# TAXES, CAPITAL STRUCTURE CHOICES, AND FIRM VALUE


## ABSTRACT

We identify a multitude of reforms affecting statutory corporate or personal tax rates across OECD countries during 1981 through 2009. We use those tax reforms to estimate the market value of the tax benefits of debt, while keeping other benefits and/or costs of debt financing constant. We report time-series evidence that the market attaches a large value to debt tax savings. The value of debt tax savings varies across firms and across countries in reasonable ways. For example, the value of debt tax savings is greater among highly profitable firms and tax payers. Additionally, the market value of debt tax savings is substantially greater in countries in which tax laws are more strongly enforced. The results are robust to a battery of endogeneity tests. The results unequivocally show that capital structure choices appear to be of first order importance.



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## TAXES, CAPITAL STRUCTURE CHOICES, AND FIRM VALUE

Do capital structure choices affect firm value? Modigliani and Miller (1958) demonstrate that, in a perfect and frictionless world, capital structure choices are irrelevant for firm value. However, when imperfections (such as corporate income taxes) are introduced, capital structure choices can affect firm value (Modigliani and Miller, 1963). For example, if interests are tax deductible at the corporate level, an interest payment of \$1 will allow a firm to save $\$1 \cdot T_c$ in corporate taxes ($T_c$ being the marginal corporate tax rate). In this simple case, with $T_c>0$, a manager can increase firm value by issuing more debt. This basic decision rule is recognized in every introductory finance textbook and taught, so we heard, in every corporate finance course.

Follow-up theoretical papers, however, have disputed the actual magnitude of the tax savings of debt (Miller (1977), Green and Hollifield (2003), and DeAngelo and Masulis (1980)). The empirical evidence that interest tax shields affect firm value is also weak at best. Contrary to the prediction above, cross-sectional tests document a negative (rather than a positive) association between debt or interests and firm value (Morck, Shleifer, and Vishny, 1988; Fama and French, 1998).

A general concern with this literature is that the cross-sectional correlation documented may be due simply to omitted variables or measurement error. Consistent with the theoretical prediction, Masulis (1980) finds that leverage-increasing exchange offers result in higher stock prices.[1] However, these stock price reactions might reflect new information or mispricing, rather than taxes. Additionally, to the extent that firms that change leverage are moving toward a new optimum, it becomes difficult to interpret why stock prices drop following leverage-decreasing

[1] This literature is reviewed in Eckbo, Masulis, and Norli (2007). An important benefit of studies of exchange offers relative to other event studies of stock or debt issuance is a better ability to hold the firm's investment policy "fixed."

exchange offers. Last but not least, a follow-up study by McConnell and Schlarbaum (1981) finds no evidence that issuing income bonds in exchange for preferred stocks affects firm value.

More recently, Graham (2000) simulates the benefit functions of interest tax deductibility and employs those to estimate the tax savings associated with each incremental dollar of interest payments. He estimates a *tax* benefit of debt of approximately 7%-10% of firm value, depending on whether personal taxes are considered. Van Binsbergen, Graham, and Yang (2010) focus on firms that appear to be optimally levered to estimate benefit and cost of debt functions for individual firms.[2] By integrating the area between these functions, they estimate the *net* benefit of debt to be on average around 3.5% of firm value. Using a different approach based on an extension of Modigliani and Miller (1958), Korteweg (2010) estimates the net benefits of debt to be 5.5% of firm value for the median firm. Thus, as highlighted by Graham and Leary (2011), the more recent evidence suggests that, for *many* firms, capital structure choices have only a *modest* impact on firm value.[3]

The key contribution of this paper is to use a quasi-experimental setting to identify a multitude of (often large) tax reforms affecting statutory corporate or personal tax rates across OECD countries during 1981 through 2009. The sample comprises 184 changes in corporate tax rates and 298 changes in personal tax rates. We employ these reforms as shocks to empirically estimate the market value attached to the *tax benefits* associated with debt tax shields. A major benefit of our approach, and its main difference from most prior studies, is that we focus on shocks directly affecting tax benefits (or costs) of debt. By isolating tax changes we are able to

[2] Costs of debt include the costs of financial distress, debt overhang, and agency costs. These costs diminish the *net* benefit of debt financing.
[3] An exception is Kemsley and Nissim (2002), who estimate the tax benefit of $1 of debt to be $0.40.

estimate the change in the tax benefits of debt while keeping other benefits and/or costs constant. This allows us to attach a pure tax interpretation to our results.[4]

A second important benefit of our approach is that the direction of the impact of a change in taxes on value (as a function of financial leverage) can be predicted *a priori* based on theory, thus circumventing the difficulties in interpreting many of the earlier studies.

As predicted by theory, we document that the impact of reforms on value differs across firms as a function of leverage. Importantly, we document that the mitigating effect of leverage is economically sizeable. For example, while an increase in corporate tax rates negatively affects firm value, we show that tax reforms have a *negligible impac*t on the value of highly-leveraged firms, suggesting that the change in after-tax cash flows is to a large extent offset by a change (in the opposite direction) in the tax benefits of debt. The sign of the impact of tax reforms on value is in line with theoretical predictions and applies to corporate tax changes, as well as to changes in personal tax rates applicable to interest and dividend income.

Recent work by Faccio and Xu (2013) documents that firms change their capital structure substantially in response to tax reforms. We show that firms that adjust their capital structure following a tax reform (presumably those that are suddenly "far away" from the "optimal" capital structure) are further able to mitigate the impact of the reform on value.

We undertake several steps beyond using (i) tax reforms (as sources of underlying shocks to the tax benefits of debt) in combination with (ii) change regressions specifications to address the issue of endogeneity. In particular, a concern is that tax reforms could potentially be correlated with changes in other determinants of firm value.

[4] Using a tax reform as a shock, Doidge and Dyck (2013) document that (prospective) tax shields mitigate the losses associated with the elimination of tax advantages given to Canadian income trusts. In particular, they document that prospective tax shields add 4.6% to firm value. Unlike our study, theirs focuses on one single reform affecting a relatively small sample of Canadian firms. It is therefore not clear whether their results generalize to other tax reforms.

First, we include country*year fixed effects in all regressions to control for the possibility that the results could be due to changes in other unobserved institutional features that might also affect firm value. These fixed effects allow controlling for *any* country-level shocks that might affect *all* firms in a given country at a given point in time. In our models, identification comes from the differential response to a given shock as a function of a firm's leverage ratio.

Second, given that the impact of tax reforms should differ across firms depending on their tax status, we investigate whether firms that should benefit (suffer) more from a reform experience a larger increase (decline) in value. We document that, following an increase in corporate tax rates, debt tax shields are more valuable for high corporate tax payers. Similarly, tax shields are more valuable for more profitable firms. We also find that debt tax shields appear to be more valuable for dividend-paying firms following an increase in tax rates on dividend income.

Third, we build on the notion that tax reforms should have a relatively small impact on value in countries with high tax evasion, and therefore tax shields should also be less valuable in those countries. To test this prediction, we split countries into two groups: those with higher than median and those with lower than median levels of tax evasion (as reported by the *World Economic Forum*). Indeed, we find little evidence that leverage provides any benefits in countries where firms and/or investors tend to evade taxes. In contrast, the impact of tax reforms on value is high in countries with low evasion. In those countries, the tax benefits of debt are also sizeable.

Fourth, we exploit the idea that insiders could also shelter income from taxation by stealing more (Desai, Dyck, and Zingales, 2007). Given that laws in some countries accommodate more stealing, we should expect tax reforms (and debt shelters) to have less

impact on value in those countries. We find both to be the case. By contrast, we document that debt tax shields contribute more to firm value in countries where stealing by insiders is relatively more difficult/costly.

Fifth, the macroeconomics literature documents that tax cuts (increases) tend to stimulate (slow down) economic growth, which gives rise to the concern that our results might reflect growth induced by tax reforms as opposed to debt-related tax savings. Given that our specifications include country*year fixed effects, this concern is valid only to the extent that firms with different leverage ratios may respond to changes in growth differently. We focus on countercyclical firms to investigate the importance of this "growth" channel. Contrary to a growth explanation of our results, we find that the previously documented tax benefits of debt are as large among countercyclical firms as among more cyclical firms/industries.

Last but not least, to mitigate the possibility that the effect captured in the previous analysis might reflect omitted shocks that might coincide with the timing of tax reforms *and* that might affect various firms differently, we alternatively adopt an event study methodology. For this purpose, we focus on unexpected (and relatively larger) reforms and conduct news searches on key events including the first rumor, the initial government announcement, and the final approval of a tax reform. As it is standard in this setting, we focus on short (five-day) event windows. By focusing on a relatively short event window, we greatly reduce the risk of contamination of the event. In fact, it is not common for tax reforms, which tend to involve extensive and detailed debates, to be approved at the same time as other major reforms. This greatly reduces any remaining concerns that the results documented might reflect something other than a tax effect. Importantly, we document that our earlier results continue to hold in this setting as well. Not surprisingly, the magnitude of the change in firm value is smaller in this

setting, because information about an upcoming tax reform can be released over a longer period of time than what is captured in our event windows.

We also show that the results are not driven by the specific methodology employed. For this purpose, we alternatively use a propensity score matching procedure and compare the change in value experienced by highly-leveraged firms affected by a tax reform to the change in value of less-leveraged but otherwise similar firms that undergo the same tax reform. A virtue of this methodology is that, since the control firms are nearly identical to the treated firms in terms of observable characteristics, the change in value experienced should be similar between the two groups if leverage is *not* an effective income-sheltering device. The propensity score results support our previous findings and mitigate the risk that the results might be methodology-specific. We also show that the results are unaffected by different measurements of the key dependent and independent variables.

While in this paper we study a simple question, our results are especially important to the corporate finance literature. Perhaps of greatest importance is the economic magnitude of the documented benefits associated with debt tax shields. In particular, we find evidence that the market attaches a value of $\$1 \cdot T_c$ to the tax savings associated with \$1 of permanent debt.

The rest of the paper is organized as follows. Section 1 describes the data. Section 2 uses a simple valuation model to derive testable predictions of the impact of tax reforms on value. It goes on to test this baseline model. Section 3 addresses various endogeneity concerns. Section 4 presents various robustness tests. Section 5 discusses the economic magnitude of the results. Section 6 concludes.

