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Capital Structure and Investor-Level Taxes: Evidence from a Natural Experiment in Europe

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

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Abstract

We study a court ruling that materially affected dividend taxation in several European countries. The tax changes were not directly related to economic conditions or corporate financial policies, providing a useful experiment for studying 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 should be the most affected by the tax changes. Moreover, investment decreases, consistent with an increase in the after-tax cost of capital that arose from the tax change.

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1 Introduction

Since Modigliani and Miller (1963), it has been understood that taxes play an important role in shaping corporate financial and investment policies. Yet, estimating the effects of taxes on corporate policies remains a challenge. One common approach to estimating these effects is to study responses to statutory changes in tax rates, such as those due to the 1986 US Tax Reform Act and the 2003 US Jobs and Growth Tax Relief Reconciliation Act (JGTRRA). However, these tax changes represent endogenous choices by policymakers and are typically accompanied by other important policy changes. Moreover, many studies analyze single tax change events, making the effects of tax changes difficult to disentangle from those of coincident economic trends. These factors potentially confound causal inference.

In this paper, we attempt to overcome the limitations of prior analyses by studying a natural experiment involving a series of country-level tax system changes in the European Union (EU). These tax changes stemmed from a 1999 European Court of Justice (ECJ) ruling in the *Verkooijen* case. Prior to *Verkooijen*, seven of the fifteen countries in the EU had *imputation* tax systems. In contrast to *classical* tax systems, such as the US tax system, domestic shareholders of firms operating under an imputation system receive "franking" credits for corporate taxes paid when they receive dividends, allowing these shareholders to at least partly offset any dividend taxes otherwise due. In *Verkooijen*, the ECJ ruled that imputation systems violated a European Commission (EC) ban on obstructions of cross-border economic activity because these systems discriminated against foreign shareholders.

To comply with the ruling, all seven EU countries with imputation systems converted to classical systems between 2000 and 2008. These changes were staggered over time and substantially increased the effective tax on dividends as well as the tax advantage of debt financing in the affected countries. The tax changes were imposed on these countries by a court ruling unrelated to economic trends or policy objectives. These tax changes thus

provide a useful natural experiment for studying the effects of changes in investor taxes on corporate policies. We exploit this experiment by analyzing changes in the financial choices of firms in the seven affected countries around the time of transition to a classical system, which varies by country. This variation in timing allows us to filter out the effects of any unrelated aggregate EU-wide shocks by removing year fixed effects in regression analysis.

To motivate our empirical analysis, we provide a simple theoretical framework extending work by Miller (1977), Auerbach (1979), and Masulis and Trueman (1988) that illustrates the link between tax policy and investment, payout policy and capital structure choices. As we show, while higher effective taxes on dividends increase the tax advantage of debt, the tax cost that paying dividends imposes on shareholders represents a friction that may deter efforts to recapitalize to higher leverage ratios.[1] This tax friction is more important for firms that do not plan to raise capital, since a firm raising capital can increase leverage by simply borrowing instead of issuing equity. In addition, as other papers have noted, while a higher dividend tax rate increases the cost of external capital, it can *decrease* the cost of internal capital since the alternative of paying out cash flow as dividends becomes more costly. Thus, a firm's investment response to an increase in dividend taxes may depend on whether it relies on internal or external capital to finance investment.

We begin our empirical analysis by investigating pre-transition differences in financial and investment policies between firms in the seven countries that transitioned from imputation systems and matched control firms from countries that already had classical tax systems at the time of *Verkooijen*. As one would expect, firms in countries with imputation systems generally pay more dividends, have lower leverage ratios, and invest at higher levels than firms in countries with classical systems. We also find that firms in imputation countries issue

[1] In principle, firms can also pay out equity by repurchasing shares, which tends to be more tax efficient than paying dividends. The *Verkooijen* ruling had no effect on the tax costs of repurchasing shares. However, in practice, repurchases represented a small fraction of total payouts for firms in the EU during our sample period. We discuss various institutional frictions that may have prevented EU firms from relying on share repurchases to return cash to shareholders during this period.

more equity, consistent with the lower cost of paying future dividends. Firms in transitioning countries and control firms do not differ significantly on other observable characteristics such as size, operating profitability, and asset tangibility.

We then investigate changes in firms' financial and investment policies around changes from imputation to classical tax systems using difference-in-differences analysis. We find that firms cut dividends significantly following changes from imputation to classical tax systems. Firms also decrease equity issuance. These changes reflect a convergence in financial policy to that of firms in countries that already had classical systems, since firms in countries changing tax systems issue more equity and pay more dividends pre-transition. Interestingly, firms decrease debt issuance as well. The decrease in capital raising overall is consistent with reduced dividend payments increasing internal financing capacity and therefore reducing the need for external financing. However, the magnitude of the observed decline in capital raising is larger than the decline in dividends. This difference in magnitudes suggests that the decline in capital raising may be partly attributable to a reduction in investment, perhaps due to an increase in the after-tax cost of capital resulting from the transition to a classical system. We return to this possibility shortly.

For our full sample, we find small, marginally statistically significant increases in leverage ratios after changes from imputation to classical systems. However, the weak average response in the full sample masks significant cross-sectional variation. Precisely as our framework predicts, we find a large increase in leverage after switches from imputation to classical systems for firms likely to raise capital post-switch - specifically, those raising net positive amounts of capital pre-switch. Book and market leverage ratios for these firms increase by 2.7 and 3.5 percentage points, respectively. In contrast, we observe no change in leverage ratios for non-capital raisers.

We further validate our experiment by exploiting variation in the size of franking credits granted under a country's imputation system prior to transition. Three of the seven

switching countries had "full imputation" systems, which award a franking credit for 100% of corporate taxes paid, while four had "partial" imputation systems, which award a franking credit equal to only 50% of corporate taxes paid. Thus, all else equal, a switch from a full imputation system should affect financial decisions more than a switch from a partial imputation system.[2] Consistent with this prediction, we find that firms in countries switching from full imputation systems increase leverage ratios and decrease equity issuance post-switch significantly more than those in countries switching from partial imputation systems, though changes in dividends do not differ significantly between the two.

Finally, we examine how the transition to a classical tax system impacts the investment level of affected firms. As our framework suggests, the effect of the transition to a classical tax system depends on the extent to which a firm requires external capital to meet its investment needs. An increase in dividend taxes should raise the cost of capital for a firm raising external capital. However, for a firm not raising capital, the effect may be the opposite, since retaining earnings and investing them becomes more attractive relative to paying them as dividends when the tax on dividends rises. We find that firms decrease investment after a switch from imputation to a classical system and that this effect is concentrated in capital-raising firms. These findings suggest that the reduction in capital-raising after switches partly reflects reduced investment due to an increased cost of capital.[3]

As we mentioned at the outset, our paper contributes to a substantial literature that explores the effect of both corporate and personal taxes on financial policies. The literature that focuses on personal taxes includes studies linking changes in capital structure to changes

[2]Countries also differ in the type of classical system they adopt after changing from an imputation system. However, while the nature of a country's imputation system is fixed at the time of *Verkooijen*, the type of classical system it subsequently adopts is not and may be endogenous with respect to financial policy.

