Capital Structure, Corporate Investment, and Investor-Level Taxes: Evidence from a Natural Experiment in Europe*

Jonathan Cohn†
McCombs School of Business
University of Texas at Austin

Sheridan Titman
McCombs School of Business
University of Texas at Austin

Garry Twite
Faculty of Business and Economics
University of Melbourne

January 18, 2023

Abstract

We study two court rulings that materially affected dividend taxation in several European countries. The tax changes were not related to economic conditions or part of broader policy initiatives, providing a useful experiment for identifying the effect of taxation on capital structure, payout, and investment decisions. Consistent with theory, we find that dividends and equity issuance decline after these changes. Leverage ratios change little on average but increase substantially for capital-raising firms, which, in theory, are the most affected by the tax changes. Moreover, investment rates decrease for capital-raising firms, consistent with an increase in their after-tax cost of capital.

*This paper previously circulated under the title "Capital Structure and Taxes in Europe." We would like to thank Gil Aharoni, Harry De Angelo, Mara Faccio, Murray Frank, Neal Galpin, Bruce Grundy, Spencer Martin, Avri Ravid, audience members at the Western Finance Association meetings, and seminar participants at the University of Texas at Austin, University of Melbourne, and Corporate Finance Virtual Seminar series for feedback. All remaining errors are our own.

†Corresponding author. Department of Finance, McCombs School of Business, University of Texas at Austin, 1 University Station, Austin, TX 78712; email: Jonathan Cohn@mccombs.utexas.edu; phone: +1 512 471 4368; fax: +1 512 471 5073.

1 Introduction

How taxes affect corporate financing and investment policies is one of the oldest questions in corporate finance. A large literature in recent years has made progress towards understanding these effects by studying changes in statutory tax rates and/or policies, effectively treating these changes as natural experiments. However, policymakers are likely to be informed by local economic conditions when contemplating tax changes and to implement tax changes as part of broader policy packages, both of which make clean identification of the causal effects from studies of statutory tax changes challenging. Papers isolating variation unlikely to be related to local economic conditions – for example, by comparing firms subject to statutory tax changes to geographically proximate firms in different tax jurisdictions (notably, Heider and Ljungqvist, 2015) – are less subject to the first of these concerns but are still subject to the second.

This paper studies a novel set of large changes in the effective tax rate on dividends in several EU countries in the 2000s that were imposed by the European Court of Justice (ECJ) for narrow reasons unrelated to economic conditions. As of 1999, seven EU countries had "imputation" tax systems, while the remaining eight had "classical" systems. Shareholders in a country with an imputation system receive "franking credits" for the corporate taxes paid by domestic firms when they receive dividends from that firm. These credits lower the effective tax on dividends relative to a classical tax system, which provides no credit to shareholders for corporate taxes. ECJ rulings in the 1999 *Verkooijen* and 2004 *Manninen* cases invalidated imputation systems solely because these systems favored domestic over foreign firms. In an imputation system, shareholders receive no credit for taxes paid by foreign firms, which violated the European Commission's (EC's) ban on obstructions of cross-border economic activity within the EU. In response to the court rulings, all seven countries with imputation systems replaced them with classical systems between 2000 and

2008, substantially increasing the effective tax on dividends in these countries.

We find that *prior to* the tax system changes that we study, firms in imputation countries pay more dividends, invest more in capital assets, and tend to have lower leverage ratios than those in countries with classical systems. These findings are consistent with the lower effective taxation of dividends under an imputation system reducing the cost of paying dividends, the cost of capital, and the tax advantage of debt relative to equity. To study the effect of the tax changes on these margins, we implement a stacked-cohort, matched-sample difference in differences framework, using firms in EU countries that already had classical systems at the time of the ruling as controls.[1] We find that dividends and capital investment decline after imputation-to-classical tax system changes, causing dividend and capital investment rates to converge to those of already-classical countries within a year or two of a tax system change. We also find evidence of an increase in leverage ratios, though this increase is small and only marginally statistically significant.

In addition to the cross-country differences, we test for differences within countries that may arise from cross-sectional differences in firms' abilities to finance their investments internally. A higher effective tax on dividends raises the cost of external equity but may actually decrease the opportunity cost of using internal equity because it makes the alternative of paying out retained earnings less attractive (Auerbach, 1979). As a consequence, taxable shareholders' preferred investment level should decrease more in response to an increase in the dividend tax if the firm relies on external financing than if it relies on internal financing (Masulis and Trueman, 1988). We extend this argument to changes in capital structure policy. While an increase in the effective tax on dividends increases the tax advantage of debt (Miller, 1977) and hence a firm's optimal leverage ratio, the need to pay dividends makes

[1] Our setup is a bit unusual. Treatment in the framework is a change from an imputation to a classical system. However, rather than being untreated, our controls are firms that initially operate under classical systems and are thus treated throughout the sample period. Matching on observables ensures that treatment and control firms are similar on observables related to fundamentals, such as industry. We do not attempt to match on financing or investment policies since these policies *should* differ pre-treatment.

increasing leverage via recapitalization costly. This tax friction may deter firms that finance their investment internally from increasing leverage. However, firms requiring external capital can increase leverage by simply slanting capital-raising towards debt, without the need to pay dividends. We formalize this argument with a simple model in Appendix A.

Because the use of external finance after a change in tax systems is clearly an endogenous choice, we use a firm's reliance on external finance *before* the tax change to proxy for its tendency to rely on external finance in general. Consistent with predicted differences based on a firm's source of financing, we find that capital-raisers increase their investment levels more after imputation-to-classical tax system changes than non-capital raisers. In addition, we find that capital-raisers increase their leverage ratios significantly, while non-capital raisers do not increase their leverage ratios. This last result suggests that a firm's dependence on external financing plays an important and under-appreciated role in how firms respond to tax changes that increase the tax advantage of debt.

We also conduct a cross-country comparison that exploits variation in the effective size of the tax changes based on the details of different imputation systems. We find larger increases in investment and leverage ratios and decreases in equity issuance for firms in countries switching from "full imputation" systems, which award a franking credit for 100% of corporate taxes paid, than for firms in countries switching from "partial" imputation systems, which award a franking credit equal to only 50% of corporate taxes paid. We provide quantitative estimates of the effect of taxes on capital structure by analyzing the relationship between the change in leverage ratios and the country-specific change in the tax advantage of debt after switches. We estimate that a 1 cent increase in the tax advantage of debt per dollar of income increases book leverage by 0.1 percentage points, on average.

Our paper contributes to three separate literatures – those examining the effects of taxation on capital structure, payout policy, and corporate investment. Papers studying changes in capital structure after country-specific tax changes include those by Givoly, Hayn, Ofer,

and Sarig (1992), Lin and Flannery (2013), Jacob and Michaely (2017), Hanlon and Hoopes (2014), Doidge and Dyck (2015), and Panier, Perez-Gonzalez, and Villanueva (2013). Fan, Titman, and Twite (2012), Faccio and Xu (2015), Faulkender and Smith (2016), and Hebous and Ruf (2017) conduct multi-country studies but do not attempt to isolate tax changes unlikely to be motivated by economic conditions. Heider and Ljungqvist (2015) study the effects of a large number of relatively small changes in US state-level corporate tax rates, relying on comparisons of firms located in close proximity to one another on opposite sides of state borders to sharpen identification. All of these papers find that capital structure responds to tax rates. Our paper adds to this literature by providing evidence from a large tax shock that affects multiple countries and is likely to be orthogonal to local economic conditions. Despite the fact that the tax shock we examine is arguably stronger than those studied in prior work, we find at best weak evidence of changes in capital structure, on average, in response to tax changes. However, we do find that the tax shock leads to significant capital structure changes for those firms that rely on external financing.

Papers that study dividend changes include that of Chetty and Saez (2005), who find that US firms increased dividend payments in response to the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA) of 2003, which cut dividend tax rates. In addition, Pattenden and Twite (2008) find that Australian firms increased dividend payments after the introduction of an imputation tax system, and Doidge and Dyck (2015) find that Canadian firms organized as trusts reduced dividend payments in response to passage of a law that taxes previously-exempt trust distributions at the same rate as corporate dividends, Isakov, Pérignon, and Weisskopf (2021) find that Swiss firms increase their dividends when dividends become tax-exempt, and Boissel and Matray (2022) find that French firms cut dividends in response to a large increase in dividend taxes. We present consistent evidence based on a shock to the effective tax on dividends that affected several countries, and again, our evidence illustrates important differences between firms that rely and do not rely on external

financing.

Evidence on the effect of taxes on investment is more mixed. Papers that examine the relationship between dividend taxes and investment include that of Becker, Jacob, and Jacob (2013), who find that low cash flow firms decrease (increase) their investment relative to high cash flow firms in response to an increase (decrease) in dividend tax rates across multiple countries. Alstadsæter, Jacob, and Michaely (2017) find a similar difference in the response of low- and high-cash flow firms in Sweden to a 2006 dividend tax in that country. Moon (2019) finds an increase in investment in response to a decrease in the capital gains tax rate in South Korea. In contrast, Boissel and Matray (2022) find an increase in investment in response to an increase in the French dividend tax rate. Yagan (2015) and Isakov, Pérignon, and Weisskopf (2021) find no change in investment in response to specific changes in dividend taxes in the U.S. and Switzerland, respectively.[2] Our paper adds to the evidence that higher dividend taxes negatively affect investment, specifically for firms that rely on external capital, presumably because these firms are affected more by the increase in the cost of external equity capital.

