient (Std Error)** | | **Coefficient (Std Error)** |
| *Loss* | ( + ) | 0.0419 | *** | 0.0394 | *** | |
| | | *(0.0080)* | | *(0.0085)* | | |
| *Loss*NOLCB* | Not Significant | | | 0.0106 | | |
| | | | | *(0.0162)* | | |
| *NOLCB* | Not Significant | | | | | (0.0047) |
| | | | | | | *(0.0152)* |
| *Controls* | | YES | | YES | | YES |
| *Year Fixed Effects* | | YES | | YES | | YES |
| *Industry Fixed Effects* | | YES | | YES | | YES |
| *Adjusted* $R^2$ | | 0.06 | | 0.06 | | 0.05 |
| *Observations* | | 13,360 | | 13,360 | | 4,452 |

All variables are winsorized at the 1 percentile and 99 percentile levels. Significance levels at the p < 0.10, 0.05, and 0.01 levels are indicated by *, **, and *** respectively (one-tailed where a prediction is made and two-tailed for all other variables). All models cluster standard errors by firm. Appendix A contains complete variable definitions.

Table 8 Asset Substitution Incentives and Tax Conformity Measure of Uncertainty

| **Dependent Variable:** | | (1) *STDHS* | | (2) *STDHS* | | (3) *STDHS* | | (4) *STDHS* | |
|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **Pred Sign** | **Coefficient (Std Error)** | | **Coefficient (Std Error)** | | **Coefficient (Std Error)** | | **Coefficient (Std Error)** | |
| *FinDistress* | ( + ) | 0.0033 | *** | | | 0.0035 | *** | 0.0048 | *** |
| | | *(0.0006)* | | | | *(0.0006)* | | *(0.0006)* | |
| *Growth* | ( + ) | | | 0.0058 | *** | 0.0060 | *** | 0.0042 | *** |
| | | | | *(0.0005)* | | *(0.0005)* | | *(0.0005)* | |
| *Loss* | ( + ) | | | | | | | 0.0082 | *** |
| | | | | | | | | *(0.0005)* | |
| *Controls* | | YES | | YES | | YES | | YES | |
| *Year Fixed Effects* | | YES | | YES | | YES | | YES | |
| *Industry Fixed Effects* | | YES | | YES | | YES | | YES | |
| *Adjusted* $R^2$ | | 0.33 | | 0.34 | | 0.34 | | 0.31 | |
| *Observations* | | 21,578 | | 21,578 | | 21,578 | | 21,578 | |

All variables are winsorized at the 1 percentile and 99 percentile levels. Significance levels at the $p < 0.10$, 0.05, and 0.01 levels are indicated by *, **, and *** respectively (one-tailed where a prediction is made and two-tailed for all other variables). All models cluster standard errors by firm. Appendix A contains complete variable definitions.

# APPENDIX A. VARIABLE DEFINITIONS

| Variable | Definition and Construction Details |
|---|---|
| Uncertain Tax Measures | |
| *UTBadd* | The additions to the tax reserve for uncertain tax benefits relating to positions adopted in the current year scaled by assets and multiplied by 100, consistent with Dyreng, Hanlon, and Maydew (2018) for interpretability. |
| *UTBend* | The total tax reserve for uncertain tax benefits scaled by total assets and multiplied by 100 for comparability. |
| Variables of Interest, Control Variables, & Robustness Variables | |
| *FinDistress* | An indicator variable equal to one if the firm's lagged Altman (1968) Z-Score is within the bottom quintile among each industry and year; zero otherwise. |
| *Growth* | An indicator variable equal to one if the firm's lagged market-to-book ratio is within the top quintile among each industry and year; zero otherwise. |
| *Loss* | An indicator variable equal to one if the firm's pre-tax income is negative year; zero otherwise. |
| *Z-Score* | The Altman (1968) bankruptcy prediction score, lagged by one year. |
| *MtB* | The market value of equity divided by the book value of equity, lagged by one year. |
| *ROA* | The ratio of pre-tax income to total assets. |
| *Age* | The firm's age in years. |
| *Size* | The natural logarithm of total assets. |
| *Big4* | An indicator variable equal to one if the firm is audited by a Big Four accounting firm. |
| *ForeignInc* | The ratio of a firm's foreign income to sales. Missing values for foreign income are set equal to zero. |
| *R&D* | The ratio of research and development expenses to sales. |
| *Intang* | The ratio of intangible assets to total assets. |
| *Leverage* | The ratio of long-term debt to total assets, lagged by one year. |
| *CDebt* | The ratio of current debt to total assets, lagged by one year. |
| *STDROA* | The standard deviation of the firm's return on assets over the prior three years. |
| *HighDebt* | An indicator variable equal to one if the ratio of firm's lagged current and long-term debt to total assets is within the top quintile among each industry and year; zero otherwise. |

