Externalities of Corporate Tax Avoidance

Stephanie A. Sikes†
The Wharton School
University of Pennsylvania
ssikes@wharton.upenn.edu

Robert E. Verrecchia
The Wharton School
University of Pennsylvania
verrecch@wharton.upenn.edu

September 2014

Abstract

We show that when a meaningful proportion of firms in an economy engage in tax avoidance strategies, the covariance between a firm’s cash flow and the market cash flows increases, thereby increasing a firm’s cost of capital. This negative externality is imposed on all firms in the economy, not just tax-avoiding firms. The negative externality results regardless of the level of uncertainty associated with the tax avoidance; however, tax avoidance with more uncertain outcomes exacerbates the effect. The negative externality is most burdensome on firms that do not engage in tax avoidance because these firms do not benefit from the increase in after-tax cash flow that is associated with tax avoidance. Our results should be of interest to policy makers who are analyzing the costs associated with tax avoidance and strategies to curb it as well as to empirical researchers examining the relation between cost of capital and tax avoidance.

Keywords: corporate taxation, tax avoidance, cost of capital
JEL Classifications: G12, G32, H23, H25, H26, K34, M41

We appreciate the helpful comments of John Robinson and Terry Shevlin.

†Corresponding Author. Mailing Address: Accounting Department, The Wharton School, University of Pennsylvania, 1300 Steinberg Hall-Dietrich Hall, 3620 Locust Walk, Philadelphia, PA 19104-6365; Phone: 215-898-7783
1. Introduction

The popular press and governments have paid considerable attention to tax avoidance strategies of multinational firms in recent years.¹ Many would argue that by not paying their fair share of taxes, firms that avoid taxes impose a negative externality on their communities, which has become an even bigger concern since the global financial crisis. Governments have to cope with fewer revenues and higher costs of ensuring compliance. Moreover, tax avoidance on the part of corporations means that other taxpayers (e.g., individuals) have to bear a larger share of the tax burden. In response to the heightened concern over the tax avoidance strategies of U.S. multinational firms, the U.S. Senate Permanent Committee on Investigations has held hearings (U.S. Senate 2012, 2013). In addition, the G20 finance ministers have asked the Organisation for Economic Co-operation and Development (OECD) to develop an action plan to address Base Erosion and Profit Shifting (BEPS) among multinational firms.

In this paper, we discuss a negative externality that results from tax avoidance strategies that prior studies and policy discussions overlook. Using a theoretical model, we show that when a meaningful proportion of firms in an economy engage in tax avoidance strategies, regardless of whether the strategies have certain or uncertain outcomes, the cost of capital of all firms in the economy increases. Consistent with prior literature, our reference to tax avoidance strategies is a reference to tax strategies that could, but do not necessarily have to have, uncertain outcomes. In other words, a tax avoidance strategy could be any strategy that reduces a firm’s cash effective tax rate, regardless of whether or not it encompasses a gray or ambiguous area of tax law.² The externality that we describe manifests regardless of whether the tax avoidance strategies have certain or uncertain outcomes; however,

1¹For example, Apple and Google have been criticized for their use of the “Double Irish with a Dutch Sandwich” accounting technique (Duhigg and Kocieniewski 2012; Womack and Drucker 2012). In response to local protests that it was not paying its fair share of taxes, Starbucks agreed to pay $10 million more than it legally owes in taxes in Great Britain in each of the years 2013 and 2014 (Pfanner 2012).

2²Our definition of “tax avoidance” is consistent with that used in Hanlon and Heitzman (2010), who define “tax avoidance broadly as the reduction of explicit taxes...and reflects all transactions that have any effect on the firm’s explicit tax liability” (p. 137). Hanlon and Heitzman (2010) explain that their definition “does not distinguish between real activities that are tax-favored, avoidance activities specifically undertaken to reduce taxes, and targeted tax benefits from lobbying activities” (p. 137).
uncertainty exacerbates the effect.

We assume that a firm’s goal when choosing whether or not to engage in a tax avoidance strategy is to maximize an objective function that places a weight on its expected cash flow net of any corporate-level taxes, and a weight on the reciprocal of its cost of capital. We begin our analysis by examining the scenario where only one firm in the economy engages in a tax avoidance strategy. In this scenario, only the firm-specific variance of the tax-avoiding firm’s cash flow increases, and the effect of the increase in variance diversifies away. In other words, only idiosyncratic risk of the firm engaging in the tax avoidance strategy increases. We then proceed to show that when a meaningful proportion of firms in an economy engage in tax avoidance, systematic and not just idiosyncratic risk increases. Specifically, when a meaningful proportion of firms in an economy seek to avoid tax, the market cash flows will manifest increased risk, and this, in turn, will be reflected in the covariance of a firm’s cash flow with the market cash flows - irrespective of whether the firm itself engages in a tax avoidance strategy. Thus, when a meaningful proportion of firms in an economy engage in tax avoidance strategies, they impose an externality in the form of higher covariance risk on all firms in the economy. This occurs regardless of whether the outcomes of the tax avoidance strategies are certain or uncertain.

Using an economic model of asset pricing, we specifically examine the impact of tax avoidance strategies on the cost of equity capital (hereinafter, cost of capital) of the firms that pursue such strategies, and on the cost of capital of the firms in the economy that do not pursue such tax strategies. We show that when a meaningful proportion of firms in an economy choose to avoid taxes, the cost of capital of all firms in the economy increases. Because the after-tax cash flows of the tax-avoiding firms increase, it is possible that they are better off even though their cost of capital also increases. However, firms that do not choose a tax avoiding strategy are unequivocally worse off because these firms experience an increase in their cost of capital without the increase in after-tax cash flow that accompanies tax avoidance strategies.
To address the effects of tax avoidance behavior that is uncertain (i.e., risky), we extend our base model and allow the amount of tax that firms pay when they engage in tax avoiding strategies to be random (rather than deterministic). These are tax strategies that the firm knows are risky: that is, there is a nontrivial chance that a tax authority could overturn the position upon audit. We show that the only effect that this has is to exacerbate the negative externality that accompanies tax avoidance strategies.

