Aggregate Corporate Tax Avoidance and Cost of Capital

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Abstract

We identify a pecuniary externality arising from corporate tax avoidance. As firms engage in more avoidance, the cost of capital increases for all firms. The intuition is that firms share risk with the government via taxation. The lower the tax rate applied to a firm's earnings, the more risk is borne by its shareholders. As firms avoid more taxes in the aggregate, the variance of the market's after-tax cash flow increases. Consequently, covariance risk, and thereby the cost of capital, increases for all firms. Consistent with our prediction, we find that firms' implied cost of capital is positively related to aggregate corporate tax avoidance. This result holds for tax-avoiding and non-tax-avoiding firms, and is stronger for firms whose cash flow covaries more with the market cash flow. U.S. multinationals' tax avoidance drives the pecuniary externality, consistent with only strategies that reduce a firm's marginal tax rate on income reducing risk-sharing.

Keywords: Corporate Tax Avoidance, Cost of Capital, Expected Rate of Return, Risk Sharing

JEL Classifications: G12, G18, G32, H25, H26, K34, M41

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I. INTRODUCTION

Corporate tax avoidance is an issue that has attracted much attention recently, with many arguments for why it is potentially harmful to the economy. For example, greater use or prevalence of tax avoidance may shift the burden of taxation from corporations onto other taxpayers, use up resources on non-productive activities, and lead to higher costs of ensuring compliance. In this paper, we identify and study a negative pecuniary externality that results from corporate tax avoidance that prior studies and policy discussions overlook.[1] We predict and show that as firms in the economy engage in more tax avoidance, the cost of capital increases for all firms in the economy, including non-tax-avoiding firms.

The intuition behind our prediction is straightforward and similar to the intuition that underlies Sikes and Verrecchia (2012). Consider the government to be an effective partner in a firm's investments. The higher the (implicit) stake the government has in the firm (i.e., the higher the tax rate), the lower the residual profits that flow to shareholders when the firm does well. However, when the firm suffers a loss, a higher stake by the government means that the government as opposed to shareholders absorbs a greater fraction of the loss. In other words, as the tax rate increases, the variance of a firm's after-tax performance decreases.

Now extend this logic to a scenario in which many firms in the economy engage in tax avoidance strategies that lower the tax rate applied to their income. As the tax rates on income of a meaningful fraction of firms decrease, the variance of the market's after-tax cash flow increases. As a result of an increase in the variance of the market's after-tax cash flow, the covariance risk of all firms (or at least those whose cash flow varies positively with the market cash flow)

[1] In a market system, the activities of some people often change relative prices or affect the value of assets, which creates benefits for or imposes costs on third parties. Because these effects are merely pecuniary and do not imply economic inefficiencies such as misallocation of resources, they are commonly referred to in the public finance literature as "pecuniary externalities."

increases, which, in turn, translates into an increase in the cost of capital for all firms, holding all else constant. Crucially, aggregate tax avoidance affects the cost of capital even for firms that do not engage in tax avoidance.

We test our prediction on a sample consisting of all U.S. firms covered by Compustat over the period from 1988 through 2007. We begin our analysis by examining the relation between annual implied cost of capital and our measure of aggregate corporate tax avoidance. Consistent with prior literature, our reference to corporate tax avoidance is a reference to tax strategies that can, but do not necessarily have to, have uncertain outcomes. In other words, a tax avoidance strategy can be any strategy that reduces a firm's effective tax rate, regardless of whether or not it encompasses a gray or ambiguous area of tax law (Hanlon and Heitzman 2010). We measure aggregate corporate tax avoidance as the sum of cash taxes paid for all U.S. firms in Compustat scaled by the sum of pretax income for all U.S. firms in Compustat, with lower values corresponding to greater tax avoidance.[2] Implied cost of capital is the internal rate of return that equates a firm's stock price to the present value of expected future cash flows.[3] We control for firm characteristics, the maximum statutory corporate tax rate, and macroeconomic variables that prior literature finds are associated with cost of capital. We expect that the greater aggregate tax avoidance is, the higher cost of capital will be for all firms.

Consistent with our prediction, we find that cost of capital is positively related to aggregate corporate tax avoidance. The effect is both statistically significant and economically meaningful. A one-standard-deviation decrease in the aggregate cash effective tax rate is associated with an

[2] The results are also robust to using an alternate measure of aggregate tax avoidance that equals the annual median of firms' long-run (5-year) cash effective tax rates.

[3] Our implied cost of capital estimate relies on the methodology in Hou, van Dijk, and Zhang (2012), who use earnings forecasts derived from a cross-sectional model to proxy for expected future cash flows.

increase in implied cost of capital of 0.92 percentage point, which represents a seven percent change in implied cost of capital for the average firm.

We predict that aggregate tax avoidance increases firms' covariance risk and thereby their cost of capital via an increase in the market risk premium. Thus, the pecuniary externality affects all firms whose cash flow varies positively with the market cash flow. Consistent with this prediction, when we split the sample based on whether a firm's cash effective tax rate (cash ETR) is below or above the annual sample median, we continue to find a significant positive relation between cost of capital and aggregate corporate tax avoidance for both the tax-avoiding and non-tax-avoiding firms. This result shows that the pecuniary externality of higher cost of capital is imposed on all firms, not just the tax-avoiding ones.

Prior literature discusses how a proportional tax on income with a loss offset provision increases risk-sharing with the government (e.g., Domar and Musgrave 1944; Tobin 1958) and how this risk-sharing can actually reduce cost of capital when either systematic risk or the market risk premium is high or the risk-free rate of return is low (Sikes and Verrecchia 2012; Hail, Sikes, and Wang 2015). Our prediction relies on the intuition from these prior studies but differs in two ways: (1) we focus on a tax on corporate as opposed to individual income, and (2) we focus on the effective tax rate (which is a function of tax avoidance activities) as opposed to the statutory tax rate.

A decrease to the statutory corporate tax rate unambiguously decreases risk-sharing with the government for all firms and thus increases the variance of the market cash flow. In contrast, two things are necessary for a reduction in firms' effective tax rates to increase the variance of the market cash flow. First, a meaningful number of firms must reduce their effective tax rates in order for there to be an effect on the market cash flow. Second, the reduction in effective tax rates must

be the result of tax avoidance activities that reduce the marginal tax rate on firms' income as opposed to just reducing firms' tax bases. With respect to the second criterion, a firm's tax liability is comprised of two parts: a tax/subsidy on firm size and a tax on income, where the former represents a fixed tax and the latter represents a variable tax. When engaging in tax avoidance, a firm can either reduce its tax base or reduce the marginal tax rate on its income. Only the latter will reduce risk-sharing with the government. Thus, we expect that the positive relation between cost of capital and aggregate tax avoidance is attributable to tax avoidance activities that reduce firms' marginal tax rates on income as opposed to firms' tax bases. Most tax avoidance strategies reduce the taxable base (e.g., bonus depreciation). However, the permanent deferral of income earned in low tax countries by U.S. multinationals (MNCs) is an example of tax planning that reduces the marginal tax rate on income. Thus, we expect that U.S. MNCs – rather than purely domestic firms – are primarily responsible for the positive relation between cost of capital and aggregate avoidance.[4]

We find a positive and significant relation between cost of capital and aggregate tax avoidance by both MNCs and domestic firms. However, when we include both in the same regression, only MNCs' aggregate tax avoidance remains significantly related to cost of capital. Consistent with our expectation, the pecuniary externality is driven primarily by tax avoidance activities of MNCs because they have more opportunities to reduce the variable portion of their tax liability.

