Does the Diversification of Tax Strategies Affect Tax Risk?

Kimberly S. Krieg
kkrieg@sandiego.edu

University of San Diego School of Business

October 2020

Abstract: I investigate the effect that the number of different tax strategies employed by a firm has on the relation between measures of corporate tax avoidance and measures of risk. Prior studies have generally failed to find a relation between measures of overall firm risk and measures of corporate tax avoidance. One possible reason for this empirical result is the failure to consider the role that the diversification of tax risk, through utilization of a portfolio of different tax avoidance strategies, might have on reducing tax risk and, as a result, on reducing overall firm risk. I create a broad measure of diversification based on five sources of tax benefits. Controlling for the level of tax avoidance, I regress measures of risk on diversification and an interaction term and find that diversification reduces tax risk and reduces the effect of tax avoidance on tax risk. However, while I do find that diversification is associated with a reduction in overall firm risk, this effect is separate from the effects of tax avoidance on risk. Consistent with prior literature, I fail to find a relation between overall firm risk and tax avoidance.

JEL Classifications: H25, H32, M41, M48

Keywords: tax risk; tax avoidance; corporate taxation; effective tax rates

Data Availability: Data are available from the public sources cited in the text.

This paper is based on my dissertation completed at the University of Oregon. I am grateful to the members of my dissertation committee, David Guenther (co-chair), Ryan Wilson (co-chair), Angela Davis, and Wesley Wilson. I also thank Claire Quinto, Brian Williams, and Kaishu Wu, as well as workshop participants at California State University Fullerton, Loyola Marymount University, San Jose State University, Texas Christian University, University of North Texas, University of Oregon, and University of San Diego for helpful comments.

Does the Diversification of Tax Strategies Affect Tax Risk?

I. Introduction

Prior studies have generally failed to find a relation between measures of overall firm risk (such as stock return volatility) and measures of corporate tax avoidance (such as low effective tax rates). I propose that one reason for this mixed evidence is that as firms engage in more tax avoidance, they add additional tax strategies, which has the effect of diversifying their tax planning.[1] Drawing on portfolio theory, diversification reduces the overall risk of the portfolio without reducing the expected return. If one considers tax planning as an overall portfolio of tax strategies, adding additional tax strategies increases the diversification and, depending on the covariance of the payoffs from the different strategies, may reduce overall tax risk. Thus, in this paper I investigate whether the diversification of tax strategies affects tax risk and, as a result, overall firm risk.[2]

A significant focus of recent tax accounting research is to explain variations in corporate tax avoidance, and why some firms are able to exhibit lower effective tax rates (ETRs) than others. A number of studies show that this variation can be partially explained by firm characteristics such as size, ownership structure, corporate governance, and subsidiary locations (Zimmerman 1983; Chen, Chen, Cheng, and Shevlin 2010; Desai, Dyck, and Zingales 2007; Dyreng and Lindsey 2009). Others have reasoned that certain types of tax avoidance are more aggressive and riskier. Lisowsky, Robinson, and Schmidt (2013) describe tax avoidance as a

[1] I define a "tax strategy" as a specific plan to reduce the amount of income tax otherwise owed. I define the broader term "tax planning" as the overall goal to reduce the amount of income tax owed, composed of one or more specific tax strategies.

[2] In finance, diversification is the process of allocating capital in one's portfolio to a mix of different investments in a way that reduces exposure to any one particular asset, thereby reducing overall risk. Thus, by this technical definition, diversification means a reduction in risk. However, in applying this concept to a tax avoidance setting, I use a more general definition of the term, an increase in the number of items or strategies. Thus, I consider the effect of the diversification of tax strategies on tax risk to be an empirical question.

continuum ranging from perfectly legitimate, to more aggressive permanent book-tax differences, to the most aggressive tax positions, such as tax sheltering.[3] Thus, more tax avoidance could suggest a firm's willingness to accept more risk. Building on agency theory and the assumption that managers are risk-averse, several studies suggest that this managerial aversion to risk drives variations in the level of tax avoidance (Chen and Chu 2005; Rego and Wilson 2012; Bardertscher, Katz, and Rego 2013; Graham, Hanlon, Shevlin, and Shroff 2014).

Consistent with this idea that there are risks associated with tax avoidance, the practitioner literature has focused on the importance of tax risk management (Arlinghaus 1998; Goodman 2004). Along with other firm-specific risks, managers regularly discuss tax-related risks and plans to address these risks as part of their annual SEC filings. Tax risk is also increasingly discussed with revenue authorities worldwide, leading Big 4 accounting firms to publish guides on the importance of managing tax risk (PricewaterhouseCoopers 2004).

However, despite this practitioner focus on reducing tax risk, it has been difficult for researchers to identify a relation between tax avoidance and risk. The literature finds that some firms are able to sustain tax avoidance in the long run (Dyreng, Hanlon, and Maydew 2008) and that higher levels of tax avoidance do not necessarily result in higher risk (Guenther, Matsunaga, and Williams 2017; Guenther, Wilson, and Wu 2019). Wilde and Wilson (2018) summarize academic research on corporate tax planning and point out our limited understanding of how these two concepts of tax avoidance and tax risk are associated. One possible reason for this empirical result is the failure to consider the role that the diversification of tax risk, through utilization of a portfolio of different tax avoidance strategies, might have on reducing tax risk

[3] As Lisowsky et al. (2013) describe, tax sheltering is composed of tax positions that have little or no business purpose, but generate tax benefits that the tax authority will most likely disallow. Thus, these tax positions have the weakest facts and the highest amount of uncertainty.

and, as a result, on reducing overall firm risk. Thus, I investigate the effect that the number of different tax strategies employed by a public company has on the relation between measures of corporate tax avoidance and measures of risk.

As described by Dyreng, Hanlon, and Maydew (2019), a precise definition of tax risk is not yet agreed upon in the tax literature, but the concepts of risk, uncertainty, and aggressiveness, with regard to tax, are related. Prior researchers have focused on the uncertainty of whether a firm will have to repay tax savings in the future (Dyreng et al. 2019; Hanlon, Maydew, and Saavedra 2018; Bauer and Klassen 2014) and uncertainty regarding a firm's future tax payments (Guenther et al. 2017). Neuman, Omer, and Schmidt (2020) draw on broad definitions of risk and define tax risk as "the uncertainty about future tax outcomes generated by current actions or activities, or the failure to take actions or pursue activities." Drake, Lusch, and Stekelberg (2017) focus on a more classical finance definition and define tax risk as "the dispersion of potential outcomes from tax avoidance."

Drawing on this, for purposes of my study, I define tax risk as the likelihood that the tax outcome differs from what is expected. In other words, the actual amount of tax ultimately avoided (after audits by the tax authorities, or the expiration of the statute of limitations) is different from what was planned. This results from the dispersion of potential outcomes or payoffs from a tax avoidance strategy due to, for example, uncertainty in the application of tax law, uncertainty over the facts of a situation, uncertainty over how well a firm's accounting system arrives at the tax result, and uncertainty over whether a tax action will subject the firm to adverse attention. Consistent with this view, I measure tax risk as the dispersion, or variance, of tax outcomes from particular tax strategies, using the volatility of future cash effective tax rates

(ETRs) over five years.[4] As an indirect way to capture tax risk, I also use firm risk, defined as the standard deviation of monthly stock returns over the subsequent year.

While I am interested in the diversification of tax strategies, empirically I cannot observe which specific tax strategies managers employ in their tax planning. Thus, I create a measure of diversification that uses broad categories of book-tax differences (BTDs) as the sources of tax benefits. While each broad category may have tens or hundreds of underlying and unobservable individual tax positions, to the extent that a firm has more diverse broad categories of tax avoidance, it follows that the firm has more diverse underlying tax strategies. Despite measuring diversification at this relatively high level, I still find significant variation in the extent to which firms rely on a different categories of tax avoidance. Finally, if I could observe the underlying individual tax positions, it is likely that many would be highly correlated, and thus diversification may not have as great of an effect on tax risk. However, by using broader categories to measure diversification, it is less likely that each broad category is highly correlated.

To create these broad categories and measure diversification, I estimate the amount of tax avoided as thirty-five percent of total BTDs. I then separate this amount into tax that is permanently avoided or tax that is temporarily avoided by deferring it to a future year. Each group is further separated into tax avoided on domestic or foreign source income. Managers may also engage in state tax planning to source domestic income to states with little or no corporate income tax, so I estimate a state BTD by comparing each firm's state tax expense to the maximum corporate state tax rate of the state in which the firm is headquartered. Therefore, I divide total tax avoided into five categories, or "buckets," of tax benefits: *Permanent Foreign*

[4] In probability theory, variance is the expected value of the squared difference of a random variable (the actual outcome) from its mean (the expected outcome) and represents the dispersion or spread of the random variables about the mean. Thus, this mathematical definition of variance is what my definition of tax risk captures.

BTD, Permanent U.S. BTD, Temporary Foreign BTD, Temporary U.S. BTD, and *State BTD*. In any given year, a firm may avoid tax by utilizing up to five buckets. Thus, over 5 years (3 years), the firm may avoid tax through 25 buckets (15 buckets). My measure of diversification, *Diverse*, is a continuous variable measuring the number of buckets utilized over the 5-year (3-year) period.

In my main test, I examine the relation between diversification and tax risk, as well as the effect of diversification on the relation between tax avoidance and tax risk. I regress tax risk on measures of tax avoidance (*TaxAvoid*), *Diverse*, and an interaction term between the two, along with control variables from Guenther et al. (2017). When using the standard deviation of future cash ETRs as a measure of tax risk, I find support for my hypotheses that for firms with average diversification and average levels of tax avoidance, diversification reduces tax risk and helps mitigate the effect of tax avoidance on tax risk. The more the firm diversifies, the less tax avoidance increases tax risk. I utilize predictive margins analysis to further examine my results at different levels of diversification and tax avoidance. While on average I find support for my hypotheses, as a more nuanced result, I find that if a firm is not avoiding tax, diversification is predicted to result in increased tax risk. Thus, the level of tax avoidance does matter. In subsequent analysis, I find similar results using the existence of tax spikes as an alternative measure of tax risk.

To indirectly test my hypotheses, I repeat my main test, replacing tax risk with a measure of overall firm risk, the standard deviation of future monthly stock returns. Overall, I find mixed results. While increasing diversification results in lower predicted firm risk, I find that increased tax avoidance only results in increased predicted firm risk for highly diversified firms. Thus, while I find that diversification is associated with reduced firm risk, this relation is separate from

the effects of tax avoidance. Consistent with prior literature, I continue to find that tax avoidance is not associated with overall firm risk, even when controlling for diversification. However, tax avoidance is associated with tax risk, and the more a firm diversifies, the less tax avoidance increases tax risk.

Overall, my study contributes to the literature in several ways. First, although the concepts of risk, uncertainty, and aggressiveness are related, the tax literature has not yet agreed upon a precise definition of tax risk (Dyreng et al. 2019). I contribute to this discussion by providing a definition of tax risk grounded by the classical finance definition of risk and measure tax risk as the dispersion, or variance, of tax outcomes from particular tax strategies. I also contribute to research on the relation between tax avoidance and tax risk. As discussed by Wilde and Wilson (2018), there is a limited understanding of how these concepts are related. I introduce a new dimension, the concept of tax diversification, to this discussion. While prior researchers have failed to find a relation between tax avoidance and risk, I find a positive relation in my sample, using tax risk. I also find that diversification reduces tax risk and mitigates the effect of tax avoidance on tax risk. Therefore, I contribute to prior literature by proposing an explanation on why although avoiding tax is thought to be risky, empirically researchers have been unable to find a relation.

II. Diversification

Tax avoidance can broadly be defined as the reduction of a firm's explicit tax liability (Hanlon and Heitzman 2010). Firms may be able to achieve a certain level of tax avoidance with no additional cost or risk in their normal course of business by taking advantage of tax incentives embedded in the tax law. This level of tax avoidance depends on available opportunities, and varies by firm, depending on circumstances and industry. For example, firms engaged in research

and development as part of their business strategy will benefit from R&D tax credits, while other firms will not. However, if a manager wants to increase the amount of the firm's tax avoidance beyond this basic level, they must engage in tax planning. There are non-trivial costs involved in tax planning, such as creating an internal tax department, paying for outside tax services, or incurring legal and accounting costs to carry out a specific tax strategy. Thus, when a firm engages in tax planning, managers are making an investment in tax avoidance.