We also explain how the results change if a firm’s cash flow covaries negatively with the market cash flows (e.g., countercyclical stock such as gold). For a countercyclical firm, tax avoidance creates a positive externality in that it reduces the firm’s cost of capital, regardless of whether the countercyclical firm engages in the tax avoidance. If the countercyclical firm engages in tax avoidance behavior, then it also benefits from higher after-tax cash flow.

It is important for policy makers to consider this negative externality when analyzing the costs of corporate tax avoidance and possible solutions. Unfortunately, we cannot suggest a solution that leads to a Pareto improvement. In the absence of commitment devices (i.e., tax law restrictions), each firm will be compelled to act in its own behalf. Implementing a commitment device would make firms that do not avoid taxes (even in the absence of the commitment device) better off by lowering their cost of capital. It would also make governments better off, and as a result likely reduce the tax burden on other types of taxpayers (e.g., individuals). However, the implementation of a commitment device renders worse off a firm that seeks to avoid taxes (in the absence of the commitment device) because of the greater importance it places on increasing its after-tax cash flow relative to reducing its cost of capital.

We focus on the externality caused by tax avoidance; however, the theory and intuition can be extended to other types of externalities that result from firm behavior. For example, when a meaningful proportion of banks make risky loans, we expect covariance risk to increase, and this, in turn, will result in a negative externality for all banks in the economy. Depending on the amount of cash flow that is generated from risky loans and the weights
that a particular bank places on maximizing cash flow and minimizing cost of capital, a bank that issues a risky loan could be better off even in the presence of the externality. However, banks that do not issue risky loans are unambiguously worse off as their cost of capital increases, yet they do not benefit from an increase in cash flow.

The paper proceeds as follows. In Section 2, we present our analysis. In Section 3, we reconcile our results to those in concurrent empirical papers. Section 4 concludes.

2. The effect of tax avoidance strategies on cost of capital

Our model is an extension of the multi-security analysis in Lambert et al. (2007). One contribution of Lambert et al. (2007) was to recast the Capital Asset Pricing Model (CAPM), which is expressed commonly in terms of returns, into a formulation based on prices and cash flows. This formulation demonstrates that the ratio of a firm’s expected future cash flow to the covariance of the firm’s cash flow with the sum of all cash flows in the market (i.e., the market cash flows) is a key determinant of the firm’s cost of capital.

We extend Lambert et al. (2007) by applying a firm-level tax rate on firms’ expected cash flow. Although Lambert et al. (2007) ignore the role of firm-level taxes (as well as investor-level taxes), their incorporation is very straightforward.\(^3\) In our model, each firm chooses its individual tax strategy. Consistent with many asset-pricing models, we assume that firms’ pre-tax incomes have a (multi-variate) normal distribution; the normal distribution allows for the possibility of negative pre-tax income.\(^4\) To deal with this possibility, we assume that the mean of pre-tax income is high, thereby rendering the likelihood of a negative outcome low. In effect, this is tantamount to assuming that each manager anticipates that his firm will be profitable; otherwise, there is no incentive to engage in tax avoidance activities. Nonetheless, in the event that a firm has negative pre-tax income, we assume that the firm can use its losses to offset positive taxable income in other years. For example, in the U.S., firms can

\(^3\)See the Appendix for a discussion.

\(^4\)For all intents and purposes, all income is in the form of cash. Thus, references to income are synonymous to references to cash.
carry back losses two years or forward twenty years to offset positive taxable income.

2.1. Market Setting

In this section we describe the market setting for our analysis. There are $J$ firms in the economy indexed as $j = 1, 2, \ldots, J$. A risk-free bond yields a return of $1 + R_f$, where $R_f \geq 0$ is the risk-free rate. Consistent with the CAPM, we consider a one-period economy in which prices are set for firms’ shares at the beginning of the period based on an uncertain cash flow at the end of the period. Let $P_j$ represent the price of shares in firm $j$ at the beginning of the period, and let $\tilde{V}_j$ represent the uncertain cash flow of firm $j$ at the end of the period prior to applying any firm-level tax, where tilde above a variable indicates uncertainty. The expression $\tilde{V}_M = \sum_{j=1}^{J} \tilde{V}_j$ represents the market cash flows. We assume that firms’ end-of-period cash flows have a multivariate normal distribution, and are correlated.

$N$ investors populate the economy indexed as $i = 1, 2, \ldots, N$, where $N$ is large. Let $U(c)$ represent investor $i$’s utility preference for residual cash proceeds of $c$. Each investor has an exponential utility function defined by $U(c)$, where $U(c) = \tau \left(1 - \exp \left[-\frac{1}{\tau} \cdot c\right]\right)$, and $\tau > 0$ represents each investor’s constant, absolute risk tolerance (CART). Finally, we assume that the market for firms’ shares is perfectly competitive (see the discussion in Verrecchia 2001). Perfect competition implies that while prices reflect the combined decisions of all market participants at an aggregate level, each individual investor behaves as if her actions have no meaningful effect on price.