Because the effect of aggregate tax avoidance on cost of capital operates through covariance risk, we expect that the positive relation between cost of capital and aggregate tax

[4] A tax avoidance strategy that could reduce the marginal tax rate on income for domestic firms is shifting income from a higher taxed to a lower taxed state. This strategy is also available to MNCs for their U.S. operations. Thus, we still expect that MNCs drive the pecuniary externality more than domestic firms.

avoidance is stronger for firms whose cash flow covaries more with the market cash flow. We use a firm's market model beta to proxy for the extent to which a firm's cash flow covaries with the market cash flow. As we predict, the positive relation between cost of capital and aggregate tax avoidance is stronger for firms with higher market betas. Furthermore, although the market beta amplifies the positive relation between cost of capital and aggregate tax avoidance of U.S. MNCs, it does not amplify the relation between cost of capital and aggregate tax avoidance of domestic firms. This latter finding provides additional support for our prediction that the variable portion of U.S. MNCs' tax avoidance is responsible for the relation between aggregate tax avoidance and cost of capital.

In our analysis, we control for an individual firm's cash ETR. Consistent with the results in Goh, Lee, Lim, and Shevlin (2016), we find a negative relation between firm-level tax avoidance and cost of capital. Goh et al. (2016) use low cash ETRs as a proxy for more certain (i.e., less aggressive) forms of tax avoidance. The findings that aggregate tax avoidance is positively related to cost of capital, whereas firm-level avoidance is negatively related, are not contradictory. The positive relation between aggregate avoidance and cost of capital is driven by an increase in the market risk premium, whereas the negative relation between firm-level avoidance and cost of capital is driven by an increase in expected cash tax savings.[5,6] For tax-avoiding firms, the increase in expected after-tax cash flow may more than compensate for the increased covariance risk, in

[5] Lambert, Leuz, and Verrecchia (2007) explain that investments can have both an indirect effect (i.e., cash flow effect) and a direct effect (i.e., risk effect) on cost of capital. Couched in their terms, the increase to cost of capital due to the pecuniary externality that we describe is a direct effect, and the decrease to cost of capital that a firm could enjoy from its own tax planning is an indirect effect.

[6] Shevlin, Shivakumar, and Urcan (2016) find that aggregate tax avoidance is positively associated with GDP. Their finding does not contradict our finding of a positive association between aggregate avoidance and cost of capital because they focus on the cash tax savings derived from avoidance. Alternatively, we focus on the variance of the market cash flow and thus the covariance risk and cost of capital that each firm faces. A firm's cost of capital could increase even if its expected cash flow also increases.

which case the *net* effect on the cost of capital will be a decrease. However, for firms that do not engage in tax avoidance, the effect of the additional covariance risk will be an unambiguous increase to their cost of capital because they do not enjoy any expected cash tax savings that could decrease their cost of capital.

Our prediction that greater tax avoidance leads to less risk-sharing with the government and therefore a higher cost capital is based on the assumption that the government does not redistribute the risk that it absorbs via taxation back into the private sector. In contrast, Diamond (1967) holds that investors, in the aggregate, bear the full risk in tax revenue either in the form of random government expenditures or random transfers from the government. If this is true, then a change in aggregate corporate tax avoidance should have no effect on cost of capital. To more directly test our assumption that greater tax avoidance leads to less risk-sharing with the government, we test whether greater aggregate tax avoidance is associated with reduced exposure of government expenditures to market returns. Consistent with our prediction and contrary to Diamond (1967), we find that aggregate corporate tax avoidance is indeed negatively related to the sensitivity of government expenditures to market returns.

Our paper contributes to prior literature that examines the effect of both individual and corporate taxes on risk-taking by individuals and corporations, as well as on cost of capital. As tax policy makers discuss how to combat tax avoidance, our results should be of interest to them as we document a cost associated with aggregate tax avoidance that prior studies overlook. However, we want to stress that we are not suggesting that firms are necessarily worse off by engaging in tax avoidance activities. It could well be that the cash tax savings resulting from tax avoidance outweigh the pecuniary externality that we describe. However, understanding the pecuniary

externality is most important for the non-tax-avoiding firms since they do not enjoy any cash tax savings from tax avoidance to counteract the effect of the pecuniary externality.

The paper proceeds as follows. In Section 2, we discuss related literature and outline our hypotheses. In Section 3, we describe our tests of the relation between aggregate tax avoidance and cost of capital and discuss the results. In Section 4, we discuss the results of additional tests that use alternate clustering of the standard errors, Newey-West standard errors to correct for serial correlation, and an alternate measure of aggregate corporate tax avoidance. Section 5 concludes.

II. RELATED LITERATURE & HYPOTHESES DEVELOPMENT

Domar and Musgrave (1944) are the first to propose that a proportional tax with a full loss offset provision results in the government being a partner in a taxpayer's investment and that such a tax system results in increased risk-taking by taxpayers. Tobin (1958) reaches similar conclusions. In a more recent paper, Cullen and Gordon (2007) conclude that a decrease in the personal income tax rate would substantially reduce entrepreneurial risk-taking, with a uniform five-percentage-point cut in personal income tax rates leading to a 40% decrease in risk-taking.

Extending the idea that the government is a partner in taxpayers' investments, Guenther and Sansing (2010) suggest that through capital gains taxes the tax authority absorbs some of the risk associated with firms' residual cash flows. Sikes and Verrecchia (2012) predict that when investors place greater value on risk-sharing with the government (i.e., when a firm's systematic risk is high, the market risk premium is high, or the risk-free rate of return is low), the general positive relation between capital gains taxes and cost of capital will be less positive or even negative. Using data from 26 countries and utilizing substantive changes in both capital gains tax rates and the risk variables (i.e., systematic risk, the market risk premium, or the risk-free rate), Hail et al. (2015) confirm the predictions in Sikes and Verrecchia (2012). More specifically, Hail

et al. (2015) find that when systematic risk is high, the market risk premium is high, or the risk-free rate of return is low, the relation between capital gains tax rates and cost of capital is less positive and in some cases even negative. Moreover, their results vary in the cross-section as expected. The mitigating role of risk on the positive relation between capital gains tax rates and cost of capital is stronger when investors are more comfortable sharing risk with the government (i.e., low corruption and evasion), when the country's tax rate is the relevant tax rate for firms' investors (i.e., low foreign direct investment and foreign institutional ownership), and when investors have fewer opportunities to diversify their risks on their own (i.e., low aggregate market turnover and aggregate market capitalization).

All of the above-mentioned studies that relate to risk-sharing with the government focus on a proportional tax imposed on individual investors. Our paper differs from these papers in that we focus on the corporate income tax. In the U.S., corporations can carryback net operating losses (NOLs) two years to offset prior taxable income and receive an immediate refund, or carryforward losses 20 years to offset future taxable income.[7] In addition, we are the first to examine the link between risk-sharing and *tax avoidance* as prior studies examine the effect of *changes in tax law* (e.g., statutory tax rates, ability to carryback losses) on risk-sharing.[8] Although we are not the first to suggest that the government shares risk with corporations through the tax system, we are the first to suggest that *tax avoidance* by many firms reduces this risk-sharing. Because we focus on the effective tax rate as opposed to the statutory tax rate, in order for changes in the effective tax

[7] Firms value the ability to offset their taxable income with their NOLs. For example, Erickson and Heitzman (2010) and Sikes, Tian, and Wilson (2014) discuss the use of poison pills by firms to prevent changes in ownership from triggering Internal Revenue Code Section 382, which limits a firm's ability to use its NOLs if one or more of the firm's five percent shareholders increases its ownership in the aggregate by more than 50 percentage points.