## 1. Data

We employ the OECD's *Tax Database* [5] and the World Bank's *World Development Indicators* to obtain data on corporate and personal tax rates. We verify and supplement those data with news articles from *Factiva*, Deloitte's and PricewaterhouseCoopers's tax reports, email exchanges with foreign tax authorities, the University of Michigan's *World Tax Database*, KPMG, Worldwide-Tax.com, countries' official websites, and other country-specific data sources. These searches yield data for a sample of 29 OECD countries and cover the period 1981-2009. The sample includes 258,742 firm-year observations.

*CORPORATE TAX CHANGE* is the annual change in the top marginal statutory corporate income tax rate. This variable includes national and regional corporate income taxes. *INTEREST TAX CHANGE* is the annual change in the highest marginal tax rate applied to residents' personal interest income from corporate bonds. *DIVIDEND TAX CHANGE* is the annual change in the net top statutory tax rate on dividend income to be paid at the shareholder level. The variable takes into account any gross-up provisions and reliefs available at the shareholder level.

Firm-level data are taken from *Worldscope* and *Datastream*. The analyses in Sections 2 through 3.3 use the change in the market value of assets, net of capital issuance, and ($dVni_t/A_{t-1}$) as a measure of the change in firm value.[6] $dVni_t/A_{t-1}$ is computed as the annual change in the market value of equity minus the annual change in the book value of equity, all divided by lagged book assets. The analysis in Section 3.4 uses the five-day *Cumulative Return* (on assets)

[5] http://www.oecd.org/statistics/.

[6] We are unable to control for changes in the market value of outstanding debt, as most of firm debt is not publicly traded. However, to the extent that the firms in the sample are typically not financially distressed, tax reforms should not affect the value of corporate debt. In the robustness tests (reported in Table 10), we repeat our analysis using the (gross) annual change in the market value of assets (scaled by book assets) and the change in the market-to-book ratio (*M/B*) as alternative measures of the change in firm value. The results are robust to using these alternative measures.

as the dependent variable. The five-day *Cumulative Return* is the sum of daily stock returns during the five-day interval surrounding a corporate tax reduction news event, multiplied by the firm's market value of equity and divided by the firm's book value of total assets.

$E_t/A_{t-1}$ is earnings before interest and taxes divided by lagged total assets. $Ln(Sales_t)$ is the natural log of (net) sales. *M/B* is the market-to-book ratio, defined as total assets minus book equity plus market equity, all divided by total assets. $dE_t/A_{t-1}$ is the change in earnings before interest and taxes divided by lagged total assets. $dNPPE_t/A_{t-1}$ is the change in net property, plant, and equipment divided by lagged total assets. $dRD_t/A_{t-1}$ is the annual change in research and development expenditures divided by lagged total assets. *Leverage* is interest-bearing debt divided by total assets.

As shown in Table 1, the average corporate tax rate is 38.11%, the average tax rate on interest income is 33.69%, and the average tax rate on dividend income is 25.90%. During our sample period, tax rates on average decline through time. The average firm has an M/B ratio of 1.80. The average leverage is 23.88%. Earnings and PPE (as a fraction of total assets) show a small average increase through time.

[Table 1 goes about here]

## 2. Results

In the main tests, we estimate the market value of interest tax shields using change regression specifications. In those specifications, annual changes in value are regressed on contemporaneous changes in tax rates, interacted with the degree of leverage at the beginning of the year along with several firm control variables. By focusing on changes, we remove the impact of any purely cross-sectional correlation between leverage and value and focus on the time-series results, therefore greatly reducing the risk of a spurious correlation. Further, we use a

conservative approach and include country*year fixed effects to control for any country-level observable and unobservable shock that might correlate with tax reforms.

The specifications presented in the tables are derived from a simple valuation model. In a simplified Modigliani and Miller (1963) setting with a permanent level of debt, D, no financial distress costs and no agency costs, the market value of a leveraged firm ($V_L$) is equal to:

$$V_L = \frac{E(OCF)\cdot(1-T_C)}{r} + D \cdot \left[1 - \frac{(1-T_C)\cdot(1-T_E)}{(1-T_D)}\right] \quad (1)$$

$V_L$ is the firm's market value of equity (E) plus market value of debt. $E(OCF)$ is the expected operating cash flow (before interest and taxes), $T_c$ is the corporate (income) tax rate, $T_E$ is the tax rate on income from equity, $T_D$ is the tax rate on interest income, and *r* is the all-equity cost of capital.

In this model, the expected impact of tax changes on value varies across firms. *Ceteris paribus*, a $\delta T_c$ change in the corporate tax rate results in a $[-\delta T_C \cdot \frac{E(OCF)}{r} + \delta T_C \cdot \frac{(1-T_E)}{(1-T_D)} \cdot D]$ change in firm value. Equivalently, in relative terms,

$$\frac{(\delta E+\delta D)}{A} = -\delta T_C \cdot \frac{1}{r} \cdot \frac{E(OCF)}{A} + \delta T_C \cdot \frac{(1-T_E)}{(1-T_D)} \cdot \frac{D}{A} \quad (2)$$

where *A* is total assets (but, of course, it could be any scaling factor). While in this model a tax increase results in a drop in firm value, this effect is less pronounced for highly-leveraged firms, as those firms are able to shield more income from corporate taxes.

Consider two firms with the same operating income of $100. (Assume for simplicity that $T_E = T_D$). Firm A is unleveraged. Firm B, which is leveraged, pays annual interests of $100, which are tax-deductible. If the corporate tax rate is 10%, firm A pays $10 (10% of its taxable income of $100) in corporate income taxes, while the firm B pays $0. If the corporate tax rate

increases to 50%, *ceteris paribus*, firm A pays income taxes of \$50, while firm B pays no income taxes. As such, the value of the unleveraged firm should drop more than the value of a highly-levered firm.

Further, a $\delta T_E$ change in the tax rate on income from equity results in a $[\delta T_E \cdot \frac{(1-T_C)}{(1-T_D)} \cdot D]$ change in firm value; or, in relative terms,

$$\frac{(\delta E+\delta D)}{A} = \delta T_E \cdot \frac{(1-T_C)}{(1-T_D)} \cdot \frac{D}{A} \tag{3}$$

or, equivalently, the higher the tax rate on income from equity, the greater the incentive to use corporate debt.

Finally, a $\delta T_D$ change in the tax rate on interest income results in a $[-\delta T_D \cdot \frac{(1-T_C)\cdot(1-T_E)}{(1-T_D)^2} \cdot D]$ change in firm value; or, in relative terms,

$$\frac{(\delta E+\delta D)}{A} = -\delta T_D \cdot \frac{(1-T_C)\cdot(1-T_E)}{(1-T_D)^2} \cdot \frac{D}{A} \tag{4}$$

or, equivalently, the higher the tax rate on interest income, the smaller the benefits from using corporate debt.

Summing up Eq.(2)–(4), we obtain the full derivative of Eq.(1):

$$\frac{(\delta E+\delta D)}{A} = -\delta T_C \cdot \frac{1}{r} \cdot \frac{E(OCF)}{A} + \frac{(1-T_E)}{(1-T_D)} \cdot \delta T_C \cdot \frac{D}{A} - \frac{(1-T_C)(1-T_E)}{(1-T_D)^2} \cdot \delta T_D \cdot \frac{D}{A} + \frac{(1-T_C)}{(1-T_D)} \cdot \delta T_E \cdot \frac{D}{A} \tag{5}$$

Assuming that everything else remains constant, except for the tax changes, a regression of the change in value can therefore be run as:

$$\delta V/A = \alpha + \beta * \delta T_c * \frac{E(OCF)}{A} + \gamma_1 * \delta T_c * D/A + \gamma_2 * \delta T_D * D/A + \gamma_3 * \delta T_E * D/A + \varepsilon \tag{6}$$

Based on Eq. (5), the following hold: (1) $\beta = -\frac{1}{r} < 0$; (2) $\gamma_1 = \frac{(1-T_E)}{(1-T_D)} > 0$; (3) $\gamma_2 = -\frac{(1-T_C)(1-T_E)}{(1-T_D)^2} < 0$; and (4) $\gamma_3 = \frac{(1-T_C)}{(1-T_D)} > 0$.

The regression results are reported in Table 2. In Regression (1) we present a simple model with only taxation at the corporate level. Regression (2) is a test of the more general valuation model with taxation at the corporate as well as at the personal level. The results are consistent with the predictions. In particular, the coefficient of $E_t/A_{t-1}$*Corporate Tax Change*, $\beta$, is less than -1. Further, the effect of an increase in corporate tax rates on value is less pronounced as leverage increases and the coefficient $\gamma_1$ is greater than 1. At the same time, the benefits associated with the deductibility of interest payments at the corporate level are offset by the disadvantage associated with the taxation of interest payments at the personal level (so that $\gamma_2 < 0$). The taxation of dividend income at the personal level further increases the overall tax benefits of debt ($\gamma_3 > 0$).

[Table 2 goes about here]

In Regressions (1) and (2) we constrain the value impact of a tax reform to be the same across all firms, to simplify our specifications. For example, we constrain $\frac{(1-T_E)}{(1-T_D)}$, $\frac{(1-T_C)(1-T_E)}{(1-T_D)^2}$, $\frac{(1-T_C)}{(1-T_D)}$, and $\frac{1}{r}$ to be the same across all firms. . However, this choice might bias the regression coefficients. Therefore, in Regression (3) of Table 2, we allow those factors to vary across firms.[7] In those specifications, the coefficients of interest are those of the triple interactions. (Theoretically, there is no reason to expect the triple interactions to matter over and above the double interactions. Rather, the purpose of the triple interactions is to reduce any bias in the

[7] The only variable that we continue to treat as constant across firms is *r*. The estimation of *r* presents empirical challenges.

estimation process. Therefore, we omit all double interactions). The signs of the coefficient on all (3) interactions are in line with theoretical predictions. Thus, the results strongly support the notion that the market value of tax reforms is more pronounced among the sets of firms more affected by the reform, and less pronounced among firms that have shielded more income from taxation through capital structure (leverage) choices. Importantly, the coefficients estimated in Models (2) and (3) are fairly close. Therefore, to make the interpretation of the results more direct and easy, the rest of the paper focuses on the double interactions.

