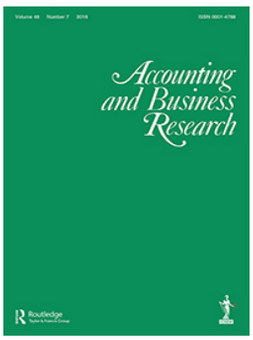

Routledge
Taylor & Francis Group

Accounting and Business Research

ISSN: 0001-4788 (Print) 2159-4260 (Online) Journal homepage: http://www.tandfonline.com/loi/rabr20

The composite dividend tax rate

Deen Kemsley, Padmakumar Sivadasan & Venkat Subramaniam

To cite this article: Deen Kemsley, Padmakumar Sivadasan & Venkat Subramaniam (2018) The composite dividend tax rate, Accounting and Business Research, 48:7, 727-758, DOI: 10.1080/00014788.2018.1433526

To link to this article: https://doi.org/10.1080/00014788.2018.1433526

Accounting and Business Research, 2018
Vol. 48, No. 7, 727–758, https://doi.org/10.1080/00014788.2018.1433526

The composite dividend tax rate

DEEN KEMSLEY*, PADMAKUMAR SIVADASAN AND VENKAT SUBRAMANIAM

A.B. Freeman School of Business, Tulane University, 7 McAlister, New Orleans, LA 70118, USA

Dividends often impose taxes on investors. However, as certain prior financial models indicate, they also can produce a tax gain from leverage. Hence the composite marginal dividend tax rate can be specified as the nominal rate minus the offsetting tax gain from leverage. Although this principle has been embedded in theoretical models for more than 40 years, no prior study has examined empirically whether the dividend-induced tax gain from leverage influences dividend policy. We address this empirical void and find dividends decrease in the nominal dividend tax rate and increase in the offsetting tax gain from leverage. In addition, we find the composite tax rate outperforms traditional measures in explaining dividend policy for our full sample of firms. Consistent with prior theory, we also find the composite rate varies in influence according to the financing source for a dividend.

Keywords: dividend tax; tax gain from leverage; tax integration

1. Introduction

Dividends often impose personal taxes on investors. In some regimes, personal taxes on dividends are material and may deter distributions. Many prior studies examine the effects of these taxes empirically, often finding a negative relation between dividends and personal tax rates (e.g. Poterba and Summers 1985, Poterba 1987, 2004, Brown et al. 2007). However, powerful nontax factors affect dividend policy, so other studies find more mixed evidence and conclude that dividend taxes have a second-order effect at best (see summary in DeAngelo et al. 2008).

As certain prior studies suggest, dividends also can produce a tax benefit (e.g. DeAngelo et al. 2008). In some cases, this tax benefit could be as large as the gross nominal dividend tax, thereby negating the nominal tax. The dividend tax benefit to which we refer is the gain from leverage. Traditionally, the tax gain from leverage is associated with debt, not dividends. Specifically, given the tax deductibility of interest expense for a corporation, the tax gain from leverage reflects the fact that future returns on equity are subject to both corporate and personal taxes whereas future returns on debt are only subject to a single layer of tax at the investor level. However, this tax benefit applies to dividends as well as to debt. In particular, paying out dividends extracts

*Corresponding author. Email: dkemsley@tulane.edu
Paper accepted by Martin Jacob

equity from the firm. Once this equity has been extracted, future returns on the equity are no longer subject to double taxation at both the corporate and investor levels. Like future returns on debt, the future returns on the extracted equity are solely subject to a single layer of tax at the investor level, thus avoiding the corporate tax.[1] Indeed, the models in King (1974), Masulis and Trueman (1988), Hennessy and Whited (2005), and other studies imply the tax gain from leverage that a dollar of dividends can produce is equal to the gain a dollar of debt produces.[2] This tax gain from leverage offsets the gross nominal dividend tax. Given this offsetting effect, the marginal dividend tax rate can be specified as a *composite* rate that is equal to the nominal dividend tax rate minus the tax gain from leverage.

Once the tax gain from leverage is incorporated, the marginal dividend tax rate should vary across dividends according to their source of financing (Auerbach and Hassett 2003, Hennessy and Whited 2005). Customarily, it is assumed all dividends produce uniform tax effects for a shareholder, which is true under certain conditions. For example, it is true if the only consideration is the nominal dividend tax the shareholder pays. It also is true if the only consideration is whether to use a dividend or a share repurchase to distribute cash, holding the total payout constant. However, a more basic choice a firm faces is whether or not to make a distribution such as a dividend in the first place, and if so, how large of a distribution to make. If a company chooses to pay out or increase a dividend, the company must finance the marginal dividend. Therefore, the decision to pay out a dividend actually is a joint decision to (i) pay the dividend and (ii) make an unavoidable financing decision. Either explicitly or implicitly, companies choose to finance each dividend with new external equity, new debt, or internally generated equity. Consistent with Hennessy and Whited (2005), the tax gain from leverage related to a dividend varies across these different financing sources, so the comprehensive marginal dividend tax rate is conditional on the marginal financing regime.

If companies use external-equity financing at the margin, as we estimate they do for almost one-quarter of the observations in our full sample, the nominal dividend tax rate and the closely-related traditional dividend tax penalty are the relevant marginal dividend tax rate measures, not the composite rate. The nominal rate measures the direct personal tax cost of a dividend without any offsetting effect. Alternatively, the widely-used traditional rate measures the incremental personal tax cost of a dividend relative to the capital gains tax on a share repurchase or liquidation, which are alternative ways to distribute a fixed amount of equity. Neither of these rates incorporates a tax gain from leverage, which is as it should be. If a company uses new external equity to finance a dividend, the new equity replaces the original equity the company pays out as a dividend, so the dividend does not alter a company's debt position and there is no tax gain from leverage.

In contrast, if companies use debt or internal-equity financing at the margin as we estimate they do for more than three-quarters of our sample observations, the choice to pay out a dividend increases a company's debt position and thus produces a tax gain from leverage. In this case, extant models imply the composite dividend tax rate is the relevant measure. Intuitively, new-debt financed dividends increase leverage because they execute debt-for-equity swaps. Although it is less obvious, internal-equity financed dividends also increase a company's debt position, boosting its debt-to-equity ratio as well as its net debt position. To illustrate the impact on net debt, consider cash dividends. Cash is a financial asset, and financial assets may be viewed as negative debt that neutralizes the tax benefits of gross debt. For example, taxable interest income from financial assets offsets tax-deductible interest expense on outstanding bonds. Given these offsetting effects, net debt is equal to gross debt minus financial assets (which can be either positive or negative), and a company's tax gain from leverage should be based on its net debt position, not just on its gross debt position (DeAngelo et al. 2008). Therefore, if a company distributes internally generated cash as a dividend instead of retaining the cash in the

firm, the dividend decreases negative debt, which increases a company's net debt position and therefore produces a tax gain from leverage.

Although the composite dividend tax rate and the associated gain from leverage are straightforward and are embedded in extant financial models, their effect may or may not be discernible in dividend policy. Nontax factors such as signaling, agency concerns regarding managerial misuse of retained equity, or profitable investment opportunities may dominate policy decisions, or managers may simply ignore the corporate tax benefit that dividends can produce. Therefore, the importance of the dividend-induced tax gain from leverage is an empirical issue. To our knowledge, no prior study has addressed the issue directly; the primary dividend tax measure in empirical research is the traditional rate, which excludes the gain from leverage. Therefore, to help fill this empirical void, we use US data from 1983 to 2012 to examine the hypothesis that dividend yields decrease in the nominal dividend tax rate and increase in the offsetting tax gain from leverage. We also examine the related hypothesis that the composite dividend tax rate outperforms traditional tax measures in explaining dividend policy. These two hypotheses are conditional on the financing source for a dividend, so we conduct conditional dividend-policy tests.

Consistent with the implications from existing financial models, we find the nominal and traditional tax measures perform well in explaining dividend policy for firms that use external equity to finance dividends. On the other hand, we find the composite tax rate outperforms the nominal and traditional tax rates in explaining dividend policy for the sample of firms that use debt or internal-equity to finance dividends. Likewise, given the preponderance of debt and internal-equity financed firms in the economy, we find the composite rate outperforms the nominal and traditional tax rates for the full sample. The estimated impact of the composite dividend tax rate is equal to approximately 7.3% of the mean dividend yield of the full sample and is equal to approximately 3.3% of the total variation in dividend yields.

Beyond these results for the full composite dividend tax rate, we also estimate an equation that separates the nominal dividend tax component of the composite rate from the tax gain from leverage component. Consistent with the theory, we find the tax gain from leverage is empirically relevant for the sample using debt or internal-equity financing at the margin but not for the sample of firms using external-equity financing. Prior studies have found that dividend taxes affect payout policy in a predictable manner (e.g. Chetty and Saez 2005). However, to our knowledge, this is the first direct empirical documentation of the dividend-induced tax gain from leverage impacting payout policy.

After finding this primary evidence for the dividend-induced tax gain from leverage, we tackle potential concerns regarding endogeneity. As with any empirical tax financial-policy study, omitted variables and simultaneity could confound interpretation of the evidence. Ideally, we would use a single event to distinguish between the traditional and composite rates, but this is not possible. For any single event, the traditional and composite tax rates move in the same direction, so the predicted sign of the impact of each rate is the same. For example, the tax act of 2003 reduced both the traditional and composite tax rates, so the reduction in either rate could induce greater dividends. Therefore, extant event studies (e.g. Chetty and Saez 2005) that find evidence for the traditional tax rate from the tax act of 2003 also can be viewed as providing evidence for the composite tax rate. Given this inability of a single event to disentangle the effects of the traditional and composite tax rates, we subject our primary result to a variety of other targeted analyses to address endogeneity concerns, with the following outcomes.

First, we find the primary result is robust to the use of panel firm-fixed-effects estimation. In the firm fixed effects model a firm acts as its own control, thereby accounting for a host of time-invariant unobserved factors that vary across firms. Therefore, it mitigates concerns regarding omitted variables and provides a crucial check against the effects of endogeneity. Second, following the approach in Lee and Gordon (2005), we find the result is robust to two-stage least squares

estimation using non-US tax rates as instruments for US statutory tax rates. Third, we find the result is robust to the use of first differences in dividend yields, which combines the effects of several tax-rate events. Fourth, we find the result is robust to the use of Tobit estimation, which accounts for both the propensity to pay dividends as well as for the amount of dividends a firm chooses to pay. Fifth, we find the result is robust to the use of dividends deflated by the book value of equity as the dependent variable instead of the use of dividend yields. Sixth, we find the result persists when we use lagged measures in lieu of contemporaneous measures to separate external-equity from debt and internal-equity financed observations. Seventh, we find the result is robust to the use of either time-specific statutory tax rates or firm-specific marginal corporate tax rates. This is a telling check against endogeneity. In particular, finding the same basic result using both sets of measures as we do provides comfort that any endogenous factor associated just with statutory tax rates or just with firm-specific marginal rates does not drive the primary results. Eighth, we find that results for share repurchases largely mirror results for dividends, which is relevant because the tax gain from leverage applies to share repurchases as well as to dividends.

These robust US results in favor of the dividend-induced tax gain from leverage generally exploit inter-temporal variation in statutory tax rates. But if the tax gain from leverage impacts dividend policy, it also should manifest itself in a cross-sectional context. Therefore, in the spirit of Jacob and Jacob (2013), we introduce global tax rate and dividend data from 38 countries for the period from 1999 to 2012. When using this database, we control for year fixed effects as well as for firm fixed effects. The year fixed effects control for any omitted macroeconomic variables that vary over time. In this final test, we find highly significant evidence for the dividend-induced tax gain from leverage, which provides an important second witness of the empirical relevance of the tax variable in a setting where there is considerable variation in tax rates.

Considered together, the results help build a case for the empirical relevance of the composite dividend tax rate and the associated dividend-induced tax gain from leverage. From a policy perspective, this implies that tax regulators should consider focusing on the overall composite rate when they attempt to influence corporate payout policy. Similarly, it implies that regulators should take the full composite tax rate into account when they consider using dividend tax imputation credits or other means to mitigate the deadweight costs of double taxation. In short, viewing dividend taxes in their broad composite tax rate context rather than viewing them in a more limited nominal tax rate context could inform policy decisions and help produce desired behaviors from taxpayers.