2 Tax Systems in the EU and Financing and Investment Policies

The section discusses the taxation of capital in the European Union and the changes made due to the *Verkooijen* and *Manninen* rulings.

[2]Giroud and Rauh (2019) present evidence that firms' location decisions are sensitive to state-level corporate and personal tax rates.

2.1 Imputation and classical tax systems

One important historical feature of taxation in Europe that distinguishes it from the US is its variation in tax systems. While some specific details of the US tax system have varied over time, the US has employed some form of a classical tax system throughout its recent history. In contrast, prior to 2000, seven EU countries had imputation systems - Finland, France, Germany, Ireland, Italy, Spain, and the UK.

In a classical tax system, income paid to shareholders is effectively taxed twice - once, when earned, through the taxation of corporate income, and again, when distributed to shareholders, through taxes on dividends and/or capital gains. An imputation system, in contrast, grants all shareholders of a domestic corporation a tax credit for income tax paid by the corporation. Taxable domestic shareholders can use this "franking" credit to offset dividend taxes that would otherwise be due. An imputation system, then, either eliminates or at least attenuates double taxation for taxable investors.[3] Thus, all else (specifically, tax rates) equal, imputation tax systems result in a lower cost of capital and confer a smaller tax advantage on debt relative to equity financing than classical systems do.

There are three specific variants of classical tax system. Under a *Full Classical Tax System*, dividends are taxed at the full personal income tax rate. Under a *Modified Classical Tax System*, dividends are taxed, but at a lower rate than the personal income tax rate. Under a *Partial Inclusion Tax System*, a specified percentage of dividends is exempt from taxation. Relative to a full classical system, the modified classical and partial inclusion systems attenuate the second layer of taxation on income received by shareholders. Thus, all else equal, the tax advantage of debt relative to equity and cost of capital are higher under a full classical system than under the other two variants.[4]

[3]In most imputation systems, tax-exempt investors receive a cash rebate for corporate taxes paid when they receive dividends. The only exception we are aware of in the EU is Finland, where tax-exempt investors were not eligible to receive imputation tax credits (Ainsworth, 2016).

[4]The US employed a full classical system until the JGTRRA cut the dividend tax below the personal tax rate in 2003, shifting the US to a modified classical system.

There are two specific variants of imputation tax system. Under a *Full Imputation* system, shareholders receive a credit equal to 100% of corporate taxes paid. If the corporate tax rate is at least as high as the dividend tax rate, then this credit effectively eliminates the taxation of dividends. Otherwise, it reduces the effective dividend tax to the difference between the dividend and corporate tax rates. Under a *Partial Imputation* system, shareholders receive a credit equal to a percentage (typically 50%) of corporate taxes paid. Thus, all else equal, the effective tax rate on dividends - and hence the tax advantage of debt relative to equity - is smaller under a full imputation system than a partial imputation system. Among the seven EU countries with imputation systems prior to 2000, three had full imputation systems (Finland, Germany, and Italy), while the other four had partial imputation systems (France, Ireland, Spain, and the UK).

2.2 The *Verkooijen* and *Manninen* rulings

In 1999, the ECJ ruled in the landmark *Verkooijen* case that the Dutch tax system, by effectively granting a limited exemption to Dutch taxpayers for dividends paid by Dutch firms but not by firms in other EU countries, violated the EC's ban on obstructions of cross-border economic activity within the EU.[5] The court held that the Dutch system discriminated against firms in other EU countries by giving Dutch firms an effective cost advantage in raising capital from Dutch investors. In its judgment, the ECJ stated that:

[5]The Dutch tax system required firms to withhold dividend taxes when they paid dividends to shareholders but allowed shareholders to offset any taxes owed by the withheld amount. It granted each Dutch taxpayer an exemption for the first NLG 1,000 of dividends (NLG 2,000 for a couple filing jointly), but this exemption only applied to dividends from shares on which the Dutch dividend tax had been collected. Because non-Dutch firms would not have withheld the Dutch dividend tax, the law had the effect of making the exemption available only for dividends paid by Dutch companies.

> *Article 1(1) of Council Directive 88/361/EEC of 24 June 1988 for the implementation of Article 67 of the Treaty and Article 52 of the EC Treaty (now, after amendment, Article 43 EC) must be interpreted as precluding legislation of a Member State which grants an exemption from the income tax payable on share dividends subject to the condition that those dividends are paid by a company established in that Member State.*

While the *Verkooijen* ruling addressed the legality of a tax exemption in Holland, which had a classical tax system, the court's conclusion that a provision of a tax system that discriminated against foreign companies violated EC law raised obvious questions about the legality of imputation tax systems in the EU. The UK and Ireland both switched from imputation to classical systems in 2000, followed by Germany in 2002 and Italy in 2004.[6] In 2003, the EC issued a directive discussing the *Verkooijen* case and its implications for EU member countries. This directive mandated equal tax treatment of dividends paid to domestic and foreign shareholders within the EU, stating that:

> *The Commission believes that analysis of this case law leads to fundamental conclusions about the design of dividend taxation systems: Member States cannot levy higher taxes on inbound dividends than on domestic dividends.*

In the meanwhile, a taxpayer in Finland sued the Finnish tax authority in 2000, challenging the legality of the Finnish imputation system on the grounds that it granted franking credits only for dividends paid by Finnish companies. The case eventually reached the ECJ, which ruled in 2004, in the *Manninen* case, that Finland's imputation tax system violated the same EC rule against obstructions to cross-border economic activity within the ECJ cited in the *Verkooijen* case. Indeed, the judgment in the *Manninen* case cites the *Verkooijen* ruling repeatedly. In its judgment, the ECJ stated that:

[6]While the UK did not technically convert from an imputation system to a classical system until 2000, the UK started granting tax credits to a company's shareholders independently of whether the company paid corporate taxes starting in April 1999 (Ainsworth, 2016). Our analysis is essentially unchanged if we treat the year of the switch for the UK as 1999 instead of 2000 (untabulated).

Article 56(1) EC and paragraphs 1(a) and 3 of Article 58 EC preclude provisions of a Member State under which the tax on a dividend received by an individual who is fully taxable in his country of residence from a share company established in the same country is calculated to take account of the corporation tax paid by the company, whereas corporation tax is not offset in the same manner if the dividend is distributed by a company established abroad.

Finland and France switched from imputation to classical tax systems immediately after the *Manninen* ruling, in 2005. Spain was the last EU country to abandon its imputation system, which it did in 2007. Thus, all seven EU countries with imputation tax systems switched to classical tax systems between 2000 and 2007.

Under a classical system, shareholders receive no credit for taxes paid at the corporate level, regardless of the domicile of the firm. Therefore, switching from imputation to classical systems allowed the governments of the affected countries to comply with the ECJ rulings and EC directive.[7] Three of the seven switching countries transitioned to full classical systems (Ireland, Italy, Spain), one to a modified classical system (UK), and three to partial inclusion systems (Finland, France, Germany). Table 1 summarizes the seven changes in tax systems, which form the basis for our empirical analysis, in detail.

[Table 1 about here]

These changes have three features that make them useful for discerning the effect of taxes on corporate policy. First, they were effectively involuntary, and the court rulings that ultimately gave rise to them were based on a largely technical argument regarding discrimination across countries rather than any consideration of economic conditions or optimal tax policy in any given country. Thus, we do not have to worry that these changes were

[7] In principle, a country could have maintained an imputation system if it granted franking credits for dividends paid by foreign companies. However, foreign governments rather than the domestic government would have received the corporate tax giving rise to the credit, making such a system unattractive to the adopter.

motivated by factors that might also have affected firms' financial and investment policies, nor were they constructed as part of broader policy packages. Second, these changes took place in seven countries in different geographic ares within the EU. This dispersion helps to rule out concerns that idiosyncratic circumstances unrelated to the tax changes in any one country or part of Europe might drive changes in financial and investment policies. Third, as we show shortly, these changes had a large impact on effective dividend tax rates.

2.3 Importance of tax system changes due to the ECJ rulings

All else equal, switching from an imputation to classical system increases the effective taxation of corporate dividends. To gauge the magnitudes of these changes, we compute Miller's (1977) measure of the tax advantage of an incremental dollar of debt at the country-year level based on a country's tax system and statutory tax rates at the time. To do so, we use a multitude of sources to obtain and verify tax rates throughout the period 1992-2012. The main sources are the OECD's Tax Database (Combined Corporate Income Tax Rate section) and PWC Worldwide Tax Summaries.[8] In countries with imputation systems, we assume that all taxable earnings are distributed to shareholders. We compute a modified version of the Miller measure that accounts for the features of different imputation and classical tax systems:

$$Miller = 1 - \frac{[1 - (1 - FC)CTR] \times [1 - DTR \times (1 - Exemption)]}{1 - ITR}, \tag{1}$$

where CTR, DTR, and ITR are the top statutory corporate, dividend, and interest income tax rates, respectively, FC is the fraction of corporate taxes paid granted to shareholders as franking credits, and $Exemption$ is the fraction of dividends exempt from taxation. The

[8]Other sources are PWC Doing Business, KPMG Tax Facts, KPMG Corporate and Indirect Tax Survey, Ernst & Young Worldwide Personal Tax Guide, Commission of European Communities Dividend Taxation of Individuals, Commission of European Communities Company Taxation, PKF Worldwide Tax Guide, and Harding (2013).

franking credit fraction FC is 1 in a full imputation system, between 0 and 1 in a partial imputation system, and 0 in any form of classical system. The dividend exemption is 0 in all systems except for a partial inclusion tax system, where it lies between 0 and 1.[9]

Figure 1 plots the time series of the Miller measure around switches from imputation to classical systems, where year S denotes the year of the switch, for the seven EU countries with imputation systems as of the *Verkooijen* ruling. In all seven switching countries, the Miller measure varies little from year to year over the four years before the switch. In six of the seven, the Miller measure increases sharply from the last year before the switch (year $S-1$) to the year in which the switch takes place (year S). The exception is France, which switched from a partial imputation system with a 50% franking credit to a partial inclusion system with a 50% dividend exemption. The dividend tax rate in France at the time (53.5%) was considerably higher than the corporate tax rate (35.4%). As a result, exempting 50% of dividend payouts from taxation had a larger effect on the total tax on each dollar of equity income than crediting shareholders for 50% of corporate taxes paid.