[3]This is a partial equilibrium argument. In general equilibrium, the price of capital goods adjusts to account for the cost of financing them. However, as in the US, small firms in the EU are often structured as pass-through entities. Thus, even if capital goods prices adjust, the adoption of a classical system would still put corporations at a disadvantage in financing capital goods relative to pass-through entities. See Chen and Frank (2019) for a theoretical analysis of the general equilibrium effects of investor-level taxes.

in US dividend and capital gains tax rates resulting from the US Jobs and Growth Tax Relief Reconciliation Act (JGTRRA) of 2003 (Lin and Flannery, 2013) and the reduction in the preferential treatment of share repurchases in the 1986 US Tax Reform Act (Givoly, Hayn, Ofer, and Sarig, 1992).[4] Other studies link changes in dividend payout to specific dividend tax shocks, including the JGTRRA (Chetty and Saez, 2005), a dividend tax cut in Sweden (Jacob and Michaely, 2017), the adoption of an imputation tax system in Australia (Pattenden and Twite, 2008), and anticipation of two dividend tax shocks in 2011 and 2013 in the US (Hanlon and Hoopes, 2014). This literature also includes multi-country studies linking leverage ratios to variation in statutory investor-level tax rates (Faccio and Xu, 2015) and to Miller's (1977) measure of the tax advantage of debt accounting for investor-level tax rates (Fan, Titman, and Twite, 2012).

Methodologically, our analysis of the effects of taxes on financial policies is closest to Heider and Ljungqvist's (2015) study of the effect of changes in state *corporate* tax rates on US firms' capital structure choices.[5] In comparison to their study, our study examines tax changes that are an order of magnitude larger and thus provide a more powerful experiment for learning about the effect of taxes on capital structure. Specifically, our changes are equivalent to a mean 9.43% increase in the dividend tax rate in the affected countries, while the mean absolute change in US state-level corporate tax rates that Heider and Ljungqvist (2015) study is 0.77%.[6] In addition, since the tax changes we study were imposed by an external court ruling instead of representing local policy choices, we can plausibly argue that

[4]Lin and Flannery (2013) find that firms decreased leverage in response to the JGTRRA. Givoly, Hayn, Ofer, and Sarig (1992) find that firms with low dividend yields, which they argue are held disproportionately by high-tax bracket investors, increased leverage more after the 1986 US Tax Reform Act reduced the preferential treatment of capital gains.

[5]Giroud and Rauh (2019) present evidence that firms' location decisions are sensitive to state-level corporate and personal tax rates, the latter affecting firms organized as pass-through entities.

[6]The 0.77% mean change in state-level tax rates is based only on changes in the statutory rate and do not include changes in the surcharge on tax liability, which Heider and Ljungqvist (2015) also include in their sample of tax changes. We cannot readily determine the effective magnitude of these changes, though they generally appear to be small.

we are examining exogenous shocks to tax rates.[7]

Our paper also contributes to the literature that studies the impact of shareholder-level taxes on corporate investment. Studying a number of dividend tax changes across multiple countries, Becker, Jacob, and Jacob (2013) 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. The tax changes they consider include the changes from classical to imputation systems in the EU that we study, among others. 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 that affected capital gains taxation differently for firms of different size. However, Yagan (2015) finds that C corporations in the US do not increase their investment relative to S corporations in response to the JGTRRA, which reduced the tax rate on dividends paid to C corporation shareholders.

2 Taxes and Capital Structure: A Theoretical Framework

In this section, we introduce a simple theoretical framework for understanding the tax implications of changing firm leverage. Our objective is not to fully characterize optimal financial policy but rather to assess the tax consequences of a change in leverage, accounting not only for corporate taxes but also for investor-level taxes. A firm optimizing in a traditional trade-off framework would consider these tax consequences along with financial distress costs and any non-tax financial adjustment costs in choosing its optimal financial

[7] Heider and Ljungqvist (2015) recognize that the tax changes may be part of an overall policy that is designed to encourage investment and provide regressions that filter out the contaminating effects of omitted local factors. Specifically, they estimate a difference-in-differences model using a matched sample of pairs of firms located in adjacent counties on opposite sides of state borders, where one state either increases or decreases its corporate tax rate and the other does not.

policy.

Consider first the case of a brand new firm choosing its capital structure *de novo*. Absent capital market frictions, such a firm would simply choose its optimal capital structure and then issue the mix of equity and debt necessary to implement that capital structure. In doing so, it would ascribe a net tax benefit to each dollar paid out to creditors instead of shareholders of $1 - \frac{(1-\tau_C)(1-\tau_E)}{1-\tau_D}$, Miller's (1977) well-known expression for the relative tax advantage of debt, where τ_C, τ_E, and τ_D are the tax rate on corporate income, equity income (dividends), and debt income (interest), respectively. We assume here that all shareholders face the same tax rate.[8]

Now consider the case of a firm that experiences a change in its tax environment and thus contemplates a change in its debt-equity mix. Suppose that the firm's total balance sheet size is fixed (we revisit this assumption shortly). In this case, the firm would need to recapitalize in order to institute a change in capital structure, issuing new securities of one type and using the proceeds to reduce the outstanding amount of the other type. In general, such transactions have tax consequences, which a complete analysis of the financial policy response to a change in dividend taxation must consider. Indeed, as we show below, the net gain from increasing leverage, which accounts for the tax associated with the transaction, may actually decrease with the dividend tax rate, even though a higher dividend tax rate increases the tax benefit of distributing future income to creditors rather than shareholders.

Formally, 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

[8] Miller (1977) argues that, if the demand for debt is imperfectly-elastic, endogenous security issuance will make any individual firm indifferent between issuing debt and equity in equilibrium. See also the analysis of DeAngelo and Masulis (1980a, 1980b).

equals $(X - rD)(1 - \tau_C)(1 - \tau_E)$. The present value of this perpetual stream of dividends is:

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

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. For the moment, as a benchmark, assume that the dividend paid out to shareholders at $t = 0$ as a result of the recapitalization is not taxed. Shareholders receive an after-tax cash flow of ΔD at $t = 0$ and cash flow of $[X - r(D + \Delta D)](1 - \tau_C)(1 - \tau_E)$ in each future period starting at $t = 1$. The present value of all cash flows shareholders receive is

$$V'_{BM} = \Delta D + \frac{[X - r(D + \Delta D)](1 - \tau_C)(1 - \tau_E)}{r(1 - \tau_D)}. \tag{2}$$

The value added for shareholders by this recapitalization as a result of reduced taxation is:

$$\Delta V_{BM} = V'_{BM} - V = \Delta D[1 - \frac{(1 - \tau_C)(1 - \tau_E)}{1 - \tau_D}]. \tag{3}$$

The expression in brackets is Miller's (1977) expression for the relative tax advantage of debt. Not surprisingly, when a firm can alter its leverage at no cost, it assigns the same tax benefit to an additional dollar of income allocated to creditors instead of shareholders as a new firm with no pre-existing capital structure would.

Now consider the case where the transition to a higher leverage ratio requires that the firm pay shareholders a taxable dividend. When this is the case, shareholders' after-tax cash flow at $t = 0$ is $\Delta D(1 - \tau_E)$, which is less than the amount ΔD shareholders receive at $t = 0$ in the benchmark case. As in the benchmark case, shareholders receive a perpetual stream of cash flows $[X - r(D + \Delta D)](1 - \tau_C)(1 - \tau_E)$ in each future period, starting at $t = 1$. The

present value of all cash flows shareholders receive is now:

$$V' = \Delta D(1-\tau_E) + \frac{[X - r(D+\Delta D)](1-\tau_C)(1-\tau_E)}{r(1-\tau_D)}. \tag{4}$$

The value added for shareholders by this recapitalization is:

$$\begin{aligned}\Delta V = V' - V &= \Delta D\left[(1-\tau_E) - \frac{(1-\tau_C)(1-\tau_E)}{1-\tau_D}\right] \\ &= \Delta D\frac{(1-\tau_E)(\tau_C-\tau_D)}{1-\tau_D}.\end{aligned} \tag{5}$$

Comparing the above expression to ΔV_{BM} yields the first main result of this analysis.