The return on the investment is the expected or planned tax savings. However, there is some probability that the initial amount of the planned tax savings will not be achieved. Planned tax savings can be reduced in several ways. First, if audited, the firm may have to repay a portion of the savings, plus penalties and interest, if the tax authority successfully challenges the position during the audit. Second, before a tax strategy is completed, the tax law could change such that savings in future years are reduced or eliminated. Tax savings may never be realized due to failures within the tax strategy, such as a miscommunication between key business units. Finally, tax savings could be offset by additional unforeseen costs such as reputational or political costs. The likelihood of any of these happening depends on the particular tax strategy.[5]

FIN 48 (now codified within ASC 740-10) establishes a "more-likely-than-not" threshold for reporting uncertain tax positions in the financial statements, suggesting that firms engage in tax strategies knowing that the final amount of tax savings may not be the same as the initial amount of planned tax savings. While firms may engage in a tax strategy with an initial amount of planned tax savings in mind, after factoring in the probabilities of reduction, there is an on-average amount of expected tax savings. The dispersion, or variance, of the possible amounts of

[5] To the extent the tax avoidance strategy results in a financial reporting problem (such as a restatement), or fails to provide a financial reporting benefit in the form of a lower tax expense, this could also reduce the expected benefit from the tax strategy.

final tax savings, compared to this on-average expected amount of tax savings, represents tax risk for the purpose of my study.

Each tax strategy has its own distribution of possible tax outcomes, with each outcome having a probability of occurring. If this distribution has a high variance, then the amount by which the firm could miss their expected return (the on-average expected tax savings) is large. This would represent higher tax risk because the firm could end up with tax savings much lower than expected. As an example, consider Firm A, which has one tax strategy with two possible outcomes: failure or success. There is an eighty percent chance Firm A will end up with one hundred dollars of planned tax savings, and a twenty percent chance Firm A will end up with nothing. Thus, the on-average expected savings is eighty dollars. However, although on average Firm A expects eighty dollars of tax savings, if the tax strategy fails, Firm A will actually end up with the much lower amount of zero tax savings. The variance of the possible two tax outcomes represents my measure of tax risk.

Drawing again on portfolio theory, diversifying a portfolio will reduce the overall variance of a portfolio's payoffs, provided that the payoffs of each individual asset are not perfectly correlated. To continue the example, consider a second firm, Firm B, which plans to avoid the same one hundred dollars of tax as Firm A. However, Firm B has two tax strategies that are perfectly correlated, planning to save fifty dollars each. These two strategies have the same possible outcomes as Firm A's strategy: either both strategies succeed, or both strategies fail. For each strategy, there is an eighty percent chance Firm B will end up fifty dollars, and a twenty percent chance Firm B will end up with nothing. Thus, adding the two together, the on-average expected tax savings of the two strategies is eighty dollars, the same as Firm A. If these two strategies are perfectly correlated, the variance of the possible outcomes for Firm B is the

same as Firm A. If both strategies fail, Firm B gets nothing. If both strategies succeed, Firm B gets one hundred dollars of savings. Thus, Firm A and Firm B have the same tax risk.

However, if the outcomes of the two strategies are not perfectly correlated, then there is a third possible outcome. Both strategies succeed, both strategies fail, or one strategy succeeds and one fails. The possible outcomes are now one hundred, fifty, or zero dollars.[6] Thus, even though for both firms the on-average expected savings is eighty dollars, if Firm B misses that amount, they could still end up with fifty dollars of tax savings. The less correlated the two strategies are, the more likely the fifty dollar outcome. Thus, having two strategies that are not perfectly correlated reduces the variance of the overall tax planning of Firm B and reduces the amount by which Firm B could miss their expected tax savings. Firm B has lower tax risk.[7] In sum, holding the on-average expected tax savings constant, increasing the number of strategies shrinks the variance of the tax planning portfolio, making the distribution of outcomes closer to the expected tax savings amount. Therefore, tax risk is reduced to the extent the distribution of possible outcomes gets closer to the expected tax savings.

As a more general analogy, tax avoidance can be thought of as creating a contingent liability, where a potential tax expense (the tax liability) may occur depending on the outcome of uncertain future events (e.g., the firm's success in carrying out tax avoidance, the potential for IRS audits, or the potential for negative public attention, to name a few). While the potential tax expense can be reasonably estimated, the final amount and thus the final amount of tax avoidance depend on these uncertain, future events. One common type of contingent liability is a

[6] The probability of both strategies having a zero payoff is 0.2 x 0.2 = 0.04. The probability of both strategies having a $50 payoff is 0.8 x 0.8 = 0.64. The probability of one strategy having a zero payoff and the other having a $50 payoff is 2 x 0.8 x 0.2 = 0.32. ($0 x 0.04) + ($100 x 0.64) + ($50 x 0.32) = $80, the expected payoff.
[7] The variance of the single strategy for Firm A is 1,600, while the variance of the two strategies for Firm B (assuming the outcomes are uncorrelated) is 800.

lawsuit. For example, assume a firm is sued for damages of $100, and the manager believes there is a 25 percent chance the firm will lose the lawsuit. Thus, the expected future cash outflow is $25, but the only two possible outcomes are $100 (a 25 percent chance of losing the lawsuit) or $0 (a 75 percent chance of winning the lawsuit). A second type of contingent liability is warranty expense. Assume a firm sells ten units. There is a 25 percent chance that each unit will need to be repaired under warranty, costing the firm $10 per unit repaired. Thus, with this type of contingent liability, the expected future cash outflow is still $25, but now there are eleven possible outcomes, ranging from a cash outflow of $100 (all ten units are repaired), to $90 (nine units are repaired), and so on to $0 (none of the units are repaired). Despite the same $25 expected future cash outflow from both contingent liabilities, the larger number of possible outcomes leads to a smaller variance for the warranty, as compared to the lawsuit.

Thus, relating back to tax avoidance, with just a single tax avoidance strategy that either succeeds or fails, the variance of the future cash outflows (taxes) behaves like that of the lawsuit. However, the more tax avoidance strategies the firm employs, or the more the firm diversifies their tax planning, the more the variance of the future cash outflows behaves like that of the warranty. Increasing the number of potential outcomes can reduce the variance, and thus reduce tax risk.

III. Hypotheses

The concept of diversification can be summarized in the popular idiom “don’t put all your eggs in one basket.” Markowitz (1952, 1959) introduces diversification in portfolio theory, where an investor constructs their portfolio of investments to minimize their risk for a given level of expected return, thus creating an efficient portfolio. Risk depends not only on the variance of each individual asset in the portfolio, but also on the correlation, or covariance,

between every two individual assets. Thus, diversifying a portfolio by including assets with unrelated risk will reduce the overall risk of the portfolio. Applying this to a corporate tax avoidance setting, engaging in tax planning represents an investment in tax avoidance. The overall goal of reducing the amount of income tax owed is carried out through specific tax strategies. While each strategy has an initial amount of planned tax savings, the final outcome may be different than planned. Based on the probability of each outcome, each tax strategy has an on-average expected amount of tax savings and a distribution of possible outcomes. The dispersion, or variance, of these outcomes represents tax risk. If a firm diversifies their tax planning portfolio with multiple tax strategies whose outcomes are not perfectly correlated, then the variance of their overall outcomes is reduced.

Thus, regardless of the riskiness of the level of tax avoidance, the diversification of tax strategies can reduce risk through the reduced variance of outcomes. Whether a diversified firm has a Cash ETR of 20 percent or 30 percent, the tax outcome is less volatile, as compared to a non-diversified firm. In addition, for a given level of tax avoidance, the diversification of tax strategies can reduce the effect of tax avoidance on tax risk. Comparing two firms that avoid more tax with a Cash ETR of 20 percent, the more diverse firm is less risky. Therefore, I hypothesize that:

H1(a): Ceteris paribus, for a given level of tax avoidance, the diversification of tax strategies reduces tax risk.

H1(b): Ceteris paribus, for a given level of tax avoidance, the diversification of tax strategies mitigates the effect of tax avoidance on tax risk.

However, there are several potential reasons why diversification could increase the variance of possible outcomes, and thus increase tax risk. First, adding certain tax strategies

could affect the likelihood of a tax strategy failing. For example, if a firm has subsidiaries in multiple countries including one tax haven, audit risk and reputational risk might increase if the firm diversified by adding subsidiaries in two additional tax havens. In such a case, the more diversified a firm's tax strategies are, the more exposure there is for a regulatory authority or the public to take notice. This could increase the likelihood that both strategies fail, increasing the variance of the possible outcomes, and increasing tax risk.

Second, more strategies could increase the complexity of the firm's operations, which could lead to a greater risk of accounting errors, affecting the probability of the tax savings failing to materialize as expected. This in turn would affect tax risk due to the increased variance of the outcomes. Thus, diversification could add new potential outcomes that would not be present without increased diversification.

Third, increasing the number of tax strategies and the complexity of the tax function could provide managers with more opportunities to divert earnings, increasing the risk of managerial theft (Desai and Dharmapala 2006). This could cause the firm to miss the on-average expected tax savings, increasing tax risk. Finally, diversification of tax strategies may fail to reduce tax risk if the potential outcomes of the tax strategies are highly correlated. In this case, the firm would be adding additional strategies to their tax planning portfolio without any benefits of diversification. In sum, the predicted effect of diversification is unclear. Thus, in testing my two hypotheses, I view the effect of the diversification of tax strategies on tax risk as an empirical question.

IV. Research Design and Results

Sample Selection and Variable Definitions

Table 1 summarizes my sample selection procedure. I begin by closely following the

sample selection procedures from Guenther et al. (2017), extended to more recent years. I refer to this sample as the GMW Replication sample. I begin with all U.S. incorporated observations in Compustat from 1987 to 2017 with available data. Selecting this time frame ensures a relatively consistent tax regime between the two most recent tax reforms, beginning after the Tax Reform Act of 1986 and ending with the Tax Cuts and Jobs Act of 2017 (TCJA). For the 5-Year (3-Year) sample, each firm is required to have data for five (three) consecutive years to calculate the *TaxAvoid* measure, as well as a sixth (fourth) consecutive year to calculate the monthly stock return volatility over the subsequent year. In addition, I require sufficient data to calculate all control variables. One deviation from the Guenther et al. (2017) sample selection process is that I also require the *TaxAvoid* measure to be calculated entirely post-FAS 109, as this is a requirement for my measure of diversification.[8] Thus, because I require five (three) years of data post-FAS 109 and one year of future data, my GMW replication sample period effectively runs from 1997 – 2016 (1995 – 2016) for the 5-Year (3-Year sample), while the Guenther et al. (2017) sample period effectively runs from 1992 – 2010 for their stock return volatility tests.

I further limit my sample, the Diversification sample, and eliminate all observations with insufficient data to calculate my measure of diversification. I exclude all observations with negative pretax income, as well as observations missing current and deferred taxes and pretax domestic and foreign income. In addition, I require firms to overall avoid tax over the 5-Year (3-Year) period. My Firm Risk sample for tests using stock return volatility consists of 11,859 (16,588) observations for the 5-Year (3-Year) sample. Finally, tests using future cash ETR volatility require five future years of data, with the last possible year of the volatility measure

[8] Statement of Financial Accounting Standards No. 109 (FAS 109), codified as ASC 740, is effective for fiscal years beginning after December 15, 1992. FAS 109 established basic principles of accounting for income taxes, including deferred tax liabilities and assets. Because my measure of diversification is calculated using "buckets" of current and deferred income taxes, I require *t*-4 (*t*-2) for the 5-Year (3-Year) sample to be no earlier than 1993.

being 2017, before the reduction of the corporate statutory tax rate under the TCJA.[9] This limits my Tax Risk sample to 7,116 (9,941) observations from 1997 – 2012 (1995 – 2012) for the 5-Year (3-Year) sample.

I create two measures of *TaxAvoid*, focusing on the level of tax avoidance managers expect when engaging in tax planning. Although managers enter into a tax strategy with an initial amount of planned tax savings in mind, after factoring in the probabilities of reduction, there are multiple potential outcomes. Thus, there is an on-average amount of expected tax savings. I first measure this expected tax avoidance as the average cash ETR (defined as cash taxes paid over pretax income less special items) over five (three) years. I winsorize the tax rates to fall between zero and one to aid in interpretation. Finally, I multiply the tax rates by negative one, so that *5-Year TaxAvoid* (*3-Year TaxAvoid*) is increasing in tax avoidance.

My second measure is *5-Year Adjusted TaxAvoid* (*3-Year Adjusted TaxAvoid*), calculated as the firm's five-year (three-year) cash ETR subtracted from the average (median) cash ETR for the firm's size/industry portfolio over the same five-year (three-year) period. This variable is increasing in tax avoidance. Rational expectations theory suggests that although managers may miss the on-average amount of expected tax savings some of the time, on average they will be correct.[10] By incorporating previous tax savings, on average this amount represents what managers estimated the expected tax savings to be. Thus, using these two five-year (three-year) average measures of tax avoidance should represent the on-average amount of expected tax

[9] The Tax Cuts and Jobs Act of 2017 reduced the corporate statutory tax rate from 35 percent to 21 percent, which necessarily affects a firm's volatility of cash ETRs, even if they consistently never avoid any tax. Thus, it is important that my sample end in 2017, before the effects of the TCJA. Among other changes, the TCJA moved the U.S. from a worldwide tax system towards a territorial tax system, further limiting the comparability of corporate tax strategies before and after the TCJA.