[Figure 1 about here]

In five of the six countries in which the Miller measure increased after the switch, it remains much higher than its pre-switch level four years after the switch. The exception is Ireland, where it rises markedly the first year under a classical system before declining steadily over the next three years to approximately its pre-switch level. This decline occurs because Ireland lowered its corporate tax rate from 24% in 2000 (Ireland's first year under

[9]If firms paid out cash to shareholders via share repurchase rather than share dividend, the calculation of the Miller measure would involve the capital gains tax rate and would be more complex. However, unlike in the US, share repurchases in the EU have historically been uncommon (Rau and Vermaelen, 2002; Oswald and Young, 2004; Manconi, Peyer, and Vermaelen, 2014). The lack of repurchases in the EU has been attributed to several factors, including the requirement in some countries that repurchases via tender offers be treated as dividends for tax purposes, prohibition of open market offers, lack of safe haven protections for repurchases, a stakeholder (employee and banks) governance structure in several countries, the limited use of options and restricted stock in executive compensation, prohibitions on using the proceeds from debt issues to repurchase stock, and the treatment of repurchases as dividends for tax purposes in countries lacking capital gains tax (see Vermaelen et al., 2005; Manconi, Peyer, and Vermaelen, 2014).

a classical system) to 20% in 2001, 16% in 2002, and 12.5% in 2003. The seven tax system changes collectively are responsible for a considerable portion of the overall variation in taxes in the EU over the period 1992-2012. Table 2 summarizes the total, cross-sectional, and time-series variation in the Miller measure for firms located across EU countries and, for comparison, firms located across US states. The observational unit is a country-year in the EU and a state-year in the US.

[Table 2 about here]

The first two rows report variances for the EU, while the last two report variances for the US. It is not surprising that cross-country variation in the Miller measure is higher in the EU than cross-state variation in the US, since most taxation in the US takes place at the federal level and is therefore uniform across states. Comparisons of time-series variation are more relevant for our analysis, since we rely on within-firm variation to identify the effect of taxes on financing and investment decisions, as do most other papers in the literature. While the EU and US exhibit similar time-series variances in the Miller measure (0.102 and 0.100, respectively), 80% of the variance in the US is attributable to a single event – the 2003 US federal dividend tax cut that was part of the JGTRRA. Suggesting that our tests are likely to have power, almost 75% of the time-series variance of the Miller measure in the EU is attributable to the seven changes in tax systems that we study. The fact that the variation is not driven by a single tax change reduces the risk that any broader trends might drive any apparent relationships between taxes and investment and financing variables.

3 Data and Sample

This section describes how we compute the variables we use in our empirical analysis and the sample construction process.

3.1 Data

At the time of the *Verkooijen* ruling, the EU consisted of 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the UK. We gather annual financial data for all listed firms in these countries from 1992 through 2012 from Compustat Global. We follow the traditional practice in capital structure studies of omitting financial firms and utilities. We further restrict the sample to firms listed on the stock market of the country in which they are domiciled.

From Compustat Global, we compute a number of variables that we use in our analysis. All of these variables are denominated in euros. We define *Book Leverage* as total debt divided by book capital. Total debt is the book value of short-term and long-term interest-bearing debt. Book capital is the book value of common equity plus the book value of preferred stock plus total debt. We define *Market Leverage* as total debt divided by market capital, where market capital is the market value of common equity plus the book value of preferred stock plus total debt. We define *Equity issues* as cash flow from the sale of common stock less cash spent on the repurchase of common stock, divided by total assets, *Debt issues* as net cash flow from the sale and redemption of long- and short-term debt divided by total assets, and *Dividends* as total dividends divided by total assets. In addition to these financing variables, we also define *Log(Assets)* as the natural logarithm of total assets, *MarketToBook* as market value of the firm (i.e., market capital) divided by total assets, *Tangibility* as fixed assets divided by total assets, *EBIT* as sales minus cost of goods sold, SG&A expense, and depreciation/amortization, divided by total assets, *EBITDA* as EBIT plus depreciation and amortization divided by total assets, and *Capital Expenditure* as capital expenditures divided by total assets.

We exclude firm-year observations for which *Book Leverage* or *Market Leverage* are missing or for which *Total Assets* is less than €15 million. We exclude these tiny firms

because their financial data appears to be less reliable.[10] To minimize the potential impact of outliers, we winsorize all variables at the 1st and 99th percentiles.

3.2 Matched sample construction

We examine the responses of firms' financial policies to changes from imputation to classical tax systems due to the ECJ rulings using a generalized difference-in-differences approach, which we describe in Section 4. To implement this approach, we construct a matched sample consisting of firms in countries that made these changes ("treated" firms) and observationally similar firms in countries that already had classical systems at the time of *Verkooijen* ("control" firms). We construct our matched sample using propensity scores to pair each firm in a switching country to a control firm from an EU country that already had a classical system at the time of the *Verkooijen* ruling. Specifically, for each of the seven switching countries, we collect all firm-year observations from the last four years before the switch (years $S-4$ through $s-1$) and the first four years after the switch (years S though $S+3$). We exclude firms for which we do not observe both *Log (Assets)* and *MarketToBook* in the year prior to the switch. We also exclude firms not present in the data in at least one of the four years after the switch, as we need both pre- and post-switch data to estimate changes in outcome variables around switches. The remaining firms represent the "treated" group for the given switching country.

This process produces seven treated groups, one for each switching country. We then separately match the firms in each of these treated groups to control firms within the same industry over the same time period based on *Log (Assets)* and *MarketToBook* to form seven matched treated-and-control samples. We match on these two variables because they, along with industry, capture the fundamental characteristics of a business in a parsimonious

[10] Studies of US firms often follow the same approach. We chose a cutoff of €15 million because it is similar to the $10 million cutoff that studies of US firms often use. The results of our empirical analysis are not sensitive to the cutoff we use.

way. We do not match on financing variables such as leverage because financial variables *should* differ pre-switch given the differences in tax incentives under imputation and classical systems.

To implement our matching approach for a given treated group, we first collect all firm-year observations from countries that had classical systems at the time of *Verkooijen*. We then remove from this sample firms for which we do not observe total assets or market-to-book ratios in the year prior to the switch for the given treated group or that are not present in the data in any of the four years after the switch. The remaining sample represents our set of candidate control firms. We then pool all treated firms for the given switching country and all candidate control firms into a single sample and estimate the following probit regression using this sample:

$$Pr(Switcher = 1|X) = \Phi(\beta_0 + \beta_1 Log(Assets) + \beta_2 MarketToBook), \tag{2}$$

where β_0, β_1, β_2 are parameters to be estimated, and Φ is the Cumulative Distribution Function of the standard normal distribution. We obtain the fitted values of this regression for each firm, which represents that firm's "propensity" to be treated - i.e., the probability that a firm in the combined sample of treated and potential control firms is in the treated set, conditional on observables. We then choose as a control firm for each firm in a given treated group the candidate control firm in the same 2-digit SIC code (i.e., strict matching) with the closest propensity score, matching with replacement.[11]

Finally, we stack the seven matched treated-and-control samples based on event time to form our final sample. The result is a sample of treated and control firm-year observations

[11] Matching within 2-digit SIC ensures reasonable similarity in terms of industry while also ensuring enough candidate matches for each firm that we can obtain good matches on other characteristics. We obtain similar empirical results if we instead match within 3-digit SIC.

spanning the window $S-4$ through $S+3$ relative to the switch year S. By using this procedure, we select control firms that are in the same industry as treated firms in the sample and similar in size and market-to-book ratio.

Table 3 reports the number of firms in the final sample for each of the seven switching countries. There are considerably more firms in our sample from Germany, France, and especially the UK than from the other four countries. Rather than allow countries with more observations to disproportionately affect our regression estimates, we weight each firm-country observation by the inverse of the number of firms in the respective country in all regression analysis.

[Table 3 about here]

Table 4 presents a comparison of treatment and control firms the year prior to the *Verkooijen* ruling and the year prior to the switch. For the pre-*Verkooijen* comparison, we construct an alternative matched sample using the same matching approach we describe above for the main sample, except that we match on observables the year prior to *Verkooijen* (i.e., 1998) instead of the year prior to the switch. In each of the comparisons, we equal weight treatment countries to avoid excessively weighting countries with more firms.