Result 1. $\Delta V < \Delta V_{BM}$.

That is, taking into account the tax consequences of increasing leverage by paying a dividend lowers the net tax benefit from a leverage-increasing recapitalization relative to the Miller expression. In the benchmark case, where the recapitalizing dividend is not taxed, the tax benefit of recapitalizing to a higher debt level is positive as long as $(1-\tau_D) > (1-\tau_C)(1-\tau_E)$, a condition likely to be satisfied in most cases. However, after accounting for the taxation of the dividend portion of the recapitalization, the tax benefits are only positive if $\tau_D < \tau_C$, or equivalently, if $(1-\tau_D) > (1-\tau_C)$. This is a tighter condition than in the benchmark case, and it may not be satisfied in many situations. If it is not satisfied, then a value-maximizing firm would not increase debt, even if it could do so without increasing expected financial distress costs. As our next result illustrates, the net tax benefit of increasing leverage depends on the relation between the corporate tax rate and the personal tax rate on dividends.

Result 2. $sign(\Delta V) = sign(\tau_C - \tau_D)$.

Now consider the effect of an increase in the dividend tax rate. Observe that $\frac{\partial \Delta V_{BM}}{\partial \tau_E} =$

$\Delta D \frac{1-\tau_C}{1-\tau_D} > 0$. That is, an increase in the dividend tax rate unambiguously increases the net tax benefit of an increase in leverage when the equity payout in the recapitalization is not taxed. However, the sign of $\frac{\partial \Delta V}{\partial \tau_E} = -\Delta D \frac{\tau_C - \tau_D}{1-\tau_D}$ is ambiguous. That is, once we account for the taxation of the equity payout in the recapitalization, an increase in the dividend tax rate may cause the net tax benefit of an increase in leverage to either increase or decrease. Indeed, if $\tau_C > \tau_D$, which is a necessary condition for an increase in debt to produce a net tax benefit, then an increase in the dividend tax rate reduces the net tax benefit of an increase in leverage. This is the third result of the analysis.

Result 3. *If an increase in debt is tax beneficial ($\tau_C > \tau_D$), then the size of the benefit (ΔV) decreases with the dividend tax rate τ_E.*

The above analysis leads to three predictions around which we center our empirical analysis. The first, and most straightforward, relates to dividend payments. All else equal, a higher tax on dividends decreases incentives to pay dividends. As Result 3 makes clear, even if a firm would like to recapitalize to a higher leverage ratio, the incentives to reduce dividends will generally be stronger.

Prediction 1. *An increase in the tax on dividends should decrease dividend payments.*

The second prediction relates to equity issuance. An increase in dividend taxes makes the tax costs of paying future dividends higher, discouraging equity issuance.

Prediction 2. *An increase in the tax on dividends decreases equity issuance.*

Our third prediction relates to leverage ratios. Recall that we have held fixed the size of the firm's balance sheet in our analysis. The analysis suggests that, when a firm needs to recapitalize in order to increase leverage, the financial policy response to an increase in the dividend tax rate is ambiguous. The firm may either increase or decrease leverage, despite the

fact that higher dividend taxes increase the tax advantage of having higher leverage.[9] This assumption that the firm needs to recapitalize in order to increase leverage is appropriate when a firm is not actively seeking to raise capital.

In contrast, a firm that is already planning to raise a positive net amount of external capital need not pay a dividend to increase its leverage. Instead, it can increase its leverage ratio by disproportionately issuing debt rather than equity. As a result, firms that are planning to raise capital should unambiguously increase their leverage in response to an increase in the dividend tax rate. This argument leads to our final capital structure prediction.

Prediction 3. *An increase in the tax on dividends should increase leverage for firms that raise capital. The predicted effect for non-capital raising firms is ambiguous.*

Our framework also has implications for investment behavior that mirror those in the analysis of Auerbach (1979). An increase in the dividend tax raises the cost of external equity. Thus, all else equal, a firm relying on external financing should decrease investment if the dividend tax increases.[10] In contrast, an increase in the dividend tax decreases the opportunity cost of internally-generated capital by increasing the cost of paying the capital out as a dividend. Thus, a firm relying on internal financing may increase investment if the dividend tax increases.

Finally, it should also 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

[9]The ambiguity of these responses is in sharp contrast to how one would expect firms to respond to an increase in the tax advantage of debt due to an increase in corporate taxes. As $\frac{\partial \Delta V}{\partial \tau_C} = \Delta D \frac{1-\tau_E}{1-\tau_D} > 0$, an increase in the corporate tax rate unambiguously increases the net tax benefit of recapitalizing to a higher leverage ratio. As a result, a firm will optimally at least weakly increase dividend payments and leverage in response to an increase in the corporate tax rate.

[10]This reduced investment should be accompanied by reduced equity issuance. The net effect on debt issuance is ambiguous. While firms may substitute debt for equity finance, debt and equity may be natural complements in the financing of investment activity, as the optimal financial strategy in most cases involves a mix of both.

taxable and tax-exempt investors, who would prefer an immediate increase in leverage if the dividend tax rate increases. As we lack data on ownership, we do not consider variation in ownership in our empirical analysis.

3 Taxation in the European Union and the *Verkooijen* ruling

This section discusses the taxation of capital in Europe and the changes made in response to the ECJ's *Verkooijen* ruling.

3.1 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.[11] Thus, all else equal, imputation

[11] 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).

tax systems confer a smaller tax advantage on debt relative to equity financing than classical systems do.

There are three specific variants of the 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 (specifically tax rates) equal, the tax advantage of debt relative to equity is higher under a full classical system than under the other two variants.[12]

There are two specific variants of imputation tax systems. 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 (commonly 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).

[12]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.

3.2 The *Verkooijen* ruling

In 1999, the ECJ ruled in the landmark *Verkooijen* case that imputation tax systems violated the EC's ban on obstructions of cross-border economic activity within the EU. The court held that imputation systems discriminated against foreign shareholders in other EU countries since only domestic shareholders could take advantage of franking credits granted by a company's home country.[13] In its opinion, the ECJ stated that:

> *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.*

The EC followed up with a directive in December 2003 that discussed 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.*

All seven EU countries with imputation tax systems changed to classical 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 ruling and EC directive. Three of the countries switched to full classical systems (Ireland,

[13] A partial exception to this disparate treatment was France, which had tax treaties with some countries under which shareholders in those countries could receive a refund of imputation credits from French companies (Ainsworth, 2016).

Italy, Spain), one to a modified classical system (UK), and three to partial inclusion systems (Finland, France, Germany). These changes were staggered, with two countries switching in 2000 (UK, Ireland), one in 2002 (Germany), one in 2004 (Italy), two in 2005 (Finland, France), and one in 2007 (Spain).[14] Table 1 summarizes the seven changes in tax systems, which form the basis for our empirical analysis, in detail.