2. Background

The composite dividend tax rate is embedded in Hennessy and Whited (2005), as well as in models that date back more than 40 years, such as King (1974). These models broaden traditional dividend tax measures by accounting for the impact of dividends on leverage. To illustrate the core concepts, consider the following basic argument from Hennessy and Whited (2005). This basic argument is based on stylized facts, but as Hennessy and Whited point out, and as we demonstrate later, it ties directly into the core results from their comprehensive dynamic model.

2.1. *External-equity financed dividends*

Hennessy and Whited (2005) begins by distinguishing between external equity-financed dividends and other dividends, which is reasonable because external equity-financed dividends are the only dividends that do not alter a company's equity or net debt position. External-equity financed dividends occur whenever a company pays a dividend and issues new shares at the

margin to finance the dividend. In this case, there is no impact on leverage so the customary tax-rate measures from prior research are relevant.

To illustrate by example, assume a company issues a dollar of new external equity and pays out a dollar dividend. In this case, the dividend would impose the nominal dividend tax on shareholders at rate τ_d, leaving shareholders with $(1-\tau_d)$ to invest on their own accounts. Per Hennessy and Whited (2005), the shareholders would invest the after-tax cash in a taxable, riskless Treasury bill with a pretax rate of return equal to r. Given a shareholder tax rate on interest equal to τ_i, they would receive an after-tax annual return from their original investment equal to $(1-\tau_d)r(1-\tau_i)$ (see Hennessy and Whited 2005 expression 8). On the other hand, if the company does not issue shares or pay dividends, shareholders simply keep their original dollar of cash instead of contributing it to the company, and they invest the dollar on their own accounts. In this case, shareholders would receive an annual after-tax return from their original investment equal to $r(1-\tau_i)$, which represents Hennessy and Whited's expression (2) when setting nontax effects equal to zero.

Given this setting, the marginal dividend tax rate is equal to the difference between the annual after-tax return without the dividend (i.e. the zero-dividend-tax benchmark return) minus the annual after-tax return with the dividend. Because the difference in returns can be viewed as perpetual, it can be divided by the shareholders' after-tax discount rate to produce the present value of the tax. This results in:

$$\tau_{New\,Equity} = \left[\frac{r(1-\tau_i)-(1-\tau_d)r(1-\tau_i)}{r(1-\tau_i)}\right] = \tau_d. \tag{1}$$

As this example illustrates, if a company uses new external equity to finance a dividend, the marginal dividend tax rate is simply equal to the nominal rate, which is well known.

Traditional analyses augment this rate by assuming a company will distribute a fixed amount of equity in one way or another. An alternative to a dividend is a share repurchase, which is taxed as capital gains. Given the benefits of tax deferral, researchers generally set the capital gains tax rate (τ_g) equal to a fraction (e.g. 0.25) of the long-term capital gains tax rate (see e.g. Poterba and Summers 1985, Poterba 1987, Bernheim and Wantz 1995, Graham 2000). The net marginal dividend tax rate then becomes the incremental tax that dividends impose on investors relative to low-taxed capital gains, or:

$$\tau_{Traditional} = \frac{(1-\tau_g)-(1-\tau_d)}{(1-\tau_g)} = \frac{(\tau_d-\tau_g)}{(1-\tau_g)}. \tag{2}$$

As Equation (2) indicates, the traditional incremental tax increases in the nominal dividend tax rate and decreases in the capital gains tax rate, i.e. dividends produce a capital gains tax benefit that offsets the nominal dividend tax. Intuitively, dividends produce this capital gains tax benefit because *ceteris paribus* dividends reduce share prices and thus reduce future capital gains.

2.2. *Internal-equity financed dividends*

Equations (1) and (2) postulate that a company uses outside equity to finance dividends. More often, however, companies pay dividends from existing assets they do not intend to replace. In this case, the cash needed for the dividend ultimately comes from accumulated profits, which is internal equity.

To illustrate the basic effects of distributing an internal-equity financed dividend, Hennessy and Whited (2005) uses the following example. If a company pays out a dollar dividend, then

just as Equation (1) posits, the after-tax return would be $(1-\tau_d)r(1-\tau_i)$. On the other hand, if the company does not pay out the dividend, retaining the equity within the firm would subject future returns on the equity to the classic two layers of tax on corporate earnings. Specifically, the after-tax annual return would be $(1-\tau_e)r(1-\tau_c)$, where τ_c is the corporate tax rate and τ_e is the tax rate on returns to equity (see Hennessy and Whited 2005 expression (9)), where Hennessy and Whited set τ_e equal to τ_d.

Given these two options, the marginal dividend tax rate is equal to the benchmark zero-dividend after-tax return minus the after-tax return with the dividend, divided by the discount rate to produce the present value of a perpetuity, which is:

$$\tau_{Composite} = \left[\frac{r(1-\tau_c)(1-\tau_e)-r(1-\tau_d)(1-\tau_i)}{r(1-\tau_i)}\right] = \tau_d - \left[1 - \frac{(1-\tau_c)(1-\tau_e)}{(1-\tau_i)}\right]. \quad (3)$$

The first term in Equation (3) is the nominal dividend tax rate and the second term is the traditional tax gain-from-leverage equation in Miller (1977) and numerous other studies. Therefore, Equation (3) indicates that internal-equity financed dividends not only impose a nominal dividend tax on investors, but they also produce a tax gain from leverage.

Intuitively, internally financed dividends produce a tax gain from leverage because they pull equity out of the firm. Once a company removes this equity, future returns on the equity are no longer subject to both corporate and personal taxes on corporate earnings. Instead, the returns are solely subject to a single layer of personal taxes. At its core, this tax gain from leverage that dividends produce is the same tax gain that new debt produces; both dividends and debt replace double taxation on corporate earnings with a single layer of tax at the investor level.

Before proceeding, note that the traditional view is that the tax gain from leverage is generally positive (Graham 2000). However, Miller (1977) points out conditions in which the gain from leverage could be zero, and with a low corporate tax rate, the gain from leverage could even become negative. However, for this study, the US corporate tax rate is rather high for our sample period. That being said, neither our model nor our empirical analysis imposes any specific limitation on the tax gain from leverage that requires it to be positive. If the tax gain from leverage were negative (i.e. if there is a tax loss from leverage), it would increase the composite dividend tax rate above the nominal dividend tax rate, which could deter dividend payments.[3]

We have used Hennessy and Whited's basic, stylized argument to explain Equation (3). However, it also ties into their full dynamic debt model which accounts for a much more comprehensive set of factors. In particular, holding nontax factors constant, Equation (3) is equal to the right side minus the left side of the second optimality condition (which pertains to the margin between debt and internal equity) in Hennessy and Whited's Proposition 5 (p. 1148), which is the crux of their full model. This is true with no bankruptcy costs ($\Phi_n' = 1$ and $\Phi_s' = 0$) for a distribution equity regime ($\Phi_d' = 1$ and $\Phi_i' = 0$) and a flat corporate tax rate (or simply for a corporate tax rate that represents the integrals specified in Hennessy and Whited's expressions (40) and (42)) after multiplying both sides of the Hennessy and Whited (2005) optimality condition by one plus the discount rate.

Indeed, the internal-equity financing that underlies Equation (3) is what drives the dynamic nature of Hennessy and Whited's complete model, distinguishing it from static models like Miller (1977) that focus on external-equity financing only. In particular, young or growing companies often use external-equity financing to finance investment or dividends at the margin, as Equations (1) and (2) assume. But companies are dynamic, not static. As Hennessy and Whited emphasize, maturing companies eventually begin to use internal-equity financing at the margin, and as has long been recognized, the tax consequences of using internal-equity financing are different from the tax consequences of using external-equity financing (see, e.g. King 1974,

Auerbach 1979, Masulis and Trueman 1988). Consistent with Hennessy and Whited's full dynamic model, Equation (3) accounts for these unique tax consequences of using internal equity to finance dividends.

2.3. *Debt-financed dividends*

A third way to finance dividends is with new debt. Paying out a dividend and issuing debt to replace the distributed capital produces two offsetting tax effects. First, it imposes a nominal dividend tax on investors. Second, it effectuates a debt-for-equity swap, which produces a tax gain from leverage. The gain from leverage specification in Miller (1977) represents debt-for-equity swaps, so the marginal dividend tax rate is equal to the nominal rate minus Miller's gain from leverage. Therefore, the composite dividend tax rate in (3) applies to both internally financed and debt-financed dividends – both types of financing lever up the firm and produce a gain from leverage.

3. Empirical research methodology

The traditional dividend tax penalty measure in Equation (2) indicates dividends impose a nominal dividend tax on investors and produce a small offsetting capital gains tax benefit. The composite dividend tax rate measure in Equation (3) indicates dividends impose a nominal dividend tax on investors and produce a potentially large offsetting tax gain from leverage. To examine these effects empirically, we test whether dividends decrease in the nominal dividend tax rate (τ_d), the traditional tax rate ($\tau_{Traditional}$) specified in Equation (2), and the composite dividend tax rate ($\tau_{Composite}$) specified in Equation (3), and we consider which of the three tax rate measures best explains dividend policy. More directly, we also test whether dividends decrease in the nominal tax rate and increase in the offsetting tax gain from leverage.

3.1. *Empirical equation*

To examine the empirical implications of Equations (2) and (3) we estimate the following equation:

$$\begin{aligned} \textit{Dividend Yield\%}_{it} = {} & \beta_0 + \beta_1 \textit{Tax Variable} + \beta_2 \textit{Size}_{it} + \beta_3 \textit{Free Cash Flow}_{it} \\ & + \beta_4 \textit{Collateral}_{it} + \beta_5 \textit{Market-to-Book}_{it} + \beta_6 \textit{Debt-to-Assets}_{it} \\ & + \beta_7 \textit{Trend}_t + \beta_8 \textit{TrendSquare}_t + \beta_9 \textit{InterestRate}_t \\ & + \beta_{10} \textit{GDPGrowthRate}_t + \varepsilon_{it}. \end{aligned} \tag{4}$$

As discussed in detail later, in some cases we use two tax variables in Equation (4) instead of just the one shown above. Specifically, we use a variable for the nominal dividend tax rate and for the offsetting tax gain from leverage.

3.2. *Dependent variable*

Following Fenn and Liang (2001), Kahle (2002), and Cuny et al. (2009), among others, dividend yield (*Dividend Yield %*) is the primary dependent variable. We set this variable equal to total common stock cash dividends divided by the market value of common equity. To express the dividend yield as a percentage, we multiply it by 100. See Appendix 1 for a detailed definition of this and all other variables. Deflating dividends by market value is consistent with Chetty and Saez (2005), which uses market value to form a constant-size portfolio before analyzing dividends.

It reflects a shareholder's return on market investment and is not subject to the small- and negative-denominator problems that often plague dividend payout measures such as dividends per dollar of earnings. Nevertheless, we report supplementary results by deflating dividends by the book value of equity as well (see Section 5.4). We also report supplementary analyses using share repurchases as the dependent variable (see Section 5.7).

3.3. *Tax variables*

We use four primary tax variables to examine dividend policy effects; namely, *Nominal Dividend Tax*, *Traditional Dividend Tax*, *Composite Dividend Tax*, and *Gain from Leverage.* We define these variables according to equations (2) and (3). These two equations require inputs for the dividend tax rate (τ_d), the interest tax rate (τ_i), the capital gains tax rate (τ_g), the corporate tax rate (τ_c), and the overall tax rate on equity (τ_e).

The tax status of the marginal investor is unobservable, so measuring tax rates is never an exact science. Following prior studies (e.g. Poterba 1987, Graham 2000, Jacob and Jacob 2013), we use top statutory personal dividend and interest tax rates to proxy for τ_d and τ_i, adjusted for the effects of tax-rate transitions, add-on minimum taxes, and personal exemption and itemized deduction phase outs (see Appendix 2 for the rates we use). Using statutory rates enables us to exploit inter-temporal variation in the rates, which reflects largely exogenous shocks that avoid the confounding effects of endogeneity and which should be positively correlated with inter-temporal variation in tax rates for the marginal investor. Similarly, we use the top long-term capital gains tax rate to proxy for τ_g, multiplying it by 0.25 to account for the benefit of deferring capital gains (see, e.g. Poterba 1987, Graham 2000).[4]

To proxy for the tax rate on equity (τ_e) we follow Hennessey and Whited (2005) by using the dividend tax rate for our dividend tests (τ_d), which is the relevant rate for dividend payout decisions. Share repurchases are subject to capital gains taxes, so when testing share repurchases we use the capital gains tax rate (τ_g) to proxy for τ_e. Ideally, we also would try following Poterba (1987), Graham (2000), and many others by letting the tax rate on equity distributions equal the weighted-average blend of the dividend tax rate and the capital gains tax rate, where the weight on the dividend tax rate increases in the dividend payout ratio. However, the dividend payout ratio is directly related to the dependent variable (*Dividend Yield %*) along nontax dimensions, so using the blended tax rate would produce a spurious mechanical relation between the tax variable and the dependent variable. In any event, using the dividend tax rate for the dividend policy tests and using the capital gains tax rate for the share repurchase policy tests captures the most relevant tax rate for each set of tests.