[Table 4 about here]

Our matching process does a good job of homogenizing the treated and control samples on fundamental variables. Treated and control firms in the main sample are similar in terms of size, market-to-book ratio, asset tangibility, and profitability. While we cannot compare firms on *unobserved* dimensions by definition, the similarity of treated and control firms on these observed dimensions provides some comfort that the as-if random assignment assumption for a valid-difference-in-differences estimation is plausibly satisfied. Treated and control firms in the alternative pre-*Verkooijen* matched sample are also similar in terms of

fundamentals prior to the *Verkooijen* ruling. We defer a comparison of treated and control firms on financing and investment dimensions to Section 5 as such a comparison represents a test of the importance of dividend taxation for financing and investment policies.

Figure 2 plots the mean value of the Miller measure across the seven countries that switched from imputation to classical systems for each year relative to the transition year. It also plots the mean value of the Miller measure for the eight countries that already had classical tax systems at the time of the *Verkooijen* ruling for the same set of years. The figure shows that the tax advantage of debt relative to equity was much lower for firms in countries with imputation systems pre-transition than for those in countries that already had classical systems. It also shows that the mean increase in the Miller measure after transition completely eliminated the pre-transition difference in the tax advantage of debt.

[Figure 2 about here]

Figure 2 suggests that we should observe that treated firms have higher leverage ratios, issue more equity, pay more dividends, and invest at a higher level pre-switch than control firms. In addition, differences in tax incentives for firms in EU countries with imputation and classical systems disappear after the former transition to classical systems. We should therefore observe convergence in financial and investment policies after transitions. We describe how we formally test both of these predictions in the next section.

4 Predictions and Empirical Strategy

This section describes predictions about the effects of tax systems and changes in tax systems on corporate financing and investment policies along with our approach for testing these predictions.

4.1 Tax systems and financing and investment policies: predictions

All else equal, imputation tax systems have lower effective tax rates on dividends than a classical tax system because they credit shareholders for corporate taxes paid when the firm pays a dividend. A lower effective tax rate on dividends implies a smaller tax advantage to debt relative to equity, as reflected in the lower average Miller measure before changes from imputation to classical systems visible in Figure 2. As a result, firms in countries with imputation systems should have lower leverage ratios pre-switch than firms in countries with classical systems. In addition, a lower effective dividend tax rate implies a lower cost of paying dividends and a lower cost of capital. As a result, firms in countries with imputation systems should pay more dividends and invest more. Furthermore, paying more dividends while maintaining lower leverage ratios is likely to require firms in countries with imputation systems to issue more equity.

After countries switch from imputation to classical tax systems, the effective tax rate on dividends increases. As a result, firms in these countries should increase leverage, decrease dividend payments, decrease equity issuance, and decrease investment. More precisely, the average effective tax on dividends in switching countries appears, on average, approximately equal to that in countries that already had classical tax systems immediately after a switch. Figure 2 shows that the average Miller measure immediately after a switch from an imputation to classical system is almost identical to the average Miller measure in the same year in countries that already had classical systems. Absent frictions, then, the post-switch financing and investment policies of firms in countries with imputation systems should approximately equal those of firms in countries that already had classical systems.

One important friction that may discourage capital structure adjustments is the tax cost of paying dividends. For a firm that relies on external capital to finance investment, this

friction may not be important, since such a firm can increase its leverage by simply tilting its issuance away from equity and towards debt. However, a firm that relies on internal capital to finance investment would need to issue debt and pay the proceeds to shareholders to increase leverage. The taxation of dividends may therefore restrain a firm relying on internal capital from increasing leverage in response to a tax system switch. This friction is especially important in our setting since one of the effects of switching from an imputation to a classical tax systems is an increase in the effective tax rate on dividends. We formalize this argument with a simple model in Appendix A.

The logic of this argument is similar to the argument that a higher effective tax rate on dividends has different effects on investment for a firm relying on internal capital than one relying on external capital (Auerbach, 1979). While the cost of external equity unambiguously increases with the effective tax rate on dividends, the opportunity cost of internal equity may, in principle, *decrease* since paying out excess earnings as a dividend immediately exposes these earnings to investor-level taxation. As a result, investment should increase less after tax system switches for firms relying on internal capital than for firms relying on external capital and could, in fact, increase for firms relying on internal capital.

4.2 Empirical strategy

Using the matched sample of firms in countries that switch from imputation to classical tax systems and control firms in countries that already had classical systems at the time of the *Verkooijen* ruling, we analyze differences in financing and investment policies across the two groups of firms pre-switch and relative changes in these policies following switches. We analyze relative changes using a difference-in-differences approach. Specifically, we estimate the following generalized difference-in-differences regression:

$$Y_{it} = \eta PostSwitch_{it} + \lambda Switcher_i * PostSwitch_{it} + \alpha_i + \delta_t + \epsilon_{it}, \quad (3)$$

where Y is an outcome variable, *Switcher* is an indicator variable equal to one for firms in switching countries and zero for controls, *PostSwitch* is an indicator variable equal to one for observations in the years after a switch (years S through $S+3$) and zero for observations in the years before (years $S-4$ through $S-1$), and α_i and δ_t represent sets of firm and year fixed effects, respectively.

The firm fixed effects absorb any time-invariant heterogeneity across firms, while year fixed effects control for any aggregate trends in corporate financial policies in the EU during our sample period. The variable *Switcher* does not enter as a separate explanatory variable because it does not vary within firm and hence is fully absorbed by the firm fixed effects. The coefficient λ represents an estimate of the change in the outcome variable Y from the four years before to the four years after a switch, for companies in switching countries relative to controls. This difference-in-differences estimate is the object of interest in the regression. The outcome variables in our analysis are *Book leverage*, *Market leverage*, *Equity issues*, *Debt issues*, and *Dividends*, and *Capex*.

We test predictions about differences in financing and investment policy changes for firms relying on external and internal capital by separating firms into capital-raisers and non-capital raisers. We do not observe a firm's *intended* capital raising after a switch from imputation to classical tax system. Instead, we use whether or not a firm raised a net positive amount of capital immediately prior to a switch as a proxy for its capital-raising status. Specifically, we consider a firm to be a capital-raiser if it raises a net positive amount of capital (*Equity issues* + *Debt issues* > 0) the year before the switch and a non-capital raiser otherwise. We then estimate (3) separately for capital-raising firms and non-capital

raising firms (and their associated controls).

We also estimate (3) separately for firms in countries with full and partial imputation systems at the time that they switched to classical systems (and their associated controls). All else equal, a switch from a full imputation system increases the relative tax advantage of debt more than a switch from a partial imputation system. Thus, any responses in capital structure we observe should be stronger for firms in countries switching from full imputation systems. In addition, we estimate triple-differences regressions to examine the sensitivity of capital structure changes to the change in Miller's (1977) measure of the tax advantage of debt.

5 Empirical Results

In this section, we present a comparison of financing and investment policies for firms in countries with imputation tax systems to control firms in countries with classical tax systems and estimates of changes in these policies around tax system changes.

5.1 Pre-switch comparisons

We begin by comparing the financing and investment policies of firms in countries with imputation tax systems, both prior to the 1999 *Verkoijen* ruling and prior to these countries changing to classical systems, to control firms from countries that already had classical systems at the time of the time of the *Verkooijen* ruling. Table 5 presents this comparison.

[Table 5 about here]

Since an imputation system credits shareholders for corporate taxes paid before levying dividend taxes, we should observe lower leverage ratios, more equity issuance, more dividends, and more capital expenditures in countries with imputation systems. Our evidence

is consistent with these predictions. Treated firms have lower market leverage ratios both before the *Verkooijen* ruling and right before switches, though book leverage ratios do not differ. Treated firms issue more equity, pay more dividends, and invest more both before the *Verkooijen* ruling and right before switches, though differences in equity issuance pre-*Verkooijen* are not statistically significant.

Note that pre-treatment differences in the levels of outcome variables between treated and control observations do not invalidate difference-in-differences estimation. In our setting, treated firms operate under imputation systems before being treated as a result of a switch to a classical system, while control firms operate under classical tax systems pre-treatment and are therefore effectively treated throughout. Since we do not match on the outcome variables, the levels of financing and investment policies *should* differ between treated and control firms. As long as the parallel trends assumption holds, difference-in-differences estimation remains valid even if the levels of outcome variables differ pre-treatment.

5.2 Changes in financing and investment policies around tax system changes

We next analyze the evolution of financial and investment policies around switches from imputation to classical systems, comparing treated firms (those in countries that switched) to control firms. Figure 3 plots mean book leverage, market leverage, equity issuance, dividends, capital expenditures, and change in assets for the treated and control firms separately for each of the four years prior to transition and the four years after transition.

[Figure 3 about here]

Figure 3 generally shows higher equity issuance, dividends, and capital expenditures and lower market leverage for firms in switching countries than for control firms pre-switch, consistent with the evidence in Table 4. Only the leverage ratio time series show clear signs

of differential pre-trends. However, as we noted in Section 4, firms in switching countries may respond to the pending tax system change by increasing leverage at the end of year $S-1$ in order to begin generating tax shields in year S, the first year under a classical system. If one considers year $S-1$ as part of the post-treatment period for leverage, then differential pre-trends in leverage are less apparent.

Figure 3 also shows a relative decrease in equity issues, dividends, and capital expenditures and an increase in market leverage post-switch for firms in switching countries. All of these changes are consistent with firms responding to the increased tax cost of paying dividends, tax benefits of debt, and cost of capital after the switch from an imputation to classical tax system. However, we do not observe meaningful changes in book leverage. The changes in dividends, capital expenditures, and, to some degree, equity issues result in convergence between firms in switching countries and control firms. As noted previously, such convergence makes sense, as firms in switching countries go from untreated to treated (i.e., from imputation to classical system) while control firms are effectively already treated.