[Table 1 about here]

Econometrically, these changes have three useful features. First, they were effectively involuntary, and the court ruling that gave rise to them was not motivated by any economic or financial factors. Thus, we can reasonably treat these changes as exogenous events for the affected countries, allowing us to sidestep concerns about confounding effects in any voluntary change in a country's tax policy. Second, they were staggered over time in their implementation, mitigating concerns that other events during the time period might make the independent effects of the tax changes difficult to tease out. Third, as we show shortly, these changes had a large impact on effective dividend tax rates.

3.3 Importance of tax system changes due to *Verkooijen* ruling

All else equal, switching from an imputation to classical system increases the effective taxation of corporate dividends. To gauge the importance 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

[14] 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).

section) and PWC Worldwide Tax Summaries.[15] In countries with imputation systems, we assume that all taxable earnings are distributed to shareholders. We compute the Miller measure as:

$$Miller = 1 - \frac{[1 - (1 - FC)CTR] \times [1 - DTR \times (1 - Exemption)]}{1 - ITR}, \tag{6}$$

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 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.

As we make clear in Section 2, the Miller measure does not account for the tax costs of paying out equity to recapitalize. Since we want to understand the incentives to recapitalize after an increase in dividend taxes, we also compute an adjusted measure that does account for this cost, based on the expression in equation (5). This adjusted measure is:

$$AdjustedMiller = 1 - \frac{[1 - DTR \times (1 - Exemption)] \times [(1 - FC)CTR - ITR]}{1 - ITR}, \tag{7}$$

Figure 1 plots the time series of the two measures 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, both the Miller and comprehensive measures vary little from year-to-year over the four years

[15] 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).

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 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 a classical system) to 20% in 2001, 16% in 2002, and 12.5% in 2003. Panel (h) shows that the mean Miller measure across the seven EU countries experiencing the shock increases substantially immediately after the shock and remains elevated through at least the first four years after the shock.[16]

Changes in $AdjustedMiller$, the alternative measure that incorporates the tax cost of paying out equity to recapitalize, are more ambiguous. The measure increases markedly in Germany and Spain, decreases in Italy, and remains essentially flat in the other four countries. Thus, while the tax advantage of debt increased substantially as a result of the end of imputation, the tax cost of paying dividends appears to largely offset incentives to

[16]The mean of the Miller measure remains at an elevated level beyond the fourth year after the switch as well.

increase leverage by substituting debt for equity, at least for firms not planning to raise external capital.

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.

The seven tax system changes we study 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. As the first column shows, the total variance of the Miller measure in the EU is 0.147, almost 50% larger than the total variance of 0.102 in the US. The second column shows that the EU exhibits substantially more cross-sectional variation in tax rates than the US. The cross-sectional variance in the Miller measure across countries in the EU is 0.105 and across states in the US is 0.020. This difference is not surprising since most taxation in the US takes place at the federal level, with comparably small differences across states. By comparison, all taxation in the EU takes place at the country level. There is therefore considerably more scope for cross-sectional variation in tax rates in the EU than in the US.

The third column shows similar time-series variances in the Miller measure in the EU (0.102) and the US (0.100). However, most of the variation in the US is attributable to one event - the 2003 US federal dividend tax cut that was part of the JGTRRA. Excluding this one dividend tax cut, the time-series variance of the measure in the US falls to 0.021. The third column also shows that almost 75% of the time-series variance of the Miller measure in the EU is attributable to the seven changes in tax systems stemming from the *Verkooijen* ruling. Thus, tests of the response of capital structure to these changes should have statistical power. Moreover, the fact that these changes were staggered over time allows us to filter out the effects of any unobserved aggregate variation that might be correlated with capital structure policies in Europe.

As further evidence of the importance of the changes in the tax systems we study, these changes were followed by a shift in the foreign ownership of firms in the affected countries. The differential treatment of foreign and domestic shareholders under an imputation system naturally gives rise to a home bias in share ownership. This home bias decreases after a switch to a classical tax system. Consistent with this disadvantage impacting ownership, foreign equity investment (reported by the International Monetary Fund's Coordinated Portfolio Investment Survey) as a fraction of stock market capitalization increases from an average of 24.7% from the period before a switch from imputation to classical system to 46.8% after.[17]

One important difference between the EU and the US that could impact the response of capital structure to taxes is the means by which companies distribute cash to shareholders. In the US, share repurchases have achieved parity with dividends as a means of distributing cash to shareholders. In the EU, by contrast, share repurchases are uncommon (Rau and Vermaelen, 2002; Oswald and Young, 2004; Manconi, Peyer, and Vermaelen, 2014), and

[17]The increase in the taxation of dividends for domestically-owned shares associated with a shift from an imputation to a classical system potentially impacts capital structure by increasing the cost of equity. Any expansion of the shareholder base because of a leveling of the tax playing field for foreign investors will attenuate the increase in the cost of the equity, especially for larger firms that are more likely to attract foreign investors, though our results should still be qualitatively valid.

dividends remain the dominant means of distributing cash throughout our sample period.

The lack of share repurchases in the EU is somewhat surprising since a share repurchase is generally more tax-efficient form of distribution than a dividend payment. European tax experts with whom we spoke attribute the lack of share repurchases in Europe to several factors - the requirement in some countries that repurchases via tender offers be treated as dividends for tax purposes, prohibition of open market offers during the first part of our sample period, lack of safe haven protections for repurchases for the first part of the sample period, 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).[18]

4 Data and Sample

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

4.1 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

[18]Open market offers were not permitted in EU countries before 1998; safe haven rules were introduced in 2003 in EU countries.

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 financial 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, *Capital Expenditure* as capital expenditures divided by total assets, and $\Delta Assets$ as the percentage year-over-year change in total assets. To minimize the potential impact of outliers, we winsorize all variables at the 1st and 99th percentiles.

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. 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.

4.2 Matched sample construction

We examine the responses of firms' financial policies to changes from imputation to classical tax systems due to the *Verkooijen* ruling using a generalized difference-in-differences approach, which we describe in Section 5. 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 then compare changes in financial policy variables in a switching country from the four years before to four years after a switch to those of control firms over the same window.

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, reflect fundamental characteristics of a business in a parsimonoius way. We do not match on financial variables such as leverage because financial variables should differ pre-switch given the differences in tax incentives under imputation and classical systems, which are evident in Figure 2.

To implement our matching approach for a given treated group, we first collect all firm-year observations from countries that already 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:

$$Pr(Switcher = 1|X) = \Phi(\beta_0 + \beta_1 Log(Assets) + \beta_2 MarketToBook), \tag{8}$$

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 with the closest propensity score, matching with replacement.[19]

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 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 and are similar in size and market-to-book ratio to treated firms in the sample.

[19]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. We report results where we match within 3-digit SIC in the Internet appendix.

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 summary statistics for the firms in the treatment sample. It also presents a comparison of the mean values of various observable characteristics between treated and control firms. In this comparison, we equal weight countries since we do so in our regression analysis. We compute all of these summary statistics as of the year prior to the switch (Year $S-1$). Recall that treatment firms operate under imputation systems pre-switch, while control firms operate under classical systems.

[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 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. We do not observe differences in leverage ratios. However, consistent with firms responding to tax incentives, treated firms issue more equity and pay fewer dividends pre-switch. They also invest in capital assets at higher levels. This difference could reflect a lower cost of external equity capital under an imputation system, since payout to equity is at least partly shielded from taxation through

the franking credit. This investment difference could explain why treated firms issue not only more equity than control firms but also more debt.