[8] For example, Langenmayer and Lester (2015) document that firms make riskier investments the longer the NOL carryforward and carryback periods. Cullen and Gordon (2007) point out that although a cut to statutory corporate income tax rates should increase investment (e.g., Jorgenson 1963; Auerbach and Hassett 1992; Djankov, Ganser, McLiesh, Ramalho, and Shleifer 2010), it is less clear whether it will stimulate business risk-taking since entrepreneurs bear more risk when the corporate tax rate is lower.

rate to have an effect on the variance of the market cash flow and thus the covariance risk of all firms, enough firms in the economy must partake in the tax avoidance. In contrast, a change in the statutory tax rate affects all firms immediately. This is why our prediction relates to aggregate tax avoidance and not simply to an individual firm's tax avoidance. This discussion leads to our first hypothesis (stated in the alternative):

> **H1:** Greater aggregate corporate tax avoidance reduces risk-sharing with the government and consequently increases the cost of capital of all firms in the economy.

In addition to aggregate tax avoidance having to be substantial in order for covariance risk of all firms to increase, the only way that a reduction in firms' effective tax rates will result in less risk-sharing with the government is if the reduction is driven by a decrease in the marginal tax rate applied to firms' income, as opposed to by a decrease in their taxable bases. An example of a tax avoidance strategy that reduces a firm's tax base is bonus depreciation, and an example of a tax avoidance strategy that reduces the marginal tax rate on a firm's income is locating subsidiaries in low-tax countries and permanently deferring U.S. tax on the income. Although domestic firms have opportunities to lower the marginal tax rate on their income through state tax planning, these opportunities are also available to U.S. MNCs. This discussion leads to our second hypothesis (stated in the alternative):

> **H2:** The positive relation between cost of capital and aggregate corporate tax avoidance is driven more by U.S. MNCs' tax avoidance than by domestic firms' tax avoidance because U.S. MNCs have more opportunities to decrease the variable portion of their tax liability.

Our prediction relates to the effect of aggregate tax avoidance on covariance risk. Thus, the effect should be stronger for firms whose cash flow covaries more with the market cash flow, which leads to our third hypothesis (stated in the alternative):

H3: The positive relation between cost of capital and aggregate corporate tax avoidance is stronger for firms whose cash flow covaries more with the market cash flow.

We do not make predictions about the effect of aggregate corporate tax avoidance on beta as beta is a relative measure (i.e., not all firms' betas can increase). Rather the effect of aggregate tax avoidance on firms' cost of capital manifests itself only through its effect on the market risk premium. Similarly, when discussing the effect of mandatory disclosures that increase information quality, Lambert et al. (2007) predict that cost of capital will decline for all firms but explain that they cannot make predictions regarding the effect on beta, as beta will increase for some firms and decrease for others.

The idea that a higher tax rate increases risk-sharing with the government relies on the assumption that the government does not redistribute all of the risk that it absorbs back into the private sector. In contrast, Diamond (1967) assumes that the government redistributes the risk that it absorbs back into the private sector via random transfers and expenditures. Thus, according to Diamond (1967), changes in a tax rate will have no effect on risk-sharing. Contrary to Diamond (1967), Hail et al. (2015) provide evidence that higher capital gains tax rates are associated with greater risk-taking by the government (i.e., not all the risk that the government absorbs through capital gains taxes is redistributed back into the private sector or transferred to future generations). Similar to prior studies, our prediction that greater aggregate tax avoidance is positively related to cost of capital relies on the assumption that not all of the risk that the government absorbs when firms avoid fewer taxes is redistributed back into the private sector.

III. EMPIRICAL TESTS

Sample Description

Our sample consists of U.S. public firms covered by COMPUSTAT with non-missing observations for the variables used in our empirical analysis. We begin our sample period in 1988 because it is the first year for which we have a large sample of observations with non-missing values for cash taxes paid, which is an input to our tax avoidance measures. We end the sample period in 2007 because aggregate pretax income for domestic firms was negative in 2008, which makes our measure of aggregate tax avoidance for these firms uninterpretable. In addition, although aggregate pretax income for domestic firms was positive in 2009, it was so low that our measure of aggregate tax avoidance for domestic firms exceeds 100%. We cannot include later years because our implied cost of capital measure requires five years of future earnings to estimate.

Empirical Design and Variable Definitions

To test H1, we estimate the following ordinary least squares (OLS) regression:

$$ICC_{i,t+1} = \beta_0 + \beta_1 AGGAVOID_t + \Sigma\beta_{2\text{-}9} FirmControls_{i,t} + \Sigma\beta_{10\text{-}14} MacroControls_t + \Sigma\beta_{15\text{-}44} IndustryFixedEffects_i + \varepsilon_{i,t}. \quad (1)$$

Our dependent variable is firm *i*'s implied cost of capital (*ICC*) in year *t*+1. Implied cost of capital is the internal rate of return that equates a firm's stock price with the future stream of its expected cash flows. The advantage of using implied cost of capital estimates to proxy for expected returns is that they do not rely on noisy realized returns nor do they rely on a specific asset pricing model. Our implied cost of capital measure uses the methodology in Hou et al. (2012); this paper uses a cross-sectional model to derive earnings forecasts as a proxy for cash flow expectations.[9] Hou et al. (2012) show that the earnings forecasts generated from their cross-sectional model are superior

[9] See Section 2.2 of Hou et al. (2012) for details on their cross-sectional model.

to analysts' forecasts in terms of coverage, forecast bias, and earnings response coefficients. They also conclude that implied cost of capital estimates based on their model are a more reliable proxy for expected returns than are implied cost of capital estimates based on analysts' forecasts.

ICC equals the average of four different implied cost of capital estimates. Each estimate uses the Hou et al. (2012) methodology, but they vary according to whether the underlying model and assumptions are based on the models and assumptions in Gebhardt, Lee and Swaminathan (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), or Easton (2004).[10] We truncate *ICC* at the 1st and 99th percentiles.[11]

The independent variable of primary interest is our aggregate tax avoidance measure (*AGGAVOID*), which equals the sum of annual cash taxes paid of U.S. public companies in Compustat scaled by the sum of annual pretax income of the same companies.[12] We multiply the ratio by -1 so that higher values are indicative of greater avoidance. Measuring aggregate avoidance this way as opposed to using, for example, the median of firms' cash ETRs allows us to retain loss firms since cumulative pretax income is generally positive (with the exception of 2008).[13] A positive β_1 is consistent with our prediction that as firms in the economy avoid more taxes, the cost of capital for all firms in the economy increases.

We control for firm-level tax avoidance with a firm's cash ETR, which we measure as cash taxes paid scaled by pretax income. Consistent with Robinson, Sikes, and Weaver (2010), we set

[10] See Appendix A in Hou et al. (2012) for a description of each of the models and assumptions. The basic idea of all four models is to substitute price and a proxy for expected cash flow into a valuation equation, and then back out the cost of capital as the internal rate of return that equates current stock price with the expected future sequence of residual incomes or abnormal earnings. The individual models differ with respect to the assumptions regarding short-term and long-term growth, the explicit forecasting horizon, and whether and how inflation is incorporated into the steady-state terminal value.

[11] We thank Luzi Hail for sharing implied cost of capital estimates with us.

[12] Note that this measure is equivalent to a value-weighted cash effective tax rate in the economy where the weights are given by each firm's pretax income.

[13] As we explain in Section IV, the results are robust to using the annual median of firms' long-run cash ETRs as our measure of aggregate corporate tax avoidance.

the cash ETR equal to zero if cash taxes paid is less than zero and pretax income is non-missing, and we set it equal to one if cash taxes paid is greater than zero but pretax income is less than or equal to zero, which allows us to retain loss firms in our sample. As explained previously, Goh et al. (2016) find that the level of a firm's cash ETR is positively associated with its cost of capital. We set the variable *FIRMAVOID* equal to a firm's cash ETR multiplied by -1, such that higher values are indicative of greater firm-level avoidance.[14] A negative coefficient on *FIRMAVOID* is consistent with the finding in Goh et al. (2016).