| | |
|---|---|
| *LowDebt* | An indicator variable equal to one if the ratio of firm's lagged current and long-term debt to total assets is within the bottom quintile among each industry and year; zero otherwise. |
| *Old* | An indicator variable equal to one if the firm's age is in the top quintile among each industry and year. |
| *Young* | An indicator variable equal to one if the firm's age is in the bottom quintile among each industry and year. |
| *LowOwn* | An indicator variable equal to one if the percentage of shares owned by the CEO is within the bottom quintile among each year; zero otherwise. |
| *HighOwn* | An indicator variable equal to one if the percentage of shares owned by the CEO is within the top quintile among each year; zero otherwise. |
| *NOLCB* | An indicator variable equal to one if the firm is a loss firm and has negative tax paid; zero otherwise. |
| *STDHS* | The standard deviation of the firm's cash tax non-conformity (Δ) scaled by the book value of assets. Adapted from Henry and Sansing (2018). |

# APPENDIX B. FIN 48 EXAMPLE AND JOURNAL ENTRIES

Consider a firm engaged in domestic manufacturing that is eligible for the Domestic Production Activities Deduction under IRC Section 199 (expired after 2017). The domestic production activities deduction provides an additional 9% deduction (2016) for "Qualified Production Activities Income" (QPAI). This additional deduction is recognized for tax purposes but not for GAAP purposes. Assume that two firms (Corporation A and Corporation B) have different levels of risk associated with the structure of the expenses classified as domestic and that arranging these expenses to be potentially eligible is costly for the firm. Also, assume for comparability that each firm has a 35% marginal tax rate for federal purposes.

**Corporation A** is unsure whether $20,000,000 of its qualified activities production income qualifies under the Treasury Regulations and IRC Section 199.

This results in potential tax exposure of $630,000 (20,000,000 * 9% * 35%), which is included as a financial statement benefit unless a tax reserve is established.

**Corporation B** is unsure if $15,000,000 of its qualified activities production income qualifies under the Treasury Regulations and IRC Section 199.

This results in potential tax exposure of $472,500 (15,000,000 * 9% * 35%), which is also included as a financial statement benefit unless a tax reserve is established.

The firms must evaluate each position separately using the two-step process outlined in FIN 48: (1) Recognition and (2) Measurement.

**Corporation A**

**Step 1 (Recognition):** Based on the position's technical merits and applicable law, the firm determines that this position has a less than 50% chance of being sustained upon examination by the tax authorities, meaning that it fails the MLTN threshold.

**Step 2 (Measurement):** Since the position fails the MLTN threshold, the firm should recognize no benefit on the financial statements for the associated tax exposure and should establish a tax reserve for 100% of the exposure of $630,000 by making the following journal entry:

| Account | Debit | Credit |
|---|---|---|
| Tax Expense | 630,000 | |
| Tax Reserve (Liability) | | (630,000) |

**Corporation B**

**Step 1 (Recognition):** Based on the position's technical merits and applicable law, the firm determines that this position has a 60% probability of being sustained upon examination by the tax authorities, meaning that it meets the MLTN threshold.