As Figure 2 shows, 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 estimate post-switch changes in these policies in the next section.

5 Empirical Methodology

This section describes our generalized difference-in-differences methodology. Using the matched sample we described in the previous section, we analyze the effects of changes from imputation to classical tax systems on the financing and investment decisions of firms by estimating the following regression:

$$Y_{it} = \eta PostSwitch_{it} + \lambda Switcher_i * PostSwitch_{it} + \alpha_i + \delta_t + \epsilon_{it}, \tag{9}$$

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 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 financial policy outcome variables in our analysis are *Book leverage*, *Market leverage*, *Equity issues*, *Debt issues*, and *Dividends*. We also include *Capex* and $\Delta Assets$ as outcome variables when we examine the response of investment behavior to the change from an imputation to classical tax system.

As we emphasize in Section 2, the tax costs of paying dividends should act as more of an impediment to increasing leverage for a firm that is not raising capital than for one that is. Therefore, we also estimate (9) separately for capital-raising firms and non-capital raising firms (and their associated controls). Specifically, we consider a firm to be a capital-raiser if it raises a net positive amount of capital (net equity plus net debt) the year before the switch and a non-capital raiser otherwise. We refrain from examining actual realized capital-raising post-switch because this variable is inherently endogenous, which would complicate the interpretation of the estimates.

We also estimate (9) 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.

Note that (9) does not include *Switcher* as a separate explanatory variable because this variable does not vary within firm and hence is fully absorbed by the firm fixed effects. We also estimate variants of (9) where we omit firm fixed effects (α_i, allowing us to include *Switcher* as a separate explanatory variable. Specifically, we estimate:

$$Y_{it} = \eta PostSwitch_{it} + \theta Switcher_i + \lambda Switcher_i * PostSwitch_{it} + \delta_t + \epsilon_{it}. \qquad (10)$$

The coefficient on *Switcher* in this regression represents an estimate of the pre-switch difference in the outcome variable between treated and control firms. If taxation of dividends affects financial policies, then we should observe differences in financial policies pre-switch, since treatment firms operate under imputation systems before the year of the switch while control firms operate under classical systems. We should then observe some degree of convergence post-switch, when treatment firms come to operate under classical systems as well. Such convergence would be reflected in estimates of θ and λ that are similar in magnitude but of opposite sign.

While estimates of equations (9) and (10) capture the average change in financial policies from the four years before to four years after the transition from an imputation to classical tax system, they do not indicate the timing of these changes. We explore how financial policies evolve over time after a switch in more detail by estimating the following regression:

$$Y_{it} = \sum_{k \in (-4,+3)1} \beta_k Year(S+k)_{it} + \sum_{k \in (-4,+3)1} \gamma_k Switcher_i * Year(S+k)_{it} + \alpha_i + \delta_t + \epsilon_{it}, \tag{11}$$

where, as previously noted, S denotes the year of the switch (i.e., the first year under a classical system). As with equation (9), this regression does not include *Switcher* as a separate explanatory variable because it is fully absorbed by the firm fixed effects. Year $S-1$, the final year under an imputation system, is the omitted year in the regression. The γ_k coefficients then capture the difference between outcome variables for firms in switching countries and control firms in a given year relative to the difference in the year $S-1$.

6 Empirical Results

In this section, we present estimates of changes in firm financial and investment policies around tax system changes arising from the *Verkooijen* ruling.

6.1 Graphical analysis

We begin by graphically analyzing 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. Figures 3, 4, and 5 show 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 shows that, as expected, market leverage ratios are higher for control firms than for treated firms in years -4 through -2. They then converge in year -1 and remain similar, with some year-to-year fluctuations, in years 0 through +4. Note that leverage is measured at year end, so year -1 leverage is leverage at the beginning of year 0. It therefore appears that firms increase market leverage the beginning of the first year under a classical system in anticipation of the increased tax advantage of debt. While treated firms' book leverage ratios also exhibit a similar increase, they are similar for treated and control firms in years -4 through -2. That is, despite the fact that the tax advantage of debt is larger for treated than control firms pre-switch, the two groups have similar mean book leverage pre-switch.

The equity issuance series are noisier pre-switch, though treated firms issue more equity in three of the four pre-switch years and considerably more in years -4 and -3. This difference is reversed post-switch, with treated firms issuing less equity than control firms post-switch,

though the post-switch differences are small in magnitude, as one would expect. Treated firms pay far more dividends pre-switch. Dividend payments appear to effectively converge immediately post-switch. It appears then that firms respond to the increased cost of paying dividends by immediately reducing dividend payments.

Treated firms expend significantly more on capital assets pre-switch than control firms. This difference is consistent with the lower effective tax on dividends in imputation systems resulting in a lower cost of capital. The treated and control capital expenditures series converge immediately in year 0 - the year of the switch - and remain similar in years +1 through +3. Similarly, treated firms have a higher rate of change in assets pre-switch. That difference disappears in year -1 and remains small through year +3.

The patterns in Figure 3 are largely consistent with our predictions. We observe differences in the financial and investment policies of treated and control firms pre-switch, consistent with firms in imputation countries facing a lower cost of paying dividends, a smaller tax advantage of debt, and a lower cost of capital than firms in classical countries. Differences in financial and investment policies largely disappear after imputation countries transition to classical systems. Our theoretical framework suggests that changes post-transition should be especially sharp for firms that are likely to raise capital since these firms can increase leverage by disproportionately issuing debt, without the need to pay dividends. Figures 4 and 5 present the same trends as Figure 3 for capital-raisers and non-capital raisers, respectively.

[Figure 4 and 5 about here]

Leverage ratios for treated capital-raisers increase markedly after a switch from imputation to classical tax system. Market leverage ratios increase for non-capital raisers, though the pattern for book leverage is less clear. Similarly, treated capital raisers reduce dividend payments and equity issuance, while the pattern is less clear for treated non-capital raisers. Finally, the decrease in investment is sharper for treated capital-raisers than for non-capital

raisers. These findings are all consistent with the need to pay dividends in order to increase leverage retarding firms' responses to a switch from imputation to classical tax system.

6.2 Changes in financial policies

We next turn to formally analyzing changes in financial policies after transitions from imputation to classical tax systems by estimating regression equation (9) for each of the financial policy variables we study. Table 5 presents these estimates.

[Table 5 about here]

Panel A reports estimates for all of the firms in our matched sample. Panels B and C report results for treated firms that we classify as capital-raisers (those for which the treated firm is a net capital raiser in the year prior to the switch) and those that we classify as non-capital raisers (the converse), respectively. We present standard errors clustered by firm below each point estimate in the table.

The estimates in the first two columns of Panel A 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 0.4 percentage points, or 15.2% of the pre-switch mean of 2.3 percentage points (see Table 4, equal-weighted means). The decline 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, which could

depress investment. Indeed, the decline in issuance activity is large relative to the decline in dividend payments, suggesting that the net effect on investment may be negative. We explore the investment response later in the paper.

While the results in Panel A provide limited support for an increase in leverage after switches from imputation to classical systems for our full sample, the estimates in Panel B indicate that capital-raising firms do 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 C 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 third prediction of our theoretical framework.

Dividends also fall by considerably more for capital raisers (a statistically significant 0.6 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.