We control for firm characteristics that prior literature finds are associated with cost of capital (see, e.g., Hail et al. 2015; Sikes and Verrecchia 2015; Goh et al. 2016). These include firm size, measured as the natural logarithm of market capitalization (*SIZE*); book-to-market ratio (*BM*); institutional ownership, measured as the percentage of outstanding shares owned by institutional investors (*INST*); leverage, measured as the sum of current and long-term liabilities scaled by total assets (*LEV*); and dividend yield, measured as dividends to common shareholders scaled by the firm's market capitalization and set equal to zero for non-dividend paying firms (*YIELD*). These variables capture differences in risk as well as in information asymmetry. For example, smaller firms, firms with higher book-to-market ratios, and more levered firms are generally considered to be riskier firms. Information asymmetry is also generally considered to be higher among smaller firms, firms with less institutional investor following, and firms with a lower dividend payout. We also control for risk by including the market beta (*BETA*), which we estimate using return data from the prior 60 months. We control for profitability with the ratio of net income before

[14] Cost of capital represents the discount rate used by investors when pricing a firm's expected future cash flow. Because we regress *ICC* in year t+1 on measures of tax avoidance in year t, inherent in our specification is an assumption that past tax avoidance is positively correlated with future tax avoidance. This assumption is consistent with the finding in Dyreng, Hanlon, and Maydew (2008) that low long-run cash ETRs are persistent. Moreover, in untabulated tests, we find that within our sample a firm's cash ETR is positively correlated with lagged values of its cash ETR, consistent with the finding in Dyreng et al. (2008).

extraordinary items divided by book value of equity (*ROE*). We include industry indicators based on the Fama-French 30-industry classification (Fama and French 1997). We collect the data to construct the above variables from Compustat, CRSP, and Thomson Reuters.

At the macroeconomic level, we control for the maximum federal statutory corporate income tax rate (*STATRATE*) to alleviate any concern that the statutory rate as opposed to firms' tax planning is responsible for the relation we document between *AGGAVOID* and *ICC*.[15] Similar to Hail et al. (2015), we control for inflation (*INFL*), change in gross domestic product (*ΔGDP*), and the risk-free rate (*RFR*). *INFL* and *ΔGDP* are controls for macroeconomic conditions and are measured as the annual percentage change in the consumer price index and gross domestic product, respectively.[16] According to the Capital Asset Pricing Model (CAPM) and most other asset pricing models, expected returns should increase with the risk-free rate. We measure *RFR* as the yield on one-year Treasury bonds. We also include a control for the yield curve (*YLDCURVE*), which equals the difference between the yields on 30-year and one-year Treasury bonds. We include the *YLDCURVE* in addition to the *RFR* because it is related to both expected market returns and economic conditions, though our results are robust to its exclusion. We collect data to calculate *RFR* and *YLDCURVE* from CRSP Fixed Term Indexes. We winsorize all continuous control variables used in our analysis other than *FIRMAVOID* and the macroeconomic control variables at the 1st and 99th percentiles.[17] We cluster standard errors by firm and by industry-year (Petersen 2009; Gow, Ormazabal, and Taylor 2010). We cluster the standard errors by industry-year in

[15] We collected the maximum statutory corporate tax rate data from the Tax Policy Center's website: http://www.taxpolicycenter.org/statistics/corporate-top-tax-rate-and-bracket.

[16] We collected data on the consumer price index from the Bureau of Labor Statistics (http://www.bls.gov/data/#prices) and on GDP from the Bureau of Economic Analysis (http://www.bea.gov/national/index.htm#gdp).

[17] We do not winsorize *FIRMAVOID* at the 1st and 99th percentiles because we set values less than zero to zero and values greater than one to one.

addition to clustering by firm because tax avoidance and cost of capital are likely correlated across similar firms at the same time due to industry shocks.[18]

Descriptive Statistics

Table 1 provides descriptive statistics for the variables in equation (1) as well as for *AGGAVOID_MNC* and *AGGAVOID_DOM*, which we define below. The mean (median) implied cost of capital for our sample firms is 13.4% (9.8%). The mean (median) *AGGAVOID* equals 33.4% (31.7%), and the mean (median) *FIRMAVOID* equals 41.2% (31.5%). The mean (median) market capitalization of the sample firms equals $1.0 billion ($184 million). The mean (median) *BETA* equals 1.0 (0.88). In untabulated tests, we compare our sample to the full Compustat sample and find that our sample is very representative of the overall Compustat sample. For example, the mean (median) *ICC* equals 13.9% (10.4%) and the mean (median) market capitalization equals $1.5 billion ($114 million) for U.S. firms in Compustat. Moreover, mean (median) *FIRMAVOID* equals 43.6% (32.6%) and the mean (median) *BETA* equals 0.98 (0.86) for the U.S. Compustat sample.

Multivariate Results

Column (1) of Table 2 presents the results of estimating equation (1). The coefficient on *AGGAVOID* is positive and significant at the one percent level, consistent with our expectation that as firms avoid more taxes, the cost of capital for all firms increases because covariance risk increases for all firms. In terms of economic magnitude, a one-standard-deviation increase in *AGGAVOID* increases *ICC* by 0.92 percentage point, which represents a seven percent change for

[18] The results are robust to instead clustering by firm and by year.

the average firm.[19] The magnitude of the result is economically significant but not implausibly large. This result supports H1.

Consistent with the results in Goh et al. (2016), the coefficient on *FIRMAVOID* is negative and significant at the one percent level. In terms of economic magnitude, a one-standard-deviation increase in *FIRMAVOID* decreases *ICC* by 1.5 percentage points, which represents an 11 percent change for the average firm.[20] This result suggests that as an individual firm avoids more tax, its cost of capital will decline due to investors expecting higher after-tax cash flows with no increase in risk, holding all else constant. Together, the results for *AGGAVOID* and *FIRMAVOID* suggest that tax-avoiding firms' cost of capital could either increase or decrease when many other firms also avoid tax—the net effect depends on whether the aggregate tax avoidance effect ("risk effect") or the firm tax avoidance effect ("cash flow effect") dominates. On the other hand, non-tax-avoiding firms will experience an unambiguous increase in cost of capital as firms in the economy avoid more tax because they incur the cost of the pecuniary externality while enjoying no reduction in cost of capital from their own tax planning. Thus, one could argue that the pecuniary externality is most harmful for these firms.

The results for the other control variables are largely consistent with our expectations and with previous work. For instance, *SIZE* and *INST* are negatively related to *ICC*, whereas, *BM*, *LEV*, and *YIELD* are positively related to *ICC*. *ΔGDP* is negatively related to *ICC*. *STATRATE* is also negatively related to *ICC*, consistent with greater risk-sharing with the government resulting in

[19] We calculate the 0.92 percentage point as the standard deviation of *AGGAVOID* multiplied by the coefficient estimate of *AGGAVOID* in column (1). The seven percent change equals the 0.92 percentage point divided by the mean value of *ICC*.

[20] The 1.5 percentage points equals the standard deviation of *FIRMAVOID* multiplied by the coefficient estimate of *FIRMAVOID* in column (1). The 11 percent equals the 1.5 percentage points divided by the mean value of *ICC*.

lower cost of capital. Importantly for our purposes, our finding of a positive relation between *ICC* and *AGGAVOID* holds after controlling for the effect of the statutory tax rate.[21]

We predict that tax avoidance by many firms in the economy increases the variance of the market cash flow and thus increases covariance risk as well as the cost of capital for *all* firms in the economy, including the ones that do not engage in tax avoidance. In the next test, we divide firms into subsamples according to whether their cash ETR is below ("tax-avoiders") or above ("non-tax-avoiders") the annual median. Columns (2) and (3) of Table 2 present results of estimating equation (1) for tax-avoiders and non-tax-avoiders, respectively. The coefficient on *AGGAVOID* is positive and significant at the one percent level in both columns consistent with the pecuniary externality being imposed on both tax-avoiding and non-tax-avoiding firms.[22] In column (4), we replace the continuous *FIRMAVOID* with an indicator variable set equal to one if a firm's cash ETR is above the yearly median (*HICASHETR*) and we interact the indicator variable with *AGGAVOID* to test whether the pecuniary externality is stronger for either the tax-avoiders or non-tax-avoiders. The coefficient on the interaction *AGGAVOID*HICASHETR* is not significant.[23] The results in columns (2)-(4) suggest that the pecuniary externality is equally imposed on tax-avoiding and non-tax-avoiding firms, confirming our prediction that the pecuniary externality operates through an increase in the market risk premium, which affects all firms.