For the sake of parsimony, we assume that shareholders are tax-exempt: the effect of shareholder-level taxes on a firm’s cost of capital is a separate issue that prior literature has addressed already (see Guenther and Sansing 2010 and Sikes and Verrecchia 2012). Also with parsimony in mind, we limit firms’ choices among tax strategies to a binary choice: firms choose either a relatively high tax rate, $t_H$, or a lower tax rate, $t_L$, where $t_H > t_L$. It is important to note that $t_H$ and $t_L$ are not the statutory corporate tax rates, but rather the

\[\text{As risk tolerance becomes unbounded, } U(c) \text{ converges asymptotically to risk neutrality: } \lim_{\tau \to \infty} U(c) = \lim_{\tau \to \infty} \tau \left(1 - \exp \left[-\frac{1}{\tau} \cdot c\right]\right) \to c. \text{ In addition, } U(\cdot) \text{ is standardized such that } U(0) = 0.\]
tax rates that firms choose to pay. In this sense, they are analogous to cash effective tax rates of corporations (Dyreng, Hanlon, and Maydew 2008). We note that a low cash effective tax rate does not necessarily mean that a firm is being “aggressive” in its tax strategies, where “aggressive” tax positions are those with weak support and thus less likely to be sustained upon audit (Rego and Wilson 2012; De Waegenaere, Sansing, and Wielhouwer 2013). A firm could lower its cash effective tax rate through strategies that are completely certain (i.e., deterministic), as well as through tax strategies whose outcomes are uncertain.

Finally, we assume that firms’ pre-tax cash flows (in the case of firm $j$, $\tilde{V}_j$) are independent of their tax avoidance choices. We discuss the implications of this assumption in Section 3.

### 2.2. Deterministic Tax Strategies

We begin our analysis by assuming that $t_H$ and $t_L$ are both deterministic. Thus, in this sense, our basic model examines the effect of tax avoidance strategies where there is no uncertainty related to the strategy’s outcome. An example of a deterministic tax strategy is accelerated depreciation deductions. Later we extend the model to consider the effect of tax avoidance strategies that encompass uncertainty (i.e., where $t_H$ and $t_L$ are not deterministic but instead randomized).

Let $t_{T_j}$ represent firm $j$’s choice between the two deterministic tax strategies of $t_H$ and $t_L$, where $T_j \in \{H, L\}$. We assume that firm $j$’s motivation in choosing its individual tax strategy is to maximize an objective function that places a weight $\alpha_j$ (where $0 \leq \alpha_j \leq 1$) on firm $j$’s expected cash flow (which is net of any corporate-level taxes), and a weight $1 - \alpha_j$ on the reciprocal of firm $j$’s cost of capital. In the notation we employ, firm $j$’s objective function reduces to

$$
\max_{T_j \in \{H, L\}} \alpha_j \cdot E[(1 - t_{T_j}) \tilde{V}_j] + (1 - \alpha_j) \cdot \frac{1}{CoC_{T_j}}.
$$

(1)
where the expression

$$CoC_{T_j} = \frac{R_f E \left[ (1 - t_{T_j}) \tilde{V}_j \right] + \frac{1}{N_T} Cov \left[ (1 - t_{T_j}) \tilde{V}_j \cdot \sum_{k=1}^{J} (1 - t_{T_k}) \tilde{V}_k \right]}{E \left[ (1 - t_{T_j}) \tilde{V}_j \right] - \frac{1}{N_T} Cov \left[ (1 - t_{T_j}) \tilde{V}_j \cdot \sum_{k=1}^{J} (1 - t_{T_k}) \tilde{V}_k \right]}$$

(2)

represents firm j’s cost of capital: see eqn. (9) in the Appendix for a derivation of $CoC_{T_j}$. While this representation of an objective function is stylized, it captures the notion that in choosing among tax strategies, firms’ objectives may be multifaceted. Henceforth we interpret firm j’s objective function as expressed in eqn. (1) as a measure of firm j’s welfare.

It is a straightforward exercise to show that when faced with an objective function that gives weight to both expected cash flow and the reciprocal of cost of capital, firm j will choose the lower tax rate $t_L$ (i.e., $T_j = t_L$). The rationale for this choice is straightforward. A lower tax rate maximizes a firm’s expected after-tax cash flow $E \left[ (1 - t_{T_j}) \tilde{V}_j \right]$. But, in addition, from the perspective of an individual firm the choice of a tax strategy has no impact on its cost of capital. The reason why the choice of a tax strategy has no impact is related to the conventional wisdom that a firm’s idiosyncratic risk is not priced in a CAPM setting. Specifically, in choosing among tax rates, firm j’s choice affects both the numerator and denominator of its cost of capital by a factor of $1 - t_{T_j}$, where $T_j \in \{H, L\}$. However, because $1 - t_{T_j}$ affects the numerator and denominator similarly, there is a mechanical relation between the numerator and denominator such that $1 - t_{T_j}$ cancels out, and thus firm j’s tax avoidance choice has no impact on firm j’s cost of capital beyond its impact on idiosyncratic risk. For example, the expression for firm j’s cost of capital can be re-expressed after cancelling out $1 - t_{T_j}$ as

$$CoC_{T_j} = \frac{R_f E \left[ \tilde{V}_j \right] + \frac{1}{N_T} \left( Cov \left[ \tilde{V}_j \cdot \sum_{k=1, k\neq j}^{J} (1 - t_{T_k}) \tilde{V}_k \right] + (1 - t_{T_j}) Var \left[ \tilde{V}_j \right] \right)}{E \left[ \tilde{V}_j \right] - \frac{1}{N_T} \left( Cov \left[ \tilde{V}_j \cdot \sum_{k=1, k\neq j}^{J} (1 - t_{T_k}) \tilde{V}_k \right] + (1 - t_{T_j}) Var \left[ \tilde{V}_j \right] \right)},$$

(3)

and here it should be clear that firm j’s choice of a tax rate only affects its cost of capital through the idiosyncratic risk term $(1 - t_{T_j}) Var \left[ \tilde{V}_j \right]$ in the numerator and denominator.
Thus, the extent to which the economy is large (i.e., \( N \) is large), idiosyncratic risk vanishes and therefore plays no role in firm \( j \)'s tax avoidance choice. Hence, firm \( j \) will choose the lower tax rate \( t_L \) so as to maximize its expected cash flow.