We next turn to formally estimating changes in financial and investment policies after transitions from imputation to classical tax systems by estimating regression equation (3) for each financing and investment variable we study. Table 6 presents these estimates. We present standard errors clustered by firm below each point estimate in the table.

[Table 6 about here]

The estimates in the first two columns provide weak evidence of an increase in leverage in the full sample. The coefficients on $Switcher * PostSwitch$ in the book and market leverage regressions are positive but only statistically significant (at the ten percent level) in the market leverage regression. We do observe statistically significant declines in dividends as well as debt and equity issuance. Dividends as a percentage of assets decline by 0.3 percentage points, or 14.6% of the pre-switch mean of 2.3 percentage points (see Table 4,

equal-weighted means). The declines in equity and debt issuance are also substantial.

The decrease in dividends is consistent with an increased tax cost of paying dividends under a classical system depressing dividend payments below their previous level. The increase in retained earnings due to this decline in dividends may explain why we observe a decline in capital-raising and only a small increase in leverage. The decline in capital-raising may also be attributable in part to an increase in the cost of external equity. Indeed, capital expenditures decline significantly after changes from imputation to classical systems for the full sample.

The relative changes we observe in Table 6 appear large enough to offset the pre-treatment differences between treated and control firms reported in Table 4, consistent with the convergence we observe in Figure 3. To verify that our difference-in-difference estimates are not being driven by a single switching country, we reestimate (3) for each outcome variable, excluding one switching country (and its associated control observations) at a time. Table 7 reports the results. For brevity, we only report the difference-in-differences estimates (i.e., the coefficients on $Switcher * PostSwitch$. The results appear largely insensitive to the exclusion of any individual country.

[Table 7 about here]

5.3 Capital raisers and non-capital raisers

We next estimate difference-in-differences regression separately for capital-raisers and non-capital raisers. Table 8 presents these estimates. Panels A and B report results for capital-raising and non-capital raising treated firms (and their associated controls), respectively.

[Table 8 about here]

While the results in Table 6 provide limited support for an increase in leverage after switches from imputation to classical systems for our full sample, the estimates in Panel A of Table 8 indicate that capital-raising firms increase their leverage ratios substantially post-switch. Book and market leverage ratios for these firms increase by 2.7 and 3.5 percentage points, respectively, after a switch, and both of these increases are statistically significant. In contrast, the estimates in Panel B indicate that non-capital raisers, if anything, decrease their leverage slightly after changes from classical to imputation systems, though the declines are statistically insignificant. These findings are consistent with the lack of adjustment by the firms not raising capital because the tax costs of paying additional dividends more than offset the tax benefits of higher leverage.

Dividends also fall by considerably more for capital raisers (a statistically significant 0.5 percentage points) than for non-capital raisers (a statistically insignificant 0.2 percentage points). Firms generating earnings in excess of their investment needs may have limited capacity to cut dividends. Under an imputation system, even a firm raising external capital has an incentive to pay dividends because of the associated franking credit. It is natural that these firms would have the strongest incentive to cut dividends after the transition to a classical system.

Finally, investment declines more for the firms we classify as capital-raisers than for non-capital raisers. This difference supports the argument that the overall decline in investment is driven in part by an increased cost of external equity. Non-capital raisers neither increase nor decrease investment. This finding suggests that non-capital raisers invest more than they otherwise would because they their ability to rely on internal equity lowers their effective cost of capital.

5.4 Heterogeneity with change in dividend taxes

Finally, we examine how changes in financing and investment policies arising from a switch vary with the magnitude of the change in the effective tax rate on dividends due to the switch. We do so using two approaches. First, we compare policy changes after switches in countries with full and partial imputation systems pre-switch by estimating regression equation (3) separately for firms (and their controls) in the two groups. All else equal, switching from a full imputation system to a classical system results in a larger increase in the tax advantage of debt relative to equity than switching from a partial imputation system.

Second, we estimate triple differences regressions of leverage ratios where we interact the difference-in-differences with the change in the Miller measure from year $S-1$ to year S in the switching country. If the increase in leverage after changes from imputation to classical systems reflects a response to an increase in the tax advantage of debt, then we should observe larger increases in leverage for firms in countries where the tax advantage of debt increases more. While this second approach allows us to assess the heterogeneous treatment effect on leverage at a finer level, post-switch tax rates are potentially endogenous. In contrast, the nature of a country's imputation system was fixed at the time of the *Verkooijen* ruling and therefore less subject to concerns about endogeneity. Table 9 presents the results from both sets of analyses.

[Table 9 about here]

Panels A and B present estimates of equation (3) where the treated sample is restricted to firms in countries with full imputation systems pre-switch and those in countries with partial imputation systems pre-switch, respectively. Consistent with a switch from a full imputation system having a larger effect on tax incentives, we observe meaningful and statistically significant increases in both book and market leverage for firms in countries switching from full imputation systems relative to controls but not for firms in countries switching from partial

imputation systems. Similarly, we only observe a decline in equity issuance for firms previously operating under full imputation systems, though we do not see meaningful differences in the reduction in dividends. In addition, capital expenditures exhibit an economically meaningful and statistically significant decrease only after changes from full imputation systems.

Panel C presents estimates from the triple differences regressions, where we interact the change in the Miller measure of the tax advantage of debt with the difference-in-differences. Book leverage increases significantly more after switches when the increase in the Miller measure is larger. Market leverage also increases more when the increase in the Miller measure is larger as well, though the difference is not statistically significant. We also observe larger decreases in equity issuance and capital expenditures when the increase in the Miller measure is larger. Overall, the evidence in Table 9 suggests that financing and investment policies respond more to larger increases in the effective tax on dividends.

6 Conclusion

This paper addresses the role of taxes in the determination of financing policy, one of the central issues in corporate finance. It also addresses the effect of taxes on corporate investment, one of the central issues in public economics. Our analysis focuses on the effects of the tax on dividends, exploiting variation in dividend taxation due to two ECJ rulings that were themselves unconnected to concerns about economic conditions or financial policies. Overall, our empirical results suggest that firms respond to changes in dividend taxes in ways that are consistent with theory.

Our analysis points to the importance of considering variation across firms in incentives to respond to changes in dividend taxes. We find only weak evidence that firms increase leverage after increases in dividend taxes overall. However, firms relying on external capital,

which can increase leverage by favoring debt over equity issuance without the need to pay out to equity, significantly increase leverage. A natural next step would be to further explore how the ownership of different firms affects the response to the tax changes we study. These changes only affect a firm's domestic shareholders, since foreign shareholders were unable to use franking credits anyway (recall that this was the rationale for the ruling in the *Verkooijen* case). A firm may also be more responsive to changes in dividend taxes if its management team owns more equity. Detailed ownership data would help to refine our analysis.

The setting we study may also be useful for analyzing the "real" effects of financing on various firm activities. One can think of a change from classical to imputation system as a shock to the cost of external equity. Because the changes we study stem from a court ruling that was itself unconnected to either economic or financial considerations, these changes represent relatively clean shocks to the cost of external equity. They can therefore justifiably be used to identify the real effects of financing on other firm activities beyond those we study here.

References

Ainsworth, Andrew, 2016, Dividend Imputation: The international experience, *JASSA* pp. 58–63.

Alstadsæter, Annette, Martin Jacob, and Roni Michaely, 2017, Do dividend taxes affect corporate investment?, *Journal of Public Economics* 151, 74–83.

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

Becker, Bo, Marcus Jacob, and Martin Jacob, 2013, Payout taxes and the allocation of investment, *Journal of Financial Economics* 107, 1–24.

Boissel, Charles, and Adrien Matray, 2022, Dividend taxes and the allocation of capital, *American Economic Review* forthcoming.

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

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

Faccio, Mara, and Jin Xu, 2015, Taxes and capital structure, *Journal of Financial and Quantitative Analysis* 50, 277–300.

Fan, Joseph P. H., Sheridan Titman, and Garry Twite, 2012, An international comparison of capital structure and debt maturity choices, *Journal of Financial and Quantitative Analysis* 47, 23–56.

Faulkender, Michael, and Jason M Smith, 2016, Taxes and leverage at multinational corporations, *Journal of Financial Economics* 122, 1–20.

Giroud, Xavier, and Joshua Rauh, 2019, State taxation and the reallocation of business activity: Evidence from establishment-level data, *Journal of Political Economy* 127, 1262–1316.

Givoly, D, C Hayn, AR Ofer, and O Sarig, 1992, Taxes and capital structure: evidence from firms' response to the Tax Reform Act of 1986, *Review of Financial Studies* 5, 331–355.

Hanlon, Michelle, and Jeffrey L Hoopes, 2014, What do firms do when dividend tax rates change? An examination of alternative payout responses, *Journal of Financial Economics* 114, 105–124.

Harding, Michelle, 2013, Taxation of dividend, interest, and capital gain income, *OECD Taxation Working Papers No.19*.

Hebous, Shafik, and Martin Ruf, 2017, Evaluating the effects of ACE systems on multinational debt financing and investment, *Journal of Public Economics* 156, 131–149.

Heider, Florian, and Alexander Ljungqvist, 2015, As certain as debt and taxes: Estimating the tax sensitivity of leverage from state tax changes, *Journal of Financial Economics* 118, 684–712.