So far in the analysis we have implicitly assumed that firms do not respond to tax reforms by changing their capital structure choices. This assumption is unwarranted, given evidence indicating that the market attaches a value to capital structure choices. Additionally, in a recent paper, Faccio and Xu (2013) show that firms substantially change their capital structure following tax reforms. We therefore investigate whether capital structure changes that follow a tax reform also impact firm value. We find that they do. More specifically, we define *Leverage adjustment* as the product of an *Adjustment dummy* and the absolute change in leverage, where the *Adjustment dummy* takes the value of 1 if the change in corporate tax and the change in leverage are in the same direction and 0 otherwise.[8] As reported in Regression (1) of Table 3, the coefficient on the interaction between *Leverage adjustment* and *Corporate Tax Change* is positive and significant at the 10% level. This result means that a tax increase has less of a negative impact on value for firms that respond by increasing leverage. Similarly, a tax reduction has a more positive impact on value for firms that respond by reducing leverage. This result is also consistent with a simple tax story. Interestingly, *Leverage adjustment* is positively correlated with the change in firm value, suggesting that firms that adjust their leverage more keenly end up being valued more.

[8] To simplify the definition of *Leverage adjustment* and the interpretation of the results, we consider only corporate tax changes in this test.

[Table 3 goes about here]

## 3. Endogeneity concerns

### 3.1 Top tax payers

Tax reforms should have different effects on firms as a function of each firm's marginal tax rate. Therefore, in this section we investigate whether the value of debt tax shields is greater for firms subject to a high(er) marginal tax rate.

The evidence in Table 4 indicates that the firms that should respond more to tax changes do exhibit a higher value response to tax reforms. In Model (1), we use a firm's effective tax rate, measured as the ratio of taxes paid over pre-tax income, as a proxy for the firm's marginal tax rate. Using this proxy, we find that the value of interest tax shields is higher for this set of firms. In Model (2) we document that similar conclusions are reached when we use firm profitability (ROA) as a proxy for a firm's tax status. These results mitigate the concern that our evidence may reflect something other than tax benefits. Last but not least, in Model (3) we document that reforms that increase tax rates on dividend income have a lower negative impact on value among firms with higher leverage.

[Table 4 goes about here]

### 3.2 Taxes and "stealing"

Taxes should have less impact on firm value in countries with high levels of tax evasion. In particular, if firms could evade taxes at no cost, taxes (and tax reforms) would have no impact on firm value; the same would apply to tax sheltering devices. To investigate whether this is the case, we split countries into two groups based on the prevalence of tax evasion, using the *World Economic Forum*'s assessment of the prevalence of tax evasion in a country in 2002. This index

builds from a survey of corporate executives' assessments of the prevalence of tax evasion in their countries. As predicted by a tax story, we find that tax reforms have little impact on value in countries with high tax evasion. By contrast, tax reforms have a large impact on value in countries with low tax evasion (Regressions (1) and (2) of Table 5). Similarly, while the market attaches a large value to debt as a tax shelter in countries with low tax evasion, such effect is not found in countries in which tax evasion is high. In fact, in countries with high tax evasion, debt has a negative market value. (A negative market value of debt could stem from distress or agency costs).

[Table 5 goes about here]

Similarly, taxes (and debt tax shields) should have less of an impact on value in countries where insiders shelter income from taxation through stealing. To investigate whether this is the case, we employ Djankov, La Porta, Lopez-de-Silanes, and Shleifer's (2008) index of anti-self-dealing, which measures the legal protection of minority shareholders against diversion of corporate wealth by insiders through self-dealing transactions. Less protection means that insiders are legally allowed to steal more, an incentive that should increase the higher the corporate tax rate. Consistent with this story, we find that tax reforms and debt tax shields have a significant impact on value only in countries that highly restrict the ability of insiders to steal. Instead, when stealing is "easy," tax reforms and tax sheltering devices appear to have no impact on firm value.[9]

[9] Although the tax evasion index and the anti-self-dealing index are positively correlated ($\rho$=0.63), there is still a fair amount of divergence between them. For example, nine countries involving 22,681 observations are classified as either high tax evasion and high anti-self-dealing countries or low tax evasion and low anti-self-dealing countries.

### 3.3 Changes in economic conditions

It is well-documented that tax cuts (increases) tend to stimulate (slow down) economic growth. If so, firm value could change not only because of a tax effect but also because of the change in future expected profitability. In our models we control for changes in current profitability. However, this control may be insufficient. To investigate the extent to which the results capture a growth channel as opposed to a pure tax channel, we split firms based on their sensitivity to macroeconomic conditions.

We start by identifying firms from industries whose M/B ratio is highly sensitive to changes in GDP growth. For this purpose, we run (industry-by-industry) regressions of the change in M/B on GDP growth. Industries with an above-median sensitivity to GDP growth are classified as "Cyclical." The underlying assumption is that tax reforms exert less effect on the growth of firms that are less cyclical. The results for this subset of firms are therefore more likely to be driven by a pure tax story as opposed to a growth channel.

The results in regression (1) of Table 6 do not support the growth story. In fact, the impact of tax reforms on value is found to be similar for cyclical and less-cyclical firms. If anything, the sign of the interaction terms with the "cyclical" firm indicator go against a growth story. More important, for less-cyclical firms we continue to find that the market attaches a large and positive value to debt tax shields.

[Table 6 goes about here]

In regression (2) we alternatively measure a firm's sensitivity to macroeconomic conditions based on keyword searches. The resulting set of "less-cyclical" industries consists of 2-digit SIC codes 01, 02, 07, 09, 20, 21, 28, 49, 51, 54, 80, 81, and 82. These sectors include

agriculture, food, tobacco, utilities, and healthcare. Using this metric, we find no support for a growth story.

In unreported tests we alternatively split the sample based on *ex-post* sales growth. Those results implicitly assume that markets have perfect foresight. In line with the other results in this section, in those tests we continue to find debt tax shields to be highly valuable even among firms whose growth is least affected by the tax reform.

### 3.4 Event study

In the previous regression analyses we included country*year fixed effects to control for changes in any omitted country-level factors that might affect all firms in a given country at a given point in time. A more subtle concern is that the results might reflect omitted shocks that might occur in the year of a tax reform *and* that might affect various firms *differently* (perhaps in ways that are not easy to predict). To mitigate this concern, we employ an event study methodology. As is standard in event studies, we focus on a *short* event window surrounding a tax reform. Selecting a short window enables us to minimize the risk that the event window might include any other value-relevant events. To the extent that no other country-wide events occur in the few days surrounding tax reforms, it cannot be the case that something other than the tax reforms themselves explains the results.

Of course, this methodology has some limitations. In particular, we can focus only on tax reforms introduced as surprises. Further, we must be able to identify an "event date." Finally, by focusing on a short window we inevitably neglect the impact of information (related to the tax reforms) released through time.

With these caveats in mind, we undertake an event study of the price change observed around large tax reductions. In particular, we focus on changes (reductions) in the top statutory

corporate tax rate of at least five percentage points. We focus on relatively large reforms so as to isolate events that should have a meaningful effect on firm value. (Presumably a very minor tax reform would have a relatively undetectable impact on value). We focus on tax reductions because those represent the vast majority of tax reforms. Imposing these constraints yields an initial sample of 40 country/years in which a large corporate tax rate reduction occurred.

For each of those 40 large corporate tax reductions, we conduct keyword searches in *Factiva* to identify the date of (i) the first rumor about the reduction in the press, (ii) a major initial statement made by government officials about a specific proposal of a reduction in the corporate tax rate, and (iii) the final approval of the law introducing a tax rate reduction. These keyword searches yield a sample of 69 announcements related to 29 specific tax reforms. The dates and a brief description of each of those events are reported in Table 7.

[Table 7 goes about here]

For each firm in those countries with available stock price data, we compute a five-day *Cumulative Return* (in US$ terms) over the interval beginning two days prior to and ending two days after the tax change news, $\sum_{t=-2}^{+2} R_{i,t}$. To facilitate the comparison with the results in the previous tables, we continue to scale the independent variables by the book value of total assets. Because of this scaling, in order for equations (2)-(6) to hold, the Y variable also needs to be scaled by the book value of assets. This is easily accomplished by multiplying ($\sum_{t=-2}^{+2} R_{i,t}$) by the firm's market value of equity and dividing it by the book value of total assets. As with the prior analyses, an implicit assumption is that the value of debt is unaffected by the tax reforms. This is necessarily true at least for the sub-sample of firms that are not financially distressed.

As shown in Panel B of Table 7, firm value increases on average around news of tax reductions. For the average firm, we document a 0.44% increase in value. As expected, among

different types of events, the first rumor of a tax cut (Rumor) is associated with the largest increase in value (1.22%), while the final approval of the new tax law (Law) accompanies an average return of 0.49%, which is marginally greater than the price response following official announcements to cut taxes (Intention). At first sight, these numbers might appear to be small, given our focus on the large changes in tax rates. The observed change in stock price is less than 5% for several reasons.[10] First, although we focus on the release of new information related to a specific tax change, that information typically relates to *partial* rather than full events. Second, the typical firm is leveraged so that its income is, at least in part, shielded from taxation. With those caveats in mind, we nevertheless find that corporate tax changes do affect equity prices.

[Table 7 goes about here]

We further document that a tax cut produces more impact on firms with low leverage and progressively less impact on firms with high leverage. This is consistent with the previously documented positive sign on the interaction between the *Corporate Tax Change* variable (which has a negative sign in the event study) and leverage. To the extent that no other shocks coincide with the tax reforms in a systematic manner and that tax reductions have a greater effect on firms with low leverage, this evidence allows us to claim that the results found reflect tax savings from interest tax shields.