[10] Rational expectations theory is an economic theory proposed by John Muth in his 1961 paper "Rational Expectations and the Theory of Price Movements," published in *Econometrica.* The theory suggests that economic outcomes will generally be what people predict. While they may be in error sometimes, errors are infrequent and random, and thus on average people are correct.

savings.

Because I define tax risk as the dispersion, or variance, of tax outcomes from particular tax strategies, I focus on measures of risk in the literature that reflect volatility. Guenther et al. (2017) find that the volatility of cash ETRs is associated with future stock volatility, suggesting a relation to firm risk. Based on this, subsequent researchers have measured tax risk as the five-year standard deviation of annual cash ETRs (Hutchens and Rego 2015; Drake et al. 2017; Abernathy, Finley, Rapley, and Stekelberg 2019; Campbell, Cecchini, Cianci, Ehinger, and Werner 2019). This measure captures fluctuations in the cash ETR due to temporary, nonrecurring strategies, as well as a tax strategy failure. It captures any reversal upon audit by tax authorities, and in addition, within each cash ETR it will capture the failure of a tax strategy to avoid as much tax as expected (resulting in a higher cash ETR). Thus, I use the five-year standard deviation of annual cash ETRs as my first measure of risk, *TaxRisk*.

One limitation of this measure is that although it is a more direct measure of tax outcomes, it does not capture any unforeseen costs of a tax strategy, such as reputational costs, as these costs would not be included in a cash ETR. I assume that the variance of tax outcomes, my definition of tax risk, will be indirectly reflected in the overall volatility of the firm. Thus, for my second measure of tax risk I want to capture overall firm risk. To do this I measure *FirmRisk* as stock return volatility, calculated as the standard deviation of monthly stock returns over the subsequent year.

Descriptive Statistics

Panels A and B of Table 2 presents descriptive statistics for the larger GMW Replication sample and my smaller Diversification sample, respectively. The mean (median) *5-Year TaxAvoid* of -22.16 percent (-24.28 percent) in the Diversification sample is less negative than

the mean (median) of -27.03 percent (-26.09 percent) in the GMW replication sample. Thus, firms in the Diversification sample avoid more tax, consistent with my sample selection requirement that firms in this sample are overall tax avoiders. Firms in the Diversification sample also avoid more tax compared to peers in their industry/size portfolio, with the mean of *5-Year Adjusted TaxAvoid* at 0.74 percent compared to -2.05 percent in the GMW Replication sample. In addition, firms in the Diversification sample are larger and less volatile in terms of *TaxRisk* and *FirmRisk*. Finally, 14.09 percent of firms in the GMW Replication sample have losses in the current year, while the Diversification sample excludes all firms with losses.

Panel C of Table 2 presents the industry composition of both samples using the Fama-French 49 industry codes. The largest industries in both samples include Retail, Business Services, Electronic Services, and Computer Software. In general, the industry composition of the two samples is similar, with a few exceptions. The GMW Replication sample has a larger percentage of firms in Utilities (4.27%) and Banking (7.31%), as compared to the Diversification sample (1.27% and 1.52%, respectively). Lastly, the Trading industry comprises 11.40% of the Diversification sample, compared to 7.12% of the GMW Replication sample.

Test of Findings from Prior Literature

Since prior literature fails to find a relation between tax avoidance and firm risk, I first replicate this finding using the GMW Replication sample and estimate the following regression model using control variables from Guenther et al. (2017):

$$\begin{aligned} FirmRisk_{i,t} = {} & \beta_0 + \beta_1 TaxAvoid_{i,t} + \beta_2 PTBI_{i,t} + \beta_3 Vol\_PTBI_{i,t} + \beta_4 BTM_{i,t} \\ & + \beta_5 Leverage_{i,t} + \beta_6 Size_{i,t} + \beta_7 Shares\_Out_{i,t} + \beta_8 Vol\_SpecialItems_{i,t} \\ & + \beta_9 Vol\_CashFlow_{i,t} + \beta_{10} Vol\_ETBSO_{i,t} + \beta_{11} ETBSO_{i,t} + \beta_{12} CHG\_NOLCF_{i,t} \\ & + \beta_{13} NOLCF_{i,t} + \beta_{14} Loss_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

where *FirmRisk*, as discussed above, is the standard deviation of monthly stock returns over the subsequent year. I use two measures of tax avoidance, *5-Year TaxAvoid* and *3-Year Adjusted TaxAvoid* to follow prior literature. All other control variables are defined in Appendix A. Table 3, columns 1 and 2, present the results. Consistent with prior literature, I fail to find a significant relation between tax avoidance and firm risk, for both the 5-Year and Adjusted 3-Year measures, and in fact, the coefficients on both measures suggest tax avoidance is not risky, though not statistically significant at conventional levels.

I next estimate Equation (1) with both measures of *TaxAvoid* using my smaller Diversification sample. Table 3, columns 3 and 4, present the results. Consistent with prior literature, I again fail to find a significant relation between tax avoidance and risk. However, I do find a positive, though statistically insignificant, coefficient on *TaxAvoid*, suggesting that for this sample, as tax avoidance increases, firm risk may increase as well. I also replace *FirmRisk* with *TaxRisk*, and estimate Equation (1). Table 3, columns 5 and 6, present the results. For the Diversification sample, as tax avoidance increases, tax risk increases as well, though not statistically significant at conventional levels.

Overall, these results differ from prior literature, suggesting that for my Diversification sample, tax avoidance may be risky. I attribute this difference to my more restrictive sample limitations resulting in a different sample composition. I estimate (not tabulated) Equation (1) using the 30,664 (30,507) observations included in the GMW Replication sample, but excluded from my Diversification sample, using *5-Year TaxAvoid* (*3-Year Adjusted TaxAvoid)* and continue to find a negative, though not statistically significant, coefficient on *TaxAvoid.* This suggests that my smaller Diversification sample behaves differently from the majority of the GMW Replication sample, and suggests that the prior finding of an insignificant relation

between tax avoidance and firm risk from prior literature may not hold for all sets of firms. This is consistent with Hutchens, Rego, and Williams (2019), who examine the relation between tax avoidance and firm risk using latent class mixture models and find that this relation varies across different groups of firms.

Diversification Measurement and Descriptive Statistics

While the focus of this paper is on the diversification of tax strategies, empirically I cannot observe which tax strategies managers employ in their tax planning. What I can observe, however, is the outcome of these tax strategies in the form of how much tax a firm has avoided, compared to the U.S. statutory rate of thirty-five percent. In addition, I can observe that these benefits of tax avoidance seem to come from different sources. As an example, these sources could include permanently avoided tax from municipal bond interest or temporarily deferred tax from accelerated depreciation. Although there can be any number of tax strategies aggregating into one source of a tax benefit, to the extent that a firm has more diverse sources of tax benefits, it follows that the firm has more diverse underlying tax strategies. Thus, my measure of diversification reflects the diversification of the sources of benefits of tax avoidance, which in turn reflect the diversification of the underlying tax strategies.

My measure of diversification uses broad categories of BTDs as the sources of tax benefits. These include permanent U.S., permanent foreign, temporary U.S., and temporary foreign BTDs, as well as an estimated state BTD. By comparing the expected current year tax, measured as pretax income multiplied by thirty-five percent, to the firm's actual current year tax, I estimate the amount of tax avoided. This avoided tax can then be separated into tax that is permanently avoided or tax that is temporarily avoided by deferring it to a future year. Each group can further be separated into tax avoided on domestic or foreign source income.

During the sample period, prior to the TCJA, the U.S statutory corporate tax rate is thirty-five percent, imposed on worldwide income. Thus, if firms do not avoid any tax, their expected current year U.S. tax on worldwide income should be:

$$Expected\ Tax\ = PI\ \times 35\%$$

where:

PI = pretax income, and observations with negative pretax income are excluded.

However, the firm's actual current year tax is:

$$Actual\ Tax\ = TXFED\ + TXFO$$

where:

TXFED = current U.S. tax expense

TXFO = current foreign tax expense

Comparing the two results in the amount of tax avoided:

$$Tax\ Avoided\ = Expected\ Tax\ - Actual\ Tax$$

Part of the tax avoided is deferred, or temporarily avoided. It is avoided in the current year, but is expected to be incurred in future years.

$$Temporarily\ Avoided\ Tax\ = TXDFED\ + TXDFO$$

where:

TXDFED = deferred U.S. tax expense

TXDFO = deferred foreign tax expense

If the tax is not temporarily avoided, it is permanently avoided.

$$Permanently\ Avoided\ Tax\ = Tax\ Avoided\ - Temporarily\ Avoided\ Tax$$

Although the income from foreign subsidiaries of U.S. multinational corporations (MNCs) is subject to U.S. corporate income tax, active source income is not taxed until the

income is repatriated, or paid as a dividend, back to the parent entity. Upon repatriation, the firm generally pays the difference between the U.S. and foreign tax rate.[11] For financial reporting purposes, if the operating earnings reinvested abroad in the foreign subsidiaries are designated as "indefinitely reinvested," the firm does not record a tax expense or deferred tax liability for the U.S. tax owed upon repatriation. Thus, the tax on indefinitely reinvested foreign earnings is generally considered to be permanently avoided.[12] Firms disclose the cumulative amount of IRFE in their annual filings. Comparing the prior year cumulative total to the current year cumulative total provides an estimation of the current year foreign earnings designated as indefinitely reinvested, *Estimated IRFE*.[13] I estimate the permanent foreign BTD as*:*

$$Permanent\ Foreign\ BTD\ = \left(35\%\ - \left(\frac{TXFO\ + TXDFO}{PIFO}\right)\right) \times Estimated\ IRFE$$

where:

PIFO = pretax foreign income

I assume *Permanent Foreign BTD* is zero for observations with zero or negative pretax foreign income.

The permanently avoided tax is composed of foreign and U.S. BTDs. Thus:

$$Permanent\ U.S.BTD\ = Permanently\ Avoided\ Tax\ - Permanent\ Foreign\ BTD$$

I assume that the incremental tax on current year foreign earnings not designated as indefinitely

[11] The amount of the dividend is grossed up by the foreign tax rate and that total amount is taxed at the U.S. statutory rate of thirty-five percent. The firm then receives a foreign tax credit for foreign taxes paid, which helps mitigate any impact from double taxation. Thus, the incremental tax owed upon repatriation can generally be thought of as the difference between thirty-five percent and the foreign tax rate.

[12] Firms report "indefinitely reinvested foreign earnings" (IRFE) as a permanent difference in the tax rate reconciliation in the income tax footnote. Because of this, IRFE are often referred to in the literature as "permanently reinvested earnings" (PRE).

[13] This information is available in the database Audit Analytics beginning in 2008. To estimate IRFE for firm-years missing this data, I multiply pretax foreign income by an average percent. The average percent is calculated as the median percent of pretax foreign earnings designated as IRFE each year pretax foreign income is greater than zero. IRFE is winsorized to range from zero to that year's total pretax foreign income.

reinvested are deferred, as the tax is not current until the year in which the repatriation occurs. Thus, I estimate the temporary foreign BTD as:

$$Temporary\ Foreign\ BTD$$
$$= \left(35\% - \left(\frac{TXFO + TXDFO}{PIFO}\right)\right) \times (PIFO - Estimated\ IRFE)$$

I assume *Temporary Foreign BTD* is zero for observations with zero or negative pretax foreign income.

The temporarily avoided tax is composed of foreign and U.S. BTDs. Thus:

$$Temporary\ U.S.BTD$$
$$= Temporarily\ Avoided\ Tax - Temporary\ Foreign\ BTD$$

Finally, managers may also engage in state tax planning to source U.S. income to states with little or no corporate income tax. Although total state income taxes can also be separated into current and deferred taxes, most taxable income for state purposes conforms very closely to federal taxable income. Thus, a temporary BTD due to a timing difference would be reflected in both federal and state deferred taxes. In other words, the same temporary tax strategies used for federal tax avoidance will often manifest in state tax avoidance. Therefore, to avoid double counting tax strategies I focus on location as the dominant state tax strategy. To estimate the State BTD, I compare each firm's total state tax expense (current and deferred) to the maximum corporate state tax rate of the state in which the firm is headquartered:

$$State\ BTD = (Headquarters\ State\ Tax\ Rate \times PIDOM) - TXS - TXDS$$

where:

PIDOM = pretax domestic income

TXS = current state tax expense

TXDS = deferred state tax expense

Therefore, each year the total tax avoided arises from five sources of tax benefits, or "buckets": *Permanent Foreign BTD, Permanent U.S. BTD, Temporary Foreign BTD, Temporary U.S. BTD,* and *State BTD*.