The corporate tax rate (τ_c) is an input for *Gain from Leverage*. For our primary tests, we opt for exogeneity by using top statutory corporate rates to proxy for this variable. However, in a supplementary test, we follow Graham (1996a, 1996b, 1999, 2000) by using firm-specific marginal corporate tax rates to produce cross-sectional variation in the corporate tax rate, which produces an alternative specification for the tax gain from leverage. Firm-specific corporate tax rates are based on profitability and other factors, so impounding these factors into τ_c could introduce endogeneity. However, it also provides cross-sectional rigor to the analysis. To conduct this test, we use marginal corporate tax rates provided by John Graham.[5]

3.4. *Control variables*

In addition to the tax variables, Equation (4) includes nine controls for nontax variables that could affect dividend policy. The first five control variables are commonly used in corporate payout studies (e.g. Smith and Watts 1992, Fenn and Liang 2001, Cuny et al. 2009). The remaining

four controls are more unique to our setting. Together, these nine variables control for (a) time-varying economy-wide factors and (b) firm-level factors that vary both across firms and over time. Similarly, some of the tax variables we use vary over time only (i.e. when using statutory tax rates only), and some vary both across firms and over time (i.e. when using firm-specific corporate tax rates as an input). Therefore, both sets of control variables are critical.

Appendix 1 provides detailed descriptions of each variable, including specification of the *Compustat* data items. In regard to the five control variables common with prior studies, note that *Free Cash Flow* and *Market-to-Book* help control for a firm's current and expected future profitability. *Collateral* and *Debt-to-Assets* both help control for the marginal financial distress costs that dividends could impose on a firm. *Size* is a general control for several related factors that could affect dividend policy.

In regard to the four control variables that are more unique to our study, given our focus on time-series variation in the test variables, we control for the time-series trends in dividend yields (*Trend* and *Trend Squared*). Data reveal that mean dividend exhibit a distinct quadratic trend during our sample period, reflecting the disappearing dividends documented by Fama and French (2001) and the reappearing dividends documented by Julio and Ikenberry (2004). Including both trend and trend squared variables in the regressions controls for this quadratic pattern in the data. It also controls for the declining trend in equity flotation costs over time and the increasing trend in institutional investors over time. We expect a negative coefficient for *Trend* and a positive coefficient for *Trend Squared.* We control for 10-year Treasury yields (*Interest Rate*) and GDP growth rate (*GDP Growth Rate*). High interest rates increase the cost of debt financing, which should decrease the appeal of paying out equity as dividends, and the pace of economic growth can influence a company's choice to distribute earnings as dividends.

3.5. *Estimation methods*

To implement a time-series approach for our primary tests, we use firm-fixed-effects panel regressions to estimate (5). This centers the analysis on the impact of inter-temporal within-firm variation in tax rates on inter-temporal variation in dividend policy, which controls for any time-invariant unobservable factors that vary across firms. In other words, using firm fixed effects allows the regression to capture changes in a firm's dividend policy as the tax rate on dividends changes, holding other firm-specific factors constant such as a company's mean profitability, mean agency factors, mean dividend signaling behavior, mean age, and constant industry effects. This within-firm approach is consistent with the dividend policy model in Lintner (1956), which postulates that companies adjust dividends from prior levels according to changes in incentives and target payouts.[6] In addition to using a firm-fixed-effects approach for our primary tests, we use panel Tobit estimation for a robustness test, which allows us to account for the fact that dividends are bound by zero at the bottom end of the distribution. We also employ a two-stage least squares specification to help address the potential effects of endogeneity in the estimates.

3.6. *Full sample*

The sample period is 1983–2012. We begin with 1983 because there is considerably more variation in statutory personal tax rates after 1982 than there is before 1983. Focusing on the post-1982 period concentrates the sample on exogenous changes in tax rates.[7] In addition, there was a dramatic nontax-related drop in dividends in 1982 (Fama and French 2001). Grullon and Michaely (2002), Chetty and Saez (2005), and DeAngelo et al. (2008) ascribe this drop to a

specific change in SEC rules that made it possible for companies to begin using safe harbor legal rules that facilitated the use of share repurchases.[8]

Using panel data enables us to exploit several changes in the values of the tax variables over time, which makes it possible to identify separate coefficients for each variable, such as for *Nominal Dividend Tax* versus *Gain from Leverage*. An alternative would be to focus on a single event, such as the 2003 dividend tax rate cut (e.g. Chetty and Saez 2005, Brown et al. 2007). However, we were unable to identify a significant tax law change that materially altered the gain from leverage or the composite dividend tax rate while holding the nominal dividend tax rate constant. Therefore, for our objective, it is more effective to use a long panel of data characterized by numerous exogenous shifts in tax rates to identify the distinct tax effects we examine.

Our panel data consist of 100,740 firm-year observations. To obtain this sample, we begin with 276,560 firm-year observations from *Compustat* that have non-missing and non-zero values for total assets and sales. Following prior financial-policy studies, we exclude 50,675 observations pertaining to firms that are headquartered outside the United States and so may be subject to separate host country tax statutes, and we exclude 58,526 observations relating to firms in the regulated (SIC 4400-4999) and financial industries (SIC 6000-6999) that are subject to additional financial reporting and regulatory requirements which often affect capital structure and distribution decisions directly. We lose 66,619 observations that have missing values for one or more variables included in our estimation model. This leaves us with a final sample of 100,740 firm-year observations.

3.7. *Subsamples*

Theoretically, the composite dividend tax rate applies to debt-financed and internal-equity financed dividends, not to external-equity financed dividends. Instead, the nominal and traditional rates apply to external-equity financed dividends. For some tests, we separate out firms which we determine use external-equity financing at the margin from the firms that use debt or internal-equity financing at the margin. This allows us to test the hypothesis that the composite tax rate outperforms the nominal and traditional rates for the sample of debt and internal-equity financed observations.

Capital is fungible, so identifying the marginal source of financing for a firm is not clear-cut. Companies sometimes issue both debt and equity in the same period, and they could produce internal profits as well. Given this limitation, we use a simple but direct procedure to identify external-equity financed observations. Specifically, we define a firm-year observation as external-equity financed if the following four conditions are met: (1) New Equity Issuance > 0, (2) New Equity Issuance > New Debt, (3) New Equity Issuance > Free Cash Flow, and (4) New Equity Issuance > (New Debt + Free Cash Flow). To finance a dividend, a firm can use new equity, new debt, or free cash flow. Our selection criteria help isolate observations that are most clearly using new equity to finance dividends. Using these selection criteria, we identify 22,441 observations as external-equity financed at the margin.[9] Of these observations, only 10% exhibit positive dividends. In contrast, 33% of the remaining 78,299 observations, which represent firms using debt and internal-equity financing at the margin, exhibit positive dividends. Overall, debt and internal-equity financed dividends represent approximately 92% of all positive dividend observations.

Despite our best efforts, some firms using debt or internal equity at the margin undoubtedly appear in our external-equity subsample. For example, a firm's new equity issues may be greater than free cash flow or new debt, but the firm could still produce enough free cash flow or new debt to finance dividends at the margin. Misclassifying these firms in the external equity sample could

cause the tax gain from leverage to be at least somewhat relevant for the external-equity sample. It also is important to recognize that the contemporaneous variables we use for our partitioning criteria are not completely exogenous, as we address directly in Section 5.1.

4. Empirical results

In this section, we present descriptive statistics, univariate correlations, and the primary regression results.

4.1. *Full-sample descriptive and univariate statistics*

Table 1 Panel A provides full-sample descriptive statistics for all primary regression variables. The mean dividend yield (*Dividend Yield %*) is 0.71% and ranges from 0% to 9.08%.[10] To understand just how large traditional tax rate measures are compared to the composite dividend tax rate, note that the full-sample mean value for *Nominal Dividend Tax* is 0.32 and the mean value for *Traditional Dividend Tax* is 0.28. The mean value for *Gain from Leverage* is equal to 0.30. *Composite Dividend Tax* is equal to the nominal dividend tax rate minus the gain from leverage. Given the offsetting effect of the gain from leverage, the mean composite dividend tax rate is only 0.02.

In untabulated results, we examine full-sample univariate Pearson correlations and find that *Nominal Dividend Tax* (0.03, $p < .01$) and *Traditional Dividend Tax* (0.03, $p < .01$) are both positively correlated with dividend yields, which is contrary to the prediction that dividend yields decrease in dividend tax rates. In contrast, *Composite Dividend Tax* is negatively correlated with dividend yields (−0.07, $p < .01$), which is consistent with theory. This univariate evidence suggests it is important to adjust the nominal dividend tax rate for the offsetting gain from leverage to produce the predicted negative relation between dividend yields and dividend taxes.[11]

Further investigation of the full-sample descriptive statistics reveals differences between firms using external-equity financing at the margin versus firms using debt or internal-equity financing. As Table 1 Panel B reports, external-equity firms (22,441 firm-year observations) report lower dividends, less free cash flow, higher market-to-book ratios, and somewhat lower assets (*Size*) than other firms. Furthermore, the concentration of external-equity observations varies across years, so year-specific macro-economic factors (e.g. interest rates) vary between external-equity and other firms. These factors could confound comparisons of empirical results from the two samples. Therefore, to address this concern, it is critical to include appropriate control variables and conduct appropriate robustness tests, which we attempt to do.

4.2. *Primary regression results*

Table 2 provides the primary results from estimating Equation (4) using *Dividend Yield %* as the dependent variable and controlling for firm fixed effects (which subsumes any constant industry effects). We report results when using all the control variables. However, the empirical results we report are qualitatively similar if we drop the control variables.

For the external-equity sample, Table 2 Panel A reports the estimated *Nominal Dividend Tax* coefficient is −0.138 (t-value = −2.25), the estimated *Traditional Dividend Tax* coefficient is −0.132 (t-value = −2.22), and the estimated *Composite Dividend Tax* coefficient is −0.345 (t-value = −1.69). The nominal and traditional tax coefficients are statistically significant at the 0.05 level, but the composite tax coefficient is just barely significant at the 0.10 level. Therefore, consistent with theory, the nominal and traditional tax rate measures appear to outperform

Table 1. Summary statistics.

Panel A: Full sample (100,740 observations).

	Mean	Median	SD	Min	Max
Dependent variable					
Dividend yield%	0.71	0.00	1.58	0.00	9.08
Test variables					
Nominal dividend tax	0.32	0.39	0.13	0.15	0.50
Traditional dividend tax	0.28	0.34	0.13	0.12	0.47
Composite dividend tax	0.02	0.01	0.04	−0.06	0.06
Interest tax rate	0.38	0.39	0.06	0.28	0.50
Capital gains tax rate	0.21	0.21	0.05	0.15	0.29
Corporate tax	0.36	0.35	0.04	0.34	0.46
Gain from leverage	0.30	0.35	0.11	0.15	0.46
Control variables					
Size	4.53	4.48	2.33	−0.95	10.09
Free cash flow	−0.08	0.05	0.47	−3.23	0.34
Collateral	0.90	0.98	0.16	0.31	1.00
Market-to-book	2.28	1.42	2.99	0.53	23.10
Debt-to-asset	0.27	0.20	0.35	0.00	2.50
Share repurchase%	2.43	0.00	8.23	0.00	62.46
Trend	15.77	16.00	8.37	1.00	30.00
Trend squared	318.65	256.00	265.75	1.00	900.00
Interest rate	5.26	5.09	2.13	1.50	9.26
Gdp growth rate	2.95	3.46	1.81	−2.78	7.26

Panel B: Primary subsamples

	External equity sample					Debt and internal equity sample						
Variable	Mean	Median	SD	Min	Max	Mean	Median	SD	Min	Max	Diff	*t*-stat
Dividend yield %	0.20	0.00	0.89	0.00	9.08	0.86	0.00	1.70	0.00	9.08	−0.66	−55.73***
Size	3.74	3.72	2.14	−1.11	10.08	4.71	4.68	2.36	−1.11	10.08	−0.98	−55.89***
Free cash flow	−0.31	−0.06	0.72	−3.66	0.34	−0.03	0.06	0.42	−3.66	0.34	−0.28	−72.75***
Collateral	0.90	0.98	0.16	0.30	1.00	0.90	0.97	0.16	0.30	1.00	0.00	3.51***
Market-to-book	3.70	2.03	4.86	0.53	27.32	2.01	1.33	2.82	0.53	27.32	1.69	65.89***
Debt-to-asset	0.20	0.07	0.38	0.00	2.73	0.30	0.23	0.37	0.00	2.73	−0.10	−35.72***
Trend	16.76	18.00	7.86	1.00	30.00	15.53	16.00	8.48	1.00	30.00	1.22	19.36***
Trend square	342.55	324.00	254.26	1.00	900.00	313.19	256.00	268.68	1.00	900.00	29.35	14.60***
Interest rate	5.12	5.09	1.93	1.50	9.26	5.29	5.09	2.18	1.50	9.26	−0.17	−10.70***
GDP growth rate	2.94	3.35	1.71	−2.78	7.26	2.95	3.46	1.84	−2.78	7.26	−0.01	−0.69
Number of observations	22,441					78,299						

Note: This table provides summary statistics for the variables used in this study. Appendix 1 provides variable definitions.