[21] In an untabulated test, we also confirm that our results hold if we drop *STATRATE* and begin the sample in 1993, after which the statutory tax rate does not change.

[22] Interestingly, the coefficient on *FIRMAVOID* flips from negative and significant to positive and significant in column (2). This suggests that among tax-avoiding firms, lowering a firm's cash ETR could actually result in higher, as opposed to lower, cost of capital. This result could be consistent with the finding in Goh et al. (2016) that more risky or uncertain tax avoidance is positively associated with cost of capital if reducing a firm's cash ETR once it is already relatively low is an indication of risky tax avoidance.

[23] This result is robust to keeping *FIRMAVOID* in the specification.

Tax Avoidance by Multinationals and Domestic Firms

H2 states that the positive relation between cost of capital and aggregate tax avoidance is driven more by U.S. MNCs' tax avoidance than by that of domestic firms because MNCs have more opportunities to reduce the variable portion of their tax liability. To test H2, we calculate aggregate cash ETRs separately for U.S. MNCs and for domestic firms. Following Dyreng, Hanlon, Maydew, and Thornock (2016), we classify a firm as an MNC in a given year if its pretax foreign income is greater than zero or the absolute value of its foreign tax expense is greater than zero. We classify all other firms as domestic firms. We divide the sum of MNCs' cash taxes paid each year by the sum of the MNCs' pretax income, and then multiply the ratio by -1 to derive a measure of annual aggregate tax avoidance by MNCs (*AGGAVOID_MNC*). We do the same for the domestic firms (*AGGAVOID_DOM*).

Columns (1) and (2) of Table 3 present the results for the MNCs and domestic firms, respectively. The coefficients on *AGGAVOID_MNC* and *AGGAVOID_DOM* are both positive and significant, consistent with the tax planning of each type of firm contributing to the pecuniary externality. In column (3), we include both *AGGAVOID_MNC* and *AGGAVOID_DOM*. The magnitude of the coefficient on *AGGAVOID_MNC* is much larger than the coefficient on *AGGAVOID_DOM* (0.111 vs. 0.010), and only the coefficient on *AGGAVOID_MNC* remains statistically significant. These results provide strong support for H2. The primary contributor to the pecuniary externality are MNCs, which have more opportunities to reduce the variable portion of their tax liabilities.

Strength of Market Beta

The increase in the variance of the market cash flow resulting from greater tax avoidance affects cost of capital through its effect on the covariance of a firm's expected cash flow with the

expected market cash flow. Thus, H3 predicts that the positive relation between aggregate tax avoidance and cost of capital is stronger for firms whose cash flow covaries more with the market cash flow. We next test this prediction. More specifically, we add an interaction of *AGGAVOID* and *BETA* to equation (1). A positive coefficient on the interaction term is consistent with H3.

Column (1) of Table 4 presents the results. The coefficient on the interaction *AGGAVOID*BETA* is positive and significant at the one percent level, providing strong support for our prediction. In columns (2) and (3), we interact *BETA* with *AGGAVOID_MNC* and with *AGGAVOID_DOM*, respectively. The interaction *AGGAVOID_MNC*BETA* is positive and significant at the one percent level, providing further support for H3. Although the coefficient on *AGGAVOID_DOM*BETA* is positive in column (3), it is not significant. Combined, the results in columns (2) and (3) provide additional support for our prediction that the pecuniary externality is driven more by MNCs than by domestic firms because we find that *BETA* only magnifies the relation between *ICC* and *AGGAVOID_MNC*.

In summary, the results in Tables 2-4 provide strong support for H1-H3. Consistent with our expectation, we find that aggregate tax avoidance is positively related to firms' cost of capital, and this relation holds equally for tax-avoiding and non-tax-avoiding firms. In addition, once we control for the tax avoidance activities of both U.S. MNCs and domestic firms, we show that only the former contributes to the pecuniary externality. Finally, consistent with the pecuniary externality operating via an increase in firms' covariance risk, we find that the positive relation between aggregate avoidance and cost of capital is stronger for firms whose cash flow covaries more with the market cash flow.

IV. ADDITIONAL TESTS

Robustness Tests

In this section, we discuss tests that we conduct to correct the effects of any serial correlation and to show that our results are robust to an alternate estimate of aggregate tax avoidance and to an alternate way of clustering.

Our use of an annual as opposed to long-run measure of aggregate tax avoidance mitigates potential concerns related to serial correlation of the primary independent variable. However, in column (1) of Table 5, we correct for any serial correlation that could affect our results. We present the results of estimating equation (1) but rather than clustering the standard errors by firm and by industry-year, we present Newey-West autocorrelation-corrected standard errors. The coefficient on *AGGAVOID* remains statistically significant at the one percent level, indicating that serial correlation does not drive our findings.

In the main analysis, we cluster the standard errors by firm and by industry-year because tax rates and cost of capital could be correlated across similar firms at the same time due to industry shocks. Column (2) of Table 5 shows that our results are robust to instead clustering by firm and by year.

Next we replace *AGGAVOID* with a variable that equals the annual median of firms' long-run (5-year) cash ETRs (*LRCASHETR_MED*). We calculate a firm's long-run cash ETR as the sum of the firm's cash taxes paid over the prior five years divided by the sum of its pretax income over the five years. We require for cumulative pretax income in the denominator to be positive, and we set values of long-run cash ETRs below zero to zero and values above one to one (Dyreng et al. 2008). Moreover, in this test, we replace *FIRMAVOID* with each firm's long-run cash ETR (*LRCASHETR*). We multiply *LRCASHETR_MED* and *LRCASHETR* each by -1 so that higher

values of each variable are indicative of greater avoidance.[24] Column (3) of Table 5 presents the results.[25] Consistent with H1 and the results in column (1) of Table 2, the coefficient on *LRCASHETR_MED* is positive and significant at the five percent level. In terms of economic magnitude, a one-standard-deviation increase in *LRCASHETR_MED* increases *ICC* by 1.3 percentage points, which is a 12 percent change for the average firm.[26] Consistent with the negative and significant coefficient on *FIRMAVOID* in Tables 2-4 and with the finding in Goh et al. (2016) that firm-level tax avoidance is associated with a lower cost of capital, the coefficient on *LRCASHETR* is negative and significant. In summary, using alternate measures of aggregate and firm-level tax avoidance, we continue to find evidence that as aggregate tax avoidance increases, cost of capital increases. Moreover, for a tax-avoiding firm, the net effect on cost of capital could be an increase or decrease, depending on whether the aggregate or firm-level effect dominates. However, for non-tax-avoiding firms, the effect is an unambiguous increase in the cost of capital.

Risk Absorption by Government

As we explain previously, Diamond (1967) concludes that any risk the government absorbs via taxation is redistributed back into the private sector via random government expenditures by or random transfers from the government. If Diamond's (1967) conclusion is true, then we should not find that cost of capital increases as firms avoid more taxes because the government would not share any risk with the private sector even when tax avoidance is low. Although our findings up to this point suggest that the government does not redistribute all of the risk it absorbs back into

[24] In this specification only, *STATRATE* equals the average of the maximum statutory corporate income tax rate over the prior five years to be consistent with the use of a 5-year cash ETR.