These results suggest that firms make changes to financial policies after a switch from an imputation to a classical tax system that are consistent with the predictions of our theoretical framework. Our framework also suggests that firms in switching countries should have lower leverage, pay more dividends, and issue more equity than control firms before the switch, ceteris paribus. The financial policies of these firms should then converge towards those of control firms post-switch, when both treatment and control firms operate under classical systems. We test these predictions by estimating regression equation (10), which excludes

firm fixed effects and therefore allows us to include *Switcher* as a separate explanatory variable. Table 6 presents these estimates.

[Table 6 about here]

As in Table 5, Panels A, B, and C present results for the full sample, capital-raising firms, and non-capital raising firms, respectively. The coefficient on *Switcher* in the dividend regressions is positive in all three panels and statistically significant for the full sample and for capital-raisers. Thus, consistent with the summary statistics in Table 4, firms pay more dividends in countries with imputation systems than in countries with classical systems, as one would expect if firms pay more dividends when the effective tax rate on dividends is lower. The coefficient on $Switcher * PostSwitch$ is negative and of similar magnitude to the positive coefficient on *Switcher* in all three panels. Thus, firms in imputation countries reduce dividends to a level similar to those in countries with classical systems after transition from an imputation to classical system.

Panels B and C indicate that capital-raising firms in imputation countries pay more dividends relative to control firms pre-switch than non-capital raising firms do. This difference is again consistent with the incentive to pay dividends in order to provide shareholders with franking credits. Firms generating cash flow in excess of their investment needs are likely to pay dividends regardless of the tax consequences, since they may lack good alternative uses of cash. Firms raising capital are more likely to pay dividends when those dividends afford shareholders a franking credit.

The coefficients on *Switcher* in the leverage regressions in Panels A and B are negative but statistically insignificant. The coefficients on $Switcher * PostSwitch$ in these regressions in Panels A and B are positive and similar in magnitude and statistical significance to those in Table 5. That is, leverage ratios appear to be slightly lower for firms in imputation countries pre-switch and then increase post-switch. We cannot reject a null hypothesis of

equality between treated and control firms in post-switch leverage ratios for any of the samples. Similarly, equity and debt issuance levels are higher pre-switch for firms in imputation countries but appear to converge to those of control firms post-switch.

While the results in Tables 5 and 6 suggest that firms adjust financial policies after a switch from an imputation to classical tax system, they do not speak to the timing of such changes. Next, we estimate regression equation (11), which allows us to examine this timing. Table 7 presents these results.

[Table 7 about here]

Panels A and B present results for the full sample and for capital-raising firms, respectively. We do not show results for non-capital raising firms here, since Panel C of Table 5 reveals few changes after switches for these firms. Recall that year $S-1$ is the final year under an imputation system in a switching country and year S is the first year under a classical system. Also recall that year $S-1$ is the omitted year in the regressions. Thus, the coefficients on $Switcher * Year(S+k)$ capture the difference between switchers and controls relative to the difference in year $S-1$.

Panel A shows that, for the full sample, dividends exhibit a downward jump in the first year under a classical system (year S). They remain between 0.3 and 0.6 percentage points lower than in the last year under imputation for all four years post-switch, and all of these estimates are statistically significant. The timing and persistence of the decline in dividends is consistent with firms clearly responding to the increased tax costs of paying dividends under a classical system.

Equity issuance as a fraction of assets is 2.5 percentage points lower the first year under a classical system (year S) than in the last year under an imputation system (year $S-1$), though the decline is not statistically significant. The decline in equity issues becomes larger in magnitude and statistically significant the second year after a switch (Year $S+1$). Debt

issues decline in the first year under a classical system (year S). There are no clear patterns in the evolution of leverage.

The first two columns of Panel B show that leverage is low relative to controls for years $S-4$ through $S-2$ before increasing in year $S-1$ and remaining at a similar level in years S through $S+4$. Keeping in mind that leverage is a stock variable and that the end of year $S-1$ is also the beginning of year S, the timing suggests that capital-raising firms in switching countries increase leverage sharply in anticipation of the start of the first year under a classical system.

They appear to do so by increasing debt issuance in year $S-1$. The coefficients on $Switcher * Year(S+k)$ are negative and statistically significant for $k=-4$ through $k=-2$ and for $k=0$ through $k=3$. Since $S-1$ is the omitted year in the regressions, these negative coefficients imply that debt issuance is high in year $S-1$ relative to debt issuance levels both before and after year $S-1$. Equity issuance is considerably lower in each of the four years post-switch than in the year prior, and the differences are statistically significant for three of the four years in the post-switch window. Dividends as a percentage of assets are also considerably lower relative to controls (between 0.6 and 0.8 percentage points) in each of the four years post-switch than in the year prior.

We next examine how changes in financial policies varied depending on the specific form of the imputation tax system a country had prior to switching to a classical tax system. We do so by estimating regression equation (9) separately for firms in countries with full and partial imputation systems pre-switch (and their corresponding control firms) separately. Table 8 presents the results.

[Table 8 about here]

Panels A and B present estimates of equation (9) 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. 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. Consistent with this difference, 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.

6.3 Changes in investment

Finally, we return to the question of whether firms adjust investment policy in response to a change from an imputation to classical tax system. Theoretically, the effect of an increase in the dividend tax rate on investment is ambiguous, and depends on whether a firm's marginal source of equity financing is retained earnings or external equity. The opportunity cost of investing internally-generated equity (i.e., retaining earnings) decreases as the cost of paying earnings out as dividends increases. This is Auerbach's (1979) "trapped equity" argument. In contrast, the cost of external equity increases, since investors demand compensation for the taxes they will pay on future dividends. Thus, ceteris paribus, firms that can finance investment out of retained earnings should increase investment after an increase in the dividend tax rate, while those that must raise external capital should decrease investment.

As noted previously, the decreases in equity and debt issuance around changes from imputation to classical systems are large compared to the simultaneous reduction in dividends. This difference in magnitudes could indicate that the average firm cuts investment in response to these changes. We analyze changes in investment directly by estimating our difference-in-differences model with two different dependent variables - capital expenditures

as a fraction of assets and year-over-year percentage change in assets. Table 9 presents the results.

[Table 9 about here]

Panels A, B, and C present results for the full sample, capital-raising firms, and non-capital raising firms, respectively. Panel A shows that investment does indeed fall after changes from imputation to classical systems for the full sample. Panels B and C show that the decline in investment only holds for the firms we classify as capital-raisers. This finding supports the argument that the overall decline in investment is driven in part by an increased cost of external equity. Firms that we classify as non-capital raisers do not increase investment, as the trapped equity argument suggests they should. One possible explanation is that our categorization of non-capital raisers is noisy. It is possible that many of the firms that do not raise capital in year $S-1$ do anticipate raising capital in subsequent years. Ultimately, the evidence suggests that the effect of an increase in the cost of external equity on investment outweighs any effect of an increase in the cost of internal equity.

We also estimate the investment regressions without firm fixed effects based on regression equation (10), where we include the *Switcher* indicator as an independent explanatory variable. Table 10 presents the results.

[Table 10 about here]

Again, Panels A, B, and C present results for the full sample, capital-raising firms, and non-capital raising firms, respectively. The positive and statistically significant coefficients on the *Switcher* indicator in both regressions in Panel A indicate that firms in switching countries invest more and grow more rapidly than control firms pre-switch, when they operate under an imputation system. The coefficients in Panel B indicate that these differences are larger for firms dependent on external capital. The negative coefficients on *Switcher* $*$

PostSwitch are roughly similar in magnitude to the coefficients on the *Switcher* indicator. This similarity in magnitude suggests that firms in imputation countries face lower costs of capital and therefore invest more than firms in classical countries pre-switch, and that their investment levels converge towards those of firms in countries with classical systems post-switch.