Each positive "bucket" counts as one source of tax benefit, where each non-positive "bucket" counts as zero, for a potential sum of five per year. Using a five-year (three-year) measure, each firm has an opportunity to utilize 25 (15) buckets over that five-year (three-year) time period. *Diverse_Count25 (Diverse_Count15)* represent the total number of buckets each firm utilized. Since the firms in my Diversification sample avoid tax overall, *Diverse_Count25 (Diverse_Count15)* can range from 1 to 25 (15). Table 4 presents the distribution of *Diverse_Count25* and *Diverse_Count15*. The average firm avoided tax using 13.18 of 25 buckets over five years and 7.88 of 15 buckets over three years. In general, both measures have similar distributions with approximately one third of the sample avoiding tax using at least an average of three buckets per year, or 15 (9) buckets over five (three) years. My measure of diversification, *Diverse*, is the continuous variable *Diverse_Count25* or *Diverse_Count15* for tests using the five- and three-year measures, respectively.

Despite evidence from Dyreng et al. (2008) that some firms are able to sustain low ETRs for a long period of time, some firms are not able to sustain low ETRs and experience spikes in their tax rate, suggesting a prior tax position may have been overturned. I adapt my measure from Saavedra (2018) and define *TaxSpike* as an indicator variable equal to 1 if a firm has a cash tax payment equal to at least 60 percent of pre-tax book income (less special items) in any of the future three years, and zero otherwise. I graph the percentage of firms at each level of diversification, using *Diverse_Count25* and *Diverse_Count15*, with a tax spike in the future three years. Figures 1 and 2 presents the graph of the percentage of *TaxSpike* at each level of

diversification over five years (*Diverse_Count25)* and three years (*Diverse_Count15)*, respectively. Both figures show that as diversification increases, the percentage of firms experiencing a tax spike in future years decreases, providing descriptive evidence that diversification may reduce tax risk (i.e. the likelihood of a tax outcome that is different from what was expected).

Main Regression

In H1(a), I hypothesize that holding tax avoidance constant, diversification reduces tax risk, and in H1(b), I hypothesize that diversification also mitigates the effect of tax avoidance on tax risk. To test H1(a) and H1(b), I estimate the following regression on my Diversification sample. I regress tax risk on tax avoidance, diversification, and the interaction term between the two, along with the control variables from Equation (1). I omit the *Loss* control variable from Equation (1) as firms in my Diversification sample are required to have positive pretax income each year.

$$\begin{aligned} TaxRisk_{i,t} = {} & \beta_0 + \beta_1 TaxAvoid_{i,t} + \beta_2 Diverse_{i,t} + \beta_3 TaxAvoid_{i,t} \times Diverse_{i,t} \\ & + \beta_3 PTBI_{i,t} + \beta_4 Vol\_PTBI_{i,t} + \beta_5 BTM_{i,t} + \beta_6 Leverage_{i,t} + \beta_7 Size_{i,t} \\ & + \beta_8 Shares\_Out_{i,t} + \beta_9 Vol\_SpecialItems_{i,t} + \beta_{10} Vol\_CashFlow_{i,t} \\ & + \beta_{11} Vol\_ETBSO_{i,t} + \beta_{12} ETBSO_{i,t} + \beta_{13} CHG\_NOLCF_{i,t} + \beta_{14} NOLCF_{i,t} \\ & + \varepsilon_{i,t} \end{aligned} \quad (2)$$

TaxRisk represents the standard deviation of future cash ETR over five years. *TaxAvoid* is one of the four measures of tax avoidance, *5-Year TaxAvoid* and *5-Year Adjusted TaxAvoid*, as well as the 3-Year measures. *Diverse*, as described above, is either of the continuous variables *Diverse_Count25* and *Diverse_Count15*. All other variables are described in Appendix A. To aid in the interpretation of the interaction term, I center both *TaxAvoid* and *Diverse* by subtracting

the mean from each case so that the new mean is zero, representing the average.

Table 5, Panel A presents the results. Across three of the four 5-Year and 3-Year measures of tax avoidance, the coefficient on *TaxAvoid* is positive and statistically significant. This suggests that for firms with average diversification (*Diverse* = 0 after centering), an increase in tax avoidance results in increased tax risk. Across both 5-Year measures of tax avoidance, the coefficient on *Diverse* is negative and statistically significant. This provides support for H1(a) that holding the firm's on-average expected tax savings constant (controlling for the tax avoidance in β_1), for firms with average tax avoidance (*TaxAvoid* = 0 after centering), an increase in diversification results in decreased tax risk. The interaction term *Diverse x TaxAvoid* can be interpreted as how when a firm increases diversification, the effect of tax avoidance on tax risk decreases. In other words, the more that the firm diversifies, the less tax avoidance increases tax risk. Across all measures, the coefficient is negative, but it is only statistically significant when using the *5-Year TaxAvoid* and *3-Year TaxAvoid* measures. This provides weak support for H1(b) that diversification reduces the positive relation between tax avoidance and tax risk.[14]

However, because *Diverse x TaxAvoid* represents the interaction of two continuous variables, a single average coefficient from the regression may not be fully informative. To aid in the interpretation of my results, I use predictive margins to examine how tax avoidance and diversification interact at different levels of each variable to jointly affect tax risk. Specifically, I use predictive margins to estimate the predicted value of *TaxRisk* at three levels of *Diverse* (Low, Medium, and High), holding *TaxAvoid* constant at eleven different levels of tax avoidance, from lowest to highest (i.e. as *TaxAvoid* increases by 0.1). I set the three levels of *Diverse* at 1, 13, and

[14] I repeat this analysis using an indicator variable for high and low diversification, rather than the continuous *Diverse* measure. I find qualitatively similar results.

25 (1, 8, and 15) for the 5-Year (3-Year) measure.[15] Table 5, Panel B presents the results with z-scores in parentheses. Overall, the results suggest that the effect of diversification on the relation between tax avoidance and tax risk depends on both the level of tax avoidance and the level of diversification.

Specifically, when tax avoidance is at lower levels (e.g. Lowest to +0.3), higher diversification is predicted to yield a higher amount of tax risk than lower diversification. However, when tax avoidance is at a more average level (e.g. +0.4 to +0.6), there is not a large difference in the predicted tax risk between the three levels of diversification. As tax avoidance increases (e.g. +0.7 to Highest), higher diversification is predicted to yield less tax risk than lower diversification. These observations generally hold across all four measures of *TaxAvoid*. Thus, while on average I find support for H1(a), these results show a more nuanced relationship. Firms with high diversification do have lower predicted tax risk than firms with low diversification, but the level of tax avoidance does matter. While high diversification may reduce tax risk for those engaging in tax avoidance, for those not avoiding tax and not needing the benefits of diversification, high diversification may result in more tax risk. This is consistent with my counterarguments that high diversification could result in increased complexity, thereby increasing tax risk.

Examining the predictive margins results from another point of view, when diversification is low, increasing tax avoidance is predicted to increase tax risk. When diversification is at a medium, or more average level, increasing tax avoidance is also predicted to increase tax risk, but at a lower rate of increase between the eleven levels. Finally, when

[15] The low and high levels of *Diverse* are the minimum and maximum values, respectively, for the 5-year and 3-year measures. I choose the medium level based on the average number of buckets reported in Table 4, 13.18 (7.88) for the 5-year (3-year) measure, rounded to the nearest whole number.

diversification is high, higher levels of tax avoidance are not predicted to result in higher levels of tax risk. This provides support for H1(b) that diversification reduces the positive relation between tax avoidance and tax risk, which I observe with low and medium levels of diversification. In sum, the predictive margins analysis provides support for my hypotheses and provides more nuanced evidence of how the two concepts of tax avoidance and diversification interact to jointly affect tax risk.

I next estimate Equation (2) and replace *TaxRisk* with my second measure of risk, *FirmRisk*, measured as the standard deviation of future monthly stock returns over the subsequent year. Both *TaxAvoid* and *Diverse* are centered to aid in interpretation of the interaction term. Table 6, Panel A presents the results. Across all four measures of *TaxAvoid,* the coefficient on *Diverse* if negative and statistically significant. This suggests that for a firm with average tax avoidance, an increase in diversification will produce a decrease in firm risk. While this supports my hypothesis that diversification reduces firm risk, overall the remaining results are inconsistent.[16] To aid with interpretation, in Table 6, Panel B, I present the predictive margins results, where I estimate the predicted value of *FirmRisk* at three levels of *Diverse* (Low, Medium, and High), holding *TaxAvoid* constant at eleven different levels of tax avoidance, from lowest to highest (i.e. as *TaxAvoid* increases by 0.1). Across all four measures of *TaxAvoid*, increasing diversification is predicted to yield a lower amount of firm risk. This provides support for H1(a) that for any given level of tax avoidance, diversification reduces firm risk. However, the predicted margins results show that as tax avoidance increases, this effect becomes weaker. The reduction in predicted firm risk decreases at a decreasing rate, until the highest level of tax avoidance when there is no discernable effect.

[16] I repeat this analysis using an indicator variable for high and low diversification, rather than the continuous *Diverse* measure. I continue to find inconsistent results.

Examining the predictive margins results from another point of view, when diversification is at a low level, increasing tax avoidance is not predicted to increase firm risk. When diversification is at a medium level, increasing tax avoidance results in a small predicted increase in firm risk. However, when diversification is high, higher levels of tax avoidance are predicted to result in higher levels of firm risk. Thus, I do not find support for H1(b). A positive relation between tax avoidance and firm risk is only predicted when diversification is high. This is consistent with my counterarguments that high diversification could result in increased complexity or increased attention on the firm resulting in political or reputational costs, thereby increasing firm risk.

Together, both panels of Table 6 provide mixed evidence on the effect of diversification on firm risk as well as on the relation between tax avoidance and overall firm risk. While increasing diversification results in lower predicted firm risk, I find that increased tax avoidance only results in increased predicted firm risk for highly diversified firms. In Table 3, I replicate findings from prior literature that there is no relation between tax avoidance and overall firm risk, which is supported by Table 6 as well. Thus, while I find support for the effect of the diversification of tax strategies on tax risk, in general I do not find an effect on the broader measure of firm risk.

V. Additional Analysis

Measure of Tax Risk

While the volatility of cash ETRs has been widely used in the literature as a proxy for tax risk, other measures may also capture the concept of unexpected tax outcomes. One such measure is tax spikes, as a spike in the cash ETR suggests that prior tax positions may have been overturned. In Figures 1 and 2, I found descriptive evidence that as diversification increases, the

percentage of firms experiencing a tax spike in the future three years decreases. I formalize this test and estimate Equation (2) using *TaxSpike* as my measures of tax risk. *TaxAvoid* is one of the four measures of tax avoidance, *5-Year TaxAvoid* and *5-Year Adjusted TaxAvoid*, as well as the 3-Year measures. *Diverse* is the continuous variables *Diverse_Count25* and *Diverse_Count15*. I continue to center *TaxAvoid* and *Diverse* to aid in the interpretation of the interaction term.

Table 7, Panel A presents the results.[17] For firms with average diversification, an increase in tax avoidance results in increased tax risk. The coefficient on the interaction term suggests that the more that the firm diversifies, the less tax avoidance increases tax risk. However, for firms with average tax avoidance, an increase in diversification does not have a statistically significant effect on tax risk. Because these results represent only firms with average diversification and average tax avoidance, I again use predictive margins to further analyze the data. In Table 7, Panel B, I present the predictive margins results, where I estimate the predicted value of *TaxSpike* at different levels of *Diverse* and *TaxAvoid*.

Though weaker than my main results using the future volatility of cash ETRs as the measure of tax risk, the results generally follow the findings of Table 5, Panel B. Firms with high diversification do have lower predicted tax risk than firms with low diversification, but only for firms with high tax avoidance levels. For firms with low and medium diversification, increasing tax avoidance is predicted to increase tax risk. However, when diversification is high, higher levels of tax avoidance are not predicted to result in higher levels of tax risk, providing support for H1(b) that higher diversification reduces the otherwise positive relation between tax avoidance and tax risk. Overall, these results provide support for my hypotheses and suggest that tax spikes are an indicator of tax risk.

[17] I repeat this analysis, expanding *TaxSpike* to the future five years instead of three, and find similar results.

VI. Conclusion

Consistent with the idea that tax avoidance is risky, the practitioner literature has focused on the importance of tax risk management. However, empirically, prior studies have generally failed to find a relation between measures of overall firm risk and measures of corporate tax avoidance. I propose that one possible reason is that prior researchers have failed to consider the role that diversification plays in reducing the risk of a portfolio of tax strategies, and thereby reducing risk. Thus, in this paper, I investigate the effect that the number of different tax strategies employed by a public company has on the relation between measures of corporate tax avoidance and measures of risk.