Table 8 presents some regression results. Regression (1) confirms a positive sign for the interaction between leverage and corporate tax reforms, after controlling for a number of firm-level attributes. Regression (2) documents that this effect is more pronounced for the subset of

[10] Consider an unleveraged firm. Holding investment opportunities constant, $\frac{\delta E}{E} = -\delta T_C \cdot \frac{1}{r} \cdot \frac{E(OCF)}{E}$ where E is the value of the firm under the old tax system, or $\frac{E(OCF)\cdot(1-T_C)}{r}$. This implies that $\frac{\delta E}{E} = \frac{-\delta T_C}{(1-T_C)}$ given that $0 \leq T_c < 1$, $\frac{\delta E}{E} \geq -\delta T_C$. Recall that, in our case, $-\delta T_C \geq 0.05$. As a consequence, the expected change in firm value following the tax reduction should be no less than 5%.

firms with high profitability and presumably higher marginal tax rates. Similarly, the results are more pronounced in countries with low tax evasion as well as those with high shareholder protection (Regressions (3) and (4), respectively). Regression (5) shows that the results are robust to controlling for possible reform-specific omitted variables though the inclusion of reform fixed effects.

[Table 8 goes about here]

## 4. Other robustness tests

### 4.1 Propensity score matching

We start our robustness tests by showing that our conclusions are not driven by the specific econometric methodology chosen. For this purpose, we alternatively employ a propensity score matching methodology (Rosenbaum and Rubin, 1983). Propensity score matching has become a very popular methodology in empirical corporate finance over approximately the past ten years.

To implement this approach, we start by calculating the probability that a firm with given characteristics undergoes a large tax-reducing reform (a reduction in the corporate tax rate of at least five percentage points).[11] The propensity score is estimated as a function of the following firm characteristics: Firm size (Ln(Sales)), market-to-book (M/B), change in EBIT scaled by total assets ($dE_t/A_{t-1}$), change in net PPE scaled by total assets ($dNPPE_t/A_{t-1}$), change in R&D expenditures scaled by total assets ($dRD_t/A_{t-1}$), leverage ($Leverage_{t-1}$) and profitability ($E_t/A_{t-1}$). For a given firm that undergoes a given tax reform, a matching peer is selected from the same year, but from a country that did not experience a large tax-reducing reform. To ensure that any

[11] We focus on tax-reducing reforms in the propensity score matching test due to the very small number of large tax-increasing reforms.

differences between the two sets of firms are kept at minimum, we require that the difference between the propensity scores does not exceed 0.1% in absolute value.

[Table 9 goes about here]

Panel A of Table 9 compares the change in firm value in the year following a tax reduction to the change in the value experienced during the same period by firms based in countries that do not experience a tax reform. The change in value is computed relative to the value as of the year-end prior to the tax reform. We find that firms that undergo a reform experience an average increase in value of 7.08%. In contrast, similar firms in countries that do not experience a tax reform have an average increase in value of around 2.53%. The differential increase in value of 4.55% during the year of a reform is highly statistically significant with a *p*-value of 0.01. (This value change is not reversed in subsequent years).

Further, given the set of firms that undergo a large tax reform (a reduction in the corporate tax rate of at least five percentage points), we also use the propensity score matching procedure to identify a control sample of firms with low leverage but that are otherwise similar in characteristics to highly-leveraged firms undergoing the same reform (the treatment group). We then compare the two groups with respect to change in value relative to the value of the firms at the year-end prior to the tax reform. As the set of control firms are nearly identical to the treatment group in terms of observables, the average change in firm value should be similar between the two groups if debt tax shields did *not* affect value.

Those results are reported in Panels B and C. There, we compare the change in value for firms with high leverage (above median in Panel B and top quartile in Panel C) to that of control firms with low leverage (below median in Panel B and bottom quartile in Panel C). Both sets of firms are taken from the same country/year. The results indicate that the change in value during

the year of the reform is significantly greater for firms with low leverage. Highly-leveraged firms are instead only marginally affected by the tax reform. These results are totally in line with our earlier evidence, including the event study results. Therefore, we conclude that our earlier results are not driven by the specific econometric methodology used.

### 4.2 Other fixed effects specifications

The regression specifications in Tables 2-6 use a very conservative approach in which country*year fixed effects are included to account for *any* country- and time-specific shock that might affect firm value. A cost of such a conservative approach is that it prevented us from assessing the role of country-specific variables of possible interest.

In Regressions (1) and (2) of Table 10 we relax our approach and introduce country-fixed effects along with year-fixed effects *in lieu* of the country*year interactions. We then add country-level controls. In particular, in Regression (1) we control for the actual changes in corporate and personal tax rates. We find that an increase in personal taxes on dividend income negatively affects value, while an increase in personal taxes on interest income positively affects value. Reforms affecting corporate tax rates do not have an effect over and beyond that stemming from the incremental taxation of corporate income and debt-related tax savings. In Regression (2) we add controls for (i) inflation and (ii) real interest rates, both of which have a negative impact on value; (iii) a bankruptcy reform indicator for each country, identifying the introduction of a procedure that allows an insolvent firm to undergo a Chapter 11-type reorganization; [12] and (iv) a governance reform indicator for each country denoting the

[12] We gather data on bankruptcy reforms from Armour and Cumming (2008); Fisher and Martel (2003); Galgano (1994); Korkeamaki, Koskinen, and Takalo (2007); Philippe & Partners and Deloitte & Touche (2002); Richter (2006); Rohrlich (1935); news articles; and internet searches.

introduction of the first corporate governance code.[13] This approach thus explicitly controls for changes in bankruptcy and governance costs across countries. Importantly, we show that our earlier results are robust to these alternative specifications.

[Table 10 goes about here]

### 4.3 Alternative measures of leverage and change in value

In Regression (3) of Table 10 we assess the robustness of our earlier results by using the interest-to-assets ratio as a proxy for leverage (Fama and French, 1998). The results are robust to this change in the specification.

We also show that the results are robust to different measures of change in value. In particular, in Regression (4), value changes are measured as changes in the market value of equity divided by total assets. This regression differs from earlier specifications in that the change in market value of equity is not adjusted for stock issuance, repurchases, and/or retained earnings. The results are not sensitive to this adjustment. Alternatively, in Regression (5), we use the change in the market-to-book ratio as the dependent variable. Once again, the results are not affected by this change.

## 5. Economic significance

The results in Table 9, Panel B, allow an easy and direct estimation of the economic magnitude of the tax benefits of debt. The tax reforms covered in Panel B result in an average reduction in the corporate tax rate, $\delta T_C$, of 7.57 percentage points. The value of high-leverage firms increases by an average of 0.0173 during the one-year interval following these tax reforms. By comparison, the value of low-leverage firms increases by an average of 0.0511.

[13] http://www.ecgi.org/codes/all_codes.php

From earlier Equation (2), it follows that the difference in the change in value between the two sets of firms, -0.034, is approximately equal to $\delta T_C \cdot \frac{(1-T_C)}{(1-T_D)} \cdot \delta\left(\frac{D}{A}\right)$, or -0.024 = (-0.0757)·1.11·(0.39-0.10). Thus, the market appears to attach a value of at least $\$T_C$ to a permanent outstanding amount of $1 of debt. We therefore conclude that the tax savings associated with the deductibility of interest payments are sizeable. Note that such a high value of debt tax shields is compatible with a scenario in which bondholders tend to be tax-exempt institutions or investors subject to low personal tax rates on interest income.

## 6. Conclusions

Using shocks to tax benefits of debt induced by tax reforms, we estimate the market value of debt tax savings. In line with a simple tax story we document that, in the time-series, the impact of reforms on value differs across firms as a function of leverage. For example, while an increase in corporate tax rates negatively affects firm value, this effect is substantially mitigated in the presence of high leverage.

The results are not driven by unobserved country-level shocks, which are accounted for through the inclusion of country*year fixed effects. Rather, in the time-series regressions, identification comes from the different response to a reform as a function of a firm's leverage ratio. A battery of other tests corroborate a tax explanation of our results. For example, the impact of tax reforms differs across firms depending on their tax status. In particular, following an increase in corporate tax rates, debt tax shields are more valuable for high corporate tax payers and more profitable firms.

The impact of tax reforms also varies across countries in sensible ways. For example, we find that tax reforms have a lower impact on value in countries with high tax evasion. In those

countries, the market value of debt tax savings is, perhaps not surprisingly, also lower. Similarly, reforms have a smaller impact on value in countries where insiders can easily shelter income from taxation by other means, such as stealing. The results also do not appear to be driven by the growth (if any) induced by the reforms.

Further, the results are robust to focusing on short event windows around the introduction of unexpected reforms. By focusing on short windows, we can contain any possible contamination of the news. Importantly, excluding other shocks by narrowing the event window mitigates the possibility that the results could be driven by omitted shocks that affect various firms differently.

We also show that the results are robust to using a propensity score matching approach as an alternative to a change regression specification. Further, the results are robust to different measurements of the key dependent and independent variables.

Important to the corporate finance profession, by using tax reforms as shocks to tax benefits of debt, we are able to provide a clear answer to a core question: Do capital structure choices affect firm value? Indeed, we find that capital structure choices have a large impact on firm value. In particular, the market attaches a value of approximately $\$1 \cdot T_c$ to the tax savings associated with \$1 of permanent debt.

**References**


Armour, John and Douglas Cumming, 2008, Bankruptcy law and entrepreneurship, ECGI working paper 105/2008.

DeAngelo, Harry, and Ronald W. Masulis, 1980, Optimal capital structure under corporate and personal taxation, *Journal of Financial Economics* 8, 3-29.

Desai, Mihir A., Alexander Dyck, and Luigi Zingales, 2007, Theft and taxes, *Journal of Financial Economics* 84, 591-623.

Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer, 2008, The law and economics of self-dealing, *Journal of Financial Economics* 88, 430-465.

Doidge, Craig and Alexander Dyck, 2013, Taxes and corporate policies: Evidence from a quasi natural experiment, *Journal of Finance*, forthcoming.

Eckbo, B. Espen, Ronald W. Masulis, and Oyvind Norli, 2007, Security offerings. In: *Handbook of Corporate Finance: Empirical Corporate Finance,* Vol. 1, B. E. Eckbo, ed., Chapter 6, pp. 233-373, Elsevier/North-Holland Handbook of Finance Series

Faccio, Mara and Jin Xu, 2013, Taxes and capital structure, *Journal of Financial and Quantitative Analysis*, forthcoming.

Fama, Eugene F. and Kenneth R. French, 1998, Taxes, financing decisions, and firm value, *Journal of Finance* 53, 819-843.