Table 2. Primary regression results.

Panel A: Composite dividend tax rate results.
Dependent Variable: Dividend Yield (%)

Independent variable and predicted sign	External equity sample			Debt and internal equity sample			Full Sample		
	Nominal dividend tax	Traditional dividend tax	Composite dividend tax	Nominal dividend tax	Traditional dividend tax	Composite dividend tax	Nominal dividend tax	Traditional dividend tax	Composite dividend tax
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(8)
Nominal dividend tax	−0.138**			−0.257***			−0.253***		
	[−2.25]			[−3.42]			[−4.12]		
Traditional dividend tax		−0.132**			−0.280***			−0.269***	
		[−2.22]			[−3.93]			[−4.59]	
Composite dividend tax			−0.345*			−1.409***			−1.297***
			[−1.69]			[−7.48]			[−7.99]
Size	0.020***	0.021***	0.021***	0.110***	0.110***	0.110***	0.086***	0.086***	0.087***
	[2.61]	[2.62]	[2.60]	[7.30]	[7.31]	[7.35]	[7.56]	[7.58]	[7.64]
Free cash flow	−0.027***	−0.027***	−0.026***	−0.105***	−0.105***	−0.105***	−0.071***	−0.072***	−0.072***
	[−2.97]	[−2.98]	[−2.90]	[−4.84]	[−4.86]	[−4.89]	[−5.48]	[−5.51]	[−5.57]
Collateral	0.091***	0.091***	0.089**	0.589***	0.589***	0.593***	0.450***	0.451***	0.454***
	[2.60]	[2.60]	[2.57]	[6.71]	[6.72]	[6.77]	[7.34]	[7.34]	[7.40]
Market-to-book	−0.002***	−0.002***	−0.002***	−0.024***	−0.024***	−0.024***	−0.013***	−0.013***	−0.012***
	[−3.04]	[−3.03]	[−2.86]	[−7.56]	[−7.56]	[−7.40]	[−8.16]	[−8.15]	[−7.90]
Debt-to-assets	−0.021*	−0.021*	−0.021*	0.060**	0.060**	0.055*	0.027	0.028	0.024
	[−1.89]	[−1.88]	[−1.91]	[2.00]	[2.00]	[1.85]	[1.35]	[1.35]	[1.15]
Trend	−0.020***	−0.020***	−0.018***	−0.084***	−0.084***	−0.074***	−0.074***	−0.074***	−0.065***
	[−4.18]	[−4.21]	[−3.44]	[−16.28]	[−16.29]	[−14.23]	[−16.34]	[−16.36]	[−14.26]
Trend square	0.001***	0.001***	0.001***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	[3.95]	[4.02]	[3.63]	[13.16]	[13.19]	[11.36]	[13.68]	[13.72]	[11.82]
Interest rate	−0.005	−0.005	−0.005	−0.008***	−0.009***	−0.016***	−0.006**	−0.007***	−0.013***
	[−1.12]	[−1.15]	[−1.32]	[−2.58]	[−2.85]	[−5.31]	[−2.35]	[−2.61]	[−5.21]
GDP growth rate	−0.006	−0.005*	−0.005	−0.027***	−0.026***	−0.022***	−0.023***	−0.022***	−0.019***
	[−1.77]	[−1.73]	[−1.46]	[−8.65]	[−8.55]	[−7.30]	[−9.03]	[−8.94]	[−7.65]
Intercept	0.277***	0.270***	0.212***	0.713***	0.715***	0.601***	0.706***	0.705***	0.596***
	[4.12]	[4.10]	[3.35]	[5.49]	[5.56]	[4.88]	[7.67]	[7.76]	[6.93]
Number of observations	22,441	22,441	22,441	78,299	78,299	78,299	100,740	100,740	100,740
Number of firms	8115	8115	8115	11,867	11,867	11,867	12,910	12,910	12,910

Within R^2	0.007	0.007	0.007	0.022	0.022	0.023	0.019	0.019	0.020
Between R^2	0.078	0.078	0.078	0.136	0.136	0.136	0.143	0.143	0.143
Overall R^2	0.050	0.050	0.050	0.109	0.109	0.109	0.113	0.113	0.113
Test of coefficient equality	**Difference**	$\chi^2_{(1)}$							
Nominal dividend tax	−0.119	1.62							
Traditional dividend tax	−0.148	2.76*							
Composite dividend tax	−1.064	15.88***							

Notes: This table reports results from estimating three models that explain dividend yield in terms of three different dividend tax measures. Models are estimated using fixed effects panel estimation methods. Appendix 1 provides detailed variable definitions. Appendix 2 provides statutory tax rates. *t*-statistics provided in parenthesis are estimated using standard errors clustered by firm. ***,**,* indicates significance at the 0.01, 0.05, and 0.10 level or better, respectively.

Panel B: Gain from leverage results.
Dependent variable: dividend yield (%)

	External equity sample	Debt and internal Equity sample	Full sample
	(1)	(2)	(3)
Dividend tax	−0.191	−2.390***	−2.058***
	[−0.69]	[−9.96]	[−10.12]
Gain from leverage	0.074	3.297***	2.740***
	[0.21]	[9.70]	[9.84]
Size	0.021***	0.110***	0.086***
	[2.60]	[7.35]	[7.62]
Free cash flow	−0.027***	−0.103***	−0.069***
	[−2.97]	[−4.76]	[−5.33]
Collateral	0.091***	0.588***	0.449***
	[2.60]	[6.72]	[7.33]
Market-to-book	−0.002***	−0.022***	−0.012***
	[−2.97]	[−7.00]	[−7.39]
Debt-to-asset	−0.021*	0.047	0.019
	[−1.90]	[1.59]	[0.95]
Trend	−0.020***	−0.062***	−0.056***
	[−3.59]	[−11.33]	[−11.77]

(*Continued*)

Table 2. Continued.

Panel B: Gain from leverage results.
Dependent variable: dividend yield (%)

	External equity sample	Debt and internal Equity sample	Full sample
Trend square	0.001***	0.002***	0.002***
	[3.68]	[11.12]	[11.59]
Interest rate	−0.005	−0.019***	−0.015***
	[−1.25]	[−6.13]	[−5.97]
GDP growth rate	−0.005	−0.019***	−0.016***
	[−1.61]	[−5.93]	[−6.15]
Intercept	0.267***	0.184	0.281***
	[3.02]	[1.32]	[2.81]
Number of observations	22,441	78,299	100,740
Number of firms	8115	11,867	12,910
Within R^2	0.01	0.02	0.02
Between R^2	0.08	0.14	0.14
Overall R^2	0.05	0.11	0.11
Test of coefficient equality	**Difference**	$\chi^2_{(1)}$	
Dividend tax	−2.199	38.55***	
Gain from leverage	3.223	44.84***	

Notes: Models are estimated using fixed effects panel estimation methods. Appendix 1 provides detailed variable definitions. Appendix 2 provides statutory tax rates. Data are from the period 1983 to 2012 (both inclusive). *t*-statistics provided in parenthesis are estimated using standard errors clustered by firm. ***,**,* indicates significance at the 0.01, 0.05, and 0.10 level or better, respectively.

the composite rate in explaining dividend policy for external-equity financed firms, at least to some degree. Of course, as discussed earlier, the external-equity sample likely incorrectly includes at least some firms that use debt or internal equity at the margin, which could help explain the marginally significant coefficient for the composite dividend tax rate.

For the debt and internal-equity sample, the estimated *Nominal Dividend Tax* coefficient is −0.257 (*t*-value = −3.42), the *Traditional Dividend Tax* coefficient is −0.280 (*t*-value = −3.93), and the *Composite Dividend Tax* coefficient is −1.409 (*t*-value = −7.48). The estimated composite tax rate coefficient is negative and highly significant, which is in contrast to the marginally significant finding in the external-equity sample. Furthermore, the magnitude of the *Composite Dividend Tax* coefficient in the debt and internal-equity sample is statistically different from the coefficient in the external-equity sample at the 0.01 level. Also in contrast to the external-equity sample, in absolute value terms the composite coefficient is more than five times larger than the nominal and traditional tax rate coefficients. In addition, the *t*-value for the composite rate is approximately twice as large as the *t*-value for the other two tax-rate coefficients. Consistent with this difference in *t*-values, a formal Vuong (1989) test indicates *Composite Dividend Tax* adds more explanatory power to the regression than either *Nominal Dividend Tax* (Vuong $Z = 5.86$, $p < 0.01$) or *Traditional Dividend Tax* (Vuong $Z = 5.87$, $p < 0.01$) add to the regression.

When turning to the full sample, the estimated *Nominal Dividend Tax* coefficient is −0.253 ($t = -4.12$), the *Traditional Dividend Tax* coefficient is −0.269 ($t = -4.59$), and the *Composite Dividend Tax* coefficient is −1.297 ($t = -7.99$). Once again, the Vuong (1989) test indicates *Composite Dividend Tax* adds more explanatory power to the regression than either *Nominal Dividend Tax* or *Traditional Dividend Tax* add to the regression at the $p < .01$ level.

The full-sample *Composite Dividend Tax* coefficient also is more economically significant than the *Nominal Dividend Tax* and *Traditional Dividend Tax* coefficients. The estimated *Composite Dividend Tax* coefficient of −1.297 implies that a one standard deviation change in *Composite Dividend Tax* corresponds to a 5.2% change in dividend yields, which is equal to approximately 7.3% of the mean dividend yield of the sample and is equal to approximately 3.3% of the total variation in dividend yields. On the other hand, the estimated *Nominal Dividend Tax* (*Traditional Dividend Tax*) coefficient of −0.253 (−0.269) implies that a one standard deviation change in the variable corresponds to a 3.3% (3.5%) change in dividend yields, which is equal to 4.6% (4.9%) of the sample mean dividend yield and is equal to 2.1% (2.2%) of the total variation in dividend yields. Hence the economic significance of the *Composite Dividend Tax* coefficient is approximately 1.6 times as large as the economic significance of the *Traditional Dividend Tax* and *Nominal Dividend Tax* coefficients, even after accounting for the relatively small standard deviation for the composite rate.