I develop a measure representing diverse sources of tax benefits, as a proxy for the underlying tax strategies, based on broad categories of book-tax differences utilized over time. I test my hypotheses by regressing risk on tax avoidance, diversification, and an interaction term. When using the standard deviation of future cash ETRs as a measure of tax risk, I find support for my hypotheses that on average, diversification reduces tax risk and helps mitigate a positive relation between tax avoidance and tax risk. However, as a more nuanced result, if a firm is not avoiding tax, I find that diversification can increase tax risk. I find mixed results when using the standard deviation of future monthly stock returns as a measure of overall firm risk. While I find that diversification is associated with reduced firm risk, this relation is separate from the effect of tax avoidance. Consistent with prior literature, I continue to find that tax avoidance is not associated with overall firm risk, even when controlling for diversification. However, tax avoidance is associated with tax risk, and the more a firm diversifies, the less tax avoidance increases tax risk. Taken together, I contribute to the literature on tax avoidance and tax risk, and add a new dimension, diversification, to our thinking of how these two concepts are related.

APPENDIX A
Variable Definitions

Diversification Variables

Diverse_Count25 — A variable ranging from 1 to 25, counting in how many buckets the firm avoided taxes over 5 years (*t-4* to *t*).

Diverse_Count15 — A variable ranging from 1 to 15, counting in how many buckets the firm avoided taxes over 3 years (*t-2* to *t*).

Negative_Count5 — A variable counting the number of negative (tax reducing) line items present in the ETR reconciliation each year, over 5 years (*t-4* to *t*).

Negative_Count3 — A variable counting the number of negative (tax reducing) line items present in the ETR reconciliation each year, over 3 years (*t-2* to *t*).

Tax Avoidance Variables

5-Year TaxAvoid — The five-year sum (from year *t-4* to year *t*) of cash taxes paid (TXPD) divided by the five-year sum of pretax income (PI) less special items (SPI), winsorized at 0 and 1. Firms are required to have a positive denominator. Multiplied by negative one to be increasing in tax avoidance.

3-Year TaxAvoid — The three-year sum (from year *t-2* to year *t*) of cash taxes paid (TXPD) divided by the three-year sum of pretax income (PI) less special items (SPI), winsorized at 0 and 1. Firms are required to have a positive denominator. Multiplied by negative one to be increasing in tax avoidance.

5-Year Adjusted TaxAvoid — The five-year sum (from year *t-4* to year *t*) of cash taxes paid (TXPD) divided by the five-year sum of pretax income (PI) less special items (SPI), subtracted from the same period five-year cash ETR for the portfolio of firms in the same quintile of total assets and the same industry, to be increasing in tax avoidance.

3-Year Adjusted TaxAvoid — The three-year sum (from year *t-2* to year *t*) of cash taxes paid (TXPD) divided by the three-year sum of pretax income (PI) less special items (SPI), subtracted from the same period three-year cash ETR for the portfolio of firms in the same quintile of total assets and the same industry, to be increasing in tax avoidance.

Risk Variables

FirmRisk (SD_Ret) — The standard deviation of monthly stock returns over the next year (*t+1*).

TaxRisk (SD_CETR) — The standard deviation of cash taxes paid (TXPD) divided by the sum of pretax income (PI) less special items (SPI), winsorized at 0 and 1, from *t+1* to *t+5*.

TaxRisk (TaxSpike)	Adapted from Saavedra (2018), an indicator variable equal to 1 if a firm has a cash tax payment (TXPD) equal to at least 60 percent of pretax income (PI) less special items (SPI) in any of the future three years, and zero otherwise.

Control Variables

PTBI	Pretax Income (PI) scaled by prior-period Total Assets (AT).
Vol_PTBI	The standard deviation of Pretax Income (PI) scaled by prior-period Total Assets (AT) from *t-4* to *t*.
BTM	Book value of equity (CEQ) over price per share (PRCC_F) times total common shares outstanding (CSHO).
Leverage	Long-Term Debt (DLTT) scaled by prior-period total Assets (AT).
Size	The natural log of total assets (AT).
Shares_Out	The log of the firm's common shares outstanding (CSHO).
Vol_SpecialItems	The standard deviation of special items (SPI) scaled by prior-period total assets (AT) from *t-4* to *t*.
Vol_CashFlow	The standard deviation of cash flow (OANCF) scaled by prior-period total Assets (AT) from *t-4* to *t*.
Vol_ETBSO	The standard deviation of excess tax benefit of stock options (TXBCOF + TXBCO) scaled by prior-period total assets (AT) from *t-4* to *t*. Set to 0 if missing.
ETBSO	The excess tax benefit of stock options (TXBCOF + TXBCO) scaled by prior-period total assets (AT). Set to 0 if missing.
CHG_NOLCF	Current year net operating loss carryforward (TLCF) less prior year scaled by prior-period total assets (AT). Set to 0 if missing (TLCF).
NOLCF	Net operating loss carryforward (TLCF) scaled by prior-period total assets (AT). Set equal to 0 if missing (TLCF).
Loss	An indicator variable equal to one if a firm has negative pretax income, zero otherwise.

References

Abernathy, J.L., A.R. Finley, E.T. Rapley, and J. Stekelberg. 2019. External auditor responses to tax risk. *Journal of Accounting, Auditing &* Finance: 1-28.

Arlinghaus, B.P. 1998. Goal setting and performance measures – by tax professionals in Fortune 500 companies. *The Tax Executive* 50(6): 434–442.

Bardertscher, B.A., S.P. Katz, and S.O. Rego. 2013. The separation of ownership and control and corporate tax avoidance. *Journal of Accounting and Economics* 56: 228-250.

Bauer, A.M. and K.J. Klassen. 2014. Estimating downside tax risk: exploration of unfavorable tax settlements. Working Paper.

Campbell, J.L., M. Cecchini, A.M. Cianci, A.C. Ehinger, and E.M. Werner. 2019. Tax-related mandatory risk factor disclosures, future profitability, and stock returns. *Review of Accounting Studies* 24: 264-308.

Chen, S., X. Chen, Q. Cheng, and T. Shevlin. 2010. Are family firms more tax aggressive than non-family firms? *Journal of Financial Economics* 95(1): 41-61.

Chen, K. and C.Y. Chu. 2005. Internal control versus external manipulation: a model of corporate income tax evasion. *RAND Journal of Economics* 36(1): 151-164.

Drake, K.D., S.J. Lusch, and J. Stekelberg. 2017. Does tax risk affect investor valuation of tax avoidance? *Journal of Accounting, Auditing & Finance*: 1-26.

Desai, M.A. and D. Dharmapala. 2006. Corporate tax avoidance and high-powered incentives. *Journal of Financial Economics* 79: 145-179.

Desai, M., A. Dyck, and L. Zingales. 2007. Theft and taxes. *Journal of Financial Economics*: 84(3): 591-623.

Dyreng, S., M. Hanlon, and E. Maydew. 2008. Long-run corporate tax avoidance. *The Accounting Review* 83(1): 61-82.

Dyreng, S., M. Hanlon, and E.L. Maydew. 2019. When does tax avoidance result in tax uncertainty? *The Accounting Review* 94(2): 179-203.

Dyreng, S.D. and B.P. Lindsey. 2009. Using financial accounting data to examine the effect of foreign operations located in tax havens and other countries on U.S. multinational firms' tax rates. *Journal of Accounting Research*: 47(5): 1283-1316.

Graham, J., M. Hanlon, T. Shevlin, and N. Shroff. 2014. Incentives for tax planning and avoidance: evidence from the field. *The Accounting Review* 89(3): 991-1023.

Goodman, G.R. 2004. Internal controls for the tax department. *Tax Notes* 103: 579–588.

Guenther, D.A., S.R. Matsunaga, and B.M. Williams. 2017. Is tax avoidance related to firm risk? *The Accounting Review* 92(1): 115-136.

Guenther, D.A., R.J. Wilson, and K. Wu. 2019. Tax uncertainty and incremental tax avoidance. *The Accounting Review* 94(2): 229-247.

Hanlon, M. and S. Heitzman. 2010. A review of tax research. *Journal of Accounting and Economics* 50: 127-178.

Hanlon, M., E.L. Maydew, and D. Saavedra. 2017. The taxman cometh: does tax uncertainty affect corporate cash holdings? *Review of Accounting Studies* 22(3): 1198-1228.

Hutchens, M. and S. Rego. 2015. Does greater tax risk lead to increased firm risk? Working Paper.

Hutchens, M., S.O. Rego, and B. Williams. 2019. Tax avoidance, uncertainty, and firm risk. Working Paper.

Lisowsky, P., L. Robinson, and A. Schmidt. 2013. Do publicly disclosed tax reserves tell us about privately disclosed tax shelter activity? *Journal of Accounting Research* 51(3): 583-629.

Markowitz, H. 1952. Portfolio selection. *The Journal of Finance* 7(1): 77-91.

Markowitz, H. 1959. Portfolio selection: efficient diversification of investments. New York: John Wiley & Sons.

Neuman, S.S., T.C. Omer, and A.P. Schmidt. 2020. Assessing tax risk: practitioner perspectives. *Contemporary Accounting Research.* Forthcoming.

PricewaterhouseCoopers. 2004. Tax risk management. London: PWC.

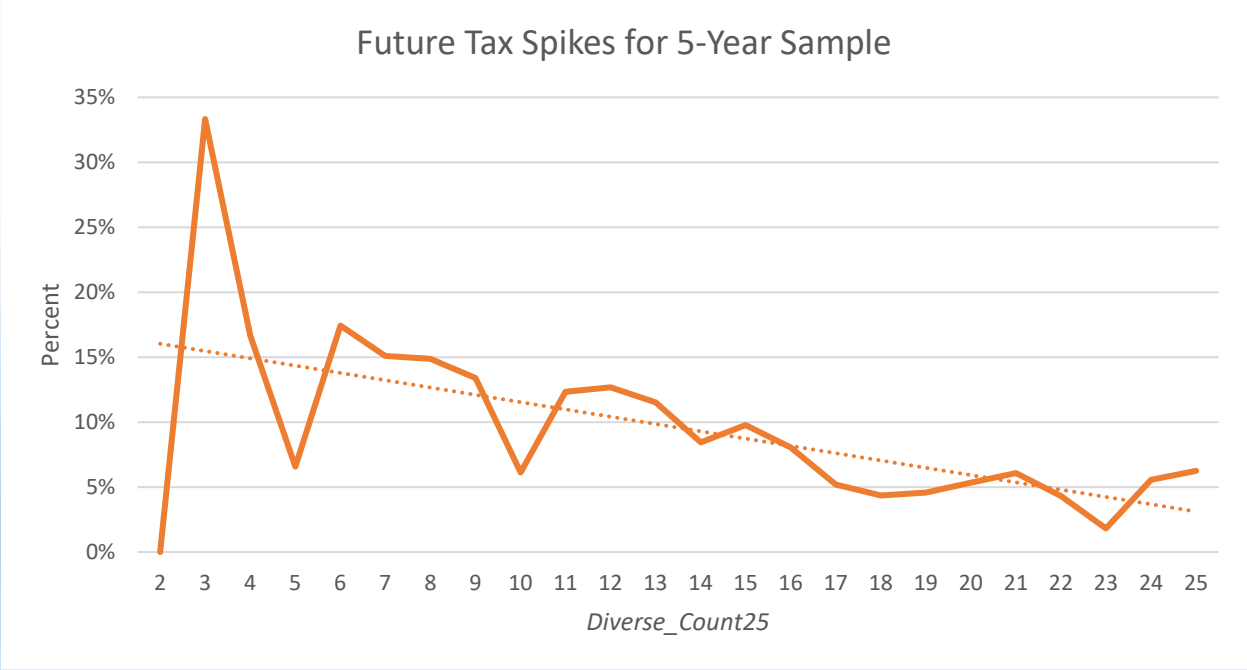
Rego, S.O. and R.J. Wilson. 2012. Equity risk incentives and corporate tax aggressiveness. *Journal of Accounting Research* 50(3): 775-810.

Saavedra, Daniel. 2018. Is tax volatility priced by lenders in the syndicated loan market? *European Accounting Review* 28(4): 1-23.

Wilde, J.H. and R.J. Wilson. 2018. Perspectives on corporate tax planning: observations from the past decade. *The Journal of the American Taxation Association* 40(2): 63-81.