7 Conclusion

This paper addresses one of the central issues in corporate finance - the role of taxes in the determination of capital structure. Our analysis focuses on the effects of the tax on dividends, exploiting variation in dividend taxation due to an ECJ ruling that was itself 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. While we find only weak evidence that firms increase leverage after increases in dividend taxes in the full sample, those firms relying on external capital significantly increase leverage, which is consistent with the predictions of our theoretical framework. In contrast, the evidence suggests that a higher tax on dividends increases the incentives of firms that do no require external finance to retain earnings, which decreases their leverage ratios.

Our paper also illustrates the importance of analyzing the effects of investor-level taxes on leverage, issuance, payout, and investment policies simultaneously. Our theoretical framework and empirical analysis highlight potential linkages. For example, incentives to reduce dividend payments in response to an increase in dividend tax rates can undermine incentives to increase leverage, especially for mature companies that are unlikely to raise net new cap-

ital, while an increase in the cost of external equity due to a higher dividend tax can curtail both equity and debt issuance.

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.

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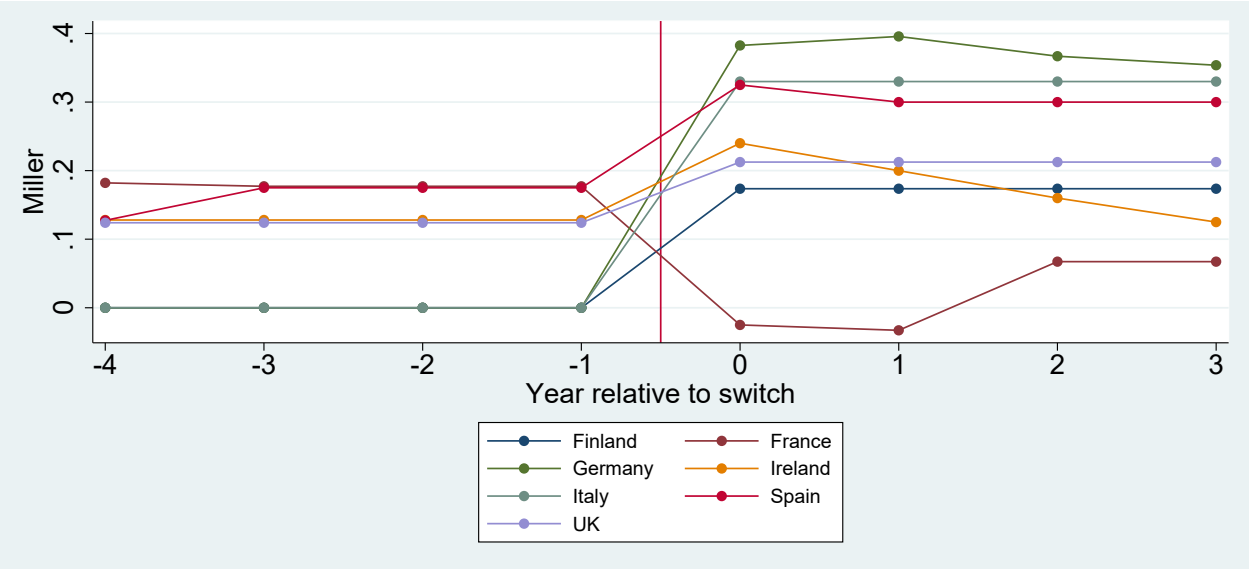
Figure 1: Evolution of Tax Advantage of Debt Around ECJ-Ruling Induced Changes in Tax System

This figure plots the evolution of the Miller measure and adjusted Miller measure, which accounts for the immediate tax cost to shareholders of paying dividends, for each imputation country over its last four years as an imputation system and first four years after changing to a classical system.

(a) Evolution of Miller measure for each imputation country



(b) Evolution of Adjusted Miller measure for each imputation country

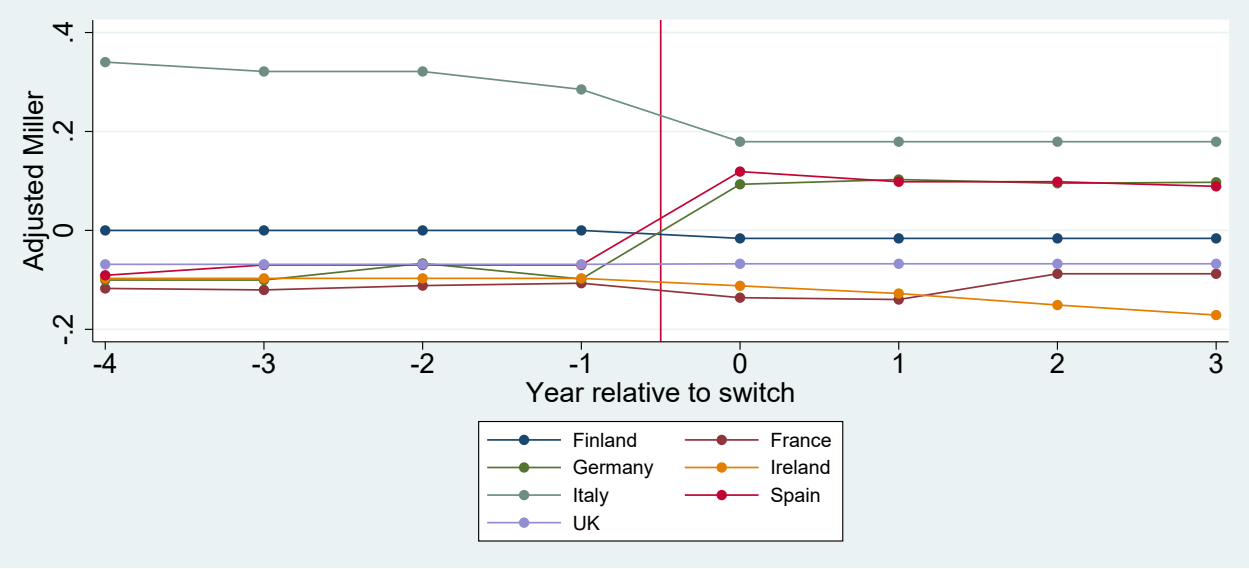


Figure 2: Comparison of Tax Advantage of Debt Around ECJ-Ruling Induced Changes in Tax System for imputation and already-classical countries

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).