But now consider the consequence of every firm in the economy choosing a tax strategy. For the moment, we restrict the consequence to firms whose cash flow covaries positively with the market cash flows: below we extend the discussion to firms with negatively correlated cash flow. If every firm in the economy chooses a tax avoidance strategy (i.e., every firm chooses \( t_L \)) because this choice maximizes the objective function in eqn. (1), then firms’ costs of capital will increase. To illustrate this, consider eqn. (3) when every firm in the economy chooses the tax strategy \( t_L \) versus \( t_H \). Here the mechanical relation between the numerator and denominator implies that firm \( j \)'s cost of capital will be higher when every firm chooses \( t_L \) versus \( t_H \):

\[
CoC_{t_L} = \frac{R_f E \left[ (1 - t_L) \hat{V}_j \right] + \frac{1}{N_I} Cov \left[ (1 - t_L) \hat{V}_j \cdot \sum_{k=1}^{J} (1 - t_L) \hat{V}_k \right]}{E \left[ (1 - t_L) \hat{V}_j \right] - \frac{1}{N_I} Cov \left[ (1 - t_L) \hat{V}_j \cdot \sum_{k=1}^{J} (1 - t_L) \hat{V}_k \right]} > \frac{R_f E \left[ \hat{V}_j \right] + (1 - t_H) \frac{1}{N_I} Cov \left[ \hat{V}_j \cdot \sum_{k=1}^{J} \hat{V}_k \right]}{E \left[ \hat{V}_j \right] - (1 - t_H) \frac{1}{N_I} Cov \left[ \hat{V}_j \cdot \sum_{k=1}^{J} \hat{V}_k \right]} = CoC_{t_H}.
\]

In effect, the choice of a tax avoidance strategy by every firm in the economy introduces a negative externality.

Whether firms that engage in the tax avoidance strategy benefit from an increase in their objective function (i.e., whether they are better off) depends on whether the increase in expected after-tax cash flow dominates the increase in cost of capital as a consequence of greater risk. For example, we might expect for a firm whose cost of capital increases above its return-on-equity as a result of engaging in a tax avoidance strategy to suffer a decline in its objective function because the objective function of this type of firm likely places
more weight on the reciprocal of cost of capital than on expected after-tax cash flow. On the other hand, firms that are financially constrained might experience an increase in their objective function because the objective function of these firms likely places more weight on expected after-tax cash flow than on the reciprocal of cost of capital. When the utility gained from higher after-tax cash flows is less than the utility lost from the increase in cost of capital, firms are worse off choosing the tax avoidance strategy. Despite this, each firm feels compelled to do so because – from the perspective of an individual firm – being a “tax avoider” is an optimal, individual-firm strategy. In other words, rather than avoid tax, firms could do better by cooperating and collectively agreeing to eschew tax avoidance. In the absence of a mechanism to cooperate, however, firms seek to avoid tax and end-up worse off. Economists refer to the phenomenon where agents or firms are compelled to make welfare-reducing choices because there is no channel through which they can cooperate as the “prisoner’s dilemma” problem.

Of course, it may be the case that only some meaningful proportion of firms, but not all firms, engage in a tax avoidance strategy. For example, consider the case where half of the firms in the economy choose \( t_L \) and the other half choose \( t_H \). In this circumstance, the firms that choose tax avoidance still impose a negative externality on all firms in the economy irrespective of their tax avoidance choice. To illustrate this, consider eqn. (2) in a circumstance where firm \( j \) chooses the tax strategy \( t_H \), firms \( k = 1, \ldots, J/2 \) choose \( t_H \), and firms \( k = J/2, \ldots, J \) choose \( t_L \). Here, firm \( j \)'s cost of capital will be higher than when every
firm in the economy chooses $t_H$:

$$
CoC_{t_H} = \frac{R_f E \left[ (1 - t_H) \tilde{V}_j \right] + \frac{1}{N_T} Cov \left[ (1 - t_H) \tilde{V}_j \cdot \sum_{k=1}^{J} (1 - t_{T_k}) \tilde{V}_k \right]}{E \left[ (1 - t_H) \tilde{V}_j \right] - \frac{1}{N_T} Cov \left[ (1 - t_H) \tilde{V}_j \cdot \sum_{k=1}^{J} (1 - t_{T_k}) \tilde{V}_k \right]}
$$

$$
= \frac{R_f E \left[ (1 - t_H) \tilde{V}_j \right] + \frac{1}{N_T} Cov \left[ (1 - t_H) \tilde{V}_j \cdot \left( (1 - t_H) \sum_{k=1}^{J/2} \tilde{V}_k + (1 - t_L) \sum_{k=J/2+1}^{J} \tilde{V}_k \right) \right]}{E \left[ (1 - t_H) \tilde{V}_j \right] - \frac{1}{N_T} Cov \left[ (1 - t_H) \tilde{V}_j \cdot \left( (1 - t_H) \sum_{k=1}^{J/2} \tilde{V}_k + (1 - t_L) \sum_{k=J/2+1}^{J} \tilde{V}_k \right) \right]}
$$

$$
\geq \frac{R_f E \left[ \tilde{V}_j \right] + (1 - t_H) \frac{1}{N_T} Cov \left[ \tilde{V}_j \cdot \sum_{k=1}^{J/2} \tilde{V}_k \right] + (1 - t_L) \frac{1}{N_T} Cov \left[ \tilde{V}_j \cdot \sum_{k=J/2+1}^{J} \tilde{V}_k \right]}{E \left[ \tilde{V}_j \right] - (1 - t_H) \frac{1}{N_T} Cov \left[ \tilde{V}_j \cdot \sum_{k=1}^{J/2} \tilde{V}_k \right] - (1 - t_L) \frac{1}{N_T} Cov \left[ \tilde{V}_j \cdot \sum_{k=J/2+1}^{J} \tilde{V}_k \right]},
$$

where the last inequality represents firm $j$’s cost of capital when every firm chooses $t_H$. The important and unique takeaway, however, is that the objective function of those firms that choose $t_H$ will decrease unequivocally because these firms incur the negative externality of higher cost of capital without experiencing the commensurate increase in expected after-tax cash flow that results from choosing $t_L$.