Considered together, the evidence in Table 2 Panel A suggests that consistent with theory, the nominal and traditional tax rates are the most relevant rates for the external-equity sample of observations, and the composite dividend tax rate is the most relevant rate for the debt and internal-equity financed sample. The full sample is more heavily populated by debt and internal-equity financed firms than by external-equity financed firms, so the composite rate is most relevant for it as well.[12]

A more direct way to assess the impact of the composite dividend tax rate is to decompose it into the nominal tax rate and the offsetting tax gain from leverage and to estimate separate coefficients for each component. As Table 2 Panel B reports, the estimated coefficients for *Nominal Dividend Tax* and *Gain from Leverage* depend on the source of marginal financing. Consistent with the theory that suggests that the tax gain from leverage is not policy relevant for external-equity financed firms, the coefficient on *Gain from Leverage* is not significant (0.074, *t*-value = 0.21) for the external-equity sample. The coefficient of *Nominal Dividend Tax* also is

insignificant (−0.191, *t*-value = −0.69). Taken together, the findings in Panel A and Panel B suggests that adding the *Gain from Leverage* variable to the model increases noise in the external-equity sample causing the negative and significant coefficient of *Nominal Dividend Tax* in Panel A to become insignificant in Panel B.[13] In contrast, for the debt and internal-equity sample the estimated *Nominal Dividend Tax* coefficient is negative (−2.390, *t*-value = −9.96) and the estimated *Gain from Leverage* coefficient is positive (3.297, *t*-value = 9.70) as theory would suggest. To our knowledge, this is the first empirical evidence to document that dividends increase in the tax gain from leverage. The full sample results reported in Table 2 Panel B also indicate the estimated *Nominal Dividend Tax* coefficient is negative (−2.058, *t*-value = −10.12) and the estimated *Gain from Leverage* coefficient is positive (2.740, *t*-value = 9.84).[14]

5. Robustness and endogeneity checks

The evidence in Table 2 suggests dividend policy is a function of both the nominal dividend tax rate and the tax gain from leverage that dividends produce. Furthermore, the influence of the gain from leverage varies across external-equity versus debt and internal-equity financed firms in a predictable manner, which supports a tax explanation for the result. Nevertheless, unobserved omitted variables and simultaneity could confound interpretation of the evidence. This section details the ways we tackle these potential sources of endogeneity and error.

5.1. *Instrumental variables*

Thus far we have treated US statutory tax rates as exogenous, which we believe is a reasonable assumption. However, we cannot reject the possibility that US companies determine dividend policy and US regulators determine statutory tax rates simultaneously. Therefore, we follow Lee and Gordon (2005) by using instrumental variables to proxy for US tax rates. Specifically, we replace US corporate and personal statutory tax rates for each year with the mean corporate and personal statutory tax rates for all OECD countries except the United States. To conduct this test, we use fixed-effects panel instrumental variables regression, which uses the two-stage least squares estimation approach. As Table 3 reports, the signs and significance of the instrumental variable results are consistent with the primary results.[15] Hence, the evidence provides comfort

Table 3. Instrumental variables regression.

Dependent variable: dividend yield (%)			
	External equity sample	Debt and internal equity sample	Full sample
	(1)	(2)	(3)
Dividend tax	−1.749	−11.166***	−8.883***
	[−1.53]	[−11.72]	[−11.64]
Gain from leverage	2.437	18.618***	14.412***
	[1.38]	[11.33]	[11.18]
Control variables	*Included*	*Included*	*Included*
Number of observations	22,441	78,299	100,740
Overall R^2	0.04	0.07	0.07

Notes: In this table, we use average OECD tax rates (excluding the US rate) as instruments for US tax rates. Each model uses a two-stage least squares approach. Models are estimated using instrumental variables panel estimation methods and include firm fixed effects. Appendix 1 provides detailed variable definitions, including the definitions of control variables. Data are from the period 1983 to 2012 (both inclusive). *t*-statistics provided in parenthesis are estimated using standard errors clustered by firm. ***,**,* indicates significance at the 0.01, 0.05, and 0.10 level or better, respectively.

Table 4. First differences.

Dependent variable: ΔDividend yield (%)			
	External equity sample	Debt and internal equity sample	Full sample
	(1)	(2)	(3)
ΔDividend tax	−0.801***	−1.922***	−1.805***
	[−2.72]	[−7.44]	[−7.81]
ΔGain from leverage	0.974***	2.487***	2.305***
	[2.77]	[7.35]	[7.70]
Control variables	*Included*	*Included*	*Included*
Number of observations	7,770	55,243	63,013
R^2	0.00	0.01	0.00
Test of coefficient equality	**Difference**	$\chi^2_{(1)}$	
ΔDividend tax	−1.121	8.27***	
ΔGain from leverage	1.513	9.82***	

Notes: The estimation sample covers the period 1983 to 2012 (both inclusive). The sample includes only those observations that belong to the same group (external-equity sample or debt and internal equity sample) in the year of change and the immediately preceding year. Models are estimated using fixed effects panel estimation methods. Appendix 1 provides detailed variable definitions, including the definitions of control variables. Appendix 2 provides statutory tax rates. *t*-statistics provided in parenthesis are estimated using standard errors clustered by firm. ***,**,* indicates significance at the 0.01, 0.05, and 0.10 level or better, respectively.

that potential endogeneity between US statutory tax rates and US firms' dividend policy may not drive the primary results.

5.2. *First differences study*

As a second check against the potential effects of endogeneity, we examine the hypothesis that first differences in dividend yields are a predictable function of changes in the tax variables, which enables us to focus on largely exogenous shocks to the statutory tax rates. Prior studies such as Chetty and Saez (2005) have found that firms increased dividends in response to the 2003 dividend tax cut. However, both the traditional dividend tax rate and the composite dividend tax rate decreased in 2003, so this result is consistent with the expected effects of both the traditional and composite tax rates. The single tax act is not sufficient to disentangle the effects of the composite rate from the traditional rate. Multiple tax acts are required. This is also true when trying to estimate separate coefficients for *Nominal Dividend Tax* and *Gain from Leverage* – no single event changes the tax gain from leverage without changing the dividend tax rate.

Despite these empirical limitations, it is possible to estimate the separate effects of changes in each tax variable on dividend policy by combining the effects of a series of shocks to tax rates. In our sample, there are 10 largely exogenous shocks to statutory tax rates. To exploit these shocks, we regress Δ *Dividend Yield* % on Δ *Nominal Dividend Tax* and Δ *Gain from Leverage* and changes in each control variable. We use ordinary-least squares estimation for the tests, which is compatible with a first differences specification. When using first differences, Table 4 reports the results are somewhat similar to the primary result. The estimated Δ *Nominal Dividend Tax* coefficient is negative for both the external equity and the debt and internal equity samples, and the Δ *Gain from Leverage* coefficient is positive for both samples. However, the Δ *Gain from Leverage* coefficient is considerably greater for the debt and internal equity sample than it is for the external-equity sample, and the difference is statistically significant at the 0.01 level. For the full sample, the estimated Δ *Nominal Dividend Tax* coefficient is −1.805 (*t*-value = −7.81) and the estimated Δ *Gain from Leverage* coefficient is 2.305 (*t*-value = 7.70).[16] This suggests that

Table 5. Panel Tobit.

Dependent variable: Dividend yield (%)			
	External equity sample	Debt and internal equity sample	Full sample
	(1)	(2)	(3)
Dividend tax	−1.441	−4.375***	−4.213***
	[−0.77]	[−8.65]	[−8.69]
Gain from leverage	−1.601	5.922***	5.426***
	[−0.60]	[7.72]	[7.42]
Control variables	*Included*	*Included*	*Included*
Number of observations	22,441	78,299	100,740

Notes: Models are estimated using random effects panel Tobit estimation. Appendix 1 provides detailed variable definitions, including the definitions of control variables. Appendix 2 provides statutory tax rates. Data are from the period 1983 to 2012 (both inclusive). *z*-statistics are provided in parenthesis. ***,**,* indicates significance at the 0.01, 0.05, and 0.10 level or better, respectively.

companies change dividend policy in a predictable manner according to exogenous changes in the nominal dividend tax rate and the gain from leverage.

5.3. *Tobit estimation*

On the lower end of the distribution, dividends are bound by zero. Given an opportunity to do so, many zero-dividend firms might pay negative dividends. Therefore, we address zero-dividend firms by using panel Tobit. Tobit explicitly accounts for both the propensity to pay dividends and the amount of dividends paid. As Table 5 reports, the Tobit results are similar to the primary results.[17] For the new equity sample, the estimated coefficients for *Nominal Dividend Tax* and *Gain from Leverage* are not statically significant. On the other hand, for the debt and external equity sample, the estimated *Nominal Dividend Tax* coefficient is −4.375 (*t*-value = −8.65) and the estimated *Gain from Leverage* coefficient is 5.922 (*t*-value = 7.72). Hence the Tobit results support the primary results.

In untabulated tests, we further investigate the Tobit result by using Probit to estimate the propensity to pay or initiate dividends. In this case, we find the *Gain from Leverage* coefficient is not statistically different from zero.[18] We also investigate the Tobit result by estimating our primary equation (Equation (4)) for dividend-paying firms only (28,099 observations) to assess choices regarding the magnitude of dividends. In this case, for the external equity sample the estimated *Nominal Dividend Tax* is significant at the 10% level and *Gain from Leverage* coefficients is not statically different from zero, but for the debt and internal equity sample, the estimated *Nominal Dividend Tax* coefficient (−5.301, *t*-value = −14.16) and estimated *Gain from Leverage* coefficient (8.135, *t*-value = 14.06) are both highly significant.[19] When considered together, these two sets of results suggest that managers do not respond to the tax incentives by treating dividends as a simple binary choice to either pay dividends or not, which represents an important limitation on the primary findings. Instead, the Tobit evidence suggests managers treat dividends as a joint choice regarding the payment of dividends and the amount of dividends to pay, and the tax factors are especially relevant for choices regarding the amount of dividends to pay.

5.4. *Alternative dependent measure*

Thus far, the dependent measure in our analyses is *Dividend Yield* % which scales dividends by the market value of equity. The market value of equity varies significantly over time and may capture various macroeconomic factors that also impact tax rates, which could lead to a spurious

Table 6. Alternative dependent measure.

Dependent variable: Dividend scaled by book value of equity (%)			
	New equity sample	Debt and internal equity sample	Full sample
	(1)	(2)	(3)
Dividend tax	−0.098	−2.284***	−1.871***
	[−0.21]	[−4.88]	[−4.76]
Gain from leverage	−0.318	2.873***	2.233***
	[−0.50]	[4.01]	[3.88]
Control variables	*Included*	*Included*	*Included*
Number of observations	22,440	78,292	100,732
Number of firms	8114	11,866	12,909
Within R^2	0.00	0.01	0.01
Between R^2	0.06	0.10	0.09
Overall R^2	0.04	0.10	0.08
Test of coefficient equality	**Difference** $\chi^2_{(1)}$		
Dividend tax	−2.186	11.57***	
Gain from leverage	2.555	11.75***	

Notes: This table reports results from estimating model reported in Table 2, Panel B by replacing the dependent measure (dividend yield %) by an alternate measure in which dividends are scaled by book value of equity. Like Table 4, the test variables in this table are dividend tax rates and the gain from leverage. Models are estimated using fixed effects panel estimation methods. Appendix 1 provides detailed variable definitions, including the definitions of control variables. Appendix 2 provides statutory tax rates. Data are from the period 1983 to 2012 (both inclusive). *t*-statistics provided in parenthesis are estimated using standard errors clustered by firm. ***,**,* indicates significance at the 0.01, 0.05, and 0.10 level or better, respectively.

correlation between our dependent and test variables. To address this concern, we estimate Equation (4) by scaling dividends by a more stable measure – the book value of equity. Table 6 reports the results. As reported, the results in Table 6 are qualitatively similar to the primary results, which provide comfort that our main results are not driven by a spurious correlation between *Dividend Yield %* and our tax measures.

5.5. *Alternative sample partitioning criteria*

In all the analyses to this point, we use contemporaneous measures of new equity issuance, new debt, and free cash flow to separate external-equity observations from debt and internal-equity observations. This contemporaneous approach is consistent with Hennessy and Whited (2005), which posits that a firm's source for marginal financing is dynamic, changing from one year to the next. Nevertheless, a cost of the contemporaneous approach is that a firm's ability to raise debt or its level of free cash flow in the current year can affect its dividend policy for the year, thus producing endogeneity. To address this concern, we use an alternative classification scheme in which we apply the original criteria using lagged measures instead of the current year values. Specifically, we classify an observation as external equity financed if the following four conditions are met: (1) New Equity Issue$_{t-1} > 0$, (2) New Equity Issuance $_{t-1}$ > New Debt $_{t-1}$, (3) New Equity Issuance $_{t-1}$ > Free Cash Flow $_{t-1}$, and (4) New Equity Issuance $_{t-1}$ > (New Debt $_{t-1}$ + Free Cash Flow $_{t-1}$). As Table 7 reports, the empirical results are qualitatively similar to the primary results, which helps confirm that using contemporaneous partitioning variables does not drive the primary results.

5.6. *Firm-specific corporate tax rates*

In the primary tests, we use period-specific statutory corporate tax rates to proxy for τ_c, which is a component of *Gain from Leverage*. To check for robustness, we replace statutory corporate tax

Table 7. Alternative sample partitioning criteria using lagged data.