[25] There are fewer observations for this test for two reasons. First, we begin the sample in 1992 rather than 1988 because we need five years of cash taxes paid data to calculate our aggregate and firm-level avoidance measures. Second, we lose some observations as a result of requiring cumulative pretax income in the denominator of the long-run cash ETR to be positive.

[26] We calculate the 1.3 percentage points as the coefficient on *LRCASHETR_MED* multiplied by the standard deviation of *LRCASHETR_MED* (0.0329). The 12 percent equals the 1.3 percentage points divided by the mean value of *ICC* for the sample used in this specification (0.1114).

the private sector, in this section we directly test the assumption that underlies our predictions, namely that as firms avoid more taxes, there is less risk-sharing with the government. In structuring this test, we follow Hail et al. (2015), who provide evidence that as capital gains tax rates increase, government expenditures are exposed to greater market risk.

We collect data on general government consumption expenditures by the U.S. for the years 1988-2007 from the World Bank. We estimate the following OLS regression:

$$EXPEND_t = \beta_0 + \beta_1 SP500RET_t + \beta_2 AGGAVOID_t + \beta_3 AGGAVOID_t * SP500RET_t + \varepsilon_t. \quad (2)$$

The dependent variable (*EXPEND*) equals annual government expenditures as a percent of GDP. *SP500RET* equals the annual return of the S&P 500 Index (*SP500RET*). *AGGAVOID* and *ΔGDP* are defined above. The coefficient β_1 captures the sensitivity of government expenditures to market returns. The coefficient β_3 captures whether the sensitivity of government expenditures to market returns is lower when there is greater avoidance. A negative β_3 is consistent with our prediction that greater tax avoidance by corporations leads to less risk-sharing with the government. Table 6 presents the results. Consistent with greater tax avoidance resulting in less risk-sharing with the government, the coefficient on *AGGAVOID*SP500RET* is negative and significant at the ten percent level. In columns (2) and (3), we replace *AGGAVOID* with *AGGAVOID_MNC* and *AGGAVOID_DOM*, respectively. The coefficient on *AGGAVOID_MNC*SP500RET* is negative and significant at the ten percent level, and the coefficient on *AGGAVOID_DOM*SP500RET* is negative but not significant.[27] These findings are consistent with our main results and provide further support that the positive relation we document between aggregate corporate tax avoidance

[27] If we exclude *ΔGDP* from the regressions, the statistical significance of the interactions *AGGAVOID*SP500RET* and *AGGAVOID_MNC*SP500RET* increases to the five percent level, and the interacton *AGGAVOID_DOM*SP500RET* remains not significant.

and cost of capital is due to less risk-sharing with the government when firms avoid more taxes via tax planning that reduces the marginal tax rate on their income.

V. DISCUSSION & CONCLUSION

We identify a novel pecuniary externality arising from corporate tax avoidance: as firms in an economy avoid more taxes, the covariance risk of all firms in the economy increases. As a result, cost of capital increases for all firms, even those that do not engage in tax avoidance. Consistent with this prediction, we find that implied cost of capital is positively related to our measure of aggregate tax avoidance by U.S. public companies. As expected, the positive relation holds for both tax-avoiding and non-tax-avoiding firms, suggesting that the pecuniary externality of higher cost of capital is imposed on all firms. Moreover, we find that the pecuniary externality is driven by the tax avoidance activities of U.S. MNCs as opposed to those of domestic firms. This is consistent with our expectation that only tax avoidance activities that lower the marginal tax rate on a firm's income, as opposed to activities reducing a firm's tax base, decrease risk-sharing with the government. Furthermore, the pecuniary externality is stronger for firms whose cash flow covaries more with the market cash flow. Finally, we provide evidence that the sensitivity of government expenditures to market returns increases when firms avoid fewer taxes, supporting the underlying assumption for our predictions and tests that the government shares more risk with investors when firms avoid fewer taxes.

Even though the pecuniary externality is imposed equally on tax-avoiding and non-tax-avoiding firms, it is most harmful for non-tax-avoiding firms because these firms suffer from the increase to their cost of capital but enjoy no cash savings from their own avoidance activities. This begs the question of why the non-avoiding firms do not also avoid tax. Presumably firms make a cost-benefit analysis when deciding whether to avoid taxes. Investing in tax planning is costly

(e.g., consulting as well as compliance fees) and firms that are resource-constrained might decide to allocate their resources to other investments that they deem to have a higher expected net payout. Moreover, firms could be concerned that they will have to pay additional taxes and penalties if tax authorities overturn their tax planning strategies. Furthermore, there could be reputation costs associated with tax avoidance. For instance, 69 percent of corporate tax executives surveyed by Graham, Hanlon, Shroff, and Shevlin (2014) claim that reputation costs are an important factor when deciding whether to engage in a tax planning strategy. Thus, although it might seem odd for non-avoiding firms to not jump on the tax-avoidance bandwagon in light of this pecuniary externality, this could be a rational decision on their part. Furthermore, tax avoidance is not an option for firms in regulated industries (e.g., a utility company).

Finally, we are not suggesting that a firm is "worse off" when it avoids tax, or that firms would be worse off if the statutory tax rate were reduced. Our goal is to explain the effects on cost of capital when many firms in the economy avoid tax. From an individual firm's perspective, the net effect of a firm avoiding taxes when many other firms also avoid tax could be an increase or decrease in the firm's cost of capital depending on whether the risk effect (from the aggregate avoidance) or cash flow effect (from the individual firm avoidance) on cost of capital dominates. We recognize that many tax avoidance activities result in significant cash tax savings, which benefit firms in ways other than through just a reduction in the cost of capital. Tax-avoiding firms for which the net effect on cost of capital when many other firms also avoid taxes is a decrease (i.e., firm tax avoidance effect on cost of capital dominates aggregate tax avoidance effect) are clearly better off as a result of avoiding taxes because they enjoy a lower cost of capital as well as the cash tax savings. For tax-avoiding firms whose net effect on cost of capital is an increase to cost of capital (i.e., aggregate tax avoidance effect dominates firm tax avoidance effect), whether

these firms are better or worse off will depend on whether the harm caused by the cost of capital increase is greater or less than the benefit derived from the cash tax savings. This will likely depend on the firm's need for external financing. But as we stress throughout the paper, the pecuniary externality is most harmful for non-tax-avoiding firms, as these firms suffer from the cost of capital increase but do not enjoy any cash tax savings from their own avoidance.

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APPENDIX A
VARIABLE DEFINITIONS