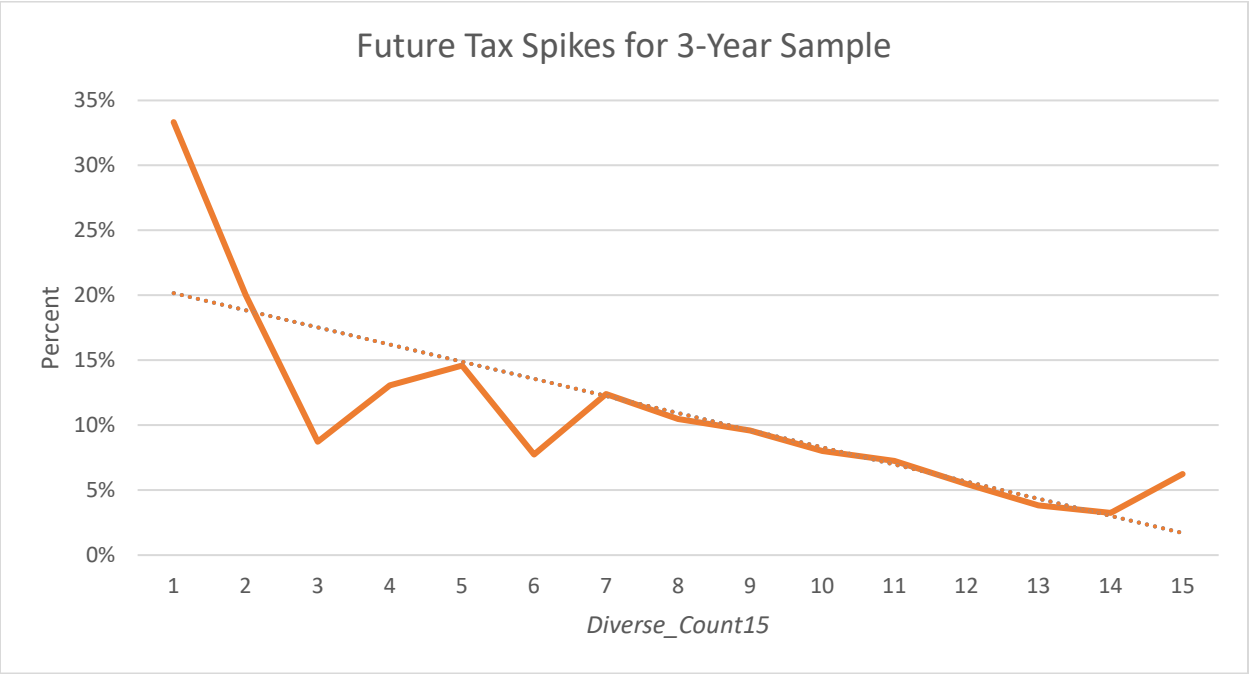
Zimmerman, J.L. 1983. Taxes and firm size. *Journal of Accounting and Economics*: 5(1): 119-149.

FIGURE 1



Note: This figure presents the percentage of firms in the 5-year sample with a tax spike in any of the future 3 years for each level of diversification.

FIGURE 2



Note: This figure presents the percentage of firms in the 3-year sample with a tax spike in any of the future 3 years for each level of diversification.

TABLE 1
Sample Selection

	5-Year	3-Year
All Compustat firms (1987–2017) incorporated in the U.S.	274,827	274,827
Insufficient Data to Calculate:		
Stock Return Volatility	(115,629)	(115,629)
Control Variables	(85,460)	(85,460)
Tax Variable (post-FAS 109)	(31,215)	(26,643)
GMW Replication Sample	42,523	47,095
Insufficient Data to Calculate Diversification Buckets:		
Negative Pretax Income	(12,894)	(9,671)
Current and Deferred Taxes	(13,413)	(14,914)
Pretax Domestic and Foreign Income	(2,841)	(3,328)
Overall Not Avoiding Tax	(1,516)	(2,594)
Diversification Sample - Firm Risk	11,859	16,588
Insufficient Data to Calculate Future Cash ETR Volatility	(4,743)	(6,647)
Diversification Sample - Tax Risk	7,116	9,941

TABLE 2
Descriptive Statistics

Panel A: GMW Replication Sample

Variable	n	Mean	Std. Dev.	25th Percentile	50th Percentile	75th Percentile
5-Year TaxAvoid	42,523	-0.2703	0.1976	-0.3490	-0.2609	-0.1449
3-Year TaxAvoid	47,095	-0.2603	0.2022	-0.3480	-0.2507	-0.1181
5-Year Adjusted TaxAvoid	42,523	-0.0205	0.1750	-0.0699	0.0000	0.0668
3-Year Adjusted TaxAvoid	47,095	-0.0217	0.1811	-0.0772	0.0000	0.0725
FirmRisk (SD_Ret)	49,121	0.1139	0.0677	0.0666	0.0968	0.1417
TaxRisk (SD_CETR)	29,452	0.1359	0.1188	0.0500	0.0973	0.1837
TaxRisk (SD_GAAPETR)	30,450	0.1183	0.1188	0.0266	0.0772	0.1674
TaxRisk (TaxSpike)	49,121	0.1175	0.3220	0.0000	0.0000	0.0000
PTBI	49,121	0.0813	0.1106	0.0169	0.0647	0.1308
Vol_PTBI	49,121	0.0699	0.0811	0.0201	0.0438	0.0869
BTM	49,121	0.6605	0.5215	0.3222	0.5378	0.8408
Leverage	49,121	0.2093	0.2235	0.0150	0.1497	0.3248
Size	49,121	6.5993	1.9790	5.2223	6.5936	7.9066
Shares_Out	49,121	3.4434	1.4309	2.4371	3.3798	4.3249
Vol_SpecialItems	49,121	0.0240	0.0398	0.0018	0.0088	0.0271
Vol_CashFlow	49,121	0.0609	0.0632	0.0217	0.0424	0.0766
Vol_ETBSO	49,121	0.0006	0.0021	0.0000	0.0000	0.0000
ETBSO	49,121	0.0004	0.0018	0.0000	0.0000	0.0000
CHG_NOLCF	49,121	0.0017	0.0391	0.0000	0.0000	0.0000
LOSS	49,121	0.1409	0.3480	0.0000	0.0000	0.0000

Note: This table presents the descriptive statistics for the full GMW diversification sample, including observations only present in either the 5-year or 3-year sample. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% and 99% levels.

TABLE 2
Descriptive Statistics
(continued)

Panel B: Diversification Sample

Variable	n	Mean	Std. Dev.	25th Percentile	50th Percentile	75th Percentile
5-Year TaxAvoid	11,859	-0.2216	0.1270	-0.3157	-0.2428	-0.1369
3-Year TaxAvoid	16,588	-0.2120	0.1372	-0.3111	-0.2280	-0.1020
5-Year Adjusted TaxAvoid	11,859	0.0074	0.1014	-0.0396	0.0000	0.0515
3-Year Adjusted TaxAvoid	16,588	0.0097	0.1164	-0.0427	0.0000	0.0648
FirmRisk (SD_Ret)	17,075	0.0992	0.0546	0.0612	0.0859	0.1220
TaxRisk (SD_CETR)	10,233	0.1207	0.1124	0.0433	0.0842	0.1597
TaxRisk (SD_GAAPETR)	10,604	0.0968	0.1095	0.0177	0.0535	0.1415
TaxRisk (TaxSpike)	17,075	0.0976	0.2967	0.0000	0.0000	0.0000
PTBI	17,075	0.1204	0.0969	0.0520	0.0958	0.1605
Vol_PTBI	17,075	0.0564	0.0682	0.0188	0.0358	0.0663
BTM	17,075	0.5385	0.4058	0.2742	0.4482	0.6945
Leverage	17,075	0.2212	0.2276	0.0120	0.1703	0.3417
Size	17,075	6.8229	1.9538	5.5311	6.8472	8.1263
Shares_Out	17,075	3.6521	1.4470	2.6608	3.5936	4.5350
Vol_SpecialItems	17,075	0.0159	0.0297	0.0015	0.0065	0.0170
Vol_CashFlow	17,075	0.0552	0.0570	0.0212	0.0385	0.0680
Vol_ETBSO	17,075	0.0009	0.0025	0.0000	0.0000	0.0000
ETBSO	17,075	0.0007	0.0023	0.0000	0.0000	0.0000
CHG_NOLCF	17,075	-0.0004	0.0313	0.0000	0.0000	0.0000

Note: This table presents the descriptive statistics for the full diversification sample, including observations only present in either the 5-year or 3-year sample. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% and 99% levels.

TABLE 2
Descriptive Statistics
(continued)

Panel C: Industry Composition

Fama-French Industry Code		GMW Replication Sample		Diversification Sample	
		n	Percent	n	Percent
1	Agriculture	151	0.31	66	0.39
2	Food Products	966	1.97	393	2.30
3	Candy & Soda	123	0.25	72	0.42
4	Beer & Liquor	170	0.35	96	0.56
5	Tobacco Products	53	0.11	39	0.23
6	Recreation	363	0.74	121	0.71
7	Entertainment	630	1.28	178	1.04
8	Printing and Publishing	362	0.74	141	0.82
9	Consumer Goods	824	1.68	297	1.74
10	Apparel	798	1.62	254	1.49
11	Healthcare	830	1.69	359	2.10
12	Medical Equipment	1,364	2.78	489	2.87
13	Pharmaceutical Products	1,229	2.50	407	2.38
14	Chemicals	1,065	2.17	429	2.51
15	Rubber and Plastic Products	451	0.92	148	0.87
16	Textiles	201	0.41	72	0.42
17	Construction Materials	1,060	2.16	423	2.48
18	Construction	627	1.28	224	1.31
19	Steel Works	630	1.28	202	1.18
20	Fabricated Products	168	0.34	36	0.21
21	Machinery	1,798	3.66	702	4.11
22	Electrical Equipment	735	1.50	191	1.12
23	Automobiles and Trucks	791	1.61	294	1.72
24	Aircraft	270	0.55	144	0.84
25	Shipbuilding, Railroad Equipment	130	0.26	46	0.27
26	Defense	135	0.27	71	0.42
27	Precious Metals	53	0.11	6	0.04
28	Non-Metallic and Industrial Metal Mining	149	0.30	53	0.31
29	Coal	79	0.16	43	0.25
30	Petroleum and Natural Gas	1,427	2.91	408	2.39
31	Utilities	2,097	4.27	216	1.27
32	Communication	986	2.01	366	2.14
33	Personal Services	576	1.17	258	1.51
34	Business Services	2,559	5.21	866	5.07
35	Computer Hardware	879	1.79	284	1.66
36	Computer Software	2,738	5.57	983	5.76
37	Electronic Equipment	2,712	5.52	895	5.24
38	Measuring and Control Equipment	1,104	2.25	403	2.36
39	Business Supplies	652	1.33	262	1.53
40	Shipping Containers	203	0.41	88	0.52
41	Transportation	1,229	2.50	608	3.56
42	Wholesale	1,950	3.97	761	4.46
43	Retail	2,756	5.61	1,157	6.78
44	Restaurants, Hotels, Motels	955	1.94	302	1.77
45	Banking	3,593	7.31	259	1.52
46	Insurance	1,816	3.70	660	3.87
47	Real Estate	344	0.70	104	0.61
48	Trading	3,497	7.12	1,947	11.4
49	Other	843	1.72	252	1.48
	Total	49,121	100	17,075	100

Note: This table presents the industry composition for the full diversification sample and GMW replication sample, including observations in only present either the 5-year or 3-year sample. Industry composition is based on Fama-French 49 groupings.

TABLE 3
The Relation between Tax Avoidance and Measures of Risk

	GMW Replication Sample - *FirmRisk (SD_Ret)*		Diversification Sample - *FirmRisk (SD_Ret)*		Diversification Sample - *TaxRisk (SD_CETR)*	
	(1) *5-Year TaxAvoid*	*(2)* *3-Year Adjusted TaxAvoid*	*(3)* *5-Year TaxAvoid*	*(4)* *3-Year Adjusted TaxAvoid*	*(5)* *5-Year TaxAvoid*	*(6)* *3-Year Adjusted TaxAvoid*
TaxAvoid	-0.0037	-0.0003	0.0095	0.0079	0.0576	0.0270
	(-1.46)	(-0.15)	(1.09)	(1.56)	(1.59)	(1.63)
PTBI	0.0013	0.0041	0.0197**	0.0239***	-0.0195	-0.0007
	(0.24)	(0.82)	(2.02)	(2.90)	(-0.77)	(-0.03)
Vol_PTBI	0.0734***	0.0609***	0.0920***	0.0432**	-0.0306	-0.0463
	(6.26)	(5.79)	(3.49)	(2.39)	(-0.54)	(-1.05)
BTM	0.0195***	0.0189***	0.0127***	0.0146***	-0.0047	-0.0062
	(14.48)	(14.14)	(4.05)	(5.70)	(-0.59)	(-0.93)
Leverage	0.0245***	0.0235***	0.0203***	0.0188***	0.0188	-0.0033
	(9.61)	(10.15)	(4.69)	(5.27)	(1.62)	(-0.32)
Size	-0.0060***	-0.0061***	-0.0029	-0.0038**	0.0130*	0.0160***
	(-4.84)	(-5.39)	(-1.35)	(-2.34)	(1.72)	(2.81)
Shares_Out	0.0003	0.0004	0.0035*	0.0022	0.0112	0.0085
	(0.22)	(0.40)	(1.76)	(1.39)	(1.57)	(1.40)
Vol_SpecialItems	0.0319*	0.0247	-0.0041	-0.0026	0.0333	-0.0232
	(1.81)	(1.53)	(-0.10)	(-0.10)	(0.20)	(-0.31)
Vol_CashFlow	0.0090	0.0190*	-0.0010	0.0322*	-0.0805	-0.0888
	(0.73)	(1.76)	(-0.04)	(1.81)	(-1.19)	(-1.63)
Vol_ETBSO	-1.4570***	-1.4875***	-1.4275***	-1.1707***	-0.4980	-0.3978
	(-6.82)	(-6.82)	(-4.64)	(-4.14)	(-0.58)	(-0.51)
ETBSO	0.3107*	0.2577	-0.2343	-0.3501	-0.6521	-0.6708
	(1.95)	(1.63)	(-1.00)	(-1.63)	(-1.26)	(-1.28)
CHG_NOLCF	0.0319***	0.0149*	0.0130	0.0009	-0.1158**	-0.0764**
	(3.78)	(1.87)	(0.72)	(0.06)	(-2.27)	(-1.98)
NOLCF	-0.0072*	-0.0038	0.0128	0.0133**	0.0356	0.0034
	(-1.65)	(-0.98)	(1.37)	(2.08)	(1.06)	(0.14)
Loss	0.0205***	0.0202***				
	(16.26)	(16.46)				
Constant	0.1387***	0.1160***	0.1074***	0.0911***	0.0130	0.0007
	(20.64)	(19.74)	(8.67)	(10.51)	(0.31)	(0.02)
N	42,523	47,095	11,859	16,588	7,116	9,941
Adj. R-sq	0.2734	0.2637	0.2479	0.2473	0.0235	0.0245