Implicit in our discussion to this point is the notion that a firm’s cash flow covaries positively with the market cash flows. There may exist, however, some firms in the economy whose cash flow covaries negatively with the market cash flows (e.g., a countercyclical stock such as gold): hereinafter, we refer to such a firm as a “negatively correlated” firm. For a negatively correlated firm, a low tax avoidance choice generates a positive (not negative) externality. Regardless of whether a negatively correlated firm engages in a tax avoidance strategy, tax avoidance behavior among a meaningful proportion of other firms in the economy will make a negatively-correlated firm an even more attractive countercyclical investment. Moreover, if the negatively-correlated firm also engages in a tax avoidance strategy, it will benefit from higher expected after-tax cash flow.

In summary, in this section we show that when a meaningful proportion of firms in an economy engage in tax avoidance strategies whose outcomes are certain, firms whose cash
flow covaries positively with the market cash flows will experience an increase in their cost of capital. Whether the tax avoiding firm is better or worse off depends on whether the firm’s objective function places more weight on maximizing expected after-tax cash flow or on minimizing cost of capital. However, firms that do not engage in tax avoidance strategies are unequivocally worse off because these firms experience an increase in their cost of capital but no increase in their expected after-tax cash flow.

2.3. Uncertain Tax Strategies

In Section 2.2, we lay the foundation for our analysis using the parsimonious case of a binary choice between deterministic tax rates, $t_L$ and $t_H$. One potential critique of such an analysis is that empirically firms that choose low (high) tax rate strategies will not have equivalent cash effective tax rates. Moreover, the outcomes of tax rate strategies are often uncertain. In this section, we consider the case where tax strategies are not deterministic, but instead are uncertain or random. Specifically, assume that $\tilde{t}_H$ and $\tilde{t}_L$ are normally distributed random variables with means $\mu_H$ and $\mu_L$ and variances $\sigma_H^2$ and $\sigma_L^2$, respectively, and independent of firms’ cash flows, $\tilde{V}_j$. In addition, assume that the mean tax rates $\mu_H$ and $\mu_L$ are between 0 and 1 and $\mu_H > \mu_L$. An uncertain, or randomized, tax rate is consistent with both the notion of “tax risk” and uncertainty related to future tax payments. In addition to modeling “uncertainty” or “tax risk” from the firm’s perspective, this analysis also captures the fact that cash effective tax rates will vary among firms choosing low and high tax rate strategies, and thus better reflects the distribution of cash effective tax rates in an empirical setting. For example, regardless of whether the outcomes of low and high tax rate strategies are certain or uncertain from each firm’s perspective, from an econometrician’s perspective, firms’ cash effective tax rates will appear to be random.

6There is a “mathematical conceit” in assuming that tax rates have a normal distribution insofar as tax rates are typically thought to be between 0 and 100%, whereas here we are limited to assuming that the mean tax rates $\mu_H$ and $\mu_L$ are between 0 and 1. But if $\mu_H$ and $\mu_L$ are between 0 and 1 and the variance in tax rates is low, then it seems reasonable to presume that most of the tax-rate probability mass is concentrated between 0 and 1, and thus a tax-rate realization outside 0 and 1 unlikely.
Generalizing our model to allow for randomized tax strategies is a non-trivial extension of Lambert et al. (2007) because now firm $j$’s after-tax cash flow is the product of two normal (Gaussian) random variables, $\tilde{V}_j$ and either $1 - \tilde{t}_H$ or $1 - \tilde{t}_L$. In general, the product of two normal (Gaussian) random variables is distributed as a linear combination of two chi-square ($\chi^2$) random variables. For example, consider the low tax rate strategy $\tilde{t}_L$. Here, firm $j$’s after-tax cash flow can be expressed as

$$(1 - \tilde{t}_L) \tilde{V}_j = \frac{1}{4}(1 - \tilde{t}_L + \tilde{V}_j)^2 - \frac{1}{4}(1 - \tilde{t}_L - \tilde{V}_j)^2.$$ 

Because $1 - \tilde{t}_L + \tilde{V}_j$ and $1 - \tilde{t}_L - \tilde{V}_j$ are normal (Gaussian) random variables, $(1 - \tilde{t}_L + \tilde{V}_j)^2$ and $(1 - \tilde{t}_L - \tilde{V}_j)^2$ are chi-square random variables distributed with 1 degree of freedom.

In short, generalizing Lambert et al. (2007) to allow for randomized tax strategies requires re-deriving their entire analysis: this would be a complex undertaking.