Fisher, Timothy C.G. and Jocelyn Martel, 2003, The effect of bankruptcy reform on the number of corporate reorganization proposals, *Canadian Public Policy* 29, 339-350.

Galgano, Francesco, 1994, *Diritto Commerciale: Le Società*, 4th Edition, Zanichelli: Bologna.

Graham, John R. and Mark T. Leary, 2011, A review of capital structure research and directions for the future, *Annual Review of Financial Economics* 3, 309-345.

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

Green, Richard C. and Burton Hollifield, 2003, The personal-tax advantages of equity, *Journal of Financial Economics* 67, 175-216.

Kemsley, Doron and Deen Nissim, 2002, Valuation of the debt tax shield, *Journal of Finance* 57, 2045-2073.

Korkeamaki, Timo P., Yrjo Koskinen, and Tuomas Takalo, 2007, Phoenix rising: Legal reforms and changes in valuations in Finland during the economic crisis, Boston University School of Management Working Paper No. 2006-18.

Korteweg, Arthur, 2010, The net benefits to leverage, *Journal of Finance* 65, 2137–2170.

Masulis, Ronald W., 1980, The effects of capital structure changes on security prices: A study of exchange offers, *Journal of Financial Economics* 8, 139-177.

McConnell, John J. and Gary G. Schlarbaum, 1981, Evidence on the impact of exchange offers on security prices: The case of income bonds, *Journal of Business* 54, 65-85.

Miller, Merton H., 1977, Debt and taxes, *Journal of Finance* 32, 261-275.

Modigliani, Franco and Merton H. Miller, 1958, The cost of capital, corporation finance, and the theory of investment, *American Economic Review* 48, 261-297.

Modigliani, Franco and Merton H. Miller, 1963, Corporate income taxes and the cost of capital: A correction, *American Economic Review* 56, 333-391.

Morck, Randall, Andrei Shleifer, and Robert W. Vishny, 1988, Management ownership and market valuation: An empirical analysis, *Journal of Financial Economics* 20, 293-315.

Philippe & Partners and Deloitte & Touche, 2002, Bankruptcy and a fresh start: Stigma on failure and legal consequences of bankruptcy, working paper, Brussels.

Richter, Thomas, 2006, The new Czech insolvency act -- New insolvency regime for Czech corporate debtors and their creditors, *Butterworths Journal of International Banking and Financial Law* 21, 271-72.

Rohrlich, Chester, 1935, The new deal in corporation law, *Columbia Law Review* 35, 1167-1195.

Rosenbaum, Paul R. and Donald B. Rubin, 1983, The central role of the propensity score in observational studies for causal effects, *Biometrika* 70, 41-55.

Van Binsbergen, Jules H., John R. Graham, and Jie Yang, 2010, The cost of debt, *Journal of Finance* 65, 2089-2136.

## Table 1: Summary Statistics

This table summarizes the variables. Changes in taxes are the changes in tax rates from the previous year to the current year. $dVni_t/A_{t-1}$ is the change in the market value of assets, net of issuances, scaled by lagged book assets, defined as the annual change in the market value of equity subtracting the annual change in the book value of equity, all divided by lagged book assets. $E_t/A_{t-1}$ is the earnings before interest and taxes divided by lagged total assets. $Ln(Sales_t)$ is the logarithmic net sales. $(M/B)_{t-1}$ is the lagged Market-to-Book ratio, defined as total assets minus book equity plus market equity, all divided by total assets. $dE_t/A_{t-1}$ is the change in earnings before interest and taxes divided by lagged total assets. $NPPE_t/A_t$ is net property, plant, and equipment divided by total assets. $dNPPE_t/A_{t-1}$ is the change in NPPE divided by lagged total assets. $dRD_t/A_{t-1}$ is the annual change in research and development expenditures divided by lagged total assets. Leverage is interest-bearing debt divided by total assets.

| Variable | Number of observations | Mean | Median | Standard deviation |
|---|---|---|---|---|
| Corporate Tax | 258,742 | 0.3828 | 0.3928 | 0.0663 |
| Interest Tax | 258,259 | 0.3388 | 0.3500 | 0.1054 |
| Dividend Tax | 258,742 | 0.2640 | 0.2720 | 0.1059 |
| Corporate Tax change | 258,742 | -0.0049 | 0.0000 | 0.0174 |
| Interest Tax change | 258,259 | -0.0032 | 0.0000 | 0.0265 |
| Dividend Tax change | 258,742 | -0.0095 | 0.0000 | 0.0536 |
| $dVni_t/A_{t-1}$ | 258,742 | 0.0791 | 0.0048 | 1.5502 |
| $E_t/A_{t-1}$ | 258,742 | 0.0189 | 0.0544 | 0.2563 |
| $Ln(Sales_t)$ | 258,742 | 12.0827 | 12.1878 | 2.4126 |
| $(M/B)_{t-1}$ | 258,742 | 1.8488 | 1.1995 | 2.4597 |
| $dE_t/A_{t-1}$ | 258,742 | 0.0142 | 0.0047 | 0.2393 |
| $dNPPE_t/A_{t-1}$ | 258,742 | -0.0001 | -0.0004 | 0.0611 |
| $dRD_t/A_{t-1}$ | 258,742 | 0.0017 | 0.0000 | 0.0183 |
| $Leverage_{t-1}$ | 258,742 | 0.2380 | 0.1978 | 0.2155 |

## Table 2: Leverage and the Effect of Tax Reforms on Value Changes

The dependent variable is $dVni_t/A_{t-1}$, the annual change in the market value of assets, net of issuances, scaled by lagged book assets. D1 equals (1-Dividend Tax)/(1-Interest Tax). D2 equals [(1-Corporate Tax)*(1-Dividend Tax)]/(1-Interest Tax)$^2$. D3 equals (1-Corporate Tax)/(1-Interest Tax). All other variables are defined in Table 1. T-values based on standard errors adjusted for firm clustering are shown in the parentheses below the coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

| | (1) | (2) | (3) |
|---|---|---|---|
| $E_t/A_{t-1}$*Corporate Tax change | -30.277*** | -30.007*** | -30.497*** |
| | (-8.25) | (-8.19) | (-8.30) |
| $Leverage_{t-1}$*Corporate Tax change | 2.449** | 5.417*** | |
| | (2.04) | (3.88) | |
| $Leverage_{t-1}$*Corporate Tax change*D1 | | | 3.680*** |
| | | | (2.95) |
| $Leverage_{t-1}$*Interest Tax change | | -7.924*** | |
| | | (-5.21) | |
| $Leverage_{t-1}$*Interest Tax change*D2 | | | -7.091*** |
| | | | (-4.86) |
| $Leverage_{t-1}$*Dividend Tax change | | 2.217*** | |
| | | (3.51) | |
| $Leverage_{t-1}$*Dividend Tax change*D3 | | | 2.104*** |
| | | | (2.86) |
| $Ln(Sales_t)$ | -0.017*** | -0.017*** | -0.017*** |
| | (-9.38) | (-9.37) | (-9.15) |
| $(M/B)_{t-1}$ | -0.073*** | -0.074*** | -0.069*** |
| | (-11.18) | (-11.19) | (-10.55) |
| $dE_t/A_{t-1}$ | 0.269*** | 0.269*** | 0.195*** |
| | (5.11) | (5.11) | (3.72) |
| $dNPPE_t/A_{t-1}$ | -1.541*** | -1.541*** | -1.538*** |
| | (-14.51) | (-14.48) | (-14.45) |
| $dRD_t/A_{t-1}$ | 4.662*** | 4.665*** | 0.822*** |
| | (9.35) | (9.35) | (5.74) |
| $Leverage_{t-1}$ | 0.109*** | 0.117*** | 0.114*** |
| | (4.14) | (4.43) | (4.29) |
| $E_t/A_{t-1}$ | -0.428*** | -0.426*** | -0.369*** |
| | (-9.34) | (-9.29) | (-7.86) |
| FEs | Country*Year | Country*Year | Country*Year |
| Number of Observations | 258,742 | 258,259 | 258,259 |
| Adj. $R^2$ | 0.062 | 0.062 | 0.060 |

Note: All Tax change variables drop out of the models naturally due to the inclusion of Country*Year fixed effects.

## Table 3: The Value Impact of Leverage Adjustments that Follow Tax Reforms

The dependent variable is $dVni_t/A_{t-1}$, the annual change in the market value of assets, net of issuances, scaled by lagged book assets. Leverage adjustment is defined as the product between an Adjustment dummy and the absolute change in leverage. The Adjustment dummy takes the value of 1 if the change in corporate tax and the change in leverage are in the same direction, 0 otherwise. All other variables are defined in Table 1. The regression model includes country*year fixed effects. T-values based on standard errors adjusted for firm clustering are shown in the parentheses below the coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

| | (1) |
|---|---|
| Leverage adjustment | 1.058*** |
| | (6.52) |
| Corporate Tax Change | 6.388* |
| *Leverage adjustment | (1.85) |
| $E_t/A_{t-1}$*Corporate Tax change | -28.377*** |
| | (-7.71) |
| $Leverage_{t-1}$*Corporate Tax Change | 3.446*** |
| | (2.90) |
| $Ln(Sales_t)$ | -0.016*** |
| | (-8.72) |
| $(M/B)_{t-1}$ | -0.074*** |
| | (-11.27) |
| $dE_t/A_{t-1}$ | 0.259*** |
| | (4.92) |
| $dNPPE_t/A_{t-1}$ | -1.509*** |
| | (-14.22) |
| $dRD_t/A_{t-1}$ | 4.638*** |
| | (9.31) |
| $Leverage_{t-1}$ | 0.072*** |
| | (2.72) |
| $E_t/A_{t-1}$ | -0.412*** |
| | (-8.97) |
| Country*Year FEs | Yes |
| Number of Observations | 258,678 |
| Adj. $R^2$ | 0.063 |