Note: This table presents the results from estimating Equation (1). I use OLS with firm and year fixed effects and cluster standard errors at the firm level. The symbols *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

TABLE 4
Diversification Descriptives

Panel A: 5-Year Measure

Diverse_Count25	n	Percent	Cum.
2	1	0.01	0.01
3	3	0.03	0.03
4	12	0.1	0.13
5	152	1.28	1.42
6	109	0.92	2.34
7	232	1.96	4.29
8	390	3.29	7.58
9	575	4.85	12.43
10	2,101	17.72	30.15
11	1,022	8.62	38.76
12	1,198	10.1	48.87
13	1,207	10.18	59.04
14	1,089	9.18	68.23
15	921	7.77	75.99
16	484	4.08	80.07
17	482	4.06	84.14
18	460	3.88	88.02
19	437	3.68	91.7
20	355	2.99	94.7
21	247	2.08	96.78
22	186	1.57	98.35
23	110	0.93	99.27
24	54	0.46	99.73
25	32	0.27	100
Total	11,859	100	
Average	13.18		

Note: This table presents the number of observations at each level of diversification using the 5-year measure. There are no observations for level 1.

Panel B: 3-Year Measure

Diverse_Count15	n	Percent	Cum.
1	6	0.04	0.04
2	30	0.18	0.22
3	344	2.07	2.29
4	528	3.18	5.47
5	1,075	6.48	11.95
6	3,653	22.02	33.98
7	2,484	14.97	48.95
8	2,556	15.41	64.36
9	2,253	13.58	77.94
10	1,074	6.47	84.42
11	936	5.64	90.06
12	804	4.85	94.91
13	471	2.84	97.75
14	246	1.48	99.23
15	128	0.77	100
Total	16,588	100	
Average	7.88		

Note: This table presents the number of observations at each level of diversification using the 3-year measure.

TABLE 5
The Impact of Diversification on the Relation between Tax Avoidance and Tax Risk

Panel A: Regression

	TaxRisk (SD_CETR)			
	5-Year TaxAvoid	*5-Year Adj. TaxAvoid*	*3-Year TaxAvoid*	*3-Year Adj. TaxAvoid*
TaxAvoid	0.1260**	0.0823**	0.0327	0.0490**
	(2.40)	(2.19)	(1.20)	(2.10)
Diverse	-0.0020**	-0.0020**	-0.0007	-0.0009
	(-2.05)	(-2.05)	(-0.71)	(-0.87)
Diverse x TaxAvoid	-0.0124*	-0.0079	-0.0104*	-0.0085
	(-1.75)	(-1.50)	(-1.65)	(-1.52)
PTBI	-0.0167	-0.0161	0.0010	0.0010
	(-0.66)	(-0.64)	(0.05)	(0.05)
Vol_PTBI	-0.0243	-0.0306	-0.0464	-0.0476
	(-0.43)	(-0.53)	(-1.05)	(-1.07)
BTM	-0.0044	-0.0045	-0.0061	-0.0062
	(-0.55)	(-0.55)	(-0.92)	(-0.94)
Leverage	0.0178	0.0174	-0.0022	-0.0031
	(1.53)	(1.48)	(-0.22)	(-0.31)
Size	0.0146*	0.0149**	0.0161***	0.0163***
	(1.96)	(1.99)	(2.86)	(2.88)
Shares_Out	0.0108	0.0104	0.0087	0.0085
	(1.53)	(1.47)	(1.43)	(1.39)
Vol_SpecialItems	-0.0061	-0.0025	-0.0276	-0.0249
	(-0.04)	(-0.01)	(-0.36)	(-0.33)
Vol_CashFlow	-0.0844	-0.0824	-0.0877	-0.0894
	(-1.25)	(-1.23)	(-1.61)	(-1.64)
Vol_ETBSO	-0.4058	-0.3440	-0.4322	-0.3826
	(-0.46)	(-0.39)	(-0.55)	(-0.49)
ETBSO	-0.6402	-0.6264	-0.6245	-0.6458
	(-1.23)	(-1.21)	(-1.18)	(-1.23)
CHG_NOLCF	-0.1017**	-0.1093**	-0.0781**	-0.0746*
	(-2.01)	(-2.17)	(-2.01)	(-1.93)
NOLCF	0.0317	0.0356	0.0029	0.0014
	(0.95)	(1.08)	(0.12)	(0.06)
Constant	0.0747	0.0132	0.0273	0.0063
	(1.42)	(0.33)	(0.84)	(0.22)
N	7,116	7,116	9,941	9,941
Adj. R-sq	0.0285	0.0268	0.0247	0.0254

Note: I use OLS with firm and year fixed effects and cluster standard errors at the firm level. The symbols *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

TABLE 5 (continued)
The Impact of Diversification on the Relation between Tax Avoidance and Tax Risk

Panel B: Predictive Margins

	TaxRisk (SD_CETR)											
	5-Year TaxAvoid			*5-Year Adj. TaxAvoid*			*3-Year TaxAvoid*			*3-Year Adj. TaxAvoid*		
	Diversification Level			*Diversification Level*			*Diversification Level*			*Diversification Level*		
	Low	*Medium*	*High*	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*
TaxAvoid												
Lowest	-0.0228	0.0606**	0.1441**	0.0389	0.0814***	0.1239**	0.0680*	0.1164***	0.1647***	0.0645**	0.1005***	0.1364***
	(-0.31)	(2.19)	(2.23)	(0.77)	(4.23)	(2.55)	(1.79)	(7.53)	(4.40)	(2.01)	(8.26)	(4.30)
+0.1	-0.0010	0.0676***	0.1362**	0.0530	0.0860***	0.1190***	0.0757**	0.1167***	0.1578***	0.0730***	0.1030***	0.1330***
	(-0.02)	(2.80)	(2.42)	(1.21)	(5.20)	(2.82)	(2.28)	(8.66)	(4.81)	(2.62)	(9.78)	(4.80)
+0.2	0.0209	0.0746***	0.1283***	0.0672*	0.0907***	0.1141***	0.0833***	0.1171***	0.1508***	0.0814***	0.1055***	0.1297***
	(0.39)	(3.63)	(2.68)	(1.82)	(6.53)	(3.18)	(2.94)	(10.17)	(5.35)	(3.44)	(11.86)	(5.45)
+0.3	0.0427	0.0815***	0.1204***	0.0813***	0.0953***	0.1092***	0.0909***	0.1174***	0.1439***	0.0899***	0.1081***	0.1263***
	(0.97)	(4.82)	(3.04)	(2.70)	(8.50)	(3.68)	(3.85)	(12.31)	(6.08)	(4.59)	(14.87)	(6.35)
+0.4	0.0645*	0.0885***	0.1125***	0.0955***	0.0999***	0.1043***	0.0985***	0.1178***	0.1370***	0.0983***	0.1106***	0.1229***
	(1.86)	(6.63)	(3.57)	(4.02)	(11.69)	(4.41)	(5.19)	(15.57)	(7.12)	(6.29)	(19.64)	(7.64)
+0.5	0.0864***	0.0955***	0.1046***	0.1096***	0.1045***	0.0994***	0.1062***	0.1181***	0.1300***	0.1068***	0.1131***	0.1195***
	(3.36)	(9.79)	(4.40)	(6.14)	(17.80)	(5.48)	(7.32)	(21.14)	(8.69)	(8.96)	(28.30)	(9.53)
+0.6	0.1082***	0.1024***	0.0967***	0.1238***	0.1092***	0.0945***	0.1138***	0.1184***	0.1231***	0.1152***	0.1157***	0.1161***
	(6.19)	(16.63)	(5.73)	(9.39)	(34.09)	(6.92)	(10.87)	(32.77)	(11.10)	(13.14)	(48.94)	(12.26)
+0.7	0.1301***	0.1094***	0.0888***	0.1379***	0.1138***	0.0896***	0.1214***	0.1188***	0.1162***	0.1237***	0.1182***	0.1127***
	(10.87)	(42.59)	(7.24)	(12.09)	(211.23)	(7.81)	(16.09)	(72.30)	(14.23)	(17.60)	(160.50)	(15.02)
+0.8	0.1519***	0.1164***	0.0809***	0.1521***	0.1184***	0.0847***	0.1291***	0.1191***	0.1092***	0.1321***	0.1207***	0.1093***
	(11.55)	(112.43)	(6.33)	(11.11)	(55.20)	(6.59)	(17.77)	(324.77)	(14.75)	(17.17)	(131.11)	(14.45)
+0.9	0.1737***	0.1233***	0.0730***	0.1662***	0.1230***	0.0798***	0.1367***	0.1195***	0.1023***	0.1406***	0.1232***	0.1059***
	(8.73)	(26.70)	(4.06)	(8.94)	(25.55)	(4.72)	(13.88)	(51.57)	(10.92)	(13.62)	(48.33)	(11.02)
Highest	0.1956***	0.1303***	0.0651***	0.1804***	0.1277***	0.0749***	0.1443***	0.1198***	0.0953***	0.1490***	0.1258***	0.1025***
	(6.87)	(15.87)	(2.59)	(7.34)	(17.05)	(3.36)	(10.48)	(27.94)	(7.42)	(10.78)	(30.06)	(8.06)
N	7,116	7,116	7,116	7,116	7,116	7,116	9,941	9,941	9,941	9,941	9,941	9,941

TABLE 6
The Impact of Diversification on the Relation between Tax Avoidance and Firm Risk

Panel A: Regression

	FirmRisk (SD_Ret)			
	5-Year TaxAvoid	*5-Year Adj. TaxAvoid*	*3-Year TaxAvoid*	*3-Year Adj. TaxAvoid*
TaxAvoid	0.0016	0.0204*	-0.0092	-0.0011
	(0.11)	(1.79)	(-1.22)	(-0.15)
Diverse	-0.0007***	-0.0007***	-0.0009***	-0.0009***
	(-2.75)	(-2.84)	(-3.26)	(-3.41)
Diverse x TaxAvoid	0.0025	0.0012	0.0048***	0.0047**
	(1.36)	(0.72)	(2.64)	(2.43)
PTBI	0.0210**	0.0213**	0.0251***	0.0256***
	(2.16)	(2.19)	(3.03)	(3.10)
Vol_PTBI	0.0916***	0.0919***	0.0431**	0.0429**
	(3.48)	(3.50)	(2.38)	(2.37)
BTM	0.0127***	0.0129***	0.0144***	0.0146***
	(4.08)	(4.13)	(5.65)	(5.73)
Leverage	0.0201***	0.0196***	0.0189***	0.0188***
	(4.67)	(4.57)	(5.30)	(5.28)
Size	-0.0025	-0.0023	-0.0035**	-0.0035**
	(-1.15)	(-1.06)	(-2.20)	(-2.17)
Shares_Out	0.0033*	0.0032*	0.0022	0.0022
	(1.70)	(1.66)	(1.38)	(1.38)
Vol_SpecialItems	-0.0086	-0.0070	-0.0040	-0.0034
	(-0.20)	(-0.17)	(-0.15)	(-0.13)
Vol_CashFlow	-0.0012	-0.0024	0.0321*	0.0315*
	(-0.05)	(-0.10)	(1.81)	(1.78)
Vol_ETBSO	-1.4163***	-1.3921***	-1.1728***	-1.1772***
	(-4.63)	(-4.53)	(-4.19)	(-4.20)
ETBSO	-0.2413	-0.2223	-0.3543*	-0.3391
	(-1.03)	(-0.96)	(-1.65)	(-1.58)
CHG_NOLCF	0.0133	0.0160	-0.0008	0.0008
	(0.74)	(0.89)	(-0.05)	(0.05)
NOLCF	0.0117	0.0113	0.0135**	0.0128**
	(1.27)	(1.23)	(2.13)	(2.04)
Constant	0.1048***	0.1090***	0.0872***	0.0950***
	(7.62)	(8.80)	(9.19)	(10.83)
N	11,859	11,859	16,588	16,588
Adj. R-sq	0.2487	0.2498	0.2481	0.2484