**Step 2 (Measurement):** In this case, since the position does meet the MLTN threshold, the firm should recognize both a financial statement benefit and a tax reserve liability. The benefit should be "the largest amount of tax benefit that is greater than 50% likely of being realized upon effective settlement with a taxing authority." Both the probability that the position will be sustained as well as the amount that will be sustained should be considered in this analysis. The firm will analyze these positions by considering the cumulative probability of the position being sustained as below:

| QPAI Amount Sustained | Potential Tax Benefit Anticipated After Settlement (QPAI * 9% * 35%) | Probability of Being Realized (Individual-Level) | Cumulative Probability of Being Realized |
|---|---|---|---|
| 15,000,000 | 472,500 | 0% | 0% |
| 12,000,000 | 378,000 | 20% | 20% |
| 11,500,000 | 362,250 | 15% | 35% |
| **9,000,000** | **283,500** | **25%** | **60%** |
| 4,000,000 | 126,000 | 40% | 100% |

The firm looks for the highest amount with a cumulative greater than 50% probability of being sustained to determine the amount of financial statement benefit it can claim. In this case, the firm can claim $283,500 of financial statement benefit, meaning that the remainder of the $472,500 total potential benefit must be established as a tax reserve (472,500 – 283,500 = 189,000). The $189,000 of remaining exposure should be recorded using the following journal entry:

| Account | Debit | Credit |
|---|---|---|
| Tax Expense | 189,000 | |
| Tax Reserve (Liability) | | (189,000) |

In both cases, the tax reserve account and tax expense account should be reversed if the statute of limitation expires, the MLTN threshold is met, or the position is otherwise settled through tax authority examination or litigation. The firm should monitor the positions annually and analyze both the MLTN test as well as the probability of sustaining particular amounts of QPAI to evaluate the position if it does meet the MLTN threshold in subsequent periods due to changes in tax law or facts.

# APPENDIX C. EXAMPLE OF RISK-SHIFTING FROM UNCERTAIN TAX PROJECTS

A firm has an expected pre-tax value of $200 (million) and an expected after-tax value of $130. Of this $130 value, $125 is the face value of debt, and $5 is the value of equity. The firm is considering adopting two different tax projects with different levels of uncertainty. Both projects have a two-point distribution (a, b), based on whether or not the project is successful.

| | |
|---|---|
| **Tax Project 1:** | (a) Generates tax savings of $10 (present value) with a probability of 60%. |
| (Less Uncertain) | (b) Generates costs of $5 (present value) with a probability of 40%. |
| **Tax Project 2:** | (a) Generates tax savings of $25 (present value) with a probability of 40%. |
| (More Uncertain) | (b) Generates costs of $10 (present value) with a probability of 60%. |

The expected tax savings to the firm from each of these tax projects is $4, but the variance of the payoffs from Project 2 is higher. Only Project 2 would require an addition to the UTB balance in the tax disclosures, given the two-point distribution.

The expected payoffs from each of the projects are as follows:

| | | |
|---|---|---|
| **Tax Project 1:** | Expected value of equity: $9 | [($15 * .6) + ($0 * .4)] |
| | Expected value of debt: $125 | [($125 * .6) + ($125 * .4)] |
| **Tax Project 2:** | Expected value of equity: $12 | [($30 * .4) + ($0 * .6)] |
| | Expected value of debt: $122 | [($125 * .4) + ($120 * .6)] |

In both cases, the expected value of the firm after adopting the tax project is $134, illustrating that the distribution of Project 2 is a mean-preserving spread of Project 1. In the absence of any risk-shifting incentives, the firm should prefer Project 1 as it has the same mean with a lower variance. However, the more uncertain project, Project 2, allows the equity holders of the firm to realize a higher expected payoff by shifting risk associated with the more uncertain tax project to the debt holders of the firm, which means the equity holders should prefer this project. In both cases, the government bears risk, since it must examine and overturn either position to keep the firm from reaping the benefits of the tax project. The government bears more risk in the case of Project 2, since it has a lower probability of being sustained upon examination and a higher potential payoff for the firm.

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