Isakov, Dušan, Christophe Pérignon, and Jean-Philippe Weisskopf, 2021, What if dividends were tax-exempt? Evidence from a natural experiment, *The Review of Financial Studies* 34, 5756–5795.

Jacob, Martin, and Roni Michaely, 2017, Taxation and dividend policy: the muting effect of agency issues and shareholder conflicts, *The Review of Financial Studies* 30, 3176–3222.

Lin, Leming, and Mark J. Flannery, 2013, Do personal taxes affect capital structure? Evidence from the 2003 tax cut, *Journal of Financial Economics* 109, 549 – 565.

Manconi, Alberto, Urs Peyer, and Theo Vermaelen, 2014, Buybacks around the world, *Working Paper*.

Masulis, Ronald W, and Brett Trueman, 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, *The Journal of Finance* 32, 261–275.

Moon, Terry S, 2019, Capital Gains Taxes and Real Corporate Investment, *Working Paper*.

Oswald, Dennis, and Steven Young, 2004, What role taxes and regulation? A second look at open market share buyback activity in the UK, *Journal of Business Finance and Accounting* 31, 257–292.

Panier, Frederic, Francisco Perez-Gonzalez, and Pablo Villanueva, 2013, Capital Structure and Taxes: What Happens When You (Also) Subsidize Equity?, *Working paper*.

Pattenden, Kerry, and Garry Twite, 2008, Taxes and dividend policy under alternative tax regimes, *Journal of Corporate Finance* 14, 1–16.

Rau, P. Raghavendra, and Theo Vermaelen, 2002, Regulation, taxes and share repurchases in the UK, *Journal of Business* 75, 245–282.

Vermaelen, Theo, et al., 2005, Share repurchases, *Foundations and Trends in Finance* 1, 171–268.

Yagan, Danny, 2015, Capital tax reform and the real economy: The effects of the 2003 dividend tax cut, *American Economic Review* 105, 3531–63.

Figure 1: Evolution of Tax Advantage of Debt Around ECJ-Ruling Induced Changes in Tax System

This figure plots the evolution of the Miller's (1977) measure of the tax advantage of debt relative to equity for each imputation country over its last four years as an imputation system and first four years after changing to a classical system.

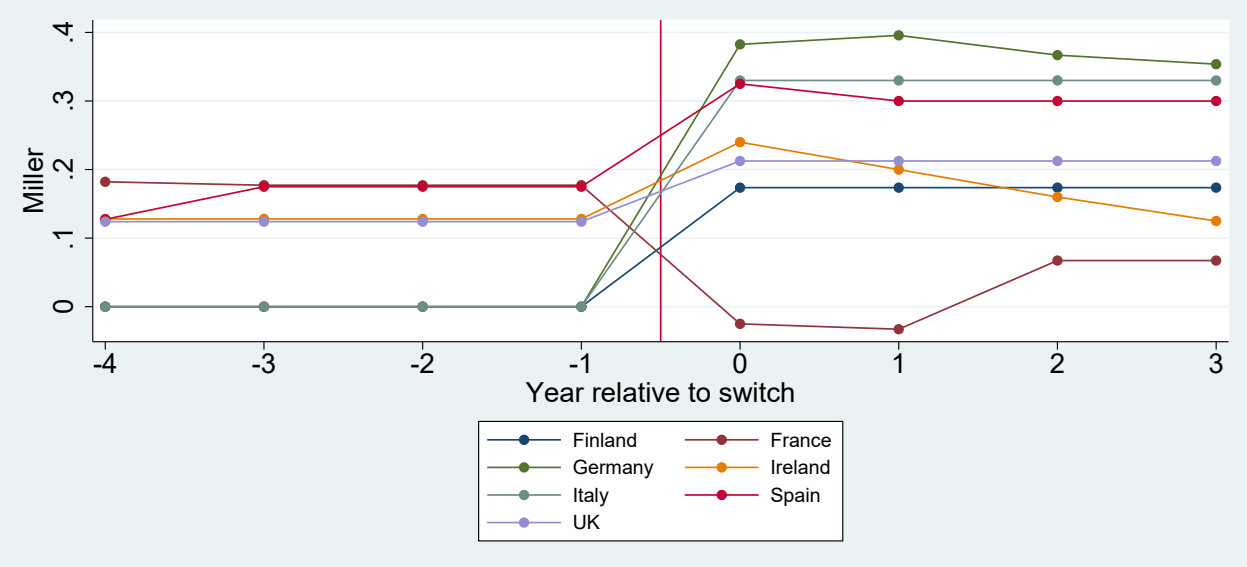


Figure 2: Comparison of Tax Advantage of Debt Around ECJ-Ruling Induced Changes in Tax System for imputation and already-classical countries

This figure plots the mean value of the Miller measure for countries with imputation systems relative to the year the country changed to a classical system as well as the mean value for the same years for all countries that already had classical systems at the time of the Verkooijen ruling).

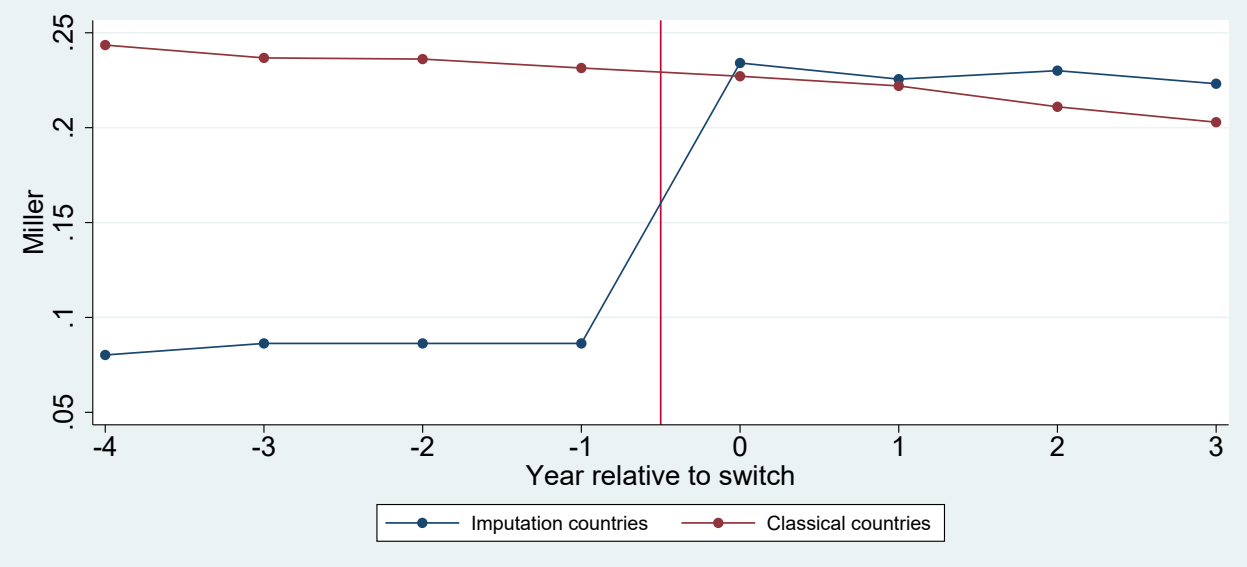
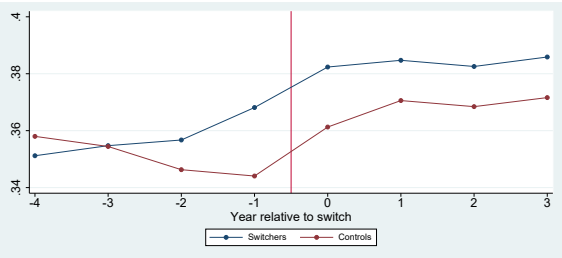


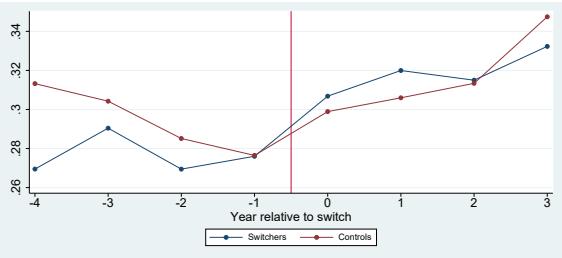
Figure 3: Trends Around ECJ-Ruling Induced Tax System Changes

This figure presents means of various financial and investment variables for firms in switching countries and control firms for the four years before and after a switch. The means are equal-weighted by switching country.

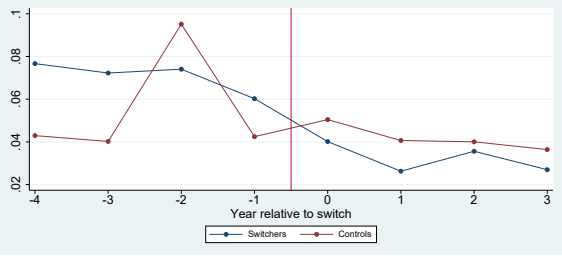
(a) Book leverage



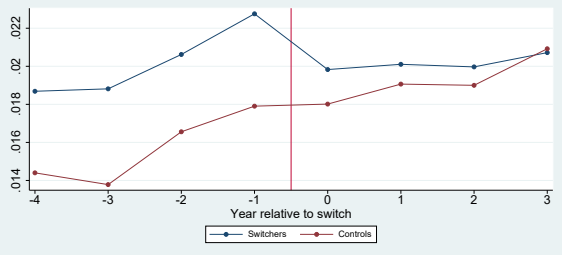
(b) Market leverage



(c) Equity issues



(d) Dividends



(e) Capex

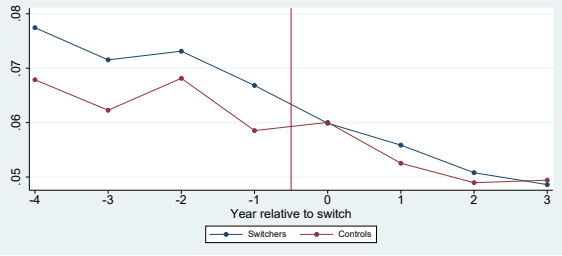


Table 1: Tax System Changes in the EU as a Result of the ECJ Rulings

This table describes the timing and nature of the switches in tax system that we analyze. For each of the seven EU countries with imputation tax systems at the time of the *Verkooijen* ruling in 1999, it reports the year of the switch (i.e., the first year under the new system), the nature of imputation system prior to the switch, and the nature of classical system after the switch.