Dependent variable: Dividend yield (%)			
	New equity sample	Debt and internal equity sample	Full sample
	(1)	(2)	(3)
Dividend tax	−0.321	−2.515***	−2.155***
	[−1.24]	[−9.94]	[−10.33]
Gain from leverage	0.306	3.442***	2.854***
	[0.86]	[9.80]	[10.08]
Control variables	*Included*	*Included*	*Included*
Number of observations	26,535	73,284	99,819
Number of firms	9669	11,080	12,855
Within R^2	0.01	0.03	0.02
Between R^2	0.08	0.13	0.14
Overall R^2	0.05	0.11	0.11
Test of coefficient equality	**Difference** $\chi^2_{(1)}$		
Dividend tax	−2.194	39.62***	
Gain from leverage	3.136	42.52***	

Notes: This table reports results from estimating firm fixed effect models. In this table, the external-equity and debt and internal-equity samples are constructed using an alternative approach that uses lagged values (instead of the contemporaneous values) of the relevant variables. Appendix 1 provides detailed variable definitions. Data are from the period 1983 to 2012 (both inclusive). *t*-statistics provided in parenthesis are estimated using standard errors clustered by firm. ***,**,* indicates significance at the 0.01, 0.05, and 0.10 level or better, respectively.

Table 8. Firm-specific corporate tax rates.

Dependent variable: Dividend yield (%)			
	External Equity sample	Debt and internal equity sample	Full sample
	(1)	(2)	(3)
Dividend tax	−0.163	−0.782***	−0.691***
	[−1.17]	[−7.01]	[−7.09]
Gain from Leverage_MTR	0.057	0.638***	0.519***
	[0.61]	[7.83]	[7.91]
Control variables	*Included*	*Included*	*Included*
Number of observations	9929	46,635	56,564
Within R^2	0.01	0.03	0.02
Between R^2	0.08	0.13	0.15
Adjusted R^2	0.06	0.10	0.11
Test of coefficient equality	**Difference**	$\chi^2_{(1)}$	
Dividend tax	−0.619	13.49***	
Gain from leverage	0.581	21.81***	

Notes: This table reports results from estimating firm fixed effects models. The gain from leverage is computed using firm-specific corporate tax rates in place of statutory tax rates. Appendix 1 provides detailed variable definitions. Data are from the period 1983 to 2012 (both inclusive). *t*-statistics provided in parenthesis are estimated using standard errors clustered by firm. ***,**,* indicates significance at the 0.01, 0.05, and 0.10 level or better, respectively.

rates with the before-interest marginal corporate tax rates that Graham (1996a, 1996b, 1999, 2000) computes, producing *Gain from Leverage_MTR*. Unlike the statutory rate, the composite rate accounts for non-debt tax shields, uncertainty regarding taxable income, deferred taxes, the progressivity of the statutory tax schedule, net operating loss carryforwards and carrybacks, certain tax credits, and the alternative minimum tax. As a result, *Gain from Leverage_MTR* varies across firms as well as over time.

We conduct this robustness test using *Nominal Dividend Tax* and *Gain from Leverage_MTR* together. The results from this test reflect the 56,358 sample observations for which Graham's marginal corporate tax rate data are available (which includes the years from 1983 to 2011). As Table 8 reports, we find the signs of the estimated *Nominal Dividend Tax* and *Gain from Leverage_MTR* coefficients are consistent with the primary results, albeit with somewhat smaller estimated coefficients

5.7. *Share repurchases*

Dividends are not the only type of equity distribution to produce a gain from leverage. Share repurchases also reduce equity and financial assets, which can increase the net debt position of the firm. Therefore, from a tax perspective, the gain from leverage theory that applies to dividends also applies to share repurchases. A key difference is that share repurchases do not trigger a gross dividend tax. Instead, they often produce capital gains taxes. Therefore, by substituting *Share Repurchase %* for *Dividend Yield %* as the dependent variable in Equation (4), and by substituting the nominal long-term capital gains tax rate (*Capital Gains Tax*) for the dividend tax rate in the equation, it is possible to test whether share repurchases decrease in the capital gains tax rate and increase in the gain from leverage.

For the share repurchase tests, we use two different definitions to identify firm-year observations that are external-equity financed. Table 9 columns (1)–(3) report results from adopting the primary partitioning criteria, which focus on new equity issues, new debt, and free cash

Table 9. Share repurchases.

Dependent variable: share repurchase (%)					
	External equity sample original definition	Debt and internal equity sample original definition	Full sample	External equity sample restrictive definition	Debt and internal equity sample restrictive definition
	(1)	(2)	(3)	(4)	(5)
Capital Gains tax	−8.904***	−3.834***	−4.584***	−4.329**	−4.454***
	[−2.74]	[−3.78]	[−4.60]	[−2.04]	[−3.93]
Gain from leverage	5.287***	1.895***	2.841***	1.217	2.958***
	[3.44]	[3.06]	[4.90]	[1.24]	[4.36]
Control variables	*Included*	*Included*	*Included*	*Included*	*Included*
Number of observations	22,441	78,299	100,740	19,605	81,135
Within R^2	0.01	0.01	0.01	0.01	0.01
Between R^2	0.03	0.02	0.02	0.01	0.02
Adjusted R^2	0.03	0.01	0.01	0.01	0.01
Test of coefficient equality	**Difference**	$\chi^2_{(1)}$	**Difference**	$\chi^2_{(1)}$	
Capital gains tax	5.070	2.24	0.125	0.00	
Gain from leverage	−3.392	4.30**	1.741	2.23	

Notes: This table reports results from estimating models that explain share repurchases in terms of capital gains tax rates and the gain from leverage. We identify the external equity sample using the definition employed in prior tables (columns 1 and 2) as well as a more restrictive definition that is specific to the share repurchase tests (columns 4 and 5). Models are estimated using fixed effects panel estimation methods. Appendix 1 provides detailed variable definitions, including the definitions of control variables. Appendix 2 provides statutory tax rates. Data are from the period 1983 to 2012 (both inclusive). *t*-statistics provided in parenthesis are estimated using standard errors clustered by firm. ***,**,* indicates significance at the 0.01, 0.05, and 0.10 level or better, respectively.

flow. These criteria should be relevant for share repurchases as well as for dividends. However, companies often conduct large share repurchases that exceed these current year variables. Stored free cash flow or debt from prior years often finance these share repurchases, which reduces the effectiveness of our primary current-year partitioning criteria. Therefore, Columns (4) and (5) report results from estimating the equation for samples selected using a more restrictive definition of the external equity sample. In particular, we add a fifth condition, which is that new equity issuance > share repurchases. This fifth condition runs the risk of increasing endogeneity by using the dependent variable (share repurchases) as a partitioning variable, but it also better ensures that we do not improperly classify debt or internal-equity financed observations as external-equity financed observations.[20]

As Table 9 columns (1)–(3) report, when using the original sample partitioning criteria, share repurchases decrease in the capital gains tax rate and increase in the tax gain from leverage for the full sample and for each subsample. Hence, the evidence does not show a distinction between external-equity versus debt and internal-equity financed observations. However, all three columns show clear evidence that the tax gain from leverage affects share repurchases significantly. On the other hand, when we use the more restrictive partitioning criteria, Table 9 columns (4) and (5) report that results are consistent with theory. In particular, share repurchases decrease in *Capital Gains Tax* for both samples, they increase in *Gain from Leverage* for the debt and internal-equity subsample, but they do not increase in *Gain from Leverage* for the external-equity subsamples.

6. Cross-country analysis

An important limitation of our primary empirical analysis is that there is somewhat limited variation in US statutory tax rates over time. To address this concern, we conduct an inter-country analysis in which we use data from 38 different countries for the period from 1999 to 2012, which is the period for which the necessary data are available. Each country in our sample provides at least 10 observations. We obtain company financial data from Compustat Global and tax rate data from Martin Jacob. We use ordinary income tax rates to proxy for the interest tax rates. See Table 10 for detailed tax rate information per country.[21] To conduct this test, we estimate Equation (4) after controlling for both firm fixed effects and year fixed effects. The year effects control for a host of potential macroeconomic variables that vary over time. Because the model includes year fixed effects, we drop *Trend* and *Trend Square* from the equation. To separate out external-equity financed observations, we use the original partitioning criteria. Compared to US firms, firms in the global sample issue new equity somewhat infrequently, which results in relatively small external-equity sample.

As reported in Table 11, the empirical results are qualitatively similar to the primary results from the US study. Specifically, for the external-equity sample, the *Nominal Dividend Tax* coefficient is not statistically significant (−0.204, *t*-value = −0.12) and the *Gain from Leverage* coefficient is not statistically significant (0.677, *t*-value = 0.59). In contrast, the estimated coefficient for *Nominal Dividend Tax* (−8.727, *t*-value = −3.03) and *Gain from Leverage* (6.911, *t*-value = 2.47) are both highly significant for the debt and internal-equity sample.[22] This cross-country support for the inter-temporal US evidence provides an important second witness of the empirical relevance of the dividend-induced tax gain from leverage. The data and approach are very different from the primary tests, and yet the result is the same.[23]

In a final cross-country test (untabulated), we examine the hypothesis that the tax gain from leverage is more relevant in countries with strong versus weak shareholder protection rights. To conduct this test, we followed the country-specific dichotomy of protection rights outlined in

Table 10. Summary statistics for dividend yield and tax rates by country for data used in cross-country analysis.

		Dividend yield		Corporate tax rate		Interest tax rate		Capital gains tax rate		Dividend tax rate	
Country	*N*	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Australia	2262	4.84	2.99	0.31	0.02	0.47	0.02	0.25	0.06	0.24	0.02
Austria	49	4.33	4.14	0.25	0.00	0.50	0.00	0.09	0.12	0.25	0.00
Belgium	204	2.93	1.91	0.35	0.02	0.51	0.01	0.10	0.00	0.19	0.12
Brazil	294	4.29	4.03	0.34	0.00	0.28	0.00	0.15	0.00	0.00	0.00
China	9665	0.44	1.52	0.28	0.04	0.45	0.00	0.07	0.10	0.20	0.00
Denmark	146	2.73	2.74	0.27	0.03	0.59	0.03	0.43	0.02	0.43	0.02
Finland	170	4.50	2.82	0.26	0.00	0.49	0.00	0.29	0.01	0.20	0.01
Germany	734	3.41	2.83	0.34	0.07	0.48	0.02	0.18	0.12	0.27	0.03
Greece	302	3.62	2.86	0.29	0.05	0.40	0.01	0.00	0.00	0.01	0.03
Hong Kong	323	3.56	2.91	0.17	0.01	0.15	0.00	0.00	0.00	0.00	0.00
India	4775	2.58	2.25	0.34	0.01	0.30	0.00	0.01	0.04	0.16	0.02
Israel	309	5.95	4.46	0.26	0.02	0.47	0.01	0.21	0.02	0.20	0.00
Italy	115	3.54	2.73	0.31	0.00	0.43	0.00	0.15	0.03	0.15	0.03
Japan	18,376	1.99	1.42	0.41	0.02	0.50	0.00	0.13	0.06	0.16	0.13
Jordan	14	5.78	3.38	0.14	0.00	0.14	0.00	0.00	0.00	0.05	0.00
Kenya	54	4.27	2.60	0.30	0.00	0.30	0.00	0.00	0.00	0.05	0.00
Korea	1380	1.99	1.51	0.25	0.02	0.40	0.02	0.00	0.00	0.31	0.01
Malaysia	3007	2.95	2.50	0.27	0.01	0.28	0.01	0.00	0.00	0.00	0.00
Mexico	54	4.07	4.69	0.30	0.02	0.30	0.02	0.00	0.00	0.00	0.00
Morocco	77	5.28	3.12	0.31	0.02	0.40	0.02	0.14	0.02	0.10	0.00
Netherlands	398	3.47	2.68	0.31	0.05	0.52	0.00	0.00	0.00	0.25	0.01
New Zealand	158	4.51	2.68	0.32	0.02	0.37	0.03	0.00	0.00	0.08	0.04
Nigeria	173	4.45	3.37	0.30	0.00	0.25	0.00	0.10	0.00	0.10	0.00
Norway	106	4.60	3.30	0.28	0.00	0.48	0.00	0.28	0.00	0.28	0.00
Pakistan	391	5.92	3.68	0.36	0.03	0.24	0.06	0.06	0.11	0.10	0.00
Philippines	60	2.74	2.35	0.30	0.00	0.32	0.00	0.00	0.00	0.10	0.00
Poland	75	3.62	2.50	0.19	0.00	0.34	0.04	0.19	0.00	0.19	0.00
Portugal	77	3.18	2.67	0.30	0.03	0.43	0.03	0.16	0.22	0.22	0.02
Singapore	1488	4.16	3.64	0.20	0.03	0.21	0.02	0.00	0.00	0.00	0.01
South Africa	419	4.05	2.79	0.36	0.03	0.41	0.02	0.09	0.04	0.00	0.00
Spain	83	3.42	2.84	0.30	0.00	0.45	0.04	0.22	0.04	0.22	0.04
Sri Lanka	240	3.43	2.88	0.32	0.03	0.31	0.05	0.00	0.00	0.10	0.00
Sweden	406	4.69	3.45	0.26	0.00	0.57	0.00	0.30	0.00	0.30	0.00
Switzerland	234	2.78	2.18	0.26	0.02	0.40	0.01	0.00	0.00	0.40	0.00
Taiwan, China	18	3.39	2.01	0.17	0.00	0.40	0.00	0.00	0.00	0.28	0.00
Thailand	239	4.82	3.32	0.28	0.03	0.37	0.00	0.01	0.04	0.13	0.04
Turkey	124	5.08	3.85	0.21	0.03	0.36	0.02	0.00	0.00	0.14	0.03
United Kingdom	1848	3.78	2.56	0.28	0.02	0.44	0.05	0.24	0.10	0.30	0.06