In an attempt to arrive at an approximation of the impact of uncertain tax strategies without re-deriving Lambert et al. (2007), below we assume that firm $j$’s objective function and cost of capital are “exogenously specified” as in eqns. (1) and (2), respectively. In addition, to capture the distinction between an uncertain high tax rate strategy versus an uncertain low tax rate strategy, we make two assumptions about these strategies. First, we assume that $\mu_H > \mu_L$; in other words, “on average” $\tilde{t}_H$ yields lower expected after-tax cash flow than $\tilde{t}_L$. Second, we define the “tax rate dispersion index” (TRDI) for high and low tax strategies as $\frac{\sigma_H^2}{1 - \mu_H}$ and $\frac{\sigma_L^2}{1 - \mu_L}$, respectively, and assume that low tax strategies have a higher TRDI: that is, $\frac{\sigma_L^2}{1 - \mu_L} > \frac{\sigma_H^2}{1 - \mu_H}$. The significance of a TRDI is that it offers a normalized measure of the dispersion of an uncertain tax rate by measuring the ratio of the variance of tax-rate outcomes ($\sigma_H^2$ and $\sigma_L^2$, respectively) relative to the expected after-tax benefit ($1 - \mu_H$ and $1 - \mu_L$, respectively) that results from using a particular tax strategy.\footnote{A dispersion index is a standard statistical tool: see Cox and Lewis (1966).} In other words, we assume that an uncertain low tax strategy has a higher dispersion of outcomes relative
to its expected after-tax benefit than an uncertain high tax strategy.\textsuperscript{8} This assumption is similar to the finding in McGuire, Neuman and Omer (2013) that firms with more sustainable tax strategies have significantly higher annual cash effective tax rates than firms with less sustainable tax strategies. McGuire et al. (2013) define sustainable tax strategies as those with a lower coefficient of variation for annual cash effective tax rates over the prior five-year period.\textsuperscript{9}

Henceforth assume that firm $j$’s objective function and cost of capital are exogenously specified as in eqns. (1) and (2), respectively. When tax rate strategies are uncertain and every firm in the economy (including firm $j$) chooses $\tilde{t}_L$, firm $j$’s objective function in eqn. (1) yields

$$\alpha_j \cdot (1 - \mu_L) E \left[ \tilde{V}_j \right] + (1 - \alpha_j) \cdot \frac{1}{CoC_{\tilde{t}_L}},$$

where eqn. (2) now yields

$$CoC_{\tilde{t}_L} = \frac{R_f (1 - \mu_L) E \left[ \tilde{V}_j \right] + \frac{1}{N_T} \left[ (1 - \mu_L)^2 + \sigma_L^2 \right] Cov \left[ \tilde{V}_j, \sum_{k=1}^j \tilde{V}_k \right]}{(1 - \mu_L) E \left[ \tilde{V}_j \right] - \frac{1}{N_T} \left[ (1 - \mu_L)^2 + \sigma_L^2 \right] Cov \left[ \tilde{V}_j, \sum_{k=1}^j \tilde{V}_k \right]}.$$

As an aside, treating the low tax rate $\tilde{t}_L$ as a random variable is interesting insofar as it

\textsuperscript{8}In our discussion, we assume that the high tax rate strategy is random (i.e., $\tilde{t}_H$). If one thinks this assumption unrealistic, without loss of generality one can assume that the high tax rate strategy is constant (deterministic). The only requirement is that now one has to assume that $t_H$ is greater than the mean of the low tax rate strategy; because the high tax rate strategy is constant, its TRDI is 0 (i.e., $\sigma_H^2 = 0$), and thus always lower than the TRDI of the low tax rate strategy.

\textsuperscript{9}Inconsistent with our assumption and the finding in McGuire et al. (2013), Guenther et al. (2013) find a positive correlation between the cash effective tax rate and the standard deviation of a firm’s annual cash effective tax rate over a five-year period. Guenther et al. (2013) explain that their finding is consistent with their prediction that as the percentage of tax avoided via “safe” (i.e., not risky) tax positions increases, the expected level of tax that a firm has to pay (i.e., its cash effective tax rate) decreases. But even allowing for the fact that the findings in Guenther et al. (2013) are true, our assumption that an uncertain low tax strategy has a higher TRDI relative to an uncertain high tax strategy is only a sufficient (not necessary) condition to prove our claims below. As eqn. (6) below shows, our claims hold provided that the sum of the after-tax rate plus the TRDI for the low tax strategy is higher than the sum of the after-tax rate plus the TRDI for the high tax strategy.
seems to capture the notion of “tax risk.” For example, in the calculation of cost of capital in eqn. (5), the TRDI seems to describe the tax risk associated with firms choosing a tax avoidance strategy whose outcome is uncertain.

As with the case when \( t_L \) is deterministic, if every firm chooses the low tax strategy \( \tilde{t}_L \), firm \( j \)’s cost of capital will be higher than when every firm chooses the high tax strategy \( \tilde{t}_H \) because

\[
1 - \mu_L + \frac{\sigma_L^2}{1 - \mu_L} > 1 - \mu_H + \frac{\sigma_H^2}{1 - \mu_H}.
\]

Thus, once again, tax avoidance behavior manifests as a negative externality insofar as it increases firms’ cost of capital. Note that “tax risk” (i.e., the TRDI) exacerbates the negative externality, but has no significance beyond that. In the end, as when tax strategies are deterministic, whether the negative externality offsets the increase to a firm’s expected after-tax cash flow in the determination of whether the firm is better or worse off depends on the weights the firm places on maximizing after-tax cash flow and minimizing cost of capital. In short, at least for the case where firms’ objective functions and costs of capital are exogenously specified, uncertain tax strategies do not affect the central logic of deterministic tax strategies: tax avoidance results in a negative externality.