Country	Switch Year	Pre-switch System	Post-Switch System
Finland	2005	Full Imputation	Partial Inclusion
France	2005	Partial Imputation	Partial Inclusion
Germany	2002	Full Imputation	Partial Inclusion
Ireland	2000	Partial Imputation	Full Classical
Italy	2004	Full Imputation	Full Classical
Spain	2007	Partial Imputation	Full Classical
UK	2000	Partial Imputation	Modified Classical

Table 2: Variation in the Tax Advantage of Debt in the EU and US, 1992 - 2012

This table reports the total, cross-sectional, and time-series annual variance in Miller's (1977) measure of the tax advantage of debt for the 15 countries in the EU as of the time of the *Verkooijen* ruling in 1999 and for the United States. The unit of observation is a country in the EU and a state in the US. The "ECJ rulings changes only" variance in Europe is variance due to the seven EU country tax system changes stemming from the ECJ rulings, ignoring all other tax rate and system variation. The "Excluding 2003 tax cut" variance for the US excludes the one-time drop in the US dividend tax rate starting in 2004 due to the 2003 Jobs and Growth Tax Relief Reconciliation Act.

	Total Variance	Cross-sectional Variance	Time-series Variance
European Union			
All country-years	0.147	0.105	0.102
ECJ rulings changes only			0.074
United States			
All state-years	0.102	0.020	0.100
Excluding 2003 dividend tax cut			0.021

Table 3: Number of Firms by Switching Country

This table reports the number of firms in our matched sample from each country switching from imputation to classical system due to the ECJ rulings.

Country	Number of firms
Finland	94
France	425
Germany	515
Ireland	38
Italy	157
Spain	88
UK	858
Total	2,175

Table 4: Comparison of Treated and Control Firms on Fundamentals

This table presents a comparison of fundamental variables for firms in countries switching from imputation to classical tax systems due to the ECJ rulings ("treated" firms) to control firms. The first two columns compare the mean value of each variable for treated and control firms the year prior to the *Verkooijen* ruling, where we equal-weight switching countries in computing the means. The third and fourth columns compare the means the year prior to the switch, where we again equal-weight switching countries in computing means. *, **, and *** indicate differences in means between treated and control firms based on a two-tailed test with significance at the 10%, 5%, and 1% levels, respectively.

	Means (equal-weighted)			
	Pre-Verkooijen		Pre-switch	
	Treated	Control	Treated	Control
Log (Assets)	8.011	8.001	8.067	8.043
MarketToBook	1.356	1.359	1.353	1.351
Tangibility	0.331	0.336	0.331	0.337
EBIT	0.096	0.092	0.096	0.092
EBITDA	0.152	0.150	0.152	0.150

Table 5: Comparison of Treated and Control Firms on Financing and Investment

This table presents a comparison of financing and investment policy variables for firms in countries switching from imputation to classical tax systems due to the ECJ rulings ("treated" firms) to control firms. The first two columns compare the mean value of each variable for treated and control firms the year prior to the *Verkooijen* ruling, where we equal-weight switching countries in computing the means. The third and fourth columns compare the means the year prior to the switch, where we again equal-weight switching countries in computing means. *, **, and *** indicate differences in means between treated and control firms based on a two-tailed test with significance at the 10%, 5%, and 1% levels, respectively.

	Means (equal-weighted)			
	Pre-Verkooijen		Pre-switch	
	Treated	Control	Treated	Control
Book Leverage	0.345	0.364	0.368	0.344
Market Leverage	0.259	0.298**	0.256	0.277*
Equity Issues	0.058	0.051	0.069	0.051**
Debt Issues	0.038	0.033	0.033	0.013***
Dividends	0.020	0.015***	0.023	0.018**
Capital Expenditures	0.095	0.088*	0.068	0.059**

Table 6: Corporate Decisions and ECJ Rulings-Induced Changes in Tax Systems - Difference-in-Differences Estimates

This table presents difference-in-differences estimates of the change in financing variables for countries switching from imputation to classical systems as a result of the ECJ rulings. The sample consists of firm-year observations from the fours years before to four years after a switch for firms in each switching EU country and matched control firms in the same 2-digit SIC industries from unaffected countries. See Appendix B for definitions of the dependent variables. The indicator *Switcher* is one for firms in countries that switched and zero for control firms. The indicator *PostSwitch* is one for the four years after a switch (S though $S+3$) and zero for the four years before ($S-4$ though $S-1$). All regressions include firm and year fixed effects. Observations are weighted by the inverse of the number of observations in the switching country. Standard errors clustered at the firm level appear in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends	Capital Expenditures
PostSwitch	0.012*	0.015**	-0.010	0.006	-0.001	0.001
	(0.007)	(0.006)	(0.013)	(0.005)	(0.001)	(0.003)
Switcher * PostSwitch	0.007	0.018*	-0.028**	-0.021***	-0.003***	-0.008***
	(0.010)	(0.009)	(0.013)	(0.005)	(0.001)	(0.003)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	30,425	29,434	22,566	27,597	28,139	27,275
Adjusted R2	0.697	0.705	0.175	0.053	0.593	0.404

Table 7: Corporate Decisions and ECJ Ruling-Induced Changes in Tax Systems - Excluding One Switching Country at a Time

This table presents difference-in-differences estimates of the change in financing variables for countries switching from imputation to classical systems as a result of the ECJ rulings, where we exclude one switching country at a time. The sample consists of firm-year observations from the four years before to four years after a switch for firms in each switching EU country and matched control firms in the same 2-digit SIC industries from unaffected countries. See Appendix B for definitions of the dependent variables. Each pair of rows reports estimates where we exclude the listed switching country and its associated controls from the sample. The table reports only the coefficients and standard errors for $Switcher * PostSwitch$ from each regression for brevity. Observations are weighted by the inverse of the number of observations in the switching country. Standard errors clustered at the firm level appear in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends	Capital Expenditures
Excluded country						
Finland	0.009	0.019**	-0.027*	-0.022***	-0.004***	-0.007**
	(0.010)	(0.010)	(0.014)	(0.005)	(0.001)	(0.003)
France	0.011	0.019*	-0.028**	-0.022***	-0.003**	-0.011***
	(0.011)	(0.011)	(0.014)	(0.006)	(0.001)	(0.003)
Germany	0.006	0.018*	-0.007	-0.023***	-0.003**	-0.004
	(0.011)	(0.010)	(0.015)	(0.006)	(0.001)	(0.003)
Ireland	0.004	0.011	-0.027**	-0.012***	-0.002	-0.008***
	(0.009)	(0.009)	(0.012)	(0.004)	(0.001)	(0.003)
Italy	-0.002	0.012	-0.031**	-0.024***	-0.004***	-0.010***
	(0.011)	(0.010)	(0.015)	(0.006)	(0.001)	(0.003)
Spain	0.003	0.020**	-0.036***	-0.021***	-0.004***	-0.009***
	(0.011)	(0.010)	(0.013)	(0.006)	(0.001)	(0.003)
UK	0.016	0.027**	-0.038***	-0.021***	-0.004***	-0.008***
	(0.011)	(0.010)	(0.014)	(0.006)	(0.001)	(0.003)

Table 8: Corporate Decisions and ECJ Rulings-Induced Changes in Tax Systems - Capital-raisers and non-capital raisers

This table presents difference-in-differences estimates of the change in financing variables for countries switching from imputation to classical systems as a result of the ECJ rulings for capital-raising and non-capital raising firms separately. The sample consists of firm-year observations from the fours years before to four years after a switch for firms in each switching EU country and matched control firms in the same 2-digit SIC industries from unaffected countries. See Appendix B for definitions of the dependent variables. The indicator *Switcher* is one for firms in countries that switched and zero for control firms. The indicator *PostSwitch* is one for the four years after a switch (S though $S+3$) and zero for the four years before ($S-4$ though $S-1$). Panels A and B report results for capital-raising firms (those raising positive net capital the year before the switch) and non-capital raising firms (the converse), respectively. All regressions include firm and year fixed effects. Observations are weighted by the inverse of the number of observations in the switching country. Standard errors clustered at the firm level appear in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Capital-Raising Firms

	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends	Capital Expenditures
PostSwitch	0.004	0.014	-0.027	-0.003	-0.002*	-0.004
	(0.009)	(0.009)	(0.020)	(0.008)	(0.001)	(0.004)
Switcher * PostSwitch	0.027**	0.035***	-0.033	-0.044***	-0.005***	-0.014***
	(0.013)	(0.012)	(0.020)	(0.008)	(0.002)	(0.004)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	14,966	14,432	11,286	13,645	13,847	13,470
Adjusted R2	0.683	0.693	0.208	0.068	0.620	0.425