## Table 4: Leverage and the Effect of Tax Reforms on Value Changes, Top Tax Payers

The dependent variable is $dVni_t/A_{t-1}$, the annual change in the market value of assets, net of issuances, scaled by lagged book assets. High effective tax rate means the effective tax rate is above median. The effective tax rate is taxes paid over pre-tax income. High ROA means ROA is above median. Dividend Payer is 1 if the firm pays cash dividends in a given year, 0 otherwise. All other variables are defined in Table 1. All regression models include country*year fixed effects. T-values based on standard errors adjusted for firm clustering are shown in the parentheses below the coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

| Top tax payer is a firm with | High effective tax rate | High ROA | Dividend Payer |
|---|---|---|---|
| | (1) | (2) | (3) |
| $E_t/A_{t-1}$*Corporate Tax change | -31.528*** | -29.555*** | -30.787*** |
| | (-8.25) | (-7.13) | (-8.24) |
| $Leverage_{t-1}$*Corporate Tax change | 2.358 | -1.783 | 4.607*** |
| | (1.61) | (-1.19) | (3.32) |
| $Leverage_{t-1}$*Corporate Tax change | 6.278*** | 12.045*** | |
| *Top Payer | (6.68) | (10.46) | |
| $Leverage_{t-1}$*Interest Tax change | -8.192*** | -6.871*** | -6.593*** |
| | (-5.36) | (-4.57) | (-4.61) |
| $Leverage_{t-1}$*Dividend Tax change | 2.270*** | 2.600*** | -1.019 |
| | (3.60) | (4.15) | (-1.17) |
| $Leverage_{t-1}$*Dividend Tax change | | | 5.775*** |
| *Top Payer | | | (8.58) |
| $Ln(Sales_t)$ | -0.019*** | -0.024*** | -0.016*** |
| | (-10.55) | (-13.04) | (-8.38) |
| $(M/B)_{t-1}$ | -0.075*** | -0.082*** | -0.074*** |
| | (-11.24) | (-11.77) | (-11.30) |
| $dE_t/A_{t-1}$ | 0.275*** | 0.304*** | 0.261*** |
| | (5.22) | (5.73) | (4.90) |
| $dNPPE_t/A_{t-1}$ | -1.533*** | -1.521*** | -1.563*** |
| | (-14.44) | (-14.42) | (-14.66) |
| $dRD_t/A_{t-1}$ | 4.686*** | 4.874*** | 4.605*** |
| | (9.39) | (9.71) | (9.20) |
| $Leverage_{t-1}$ | 0.128*** | 0.103*** | 0.097*** |
| | (4.74) | (3.91) | (3.58) |
| $E_t/A_{t-1}$ | -0.455*** | -0.588*** | -0.416*** |
| | (-9.41) | (-11.38) | (-8.89) |
| Top Payer | 0.054*** | 0.207*** | -0.022*** |
| | (6.90) | (22.43) | (-2.66) |
| Country*Year FEs | Yes | Yes | Yes |
| Number of Observations | 258,189 | 252,332 | 254,600 |
| Adj. $R^2$ | 0.062 | 0.066 | 0.062 |

## Table 5: Leverage and the Effect of Tax Reforms on Value Changes, Heterogeneous Effects by Country Legal Institutions

The dependent variable is $dVni_t/A_{t-1}$, the annual change in the market value of assets, net of issuances, scaled by lagged book assets. Low Tax Evasion refers to lower than median tax evasion and Strong Anti-self-dealing Protection refers to greater than median Anti-self-dealing Index. All other variables are defined in Table 1. All regression models include country*year fixed effects. The regression models also include all the control variables in Table 2 although their coefficients are omitted for brevity. T-values based on standard errors adjusted for firm clustering are shown in the parentheses below the coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

| Good Institution is | Low Tax Evasion | | Strong Anti-self-dealing Protection | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $E_t/A_{t-1}$*Corporate Tax change | -30.888*** | -30.094*** | -24.750*** | -24.005*** |
| *Good Institution | (-4.62) | (-4.51) | (-3.64) | (-3.53) |
| $Leverage_{t-1}$*Corporate Tax change | 10.970*** | 18.395*** | 9.964*** | 16.891*** |
| *Good Institution | (4.99) | (7.14) | (4.30) | (6.32) |
| $Leverage_{t-1}$*Interest Tax change | | -15.858*** | | -16.135*** |
| *Good Institution | | (-6.31) | | (-6.22) |
| $Leverage_{t-1}$*Dividend Tax change | | 3.574*** | | 6.740*** |
| *Good Institution | | (3.33) | | (5.93) |
| $E_t/A_{t-1}$*Corporate Tax change | -4.519 | -4.575 | -8.693* | -8.599* |
| | (-1.03) | (-1.04) | (-1.85) | (-1.83) |
| $Leverage_{t-1}$*Corporate Tax change | -6.222*** | -6.457*** | -5.694*** | -5.554*** |
| | (-3.90) | (-4.01) | (-3.17) | (-3.08) |
| $Leverage_{t-1}$*Interest Tax change | | 2.039 | | 1.630 |
| | | (1.54) | | (1.41) |
| $Leverage_{t-1}$*Dividend Tax change | | 0.259 | | -2.842*** |
| | | (0.31) | | (-3.08) |
| $Leverage_{t-1}$*Good Institution | 0.287*** | 0.300*** | 0.300*** | 0.325*** |
| | (7.08) | (7.38) | (7.26) | (7.81) |
| $E_t/A_{t-1}$*Good Institution | -0.941*** | -0.938*** | -0.838*** | -0.835*** |
| | (-8.01) | (-7.98) | (-6.18) | (-6.15) |
| Other controls (see Table 2) | Yes | Yes | Yes | Yes |
| Country*Year FEs | Yes | Yes | Yes | Yes |
| Number of Observations | 258,742 | 258,259 | 258,742 | 258,259 |
| Adj. $R^2$ | 0.063 | 0.063 | 0.063 | 0.063 |

## Table 6: Leverage and the Effect of Tax Reforms on Value Changes, Macroeconomic Conditions

The dependent variable is $dVni_t/A_{t-1}$, the annual change in the market value of assets, net of issuances, scaled by lagged book assets. Cyclical is represented by one of the two following variables. The first is an indicator for Above-Median Sensitivity of M/B Change to GDP Growth, defined as the slope coefficient from an industry-by-industry regression of the annual change in M/B on GDP growth. The second is an indicator named Cyclical Industry, which is 1 for any 2-digit SIC industry whose performance is perceived to be positively related to the overall market and 0 for non-cyclical industries. All other variables are defined in Table 1. All regression models include country*year fixed effects. The regression models also include all the control variables in Table 2 although their coefficients are omitted for brevity. T-values based on standard errors adjusted for firm clustering are shown in the parentheses below the coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

| Cyclical = Dummy for | Above-Median Sensitivity of M/B Change to GDP Growth | | Cyclical Industry | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $E_t/A_{t-1}$*Corporate Tax change | -35.513*** | -35.065*** | -28.957*** | -28.658*** |
| | (-7.35) | (-7.27) | (-4.43) | (-4.38) |
| $Leverage_{t-1}$*Corporate Tax change | 2.990** | 6.020*** | 2.805 | 6.334*** |
| | (2.08) | (3.66) | (1.61) | (3.20) |
| $Leverage_{t-1}$*Interest Tax change | | -8.388*** | | -7.852*** |
| | | (-4.76) | | (-4.41) |
| $Leverage_{t-1}$*Dividend Tax change | | 1.544** | | 3.780*** |
| | | (2.07) | | (4.54) |
| $E_t/A_{t-1}$*Corporate Tax change | 9.212* | 8.861 | -1.640 | -1.760 |
| *Cyclical | (1.70) | (1.64) | (-0.25) | (-0.26) |
| Leverage*Corporate Tax change | -0.925 | -1.025 | -0.258 | -0.865 |
| *Cyclical | (-0.76) | (-0.78) | (-0.16) | (-0.50) |
| $Leverage_{t-1}$*Interest Tax change | | 0.755 | | -0.285 |
| *Cyclical | | (0.64) | | (-0.21) |
| $Leverage_{t-1}$*Dividend Tax change | | 1.232** | | -1.855*** |
| *Cyclical | | (2.23) | | (-2.75) |
| Cyclical | 0.007 | 0.010 | -0.057*** | -0.061*** |
| | (0.94) | (1.33) | (-6.02) | (-6.44) |
| $E_t/A_{t-1}$*Cyclical | -0.117 | -0.120 | 0.422*** | 0.424*** |
| | (-1.34) | (-1.37) | (3.86) | (3.89) |
| Other controls (see Table 2) | Yes | Yes | Yes | Yes |
| Country*Year FEs | Yes | Yes | Yes | Yes |
| Number of Observations | 257,689 | 257,206 | 248,831 | 248,381 |
| Adj. $R^2$ | 0.062 | 0.062 | 0.062 | 0.062 |

## Table 7: Summary Statistics of Corporate Tax Reduction Events Tests

Panel A lists the dates, types and other information about the news announcements on major corporate tax reductions in OECD countries during 1980 through 2009. Major corporate tax reductions are tax reductions of 5% or more. News type "rumor" indicates news about a possible upcoming tax reform without much detail. News type "intention" indicates news about a government's or legislator's intention to initiate a tax reform with fair amounts of detail. News type "law" indicates news about the passage of the tax law. Panel B provides summary statistics of the 5-day Cumulative Stock Returns for all firms, by news type, and for book leverage quartiles. The 5-day Cumulative Stock Return is the sum of daily stock returns in the five-day window surrounding a tax reduction event (between day -2 and day 2), multiplied by the firm's market value of equity and divided by the book value of total assets. Leverage is total interest-bearing debt divided by total assets at the beginning of the reform year. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Description of news events around corporate tax changes