3. Reconciliation with the Extant Literature

In this section we attempt to reconcile our analysis with the extant literature. Four concurrent working papers (Cook, Moser and Omer 2013; Goh, Lee, Lim and Shevlin 2013; Hutchens and Rego 2013; McCarty 2012) investigate the empirical link between measures of tax avoidance and cost of capital. Cook, Moser and Omer (2013), Goh, Lee, Lim and Shevlin (2013), and Hutchens and Rego (2013) rely on the theory in Lambert et al. (2007) for their motivation. In an attempt to reconcile our analysis with the extant literature, a useful starting point is to emphasize two key differences between the two analyses. First, we assume that firms’ pre-tax cash flows (\( \tilde{V}_j \)) are independent of their tax avoidance strategies. Alternatively, the extant literature assumes that firms’ tax avoidance strategies can affect
their pre-tax cash flows. When firms’ pre-tax cash flows are a consequence of their tax avoidance strategies, for all intents and purposes the choice of a tax strategy is tantamount to the choice among generic investments. As Lambert et al. (2007) explain, investment choice has two potential effects on a firm’s cost of capital: an indirect effect that operates through the impact of the investment on the firm’s expected cash flow, and a direct effect that operates through the impact of the investment on the covariance of the firm’s cash flow with the market cash flow. In principle, either the indirect effect or the direct effect can govern the investment’s impact on cost of capital. Moreover, a single firm’s investment choice can affect its cost of capital.

The second key difference is that the concurrent empirical papers describe the direct effect of tax avoidance on cost of capital as being attributable to an increase in opacity in financial reports resulting from uncertain tax avoidance. In contrast, the direct effect that we describe is solely a result of reducing the tax rate that is applied to the cash flows of a meaningful proportion of firms in the economy. If we also introduced the effect of tax avoidance on opacity into our model, we too could find that a single firm’s tax avoidance strategy affects its cost of capital and that the effect could be a decrease or increase depending on the direction of the effect that we assume tax avoidance has on opacity.

The extant literature’s approach of assuming that firms’ pre-tax cash flows depend on firms’ tax avoidance strategies and that tax avoidance affects covariance risk through opacity leaves completely open the possibility that corporate tax avoidance is positively or negatively associated with cost of capital. For example, Goh et al. (2013) argue that corporate tax avoidance can increase the opacity of a firm’s information environment (Balakrishnan, Blouin, and Guay 2013) and can be associated with aggressive financial reporting (Frank, Lynch and Rego 2009), both of which could impair the quality or precision of a firm’s accounting information and thus increase investors’ uncertainty about a firm’s future cash flow. Thus, relying on the language in Lambert et al. (2007), Goh et al. (2013) claim that corporate tax avoidance simultaneously has a direct effect that increases a firm’s cost of capital.
and an indirect effect that could either increase or decrease a firm’s cost of capital. With regard to the latter, prior studies (Desai and Dharmapala 2006; Desai, Dyck and Zingales 2007) provide evidence consistent with managerial diversion being positively associated with corporate tax avoidance. Moreover, a firm could suffer potential compliance or reputation costs if the relevant tax authority overturns a tax position.\textsuperscript{10} For both of these reasons, corporate tax avoidance could operate through the indirect effect to increase a firm’s cost of capital. Alternatively, successful corporate tax avoidance could increase a firm’s expected future cash flow; investors might perceive that managers who are able to structure complex tax transactions are also more capable in terms of other investment decisions. Thus, corporate tax avoidance could operate through the indirect effect to decrease cost of capital. In summary, Cook et al. (2013), Goh et al. (2013), and Hutchens and Rego (2013) conclude that whether tax avoidance increases or decreases cost of capital depends on whether the indirect effect increases or decreases cost of capital, and, if the latter, whether the indirect effect dominates the direct effect in the determination of cost of capital.

Allowing for all these possibilities, Goh et al. (2013) conclude that “less aggressive” tax avoidance reduces a firm’s cost of capital.\textsuperscript{11} Their results are consistent with the expected cash tax savings arising from tax avoidance (the indirect effect) dominating any associated increase in risk (the direct effect) in the determination of cost of capital.\textsuperscript{12} Moreover, they find that more aggressive tax avoidance is either not associated or positively associated with cost of capital.\textsuperscript{13} Similar to the results in Goh et al. (2013), Cook et al. (2013) conclude that

\textsuperscript{10}According to Graham, Hanlon, Shevlin and Shroff (2013), 69% of executives rate reputation as important, and reputation ranks second in order of importance among all factors explaining why firms do not adopt a potential tax planning strategy.

\textsuperscript{11}Their measures of “less extreme” tax avoidance are book-tax differences, permanent book-tax differences, and long-run cash effective tax rates. Note that although the authors describe these measures as being measures of “less extreme” or “less aggressive” tax avoidance, all of these measures could capture both aggressive and less aggressive tax avoidance. The authors acknowledge this in footnote 4 of their paper.

\textsuperscript{12}In contrast to Goh et al.’s (2013) finding, Hutchens and Rego (2013) find that the cash tax savings from income tax avoidance, measured using cash effective tax rates, are not significantly associated with cost of capital.

\textsuperscript{13}Specifically, they find a negative but statistically insignificant relation between cost of capital and Wilson’s (2009) tax shelter prediction score, and a positive and statistically significant relation between cost of capital and unrecognized tax benefits per Financial Interpretation No. 48.
there is a nonlinear convex relationship between tax avoidance and cost of capital. They conclude that the association between cost of capital and tax avoidance is negative for those firms for which the expected benefits of tax avoidance exceed the expected costs, and positive for those firms for which the expected costs exceed the expected benefits. McCarty (2012) uses unrecognized tax benefits under Financial Interpretation No. 48 (FIN 48) to proxy for tax risk.\footnote{In 2007, the Financial Accounting Standards Board in the U.S. passed FIN 48, which significantly increased the amount of disclosures that companies must make in their annual reports related to unrecognized tax benefits (i.e., the reserve for tax positions that are uncertain or risky). The motivation for FIN 48 was the SEC’s concern that some companies were engaging in too much tax risk and that investors needed to be aware of these risks in making their investment choices.} Similar to the conclusion in Goh et al. (2013) and Cook et al. (2013), McCarty (2012) documents a concave relation between tax risk and firm value (i.e., log of market value of equity). In other words, firm value increases in tax risk at a diminishing rate until an optimal level of tax risk is reached, after which point firm value decreases in tax risk. Moreover, McCarty (2012) finds that tax risk is related to cost of capital only among firms engaging in the most tax risk.