Panel B: Non-Capital-Raising Firms

	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends	Capital Expenditures
PostSwitch	0.022**	0.015*	0.001	0.018***	0.000	0.007**
	(0.009)	(0.008)	(0.011)	(0.007)	(0.001)	(0.003)
Switcher * PostSwitch	-0.020	-0.004	-0.016	0.005	-0.002	-0.002
	(0.013)	(0.013)	(0.011)	(0.006)	(0.002)	(0.004)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	14,609	14,179	10,853	13,377	13,570	13,233
Adjusted R2	0.720	0.727	0.116	0.050	0.569	0.379

Table 9: Corporate Decisions and ECJ Rulings-Induced Changes in Tax Systems - Variation with Scale of Changes

This table presents difference-in-differences estimates of the change in financing variables for countries switching from imputation to classical systems as a result of the *Verkooijen* ruling. The sample consists of firm-year observations from the fours years before to four years after a switch for firms in each switching EU country and matched control firms in the same 2-digit SIC industries from unaffected countries. See Appendix B for definitions of the dependent variables. The indicator *Switcher* is one for firms in countries that switched and zero for control firms. The indicator *PostSwitch* is one for the four years after a switch (S though $S+3$) and zero for the four years before ($S-4$ though $S-1$). Panel A reports results for the full sample. Panels B and C report results for capital-raising firms (those raising positive net capital the year before the switch) and non-capital raising firms (the converse), respectively. Panel A reports results for firms in countries switching from full imputation countries and Panel B for firms in countries switching from partial imputation systems. All regressions include firm and year fixed effects. Observations are weighted by the inverse of the number of observations in the switching country. Standard errors clustered at the firm level appear in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Full Imputation Countries

	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends	Capital Expenditures
PostSwitch	0.005	0.012	0.015	0.003	-0.005***	0.002
	(0.010)	(0.010)	(0.013)	(0.007)	(0.001)	(0.004)
Switcher * PostSwitch	0.020*	0.025**	-0.062***	-0.007	-0.004*	-0.015***
	(0.012)	(0.013)	(0.015)	(0.006)	(0.002)	(0.004)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	10,852	10,439	8,163	9,887	10,241	9,763
Adjusted R2	0.706	0.698	0.163	0.045	0.591	0.321

Panel B: Partial Imputation Countries

	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends	Capital Expenditures
PostSwitch	-0.001	0.008	0.001	-0.003	0.001	-0.001
	(0.013)	(0.011)	(0.030)	(0.010)	(0.002)	(0.004)
Switcher * PostSwitch	-0.004	0.012	0.001	-0.031***	-0.004**	-0.003
	(0.014)	(0.012)	(0.020)	(0.008)	(0.002)	(0.004)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	19,573	18,995	14,403	17,710	17,898	17,512
Adjusted R2	0.693	0.712	0.219	0.062	0.598	0.471

Panel C: Variation in Δ Miller

	Book Leverage	Market Leverage
PostSwitch	0.012	0.013*
	(0.008)	(0.007)
Switcher * PostSwitch	-0.008	0.012
	(0.011)	(0.010)
PostSwitch * Δ Miller	-0.007	0.003
	(0.024)	(0.024)
Switcher * PostSwitch	0.099***	0.040
* Δ Miller	(0.033)	(0.030)
Fixed effects	Firm & Year	Firm & Year
Observations	30,425	29,434
Adjusted R2	0.698	0.705

A Taxes and Capital Structure: A Theoretical Framework

Consider a firm with perpetual risk-free debt of D as of $t = 0$. The firm produces deterministic operating profits of X per period in perpetuity, starting in period $t = 1$. The risk-free rate is $r > 0$. Interest is tax deductible, so the firm's after-tax profit in each period is $(X - rD)(1 - \tau_C)$. The firm pays all of its after-tax profits in each period to shareholders in the form of a dividend. Shareholders' after-tax cash flow in each period then equals $(X - rD)(1 - \tau_C)(1 - \tau_E)$. The present value of this risk-free cash flow stream is:

$$V = \frac{(X - rD)(1 - \tau_C)(1 - \tau_E)}{r(1 - \tau_D)}. \tag{4}$$

Now suppose that, at $t = 0$, the firm recapitalizes by borrowing an additional amount ΔD at the risk-free rate and immediately paying out the proceeds to shareholders as a dividend, and then maintains its new debt level, $D + \Delta D$, in perpetuity. Shareholders receive an after-tax cash flow of $\Delta D(1 - \tau_E)$ at $t = 0$ and an after-tax perpetuity beginning in period $t = 1$ of $[X - r(D + \Delta D)](1 - \tau_C)(1 - \tau_E)$. The present value of these cash flows is now:

$$V' = \Delta D(1 - \tau_E) + \frac{[X - r(D + \Delta D)](1 - \tau_C)(1 - \tau_E)}{r(1 - \tau_D)}. \tag{5}$$

The present value of the tax savings due to this recapitalization is:

$$\Delta V = V' - V = \Delta D \left[(1 - \tau_E) - \frac{(1 - \tau_C)(1 - \tau_E)}{1 - \tau_D}\right]. \tag{6}$$

Absent tax-driven adjustment costs, the first term in the brackets in (6) is 1 instead of $1 - \tau_E$, and the entire term in the brackets becomes Miller's (1977) familiar measure of the tax advantage of debt relative to equity per dollar of corporate income, $1 - \frac{(1-\tau_C)(1-\tau_E)}{1-\tau_D}$. The taxation of dividends in a recapitalization then reduces the benefit of increasing leverage. The expression in (6) simplifies slightly to:

$$\Delta V = \Delta D \times \frac{(1 - \tau_E)(\tau_C - \tau_D)}{1 - \tau_D}. \tag{7}$$

Now consider the effect of an increase in the dividend tax rate on the tax benefit of additional debt:

$$\frac{\partial \Delta V}{\partial \tau_E} = \Delta D \times \frac{\tau_D - \tau_C}{1 - \tau_D}. \tag{8}$$

This effect is smaller than the effect ignoring the taxation of dividends in a recapitalization, $\Delta D \times \frac{1-\tau_C}{1-\tau_D}$. Indeed, the sign of $\frac{\partial \Delta V}{\partial \tau_E}$ is ambiguous.

This analysis implies that the need to pay taxes on dividends to increase leverage may cause firms to adjust capital structure slowly or not at all in response to an increase in the

tax on dividends. Whether a firm needs to pay dividends to increase leverage depends on whether it relies on internal or external capital to finance investment. If a firm relies on internal capital, then increasing leverage requires replacing equity with debt, which requires a payout to shareholders. On the other hand, a firm that relies on external financing can increase leverage by simply tilting its issuance towards debt, with no need to pay out to shareholders.

It should be noted that the above analysis assumes that all shareholders face the same marginal tax rates, which ignores the fact that some investors, such as pension funds, are exempt from taxation. The taxation of distributions in a leveraged recapitalization only affects taxable shareholders, so there will be a conflict between the interests of the taxable and tax-exempt investors, who would prefer an immediate increase in leverage if the dividend tax rate increases. The analysis also focuses on dividends rather than repurchases as a means of paying out capital to shareholders. While τ_E could, in principle, represent the tax rate on repurchases as well, firms in Europe during our sample period pay out capital almost exclusively through dividends.

B Variable Definitions

Variable	Definition
Financing variables:	
Book Leverage	Total debt divided by book capital.
Market Leverage	Total debt divided by market capital.
Total debt	Book value of short-term and long-term interest-bearing debt.
Book capital	Book value of common equity plus the book value of preferred stock plus total debt.
Market capital	Market value of common equity plus the book value of preferred stock plus total debt.
Equity issues	Cash flow from the sale of common stock less cash spent on the repurchase of common stock, divided by total assets.
Debt issues	Net cash flow from the sale and redemption of long- and short-term debt divided by total assets.
Equity Issues/Total Issues	Equity issues divided by the sum of equity and debt issues if the sum is positive.
Dividends	Total dividends divided by total assets.
Other firm variables:	
Log(Assets)	Natural logarithm of total assets.
MarketToBook	Market value of the firm divided by total assets.
Tangibility	Fixed assets divided by total assets.
EBIT	Sales minus cost of goods sold, SG&A expense, and depreciation/amortization, divided by total assets.
EBITDA	Sales minus cost of goods sold and SG&A expense divided by total assets.
Capital Expenditure	Capital expenditure divided by total assets.
Tax and tax system variables:	
Miller	$\left[1 - \frac{(1-CorporateTaxRate)\times(1-DividendTaxRate)}{(1-InterestTaxRate)}\right]$
Corporate Tax Rate (CTR)	Top statutory tax rate on corporate profits.
Interest Tax Rate (ITR)	Top statutory personal tax rates on interest income.
Dividend Tax Rate (DTR)	Top statutory tax rate on dividend income to resident shareholders, adjusted for allowance
Exemption	Fraction of dividends exempt from taxation
FC	Fraction of corporate profits for which shareholders can receive a franking credit under an imputation system (equal to zero in a classical system).
Switcher	Indicator variable equal to one for countries that switch from imputation to classical systems during the sample period and zero otherwise.
PostSwitch	Indicator variable equal to one in the post-switch period and zero in the pre-switch period.