Alzahrani and Lasfer (2012), which resulted in 3647 strong protection observations (which excludes the United States and Canada) and 21,204 weak protection observations. Using firm fixed effects (adding year effects produces excess multicollinearity), we find the estimated coefficients for the strong protection sample are −7.291 (*t*-value = −7.33) for *Nominal Dividend Tax* and 12.482(*t*-value = 4.56) for *Gain from Leverage*. The estimated coefficients for the weak protection sample are −5.597 (*t*-value = −4.11) for *Nominal Dividend Tax* and 6.949 (*t*-value = 5.84) for *Gain from Leverage*. Consistent with the implications of the findings in Alzahrani and Lasfer (2012), the *Gain from Leverage* coefficient is statistically greater for the strong protection group than it is for the weak protection group at the 0.10 level.

Table 11. Cross-country analysis.

Dependent variable: Dividend yield (%)			
	External equity sample	Debt and internal equity sample	Full sample
	(1)	(2)	(3)
Dividend tax	−0.204	−8.727***	−8.371***
	[−0.12]	[−3.03]	[−2.80]
Gain from leverage	0.677	6.911**	6.706**
	[0.59]	[2.47]	[2.38]
Size	−0.036	−0.482***	−0.480***
	[−0.15]	[−7.31]	[−6.58]
Free cash flow	2.489**	1.492	1.656
	[2.50]	[1.18]	[1.29]
Collateral	−0.042	−0.706	−0.756*
	[−0.07]	[−1.59]	[−1.71]
Market-to-book	−0.277***	−0.460**	−0.469***
	[−2.82]	[−2.55]	[−2.86]
Debt-to-asset	1.026	−0.390*	−0.325
	[1.52]	[−1.97]	[−1.57]
Intercept	2.986	7.247***	7.212***
	[1.31]	[9.36]	[8.77]
Company fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Number of observations	2,842	46,005	48,847
Adjusted R^2	0.15	0.15	0.14
Test of coefficient equality	**Difference**	$\chi^2_{(1)}$	
Dividend tax	−8.523	8.82***	
Gain from leverage	6.234	5.68***	

Notes: This table reports results from estimating a model with company and year fixed effects using international data. The sample includes 38 countries each of which have a minimum of 10 observations in at least one year in our sample. Appendix 1 provides detailed variable definitions. Data are from the period 1994 to 2012 (both inclusive). *t*-statistics provided in parenthesis are estimated using standard errors clustered by country. ***,**,* indicates significance at the 0.01, 0.05, and 0.10 level or better, respectively.

7. Conclusion

In this study, we empirically examine the hypothesis that external-equity financed dividends impose a nominal or traditional dividend tax rate on investors whereas debt and internal-equity financed dividends produce a tax gain from leverage that offsets the nominal dividend tax rate, resulting in a net composite dividend tax rate. Consistent with the disparate roles for these different tax rates, we find that the nominal and traditional tax rates best explain dividend policy for companies that use external-equity financing at the margin, and the composite tax rate best explains dividend policy for the majority of companies, which use debt or internal-equity financing at the margin. More directly, we also find that dividends decrease in the nominal dividend tax rate and increase in the offsetting gain from leverage. This impact of the tax gain from leverage is concentrated in the magnitude of dividend payouts, as opposed to the propensity to pay dividends.

The evidence in this study links dividends to the debt-tax shield directly. The dividend-tax literature has developed without incorporating the debt-tax shield, and the debt-tax-shield literature does not incorporate the gain from leverage that dividends produce. Our evidence ties these two seemingly disparate literatures together at their core, showing they are integrally connected – dividends often produce a gain from leverage and the gain from leverage they produce reduces the marginal dividend tax rate. Future studies could fully integrate dividends and the debt-tax-shield into a single stream of literature, which may produce many yet unforeseen insights.

Notes

1. For example, if a firm retains equity and invests it in interest-bearing securities, the future interest revenue from the securities will be subject to corporate taxes each year and it will also be subject to investor taxes upon eventual distribution to shareholders. On the other hand, if the firm distributes the equity now and shareholders invest the distribution in the same interest-bearing securities, the future interest revenue from the securities will only be subject to a single layer of investor taxes. Hence, as is widely understood by both managers and shareholders, distributing the equity now eliminates double taxation on the future interest revenue by avoiding the future corporate taxes.
2. Financial economists generally assume the tax gain from leverage is positive (Graham 2000). However, Miller (1977) points out cases in which it could be zero or even negative. See Section 2.2 for a discussion.
3. On the other hand, it also is possible that the tax gain from leverage is both positive and large enough to more than offset the nominal dividend tax rate, which would result in a negative composite dividend tax rate. For example, if $\tau_e = \tau_d$ as Hennessey and Whited (2005) assume, the sign of the composite dividend tax rate depends on the difference between τ_i and τ_c. If $\tau_i < \tau_c$, then the tax gain from leverage is large enough to more than offset the nominal dividend tax rate, so the composite rate is negative. This could encourage dividends. Empirically, some of our measures for the composite dividend tax rate are indeed negative (see Appendix 2).
4. Using top personal tax rates to proxy for τ_d and τ_g does not account for the fact that companies also pay dividends to institutions, such as tax-exempt pension funds. However, the majority of institutions pass tax consequences through to their owners (e.g. LLCs, partnerships, and mutual funds), so personal taxes could still be relevant. In any case, the applicability of personal taxes is an empirical issue. Finding evidence for the hypotheses despite the presence of tax-exempts would indicate personal tax rates remain relevant. In addition to their impact on our tax rate measures, institutional ownership could affect dividend policy directly. Therefore, we conduct a robustness test using institutional holdings as a control variable. Doing so reduces the sample size by more than half of its original size but does not affect the basic qualitative results.
5. See https://faculty.fuqua.duke.edu/~jgraham/taxform.html.
6. Including a lagged dependent variable in a fixed-effects within-firm context could confound interpretation of empirical results, so we exclude it from our primary firm-fixed-effects analyses. Nevertheless, in untabulated results we find the primary fixed-effects results are robust to the addition of a lagged dependent variable.
7. Given the limited variation in dividend tax rates before the early 1980s, Poterba and Summers (1985) steer clear of US data for dividend policy tests, using UK data instead.
8. Statutory dividend tax rates decreased substantially in 2003, which was accompanied by a modest increase in dividend distributions. Therefore, a priori it may seem possible that the tax rate and dividend policy shifts during the period from 2003 to 2012 could drive results for the entire sample. Empirically, however, the principal results we report in this study are qualitatively similar whether or not we drop this latter sub-period from the sample.
9. Some of these observations represent small equity issues for dedicated purposes, such as to finance employee stock option plans. Therefore, to assess robustness, we add another criterion for external-equity observations, which is that new external equity issues for the year must exceed 0.5% of the market value of equity, which does not materially affect the empirical results we report. We also obtain similar qualitative results when requiring that new external equity issues for the year must exceed other thresholds, such as 2.5% of the market value of equity.
10. Following prior studies (e.g. Jacob and Jacob 2013), we winsorize the independent variable and all the firm-specific control variables at the top and bottom 1% of their distributions.
11. This adjustment is especially important because statutory tax rates are correlated with each other over time, so attempting to estimate the *Nominal Dividend Tax* coefficient without controlling for *Gain from Leverage* should result in correlated omitted variable bias. Using the *Composite Dividend Tax* variable avoids this bias. Using *Composite Dividend Tax* also circumvents any potential concerns regarding the effects of multicollinearity among the tax variables by accounting for both the nominal rate and the offsetting gain from leverage in a single measure without requiring separate coefficient estimates. However, when we do estimate separate coefficients for *Nominal Dividend Tax* and *Gain from Leverage*, we obtain high *t*-statistics and robust, stable coefficients for each variable, suggesting that multicollinearity is not a major concern (Kennedy 2008).
12. All of these results are consistent with the quasi-natural experiment result in Doidge and Dyck (2015), which indicates that tax factors affect payout policy.

13. To confirm this interpretation of the statistically insignificant *Nominal Dividend Tax* coefficient, we re-estimate each of the models reported in Tables 2 and 3 as well as in Tables 5–8 after dropping the *Gain from Leverage* variable from the equation. When doing so, the coefficient of *Nominal Divided Tax* is negative and statistically significant in every case except Table 6 (−0.106, *t*-value = −1.55). These findings generally support the interpretation that introducing the *Gain from Leverage* variable adds noise to the equation for external-equity observations, thus causing the *Nominal Dividend Tax* variable to lose significance.
14. In terms of economic significance, the estimated −2.058 coefficient for *Nominal Dividend Tax* explains 16.9% of the total variation in dividend yield, and the estimated 2.740 coefficient for *Gain from Leverage* explains 19.1% of the total variation in dividend yield. Of course, the influence of these two variables often oppose each other within the total composite dividend tax rate, so the net effect of taxes on dividends is smaller.
15. However, the magnitudes of the absolute value of the estimated coefficients are significantly higher when using instrumental variables than they are for the primary results, which can raise suspicions regarding the quality of the instruments (Larcker and Rusticus 2010). To address this concern, we conduct diagnostic tests and find the Kelibergen-Paap rank LM Statistic is 2301.51 and the Kelibergen-Paap rank Wald F Statistic is 1560.84. Together, these two statistics reject the null hypothesis that the equation is under-identified and they imply that the instruments are correlated with the endogenous regressors as desired. Despite the favorable results from these diagnostic tests, the especially large estimated coefficients for the tax variables in Table 3 suggest the need for caution when interpreting the instrumental variable results.
16. The standard deviation of Δ *Nominal Dividend Tax* is 0.056, the standard deviation of Δ *Gain from Leverage* 0.042, and the standard deviation of Δ *Dividend Yield* % is 1.125. Given these figures, in terms of economic significance, the estimated Δ *Nominal Dividend Tax* coefficient explains 9.0% of the total variation in Δ *Dividend Yield* %, and the estimated Δ *Gain from Leverage* explains 8.6% of the variation.
17. The results are based on random effects panel Tobit models estimated using the Stata routine *xttobit*.
18. For example, when using panel Probit to estimate the impact of taxes on dividend initiations, and when restricting the sample to observations in the year before and in the year of a dividend initiation, the estimated *Nominal Dividend Tax* coefficient (−1.730, *t*-value = −2.18) is statistically significant, but the *Gain from Leverage* coefficient (1.687, *t*-value = 1.44) is not significant, at least not at the 0.10 level.
19. In terms of economic significance, the estimated −5.301 coefficient for *Nominal Dividend Tax* (Standard Deviation = 0.129) explains 33.1% of the total variation in dividend yield for this sample (Standard Deviation = 2.067), and the estimated 8.135 coefficient for *Gain from Leverage* (Standard Deviation = 0.114) explains 44.9% of the total variation in dividend yield.
20. To check robustness, we also impose a similar fifth restriction for the primary dividend test (i.e., new equity issues > dividends). Doing so does not alter inferences from the primary dividend analysis we report. In fact, it tends to sharpen results (at the cost of introducing additional endogeneity).
21. Tax rate information is available upon request from Professor Martin Jacob.
22. Results are similar when controlling for both country and year fixed effects instead of controlling for firm and year fixed effects. Specifically, for the external-equity sample, the *Nominal Dividend Tax* coefficient is not statistically significant (−1.105, *t*-value = −0.41) and the *Gain from Leverage* coefficient is not statistically significant (1.877, *t*-value = 0.99). In contrast, for the debt and internal equity sample, the estimated coefficient for *Nominal Dividend Tax* (−8.792, *t*-value = −2.69) and *Gain from Leverage* (6.975, *t*-value = 2.32) are both significant.
23. Qualitatively, this result is not solely driven by large-economy countries. For example, it is robust to dropping both Japan and the United Kingdom from the sample, which reduces the total number of observations from 48,847 to 28,623. In this case, for the external-equity sample, the *Nominal Dividend Tax* coefficient is −13.942 (*t*-value = −4.03) and the *Gain from Leverage* coefficient is not statistically significant (−2.509, *t*-value = −0.71). In contrast, for the debt and internal-equity sample, the estimated coefficient for *Nominal Dividend Tax* (−13.811, *t*-value = −3.47) and *Gain from Leverage* (8.964, *t*-value = 2.94) are both significant.