In summary, by virtue of assuming that a firm’s pre-tax cash flow ($V_j$) is a function of a firm’s tax avoidance strategy, the authors of the concurrent empirical papers are able to motivate their prediction that a single firm’s tax avoidance strategy can affect its cost of capital, where the effect can either be an increase or decrease to cost of capital. Alternatively, we show that if one assumes that $V_j$ is independent of tax avoidance strategies, then it is mathematically impossible for: 1) a single firm’s tax avoidance strategy to have an impact on the firm’s cost of capital unless a significant proportion of firms also engage in the tax avoidance; and 2) tax avoidance to decrease cost of capital. Moreover, in our analysis, we ignore any potential effect of tax avoidance on opacity. A consequence of allowing tax avoidance to have an impact on opacity, however, is that even in the case where only one firm engages in tax avoidance, the tax avoidance can affect cost of capital.

While our approach and the approach taken in concurrent empirical papers that treat tax avoidance as a generic investment may both have merit, suffice it to say that the advantage
of our approach is that we model the effect of actual tax avoidance (i.e., the effect of a firm’s cash-effective, tax-rate choice) on cost of capital, and ignore the effect of features that might only be correlated with tax avoidance (e.g., assessments of managers’ ability, reputation concerns, expropriation concerns, financial reporting opacity).

4. Conclusion

Much attention has been paid to corporate tax avoidance in recent years. In this paper, we describe a negative externality of corporate tax avoidance that prior policy discussions and prior literature overlook. We theoretically show that when a meaningful proportion of firms in an economy engage in tax avoidance, they impose an externality on all firms in the economy, even those firms that do not engage in tax avoidance. The negative externality is higher covariance risk between a firm’s cash flow and the market cash flows, which results in a higher cost of capital. The negative externality results regardless of whether the outcomes of the tax avoidance strategies are certain or uncertain; however, uncertainty exacerbates the negative externality. Finally, in general, the externality is likely greater the greater the proportion of firms in an economy that engage in tax avoidance strategies.

We believe that this is an important externality for policy makers to consider when discussing the costs associated with many firms in an economy partaking in tax avoidance. If the expected after-tax cash flow of a firm that engages in tax avoidance increases, it is unclear whether the firm is better or worse off as a result of its tax avoidance. It will depend on the importance each firm places on maximizing after-tax cash flow as opposed to minimizing cost of capital. However, firms that do not engage in tax avoidance are unequivocally worse off, because these firms suffer an increase in cost of capital but do not experience an increase in after-tax cash flow that is associated with tax avoidance.

Our paper also contributes to academic literature on the relation between tax avoidance and cost of capital by clarifying several key points. First, ignoring any potential change to pre-tax cash flows or to opacity of financial information that is correlated with tax avoidance,
we show that tax avoidance can only increase cost of capital if a meaningful proportion of firms in an economy engage in the tax avoidance. Second, in such cases, cost of capital will increase for all firms in the economy, not just for the tax-avoiding firms. Third, the increase in cost of capital will occur regardless of whether the tax avoidance is certain or uncertain; however, uncertainty exacerbates the effect.
References

84: 591-623.
Appendix

Our analysis is identical to the analysis in Lambert et al. (2007), save for the fact that the latter ignores firm-level taxes (as well as investor-level taxes). One can extend the analysis in Lambert et al. (2007) to include firm-level taxes. For example, in the “Proof of equation (3)” in the Appendix of Lambert et al. (2007), the price for firm $j$ is derived as

$$P_j = \frac{E \left[ \tilde{V}_j | \Phi \right] - \frac{1}{N^T} Cov \left[ \tilde{V}_j \cdot \sum_{k=1}^J \tilde{V}_k | \Phi \right]}{1 + R_f},$$

where $\Phi$ represents investors’ common knowledge about the distribution of $\tilde{V}_j$. When firms pay firm-level taxes and firm $j$ chooses a tax strategy $t_{T_j}$, $j = 1, 2, ..., J$, then the price of firm $j$ is

$$P_j = \frac{E \left[ (1 - t_{T_j}) \tilde{V}_j | \Phi \right] - \frac{1}{N^T} Cov \left[ (1 - t_{T_j}) \tilde{V}_j \cdot \sum_{k=1}^J (1 - t_{T_k}) \tilde{V}_k | \Phi \right]}{1 + R_f}. \quad (7)$$

Henceforth we drop the “common knowledge” conditioning parameter $\Phi$ in our notation. Continuing, a conventional interpretation of firm $j$’s after-tax cost of capital is

$$\frac{E \left[ (1 - t_{T_j}) \tilde{V}_j \right] - P_j}{P_j}. \quad (8)$$

Using eqn. (8) in conjunction with eqn. (7) implies that firm $j$’s after-tax cost of capital reduces to

$$\frac{R_f E \left[ (1 - t_{T_j}) \tilde{V}_j \right] + \frac{1}{N^T} Cov \left[ (1 - t_{T_j}) \tilde{V}_j \cdot \sum_{k=1}^J (1 - t_{T_k}) \tilde{V}_k \right]}{E \left[ (1 - t_{T_j}) \tilde{V}_j \right] - \frac{1}{N^T} Cov \left[ (1 - t_{T_j}) \tilde{V}_j \cdot \sum_{k=1}^J (1 - t_{T_k}) \tilde{V}_k \right]}. \quad (9)$$

Henceforth eqn. (9) describes firm $j$’s after-tax cost of capital.