Variable	Definition
ICC	Average of four different implied cost of capital estimates. Each estimate uses the Hou et al. (2012) methodology, but they vary according to whether the underlying model and assumptions are based on the models and assumptions in Gebhardt, Lee and Swaminathan (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), or Easton (2004).
AGGAVOID	Sum of annual cash taxes paid of U.S. public companies in Compustat scaled by the sum of annual pretax income of the same companies, multiplied by -1 so that higher values are indicative of greater avoidance.
AGGAVOID_MNC	Sum of annual cash taxes paid by firms classified as MNCs scaled by the sum of annual pretax income of the same firms, multiplied by -1 so that higher values are indicative of greater avoidance. We classify a firm as an MNC in a given year if its pretax foreign income or the absolute value of its foreign tax expense is greater than zero. We classify all other firms as domestic-only firms.
AGGAVOID_DOM	Sum of annual cash taxes paid by firms classified as domestic-only firms scaled by the sum of annual pretax income of the same firms, multiplied by -1 so that higher values are indicative of greater avoidance. We classify a firm as an MNC in a given year if its pretax foreign income or the absolute value of its foreign tax expense is greater than zero. We classify all other firms as domestic-only firms.
FIRMAVOID	Sum of a firm's cash taxes paid over the prior five years scaled by the sum of its pretax income over the same period. We require for cumulative pretax income in the denominator to be positive, and we set values of *FIRMAVOID* below zero to zero and values above one to one. Finally, the ratio is multiplied by -1 so that higher values are indicative of greater avoidance.
HICASHETR	1 if a firm's annual cash ETR exceeds the annual sample median cash ETR; 0 otherwise.
LRCASHETR_MED	Annual median of firms' long-run (5-year) cash ETRs (LRCASHETR), defined below. Because we multiply firms' long-run cash ETRs by -1 when calculating *LRCASHETR*, higher values of *LRCASHETR_MED* are indicative of greater aggregate tax avoidance.
LRCASHETR	Sum of a firm's cash taxes paid over prior five years divided by the sum of its pretax income over the five years. We require for cumulative pretax income in the denominator to be positive, and we set values of the long-run cash ETRs below zero to zero and above one to one. We multiply the ratio by -1 so that higher values are indicative of greater avoidance.
SIZE	Natural logarithm of market value of equity.
BM	Book equity divided by market value of equity.
INST	Percentage of outstanding shares owned by institutional investors.
LEV	Sum of current and long-term liabilities scaled by total assets.
ROE	Net income before extraordinary items divided by book value of equity.
YIELD	Dividends paid to common shareholders divided by market value of equity; equal to zero for non-dividend paying firms.
BETA	Beta coefficient from a regression of a firm's monthly returns on the return of a value-weighted market index using return data from the prior 60 months.
STATRATE	Maximum federal statutory corporate income tax rate in the U.S.
RFR	Yield on the one-year Treasury bond.
YLDCURVE	Difference between the yields on 30-year and one-year Treasury bonds.
INFL	Annual percentage change in consumer price index.
ΔGDP	Annual percentage change in gross domestic product.
EXPEND	Annual expenditures by U.S. government as a percent of annual gross domestic product.
SP500RET	Annual return of the S&P 500 Index.

TABLE 1
Descriptive Statistics

This table presents the descriptive statistics for the variables in equation (1). See Appendix A for variable definitions. The number of observations is 39,595 for all variables.

Variable	Mean	Std. Dev.	5th Pctile	25th Pctile	Median	75th Pctile	95th Pctile
ICC	0.1344	0.1127	0.0359	0.0654	0.0982	0.1589	0.3696
AGGAVOID	-0.3341	0.0789	-0.4651	-0.3658	-0.3169	-0.2812	-0.2468
FIRMAVOID	-0.4117	0.3599	-1.0000	-0.6487	-0.3149	-0.1188	0.0000
AGGAVOID_MNC	-0.3361	0.0856	-0.5039	-0.3645	-0.3117	-0.2827	-0.2578
AGGAVOID_DOM	-0.3338	0.0726	-0.4054	-0.3557	-0.3273	-0.2775	-0.2229
SIZE	19.1268	1.8519	16.2154	17.7586	19.0302	20.4198	22.3714
Market Value of Equity ($billions)	1.0482	2.5955	0.0110	0.0516	0.1840	0.7383	5.1972
BM	0.7009	0.5365	0.1490	0.3677	0.5792	0.8617	1.6787
INST	0.4012	0.2733	0.0227	0.1633	0.3671	0.6115	0.8907
LEV	0.2373	0.1990	0.0000	0.0518	0.2156	0.3729	0.6048
ROE	0.0043	0.3729	-0.4895	0.0072	0.0816	0.1340	0.2473
YIELD	0.0167	0.0252	0.0000	0.0000	0.0001	0.0259	0.0704
BETA	0.9989	0.8104	-0.0089	0.4419	0.8764	1.3744	2.5215
STATRATE	0.3480	0.0040	0.3400	0.3500	0.3500	0.3500	0.3500
RFR	0.0463	0.0188	0.0123	0.0327	0.0460	0.0552	0.0779
YLDCURVE	0.0132	0.0133	-0.0019	0.0009	0.0074	0.0260	0.0358
INFLATION	0.0302	0.0101	0.0161	0.0254	0.0275	0.0339	0.0465
ΔGDP	0.0307	0.0117	0.0100	0.0270	0.0340	0.0400	0.0450

TABLE 2
Aggregate Tax Avoidance and Cost of Capital

This table presents coefficient estimates for equation (1). The dependent variable in all columns is *ICC*. Standard errors clustered by firm and by industry-year appear in parentheses below coefficient estimates. Industry fixed effects are included in the estimation but excluded from the table for brevity. Column (1) presents results for all firms. Columns (2) and (3) present the results for tax-avoiding and non-tax-avoiding firms defined as firms whose cash ETR is either below or above the annual sample median, respectively. Column (4) modifies equation (1) by adding an indicator variable for firms with above annual sample median cash ETRs (*HICASHETR*) and its interaction with *AGGAVOID*. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

TABLE 2
Aggregate Tax Avoidance and Cost of Capital
(continued)

Independent Variables	(1)	(2)	(3)	(4)
AGGAVOID	0.117***	0.057***	0.170***	0.111***
	(0.020)	(0.017)	(0.026)	(0.019)
FIRMAVOID	-0.042***	0.038***	-0.076***	
	(0.003)	(0.009)	(0.005)	
HICASHETR				0.013*
				(0.007)
*AGGAVOID*HICASHETR*				-0.012
				(0.021)
SIZE	-0.031***	-0.023***	-0.039***	-0.031***
	(0.001)	(0.001)	(0.001)	(0.001)
BM	0.025***	0.032***	0.013***	0.027***
	(0.003)	(0.003)	(0.003)	(0.003)
INST	-0.014***	-0.021***	-0.010**	-0.016***
	(0.004)	(0.004)	(0.005)	(0.004)
LEV	0.036***	0.019***	0.041***	0.037***
	(0.005)	(0.005)	(0.006)	(0.005)
ROE	0.010***	-0.004	0.024***	0.001
	(0.003)	(0.005)	(0.003)	(0.003)
YIELD	0.365***	0.270***	0.602***	0.331***
	(0.053)	(0.062)	(0.066)	(0.056)
BETA	-0.006***	-0.005***	-0.008***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
STATRATE	-3.489***	-3.500***	-3.324***	-3.602***
	(0.545)	(0.585)	(0.626)	(0.541)
RFR	0.085	-0.225	0.647***	0.046
	(0.153)	(0.166)	(0.188)	(0.152)
YLDCURVE	-0.385*	-0.734***	0.166	-0.461**
	(0.208)	(0.230)	(0.252)	(0.208)
INFL	0.253	0.571***	-0.015	0.224
	(0.194)	(0.204)	(0.234)	(0.195)
ΔGDP	-0.597***	-0.385***	-0.915***	-0.566***
	(0.137)	(0.146)	(0.176)	(0.134)
Constant	1.956***	1.807***	2.024***	2.007***
	(0.201)	(0.216)	(0.231)	(0.199)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	39,595	20,274	19,321	39,595
R-squared	0.4214	0.4179	0.4420	0.4128

TABLE 3
Aggregate Tax Avoidance and Cost of Capital: MNC v. Domestic Firms

This table modifies equation (1) by replacing *AGGAVOID* with either *AGGAVOID_MNC* in column (1) or *AGGAVOID_DOM* in column (2). Column (3) includes both *AGGAVOID_MNC* and *AGGAVOID_DOM*. The dependent variable in all columns is *ICC*. Standard errors clustered by firm and by industry-year appear in parentheses below coefficient estimates. Industry fixed effects are included in the estimation but excluded from the table for brevity. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

TABLE 3
Aggregate Tax Avoidance and Cost of Capital: MNC v. Domestic Firms
(continued)