| News Counts | Country | Year Tax Change Implemented | News Type | News Date | Old Tax Rate | New Tax Rate |
|---|---|---|---|---|---|---|
| 1 | Australia | 1988 | rumor | 9/17/1987 | 49.00 | 39.00 |
| 2 | Australia | 1988 | intention | 2/14/1988 | 49.00 | 39.00 |
| 3 | Australia | 1988 | law | 5/26/1988 | 49.00 | 39.00 |
| 4 | Australia | 1988 | law | 5/29/1988 | 49.00 | 39.00 |
| 5 | Australia | 1993 | rumor | 2/10/1993 | 39.00 | 33.00 |
| 6 | Austria | 1989 | law | 3/7/1988 | 55.00 | 30.00 |
| 7 | Austria | 2005 | rumor | 3/7/2003 | 34.00 | 25.00 |
| 8 | Austria | 2005 | rumor | 1/9/2004 | 34.00 | 25.00 |
| 9 | Austria | 2005 | law | 3/23/2004 | 34.00 | 25.00 |
| 10 | Belgium | 2003 | rumor | 10/4/2001 | 40.17 | 33.99 |
| 11 | Belgium | 2003 | intention | 10/9/2001 | 40.17 | 33.99 |
| 12 | Belgium | 2003 | intention | 3/26/2002 | 40.17 | 33.99 |
| 13 | Belgium | 2003 | law | 12/11/2002 | 40.17 | 33.99 |
| 14 | Denmark | 1990 | intention | 5/12/1989 | 50.00 | 40.00 |
| 15 | Denmark | 1990 | law | 12/1/1989 | 50.00 | 40.00 |
| 16 | Finland | 1990 | intention | 11/1/1989 | 52.50 | 44.50 |
| 17 | Finland | 1993 | intention | 9/25/1992 | 39.00 | 25.00 |
| 18 | France | 1992 | intention | 8/29/1990 | 42.00 | 34.00 |
| 19 | France | 1992 | law | 6/1/1991 | 42.00 | 34.00 |
| 20 | Germany | 1990 | intention | 6/22/1989 | 60.00 | 54.55 |
| 21 | Germany | 1990 | intention | 8/28/1990 | 60.00 | 54.55 |
| 22 | Germany | 2001 | intention | 12/7/1999 | 52.03 | 38.90 |
| 23 | Germany | 2001 | intention | 12/21/1999 | 52.03 | 38.90 |
| 24 | Germany | 2001 | intention | 2/9/2000 | 52.03 | 38.90 |
| 25 | Germany | 2001 | law | 7/14/2000 | 52.03 | 38.90 |
| 26 | Germany | 2008 | intention | 3/14/2007 | 38.90 | 30.18 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 27 | Germany | 2008 | law | 7/6/2007 | 38.90 | 30.18 |
| 28 | Hungary | 1995 | rumor | 10/26/1994 | 36.00 | 18.00 |
| 29 | Hungary | 1995 | intention | 10/28/1994 | 36.00 | 18.00 |
| 30 | Italy | 1998 | intention | 5/3/1996 | 53.20 | 41.25 |
| 31 | Italy | 1998 | intention | 9/13/1997 | 53.20 | 41.25 |
| 32 | Italy | 1998 | intention | 10/15/1997 | 53.20 | 41.25 |
| 33 | Italy | 1998 | law | 12/9/1997 | 53.20 | 41.25 |
| 34 | Italy | 2008 | rumor | 8/28/2007 | 37.25 | 31.40 |
| 35 | Italy | 2008 | intention | 9/25/2007 | 37.25 | 31.40 |
| 36 | Italy | 2008 | law | 9/28/2007 | 37.25 | 31.40 |
| 37 | Italy | 2008 | law | 12/5/2007 | 37.25 | 31.40 |
| 38 | Japan | 2000 | intention | 5/17/1998 | 48.00 | 42.00 |
| 39 | Luxembourg | 2002 | intention | 9/18/2000 | 37.45 | 30.38 |
| 40 | Netherlands | 1989 | intention | 3/15/1988 | 42.00 | 35.00 |
| 41 | New Zealand | 1988 | intention | 11/19/1987 | 48.00 | 28.00 |
| 42 | New Zealand | 1988 | intention | 12/17/1987 | 48.00 | 28.00 |
| 43 | New Zealand | 1988 | law | 2/10/1988 | 48.00 | 28.00 |
| 44 | Norway | 1992 | intention | 5/21/1990 | 50.80 | 28.00 |
| 45 | Norway | 1992 | intention | 4/10/1991 | 50.80 | 28.00 |
| 46 | Poland | 2004 | rumor | 2/24/2003 | 27.00 | 19.00 |
| 47 | Poland | 2004 | intention | 4/10/2003 | 27.00 | 19.00 |
| 48 | Poland | 2004 | intention | 4/24/2003 | 27.00 | 19.00 |
| 49 | Poland | 2004 | law | 6/17/2003 | 27.00 | 19.00 |
| 50 | Portugal | 2004 | intention | 3/17/2002 | 33.00 | 27.50 |
| 51 | Portugal | 2004 | intention | 12/19/2002 | 33.00 | 27.50 |
| 52 | Portugal | 2004 | intention | 11/1/2003 | 33.00 | 27.50 |
| 53 | Portugal | 2004 | law | 11/21/2003 | 33.00 | 27.50 |
| 54 | Slovakia | 2000 | intention | 5/19/1998 | 40.00 | 29.00 |
| 55 | Slovakia | 2000 | intention | 11/1/1999 | 40.00 | 29.00 |
| 56 | Slovakia | 2000 | law | 11/24/1999 | 40.00 | 29.00 |
| 57 | Slovakia | 2004 | intention | 3/26/2003 | 25.00 | 19.00 |
| 58 | Sweden | 1990 | intention | 10/3/1989 | 60.10 | 53.00 |
| 59 | Turkey | 1994 | intention | 11/17/1993 | 49.22 | 42.80 |
| 60 | Turkey | 1999 | intention | 9/17/1997 | 44.00 | 33.00 |
| 61 | Turkey | 1999 | intention | 3/11/1998 | 44.00 | 33.00 |
| 62 | Turkey | 1999 | law | 7/23/1998 | 44.00 | 33.00 |
| 63 | Turkey | 2006 | intention | 8/4/2005 | 30.00 | 20.00 |
| 64 | Turkey | 2006 | intention | 9/8/2005 | 30.00 | 20.00 |
| 65 | Turkey | 2006 | intention | 11/29/2005 | 30.00 | 20.00 |
| 66 | United States | 1987 | intention | 11/28/1984 | 49.82 | 44.18 |
| 67 | United States | 1987 | intention | 5/30/1985 | 49.82 | 44.18 |
| 68 | United States | 1987 | law | 6/24/1986 | 49.82 | 44.18 |

Panel B: 5-day Cumulative stock returns (in %), total and by leverage quartiles

| | Number of observations | Mean |
|---|---|---|
| All firms | 18,743 | 0.44*** |
| By types of event | | |
| Rumor | 1,019 | 1.22*** |
| Intention | 12,431 | 0.36*** |
| Law | 5,293 | 0.49*** |
| Quartiles by leverage | | |
| 1 | 4,659 | 0.82*** |
| 2 | 4,725 | 0.54*** |
| 3 | 4,695 | 0.35*** |
| 4 | 4,664 | 0.07 |
| Q4 - Q1 | | -0.76*** |

## Table 8: Leverage, Tax Changes, and 5-day Cumulative Stock Returns

The dependent variable is the 5-day cumulative stock return (in %) around news events on major corporate tax reforms, as defined in Table 7. Major corporate tax reforms are corporate tax reductions of 5% or more. Tax change is the difference between the Old Tax Rate and the New Tax Rate of a reform. High ROA is a dummy variable that is 1 when ROA is above median, 0 otherwise. Low Tax Evasion is a dummy variable that is 1 when tax evasion is below median, 0 otherwise. Strong Anti-self-dealing Protection is a dummy that is 1 when the Anti-self-dealing Index is above median, 0 otherwise. All variables are defined in Table 1 and the independent variables are measured in the year (or year-end) prior to the event dates. T-values based on standard errors adjusted for firm clustering are shown in the parentheses below the coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

| Subgroup = | | High ROA | Low Tax Evasion | Strong Anti-self-dealing Protection | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $E_t/A_{t-1}$*Tax change | -94.520*** | 86.750** | -48.282 | -119.195 | -106.088*** |
| | (-2.94) | (2.37) | (-0.86) | (-1.61) | (-3.03) |
| $Leverage_{t-1}$*Tax change | 12.333* | -6.568 | -10.802 | -12.771 | 16.144** |
| | (1.83) | (-0.94) | (-0.86) | (-0.88) | (2.47) |
| $E_t/A_{t-1}$*Tax change*Subgroup | | -276.758*** | -48.344 | 98.240 | |
| | | (-3.91) | (-0.74) | (1.25) | |
| $Leverage_{t-1}$*Tax change *Subgroup | | 39.938*** | 34.894** | 48.715*** | |
| | | (2.61) | (2.44) | (3.01) | |
| $Log(Sales_t)$ | 0.078** | 0.071** | 0.082*** | 0.081*** | 0.072** |
| | (2.57) | (2.34) | (2.69) | (2.67) | (2.35) |
| $(M/B)_{t-1}$ | 0.027 | 0.015 | 0.029 | 0.027 | 0.028 |
| | (0.14) | (0.08) | (0.16) | (0.14) | (0.15) |
| $dE_t/A_{t-1}$ | 0.175 | 0.598 | 0.041 | 0.024 | -0.049 |
| | (0.20) | (0.66) | (0.05) | (0.03) | (-0.06) |
| $dNPPE_t/A_{t-1}$ | 1.230*** | 1.169*** | 0.891*** | 1.090*** | 0.311 |
| | (3.62) | (3.37) | (2.59) | (3.18) | (0.88) |
| $dRD_t/A_{t-1}$ | -14.854* | -14.447* | -13.000 | -14.915* | -14.773* |
| | (-1.74) | (-1.70) | (-1.55) | (-1.77) | (-1.76) |
| $Leverage_{t-1}$ | 0.248 | -1.133* | -2.311* | -2.567* | 0.964 |
| | (0.41) | (-1.67) | (-1.80) | (-1.67) | (1.63) |
| $E_t/A_{t-1}$ | -4.033 | 9.349*** | 0.917 | -4.319 | -4.316 |
| | (-1.50) | (2.71) | (0.18) | (-0.63) | (-1.47) |
| Tax change | -6.157** | -5.492 | 10.841** | 20.138*** | |
| | (-2.02) | (-1.62) | (2.06) | (3.19) | |
| $Leverage_{t-1}$*Subgroup | | 2.949** | 3.926*** | 4.806*** | |
| | | (2.25) | (2.78) | (2.91) | |

| | | | | | |
|---|---|---|---|---|---|
| Subgroup | | 0.491 | -2.972*** | -4.310*** | |
| | | (0.72) | (-5.07) | (-6.21) | |
| $E_t/A_{t-1}$*Subgroup | | -20.709*** | -4.696 | 4.613 | |
| | | (-3.59) | (-0.87) | (0.66) | |
| Tax change*Subgroup | | 5.037 | -23.444*** | -45.648*** | |
| | | (0.59) | (-3.68) | (-6.29) | |
| Rumor | 1.262*** | 1.215*** | 1.013*** | 1.315*** | 3.463*** |
| | (7.80) | (7.38) | (6.16) | (8.02) | (5.73) |
| Law | 0.227** | 0.228** | 0.086 | 0.227** | 0.455** |
| | (2.06) | (2.06) | (0.76) | (2.00) | (2.12) |
| FEs | Industry | Industry | Industry | Industry | Tax Reform Event, Industry |
| Number of observations | 15,775 | 15,550 | 15,775 | 15,775 | 15,775 |
| Adjusted $R^2$ | 0.025 | 0.029 | 0.032 | 0.031 | 0.074 |