Note: I use OLS with firm and year fixed effects and cluster standard errors at the firm level. The symbols *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

TABLE 6 (continued)
The Impact of Diversification on the Relation between Tax Avoidance and Firm Risk

Panel B: Predictive Margins

	FirmRisk (SD Ret)											
	5-Year TaxAvoid			*5-Year Adj. TaxAvoid*			*3-Year TaxAvoid*			*3-Year Adj. TaxAvoid*		
	Diversification Level			*Diversification Level*			*Diversification Level*			*Diversification Level*		
	Low	*Medium*	*High*	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*
TaxAvoid												
Lowest	0.1147***	0.0848***	0.0549***	0.0943***	0.0762***	0.0580***	0.1264***	0.0954***	0.0643***	0.1196***	0.0898***	0.0600***
	(5.85)	(12.47)	(3.27)	(5.84)	(14.58)	(3.92)	(11.70)	(23.38)	(6.10)	(11.22)	(24.55)	(5.65)
+0.1	0.1129***	0.0861***	0.0593***	0.0955***	0.0788***	0.0621***	0.1235***	0.0958***	0.0682***	0.1175***	0.0910***	0.0645***
	(6.63)	(14.53)	(4.05)	(6.86)	(17.51)	(4.85)	(13.11)	(26.90)	(7.40)	(12.73)	(28.74)	(7.00)
+0.2	0.1112***	0.0874***	0.0636***	0.0966***	0.0814***	0.0662***	0.1205***	0.0963***	0.0720***	0.1154***	0.0922***	0.0690***
	(7.68)	(17.30)	(5.10)	(8.25)	(21.57)	(6.13)	(14.99)	(31.61)	(9.14)	(14.77)	(34.47)	(8.81)
+0.3	0.1095***	0.0887***	0.0680***	0.0977***	0.0840***	0.0702***	0.1176***	0.0967***	0.0759***	0.1133***	0.0934***	0.0735***
	(9.15)	(21.22)	(6.58)	(10.27)	(27.57)	(7.97)	(17.62)	(38.25)	(11.55)	(17.67)	(42.78)	(11.38)
+0.4	0.1077***	0.0900***	0.0723***	0.0988***	0.0866***	0.0743***	0.1147***	0.0972***	0.0797***	0.1113***	0.0946***	0.0780***
	(11.39)	(27.21)	(8.78)	(13.41)	(37.32)	(10.80)	(21.51)	(48.30)	(15.09)	(22.08)	(55.90)	(15.26)
+0.5	0.1060***	0.0913***	0.0767***	0.1000***	0.0892***	0.0784***	0.1117***	0.0976***	0.0835***	0.1092***	0.0958***	0.0825***
	(15.07)	(37.49)	(12.32)	(18.72)	(55.94)	(15.49)	(27.69)	(65.29)	(20.67)	(29.31)	(79.73)	(21.56)
+0.6	0.1043***	0.0926***	0.0810***	0.1011***	0.0918***	0.0824***	0.1088***	0.0981***	0.0874***	0.1071***	0.0970***	0.0870***
	(21.79)	(59.24)	(18.49)	(27.92)	(105.69)	(23.42)	(38.20)	(100.20)	(29.96)	(41.84)	(136.42)	(32.42)
+0.7	0.1025***	0.0939***	0.0854***	0.1022***	0.0944***	0.0865***	0.1058***	0.0985***	0.0912***	0.1050***	0.0982***	0.0915***
	(32.85)	(135.55)	(27.85)	(35.97)	(634.35)	(31.15)	(53.39)	(212.67)	(43.51)	(56.65)	(442.50)	(46.81)
+0.8	0.1008***	0.0952***	0.0897***	0.1034***	0.0970***	0.0906***	0.1029***	0.0990***	0.0951***	0.1030***	0.0995***	0.0960***
	(31.84)	(493.51)	(29.45)	(28.22)	(164.97)	(26.63)	(53.24)	(1322.54)	(47.55)	(48.40)	(364.16)	(45.25)
+0.9	0.0991***	0.0966***	0.0941***	0.1045***	0.0996***	0.0946***	0.0999***	0.0994***	0.0989***	0.1009***	0.1007***	0.1005***
	(20.33)	(91.40)	(21.66)	(19.36)	(75.83)	(19.33)	(36.43)	(172.81)	(36.58)	(32.20)	(131.98)	(33.07)
Highest	0.0973***	0.0979***	0.0984***	0.1056***	0.1022***	0.0987***	0.0970***	0.0999***	0.1028***	0.0988***	0.1019***	0.1050***
	(13.64)	(50.76)	(15.93)	(14.21)	(50.10)	(14.73)	(24.79)	(91.52)	(27.13)	(22.48)	(81.28)	(24.73)
N	11,859	11,859	11,859	11,859	11,859	11,859	16,588	16,588	16,588	16,588	16,588	16,588

TABLE 7
The Impact of Diversification on the Relation between Tax Avoidance and Tax Risk (Tax Spike)

Panel A: Regression

	TaxRisk (TaxSpike)			
	5-Year TaxAvoid	*5-Year Adj. TaxAvoid*	*3-Year TaxAvoid*	*3-Year Adj. TaxAvoid*
TaxAvoid	0.3696***	0.2530***	0.1537**	0.1701***
	(2.85)	(2.70)	(2.31)	(2.93)
Diverse	-0.0030	-0.0034	0.0007	0.0001
	(-1.30)	(-1.49)	(0.27)	(0.03)
Diverse x TaxAvoid	-0.0282	-0.0082	-0.0396**	-0.0292*
	(-1.55)	(-0.60)	(-2.38)	(-1.95)
PTBI	-0.0771	-0.0762	-0.0467	-0.0465
	(-1.05)	(-1.04)	(-0.82)	(-0.82)
Vol_PTBI	-0.0912	-0.1053	-0.1690	-0.1706
	(-0.59)	(-0.67)	(-1.51)	(-1.52)
BTM	-0.0153	-0.0148	-0.0029	-0.0032
	(-0.76)	(-0.73)	(-0.19)	(-0.20)
Leverage	0.0530*	0.0502*	0.0283	0.0261
	(1.86)	(1.76)	(1.15)	(1.06)
Size	0.0423**	0.0438**	0.0371***	0.0384***
	(2.42)	(2.50)	(2.92)	(3.01)
Shares_Out	0.0110	0.0103	0.0003	-0.0004
	(0.61)	(0.58)	(0.03)	(-0.03)
Vol_SpecialItems	0.4899	0.5096	0.0263	0.0306
	(1.32)	(1.36)	(0.16)	(0.18)
Vol_CashFlow	-0.0719	-0.0621	-0.0264	-0.0266
	(-0.41)	(-0.35)	(-0.19)	(-0.19)
Vol_ETBSO	0.0515	0.3644	-0.5231	-0.4426
	(0.02)	(0.17)	(-0.26)	(-0.22)
ETBSO	-1.1991	-1.0810	0.5930	0.5008
	(-0.78)	(-0.70)	(0.42)	(0.36)
CHG_NOLCF	0.0043	-0.0141	0.0595	0.0641
	(0.03)	(-0.11)	(0.65)	(0.71)
NOLCF	-0.0183	-0.0070	-0.0611	-0.0620
	(-0.22)	(-0.09)	(-1.12)	(-1.16)
Constant	0.0090	-0.1560*	-0.0199	-0.1105*
	(0.08)	(-1.72)	(-0.30)	(-1.80)
N	11,859	11,859	16,588	16,588
Adj. R-sq	0.0154	0.0150	0.0119	0.0122

Note: I use OLS with firm and year fixed effects and cluster standard errors at the firm level. The symbols *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

TABLE 7 (continued)
The Impact of Diversification on the Relation between Tax Avoidance and Tax Risk (Tax Spike)

Panel B: Predictive Margins

	TaxRisk (TaxSpike)											
	5-Year TaxAvoid			*5-Year Adj. TaxAvoid*			*3-Year TaxAvoid*			*3-Year Adj. TaxAvoid*		
	Diversification Level			*Diversification Level*			*Diversification Level*			*Diversification Level*		
	Low	*Medium*	*High*	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*
TaxAvoid												
Lowest	-0.3037	-0.0968	0.1102	-0.0903	-0.0634	-0.0364	-0.1479	0.0605*	0.2690***	-0.1167	0.0293	0.1753**
	(-1.57)	(-1.52)	(0.67)	(-0.67)	(-1.43)	(-0.30)	(-1.47)	(1.73)	(2.76)	(-1.34)	(1.03)	(2.05)
+0.1	-0.2458	-0.0726	0.1005	-0.0589	-0.0418	-0.0247	-0.1160	0.0648**	0.2455***	-0.0875	0.0381	0.1637**
	(-1.46)	(-1.31)	(0.70)	(-0.50)	(-1.09)	(-0.23)	(-1.31)	(2.11)	(2.87)	(-1.15)	(1.55)	(2.19)
+0.2	-0.1878	-0.0485	0.0909	-0.0275	-0.0202	-0.0129	-0.0840	0.0690***	0.2220***	-0.0583	0.0469**	0.1521**
	(-1.31)	(-1.02)	(0.75)	(-0.28)	(-0.63)	(-0.14)	(-1.11)	(2.63)	(3.02)	(-0.90)	(2.26)	(2.38)
+0.3	-0.1299	-0.0243	0.0813	0.0039	0.0014	-0.0012	-0.0521	0.0732***	0.1985***	-0.0291	0.0557***	0.1405***
	(-1.09)	(-0.62)	(0.80)	(0.05)	(0.05)	(-0.02)	(-0.82)	(3.37)	(3.21)	(-0.54)	(3.29)	(2.63)
+0.4	-0.0719	-0.0001	0.0716	0.0353	0.0229	0.0106	-0.0201	0.0775***	0.1750***	0.0001	0.0645***	0.1289***
	(-0.76)	(-0.00)	(0.89)	(0.54)	(1.16)	(0.18)	(-0.39)	(4.48)	(3.49)	(0.00)	(4.92)	(2.98)
+0.5	-0.0140	0.0240	0.0620	0.0667	0.0445***	0.0224	0.0119	0.0817***	0.1515***	0.0294	0.0733***	0.1173***
	(-0.20)	(1.05)	(1.02)	(1.35)	(3.28)	(0.50)	(0.30)	(6.35)	(3.90)	(0.88)	(7.88)	(3.51)
+0.6	0.0440	0.0482***	0.0524	0.0981***	0.0661***	0.0341	0.0438	0.0859***	0.1280***	0.0586**	0.0821***	0.1057***
	(0.90)	(3.27)	(1.22)	(2.75)	(8.90)	(1.03)	(1.54)	(10.21)	(4.50)	(2.42)	(14.93)	(4.29)
+0.7	0.1019***	0.0723***	0.0427	0.1295***	0.0877***	0.0459*	0.0758***	0.0901***	0.1045***	0.0878***	0.0909***	0.0941***
	(3.25)	(11.03)	(1.45)	(4.65)	(66.16)	(1.71)	(3.87)	(22.68)	(5.20)	(4.95)	(53.06)	(5.11)
+0.8	0.1599***	0.0965***	0.0331	0.1609***	0.1093***	0.0577*	0.1078***	0.0944***	0.0810***	0.1170***	0.0997***	0.0825***
	(5.45)	(54.38)	(1.16)	(5.23)	(22.19)	(1.93)	(6.44)	(147.96)	(4.69)	(6.74)	(46.55)	(4.67)
+0.9	0.2178***	0.1206***	0.0235	0.1923***	0.1309***	0.0694*	0.1397***	0.0986***	0.0575***	0.1462***	0.1085***	0.0708***
	(4.87)	(12.23)	(0.57)	(4.55)	(11.82)	(1.73)	(6.25)	(19.89)	(2.59)	(6.27)	(18.29)	(3.08)
Highest	0.2758***	0.1448***	0.0138	0.2237***	0.1524***	0.0812	0.1717***	0.1028***	0.0340	0.1755***	0.1173***	0.0592*
	(4.16)	(8.03)	(0.23)	(3.90)	(8.85)	(1.51)	(5.32)	(10.94)	(1.08)	(5.43)	(12.05)	(1.89)
N	11,859	11,859	11,859	11,859	11,859	11,859	16,588	16,588	16,588	16,588	16,588	16,588