Independent Variables	(1)	(2)	(3)
AGGAVOID_MNC	0.120***		0.111**
	(0.019)		(0.052)
AGGAVOID_DOM		0.103***	0.010
		(0.023)	(0.054)
FIRMAVOID	-0.042***	-0.042***	-0.042***
	(0.003)	(0.003)	(0.003)
SIZE	-0.031***	-0.031***	-0.031***
	(0.001)	(0.001)	(0.001)
BM	0.025***	0.025***	0.025***
	(0.003)	(0.003)	(0.003)
INST	-0.014***	-0.014***	-0.014***
	(0.004)	(0.004)	(0.004)
LEV	0.036***	0.037***	0.036***
	(0.005)	(0.005)	(0.005)
ROE	0.010***	0.010***	0.010***
	(0.003)	(0.003)	(0.003)
YIELD	0.362***	0.370***	0.363***
	(0.053)	(0.053)	(0.052)
BETA	-0.006***	-0.006***	-0.006***
	(0.001)	(0.001)	(0.001)
STATRATE	-3.947***	-2.792***	-3.853***
	(0.562)	(0.534)	(0.747)
RFR	0.047	0.099	0.057
	(0.147)	(0.177)	(0.180)
YLDCURVE	-0.399*	-0.399*	-0.394*
	(0.204)	(0.222)	(0.219)
INFL	0.174	0.430**	0.190
	(0.191)	(0.203)	(0.177)
ΔGDP	-0.617***	-0.518***	-0.620***
	(0.137)	(0.139)	(0.138)
Constant	2.121***	1.701***	2.088***
	(0.208)	(0.195)	(0.274)
Industry Fixed Effects	Yes	Yes	Yes
Observations	39,595	39,595	39,595
R-squared	0.4216	0.4210	0.4216

TABLE 4
Aggregate Tax Avoidance and Cost of Capital: Market Beta

Columns (1), (2), and (3) of this table present the results of adding an interaction of *BETA* with *AGGAVOID*, *AGGAVOID_MNC*, and *AGGAVOID_DOM*, respectively, to equation (1). The dependent variable in all columns is *ICC*. Standard errors clustered by firm and by industry-year appear in parentheses below coefficient estimates. Industry fixed effects are included in the estimation but excluded from the table for brevity. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

TABLE 4
Aggregate Tax Avoidance and Cost of Capital: Market Beta
(continued)

Independent Variables	(1)	(2)	(3)
AGGAVOID	0.121***		
	(0.018)		
*AGGAVOID*BETA*	0.031***		
	(0.011)		
AGGAVOID_MNC		0.125***	
		(0.016)	
*AGGAVOID_MNC*BETA*		0.034***	
		(0.010)	
AGGAVOID_DOM			0.104***
			(0.023)
*AGGAVOID_DOM*BETA*			0.014
			(0.015)
FIRMAVOID	-0.042***	-0.042***	-0.042***
	(0.003)	(0.003)	(0.003)
SIZE	-0.031***	-0.031***	-0.031***
	(0.001)	(0.001)	(0.001)
BM	0.025***	0.025***	0.025***
	(0.003)	(0.003)	(0.003)
INST	-0.014***	-0.014***	-0.014***
	(0.004)	(0.004)	(0.004)
LEV	0.036***	0.036***	0.037***
	(0.005)	(0.005)	(0.005)
ROE	0.010***	0.010***	0.010***
	(0.003)	(0.003)	(0.003)
YIELD	0.362***	0.359***	0.369***
	(0.052)	(0.052)	(0.052)
BETA	-0.007***	-0.007***	-0.006***
	(0.001)	(0.001)	(0.001)
STATRATE	-3.504***	-3.980***	-2.787***
	(0.544)	(0.557)	(0.535)
RFR	0.090	0.052	0.099
	(0.153)	(0.147)	(0.177)
YLDCURVE	-0.376*	-0.389*	-0.395*
	(0.208)	(0.205)	(0.223)
INFL	0.256	0.172	0.437**
	(0.195)	(0.192)	(0.204)
ΔGDP	-0.600***	-0.620***	-0.517***
	(0.138)	(0.138)	(0.139)
Constant	1.961***	2.134***	1.699***
	(0.200)	(0.206)	(0.195)
Industry Fixed Effects	Yes	Yes	Yes
Observations	39,595	39,595	39,595
R-squared	0.4218	0.4221	0.4211

TABLE 5
Robustness Tests

This table presents robustness tests for the results presented in column (1) of Table 2. In column (1), we present the results of estimating equation (1) with Newey-West standard errors. In column (2), we cluster the standard errors by firm and by year rather than by firm and by industry-year. In column (3), we replace *AGGAVOID* with *LRCASHETR_MED* and *FIRMAVOID* with *LRCASHETR*. Standard errors appear in parentheses below coefficient estimates. In column (3), the standard errors are clustered by firm and by industry-year. The dependent variable in all columns is *ICC*. Industry fixed effects are included in the estimation but excluded from the table for brevity. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

TABLE 5
Robustness Tests
(continued)

Independent Variables	(1)	(2)	(3)
AGGAVOID	0.117***	0.117***	
	(0.009)	(0.032)	
FIRMAVOID	-0.042***	-0.042***	
	(0.002)	(0.005)	
LRCASHETR_MED			0.402***
			(0.056)
LRCASHETR			-0.020***
			(0.004)
SIZE	-0.031***	-0.031***	-0.022***
	(0.000)	(0.002)	(0.001)
BM	0.025***	0.025***	0.028***
	(0.001)	(0.008)	(0.003)
INST	-0.014***	-0.014**	-0.029***
	(0.002)	(0.007)	(0.004)
LEV	0.036***	0.036***	0.030***
	(0.003)	(0.006)	(0.006)
ROE	0.010***	0.010*	-0.017**
	(0.002)	(0.005)	(0.008)
YIELD	0.365***	0.365***	0.430***
	(0.024)	(0.059)	(0.063)
BETA	-0.006***	-0.006***	0.001
	(0.001)	(0.002)	(0.001)
STATRATE	-3.489***	-3.489**	-0.466
	(0.200)	(1.704)	(0.459)
RFR	0.085	0.085	1.081***
	(0.059)	(0.479)	(0.190)
YLDCURVE	-0.385***	-0.385	0.822***
	(0.073)	(0.645)	(0.220)
INFL	0.253***	0.253	0.290
	(0.065)	(0.610)	(0.184)
ΔGDP	-0.597***	-0.597	-0.728***
	(0.061)	(0.406)	(0.124)
Constant	1.956***	1.956***	0.754***
	(0.074)	(0.616)	(0.165)
Industry Fixed Effects	Yes	Yes	Yes
Observations	39,595	39,595	19,188
R-squared	0.4214	0.4214	0.4079

TABLE 6
Risk Absorption by Government

Column (1) presents the results of estimating equation (2). Columns (2) and (3) modify equation (2) by replacing *AGGAVOID* with *AGGAVOID_MNC* and *AGGAVOID_DOM*, respectively. The dependent variable in all columns is *EXPEND*. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions.

Independent Variables	(1)	(2)	(3)
SP500RET	0.001	0.000	-0.087
	(0.009)	(0.009)	(0.053)
AGGAVOID	-0.014		
	(0.025)		
*AGGAVOID*SP500RET*	-0.194*		
	(0.102)		
AGGAVOID_MNC		-0.020	
		(0.022)	
*AGGAVOID_MNC*SP500RET*		-0.183*	
		(0.089)	
AGGAVOID_DOM			0.013
			(0.025)
*AGGAVOID_DOM*SP500RET*			-0.192
			(0.118)
ΔGDP	-0.260*	-0.209	-0.374***
	(0.141)	(0.143)	(0.124)
Constant	0.155***	0.151***	0.177***
	(0.012)	(0.011)	(0.011)
Observations	20	20	20
R-squared	0.2559	0.2678	0.2999