Acknowledgements

We express gratitude to the associate editor, Martin Jacob, and the reviewers, who provided invaluable guidance. We also express gratitude to Alan J. Auerbach, Zhenhua Chen, Harry DeAngelo, Roger Gordon, John

R. Graham, Kevin A. Hassett, Douglas Holtz-Eakin, Mervyn A. King, Stephen Penman, James M. Poterba, Jacob K. Thomas, Michael J. Rebello, Lawrence H. Summers, Adam Wantz, Toni Whited, and Danny Yagan for their insightful comments on previous drafts of the paper, which were vital to us. In addition, we express appreciation to workshop participants at Yale University. All data are available from *Compustat* and sources cited, including firm-specific corporate tax rate data from John Graham and global tax rate data from Martin Jacob.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Alzahrani, M. and Lasfer, M., 2012. Investor protection, taxation, and dividends. *Journal of Corporate Finance*, 18, 745–762.

Auerbach, Alan J., 1979. Wealth maximization and the cost of capital. *Quarterly Journal of Economics*, 93, 433–446.

Auerbach, Alan J. and Hassett, Kevin J., 2003. On the marginal source of investment funds. *Journal of Public Economics*, 87, 205–232.

Bernheim, B. Douglas and Wantz, Adam, 1995. A tax-based test of the dividend signaling hypothesis. *American Economic Review*, 85, 532–551.

Brown, Jeffrey R., Liang, Nellie and Weisbenner, Scott, 2007. Executive financial incentives and payout policy: firm responses to the 2003 dividend tax cut. *Journal of Finance*, 62, 1935–1965.

Chetty, Raj and Saez, Emmanuel, 2005. Dividend taxes and corporate behavior: evidence from the 2003 dividend tax cut. *Quarterly Journal of Economics*, 120, 791–833.

Cuny, Charles J., Martin, Gerald S. and Puthenpurackal, John J., 2009. Stock options and total payout. *Journal of Financial and Quantitative Analysis*, 44, 391–410.

DeAngelo, Harry, DeAngelo, Linda and Skinner, Douglas J., 2008. Corporate payout policy. *Foundations and Trends in Finance*, 3, 95–287.

Doidge, Craig and Dyck, Alexander, 2015. Taxes and corporate policies: evidence from a quasi-natural experiment. *Journal of Finance*, 70: 45–89.

Fama, Eugene F. and French, Kenneth R., 2001. Disappearing dividends: changing firm characteristics or lower propensity to pay? *Journal of Financial Economics*, 60, 3–43.

Fenn, George W. and Liang, Nellie, 2001. Corporate payout policy and managerial stock incentives. *Journal of Financial Economics*, 60, 45–72.

Graham, John R., 1996a. Debt and the marginal tax rate. *Journal of Financial Economics* 41, 41–73.

Graham, John R., 1996b. Proxies for the corporate marginal tax rate. *Journal of Financial Economics*, 42: 187–221.

Graham, John R., 1999. Do personal taxes affect corporate financing decisions? *Journal of Public Economics*, 73, 147–185.

Graham, John R., 2000. How big are the tax benefits of debt? *Journal of Finance* 55, 1901–1941.

Grullon, Gustavo and Michaely, Roni, 2002. Dividends, share repurchases, and the substitution hypothesis. *The Journal of Finance*, 57, 1649–1684.

Hennessy, Christopher A. and Whited, Toni M., 2005. Debt dynamics. *Journal of Finance*, 60, 1129–1165.

Jacob, Marcus and Jacob, Martin, 2013. Taxation, dividends, and share repurchases: taking evidence global. *Journal of Financial and Quantitative Analysis*, 48, 1241–1269.

Julio, Brandon L. and Ikenberry, David L., 2004. Reappearing dividends. *Journal of Applied Corporate Finance*, 16, 89–100.

Kahle, K., 2002. When a buyback isn't a buyback: open market repurchases and employee options. *Journal of Financial Economics*, 63, 235–261.

Kennedy, Peter, 2008. *A Guide to Econometrics*. (6th ed.). Malden, MA: Blackwell.

King, Mervyn A., 1974. Taxation and the cost of capital. *Review of Economic Studies*, 41, 21–35.

Larcker, David F. and Rusticus, Tjomme O., 2010. On the use of instrumental variables in accounting research. *Journal of Accounting and Economics*, 49, 186–205.

Lee, Young and Gordon, Roger H., 2005. Tax structure and economic growth. *Journal of Public Economics*, 89, 1027–1043.

Lintner, John V., 1956. Distribution of incomes of corporations among dividends, retained earnings and taxes. *American Economic Review*, 46, 97–113.

Masulis, Ronald W. and Trueman, Brett, 1988. Corporate investment and dividend decisions under differential personal taxation. *Journal of Financial and Quantitative Analysis*, 23, 369–385.

Miller, Merton H., 1977. Debt and taxes. *Journal of Finance*, 32, 261–276.

Poterba, James M., 1987. Tax policy and corporate saving. *Brookings Papers on Economic Activity*, 2, 454–504.

Poterba, James M, 2004. Corporate payout policy. *American Economic Review*, 94, 171–175.

Poterba, James M. and Summers, Lawrence H., 1985. The economic effects of dividend taxation. In: E. Altman and M. Subrahmanyam, eds. *Recent Advances in Corporation Finance*. Homewood, IL: Dow Jones-Irwin, 227–284.

Smith, Clifford W. and Watts, Ross L., 1992. The investment opportunity set and corporate financing, dividend and compensation policies. *Journal of Financial Economics*, 32, 263–292.

Vuong, Quang H., 1989. Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica*, 57, 307–333.

Appendix 1

Variable definitions

Variable	Definition
Dependent variables	
Dividend yield %	Dividend yield computed as [dividend paid to common stock holders (DVC) ÷ market value of equity (PRCC_F*CSHO)]*100. Dividend yield values are truncated between 0 and 10.
Share repurchase %	Share repurchase ratio where share repurchase is computed as the purchase of common and preferred stock (PRSTKC) plus change in redemption value of preferred stock ($PSTKRV_t$-$PSTKRV_{t-1}$). Share Repurchase % is scaled by market value of equity (PRCC_F*CSHO) and multiplied by 100 to express it as a percentage. Share Repurchase % is winsorized at the top and bottom 1% of the distribution.
Test variables	
Nominal dividend tax	The statutory dividend tax rate as per Appendix 2.
Traditional dividend tax	The traditional dividend tax penalty, computed as (*Nominal Dividend Tax* −0.25*statutory long-term capital gains rate) ÷ (1 − 0.25*statutory long-term capital gains rate).
Interest tax rate	The top personal interest tax rate as per Appendix 2.
Capital gains tax	The long-term capital gains tax rate as per Appendix 2.
Corporate tax	Statutory corporate tax rate as per Appendix 2.
Gain from leverage	Computed as 1 − [{(1−*Corporate Tax*)*(1 − *Nominal Dividend Tax*)} ÷ (1 − statutory interest tax rate)]. These tax rates are provided in Appendix 2.
Gain from leverage_MTR	Computed as 1 − [{(1 − *Marginal Corporate Tax*)*(1 − *Nominal Divided Tax*)} ÷ (1 − statutory interest tax rate)]. The other tax rates are provided in Appendix 2. The marginal corporate tax rate is obtained from John Graham.
Composite dividend tax	Computed as *Nominal Dividend Tax* − *Gain from Leverage*.
Control variables	
Size	Natural logarithm of the value of the firm computed as book value of total assets (AT).
Free cash flow	[Operating income before depreciation (OIBDP) − Capital expenditure (CAPX)] ÷ Asset Total (AT)
Collateral	[Asset total (AT) less intangibles (INTAN)] ÷ Asset Total (AT).
Market-to-book	The ratio of market value of assets (MVA) to book value of assets (AT). MVA is computed as the book value of assets (AT) plus market value of equity (PRCC_F*CSHO) minus book value of equity (CEQ).
Debt-to-asset	Ratio of total debt to the value of the firm. Total debt is computed as the sum of long-term debt (DLTT) and debt in current liabilities (DLC). Value of the firm computed as book value of total assets (AT).
Trend	Computed as fiscal year less a constant (1982).
Trend squared	*Trend* raised to the power of two.
Interest rate	10-year treasury yields. Data from the St. Louis Federal Reserve http://research.stlouisfed.org/fred2/data/GS10.txt
GDP growth rate	Gross rate of US Gross Domestic Product. Data from World Bank http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG
Partitioning variables	
New equity issuance	Is the proceeds from sale of common and preferred stock (SSTK)
Change in debt	Computed as Total Debt_t − Total Debt_{t-1} where total debt is the sum of Long-term debt (DLTT) and Debt in current liabilities (DLC).
Free cash flow	Is the sum of net cash flow from operating activities (OANCF) and net cash flow from investing activities (IVNCF). For pre-1987 period it is computed as operating income before depreciation (OIBDP) less capital expenditures (CAPX).

Appendix 2

Annual tax rates used in the analysis.

Year	Dividend tax rate	Long-term capital gains tax rate	Interest tax rate	Corporate tax rate	Composite dividend tax rate
1983	0.500	0.200	0.500	0.46	0.040
1984	0.500	0.200	0.500	0.46	0.040
1985	0.500	0.200	0.500	0.46	0.040
1986	0.500	0.200	0.500	0.46	0.040
1987	0.385	0.280	0.385	0.40	−0.015
1988	0.280	0.280	0.280	0.34	−0.060
1989	0.280	0.280	0.280	0.34	−0.060
1990	0.280	0.280	0.280	0.34	−0.060
1991	0.319	0.289	0.319	0.34	−0.021
1992	0.319	0.289	0.319	0.34	−0.021
1993	0.408	0.292	0.408	0.35	0.058
1994	0.408	0.292	0.408	0.35	0.058
1995	0.408	0.292	0.408	0.35	0.058
1996	0.408	0.292	0.408	0.35	0.058
1997	0.408	0.212	0.408	0.35	0.058
1998	0.408	0.212	0.408	0.35	0.058
1999	0.408	0.212	0.408	0.35	0.058
2000	0.408	0.212	0.408	0.35	0.058
2001	0.403	0.212	0.403	0.35	0.053
2002	0.398	0.212	0.398	0.35	0.048
2003	0.161	0.161	0.361	0.35	0.014
2004	0.161	0.161	0.361	0.35	0.014
2005	0.161	0.161	0.361	0.35	0.014
2006	0.157	0.157	0.357	0.35	0.009
2007	0.157	0.157	0.357	0.35	0.009
2008	0.154	0.154	0.354	0.35	0.005
2009	0.154	0.154	0.354	0.35	0.005
2010	0.150	0.150	0.350	0.35	0.000
2011	0.150	0.150	0.350	0.35	0.000
2012	0.150	0.150	0.350	0.35	0.000

Notes: The tax rates we use account for all effects of transitions, add-on minimum taxes, personal exemption and itemized deduction phase outs, and maximum rates on long-term capital gains. Sources: Citizens for Tax Justice (see http://www.ctj.org/pdf/regcg.pdf) and the Internal Revenue Service (see http://www.irs.gov/pub/irs-soi/02corate.pdf).