## Table 9: Leverage and the Effect of Tax Reforms on Value Changes:

## Propensity Score Matching Results

Panel A reports the mean differences in firm characteristics and value changes ($dVni_t/A_{t-1}$) between firms in countries undergoing a corporate tax-reducing reform and control firms in countries without such a reform. Panels B and C report the mean differences between high-leverage firms and low-leverage control firms, both in countries undergoing a corporate tax-reducing reform. A corporate tax-reducing reform is defined as a reduction in the Corporate Tax of at least 5 percentage points. The control firms are matched by $Ln(Sales_t)$, $(M/B)_{t-1}$, $dE_t/A_{t-1}$, $dNPPE_t/A_{t-1}$, $Leverage_{t-1}$, $dRD_t/A_{t-1}$ and $E_t/A_{t-1}$ in Panel A and by $Ln(Sales_t)$, $(M/B)_{t-1}$, $dE_t/A_{t-1}$, $dNPPE_t/A_{t-1}$, $dRD_t/A_{t-1}$ and $E_t/A_{t-1}$ in Panels B and C. In Panel B, high-leverage firms are firms with leverage above the country median and low-leverage firms are firms with leverage below the country median. In Panel C, high-leverage firms are firms with leverage in the top leverage quartile and low-leverage firms are firms with leverage in the bottom leverage quartile. All matching variables are defined in Table 1. The matching process follows the propensity score matching procedure proposed by Rosenbaum and Rubin (1983). *P*-values are based on two-tailed T-tests. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Differences between firms undergoing corporate tax-reducing reforms and control firms without such reforms

| | Reform (N=5,304) | Nonreform (N=5,304) | Diff. in Means (Reform - Nonreform) | *p*-value |
|---|---|---|---|---|
| *Matching variables:* | | | | |
| $Ln(Sales_t)$ | 12.7567 | 12.8137 | -0.0570 | 0.12 |
| $(M/B)_{t-1}$ | 1.4321 | 1.4740 | -0.0419 | 0.10 |
| $dE_t/A_{t-1}$ | 0.0119 | 0.0118 | 0.0001 | 0.97 |
| $dNPPE_t/A_{t-1}$ | 0.0002 | 0.0002 | 0.0001 | 0.93 |
| $dRD_t/A_{t-1}$ | 0.0014 | 0.0014 | 0.0000 | 0.89 |
| $Leverage_{t-1}$ | 0.2256 | 0.2259 | -0.0003 | 0.93 |
| $E_t/A_{t-1}$ | 0.0777 | 0.0782 | -0.0005 | 0.85 |
| *Value change:* | | | | |
| $(Vni_t - Vni_{t-1})/A_{t-1}$ | 0.0708*** | 0.0253** | 0.0455*** | 0.01 |
| (*p*-value) | (0.00) | (0.05) | | |

Panel B. Differences between high-leverage (above median) firms and low-leverage (below median) control firms, both from countries undergoing corporate tax-reducing reforms

| | High leverage (N=2,028) | Low leverage (N=2,028) | Diff. (High - low leverage) | *p*-value |
|---|---|---|---|---|
| *Matching variables:* | | | | |
| $Ln(Sales_t)$ | 12.8963 | 12.9190 | -0.0227 | 0.65 |
| $(M/B)_{t-1}$ | 1.2948 | 1.2607 | 0.0341 | 0.26 |
| $dE_t/A_{t-1}$ | 0.0092 | 0.0091 | 0.0001 | 0.97 |
| $dNPPE_t/A_{t-1}$ | -0.0005 | -0.0010 | 0.0005 | 0.72 |
| $dRD_t/A_{t-1}$ | 0.0017 | 0.0014 | 0.0003 | 0.30 |
| $E_t/A_{t-1}$ | 0.0742 | 0.0732 | 0.0010 | 0.72 |
| *Value change:* | | | | |
| $(Vni_t - Vni_{t-1})/A_{t-1}$ | 0.0173 | 0.0511*** | -0.0338** | 0.05 |
| (*p*-value) | (0.16) | (0.00) | | |

Panel C. Differences between high-leverage (top quartile) firms and low-leverage (bottom quartile) control firms, both from countries undergoing corporate tax-reducing reforms

| | High leverage (N=649) | Low leverage (N=649) | Diff. (High - low leverage) | *p*-value |
|---|---|---|---|---|
| *Matching variables:* | | | | |
| $Ln(Sales_t)$ | 12.6209 | 12.7320 | -0.1110 | 0.20 |
| $(M/B)_{t-1}$ | 1.2481 | 1.2255 | 0.0226 | 0.64 |
| $dE_t/A_{t-1}$ | 0.0080 | 0.0066 | 0.0014 | 0.74 |
| $dNPPE_t/A_{t-1}$ | -0.0029 | 0.0006 | -0.0035 | 0.16 |
| $dRD_t/A_{t-1}$ | 0.0014 | 0.0022 | -0.0008 | 0.15 |
| $E_t/A_{t-1}$ | 0.0596 | 0.0610 | -0.0013 | 0.79 |
| *Value change over 1 or 2 years:* | | | | |
| $(Vni_t - Vni_{t-1})/A_{t-1}$ | 0.0378 | 0.1104*** | -0.0726** | 0.05 |
| (*p*-value) | (0.11) | (0.00) | | |

## Table 10: Robustness Tests

In Columns 1–3, the dependent variable is $dVni_t/A_{t-1}$, the annual change in the market value of assets, net of issuances, scaled by lagged book assets. The dependent variable is the annual change in the market value of assets scaled by lagged book assets in Column 4 and the annual change in M/B in Column 5. Real Interest Rate is "the lending interest rate adjusted for inflation as measured by the GDP deflator," and Inflation is measured by the consumer price index and "reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly." Both variables are obtained from the World Bank. All other variables are defined in Table 1. T-values based on standard errors adjusted for firm clustering are shown in the parentheses below the coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

| | Alt. FEs | Alt. FEs, more controls | Leverage measured by interest-to-assets | Value change measured by total value change | Value change measured by change in M/B |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $E_t/A_{t-1}$*Corporate Tax change | -25.649*** | -27.600*** | -29.140*** | -48.441*** | -25.688*** |
| | (-7.76) | (-8.19) | (-7.96) | (-11.66) | (-8.87) |
| $Leverage_{t-1}$*Corporate Tax change | 3.160*** | 4.054*** | 84.747*** | 5.771*** | 6.896*** |
| | (2.77) | (3.42) | (4.00) | (3.69) | (6.22) |
| $Leverage_{t-1}$*Interest Tax change | -8.071*** | -9.365*** | -103.821*** | -8.858*** | -4.488*** |
| | (-6.42) | (-7.24) | (-5.26) | (-5.21) | (-3.97) |
| $Leverage_{t-1}$*Dividend Tax change | 1.142* | 1.456** | 36.290*** | 2.497*** | 2.096*** |
| | (1.87) | (2.37) | (3.59) | (3.52) | (4.70) |
| $Ln(Sales_t)$ | -0.018*** | -0.018*** | -0.017*** | -0.017*** | -0.029*** |
| | (-9.60) | (-9.66) | (-9.26) | (-7.98) | (-16.71) |
| $(M/B)_{t-1}$ | -0.076*** | -0.077*** | -0.075*** | 0.010 | -0.249*** |
| | (-11.50) | (-11.63) | (-11.41) | (1.57) | (-32.91) |
| $dE_t/A_{t-1}$ | 0.286*** | 0.285*** | 0.249*** | 0.423*** | 0.398*** |
| | (5.43) | (5.39) | (4.71) | (7.18) | (9.60) |
| $dNPPE_t/A_{t-1}$ | -1.636*** | -1.635*** | -1.520*** | -2.038*** | 0.497*** |
| | (-15.35) | (-15.31) | (-14.27) | (-16.09) | (6.19) |
| $dRD_t/A_{t-1}$ | 4.692*** | 4.745*** | 4.727*** | 7.088*** | -1.180*** |
| | (9.37) | (9.48) | (9.47) | (13.01) | (-3.36) |
| $Leverage_{t-1}$ | 0.093*** | 0.094*** | 2.484*** | 0.070** | 0.262*** |
| | (3.58) | (3.62) | (7.44) | (2.44) | (11.59) |
| $E_t/A_{t-1}$ | -0.413*** | -0.414*** | -0.397*** | -0.303*** | -0.705*** |
| | (-9.03) | (-9.03) | (-8.63) | (-6.29) | (-14.01) |
| Corporate Tax change | 0.459 | 0.477 | | | |
| | (1.56) | (1.55) | | | |
| Interest Tax change | 1.233*** | 1.509*** | | | |
| | (6.35) | (7.26) | | | |
| Dividend Tax change | -0.598*** | -0.693*** | | | |
| | (-4.76) | (-5.45) | | | |
| Change in Inflation | | -4.989*** | | | |
| | | (-15.40) | | | |
| Change in the Real Interest Rate | | -0.952*** | | | |
| | | (-4.67) | | | |
| FEs | Country, Year | Country, Year, Bankruptcy reform, Governance reform | Country *Year | Country *Year | Country *Year |
| Number of Observations | 258,259 | 257,854 | 258,359 | 258,259 | 258,259 |
| Adj. $R^2$ | 0.045 | 0.046 | 0.063 | 0.067 | 0.223 |