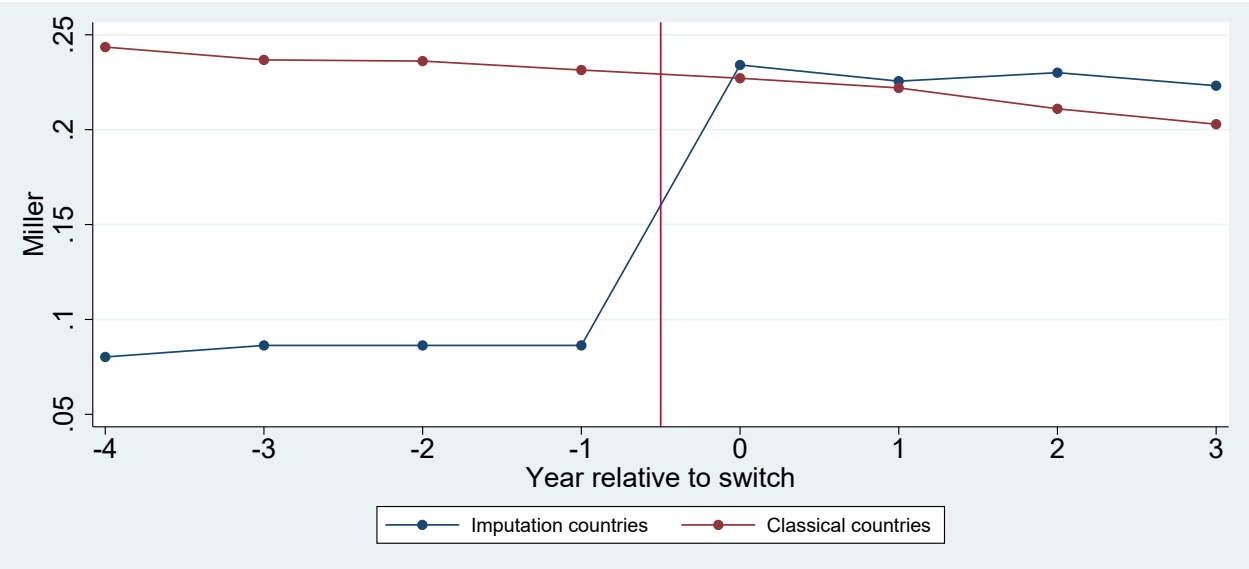
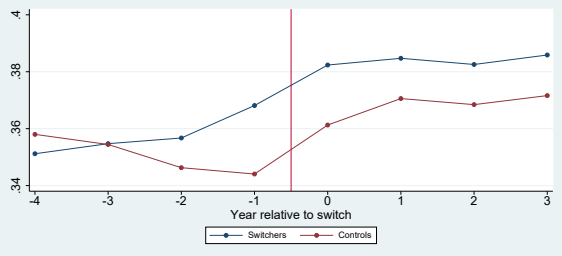


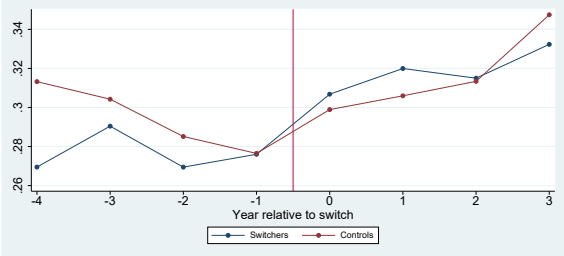
Figure 3: Trends Around ECJ-Ruling Induced Tax System Changes

This figure presents means of various financing, distribution, 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.

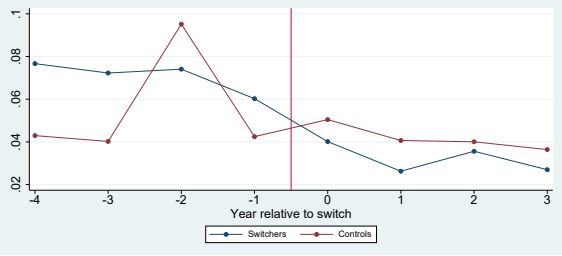
(a) Book leverage



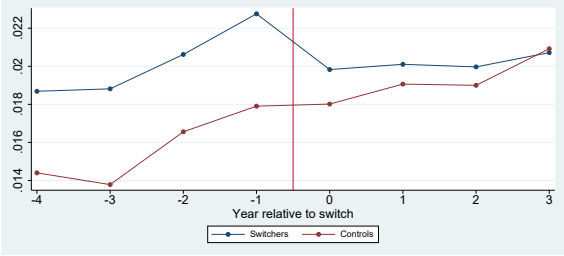
(b) Market leverage



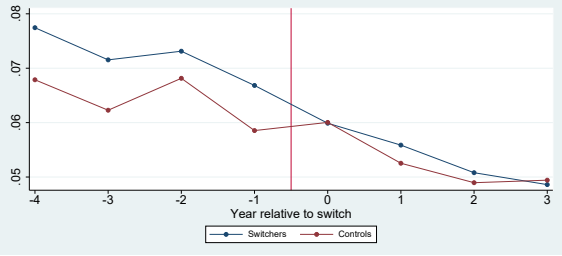
(c) Equity issues



(d) Dividends



(e) Capex



(f) % ΔAssets

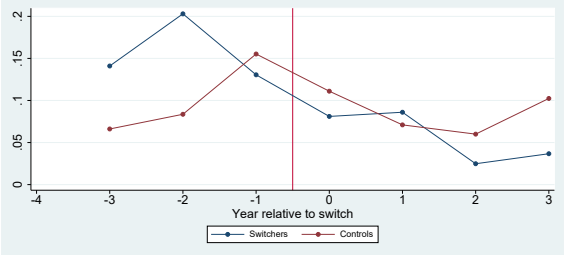
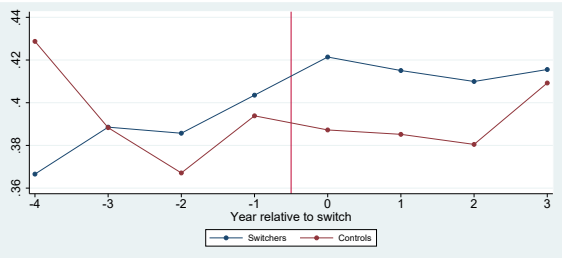


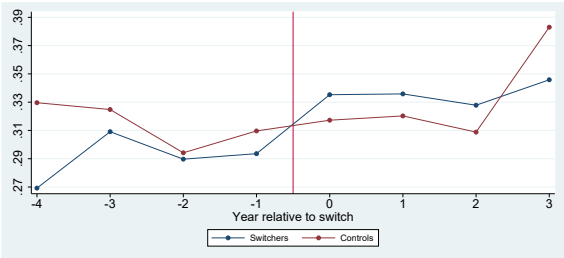
Figure 4: Trends Around ECJ-Ruling Induced Tax System Changes - capital raisers only

This figure presents means of various financing, distribution, and investment variables for firms in switching countries and control firms for the four years before and after a switch. The sample is restricted to capital-raising treated firms and their matched control firms. The means are equal-weighted by switching country.

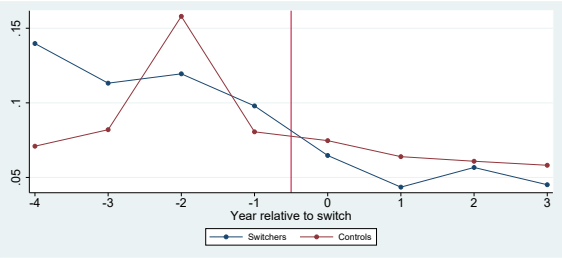
(a) Book leverage



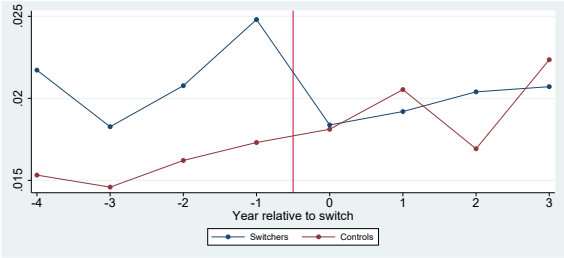
(b) Market leverage



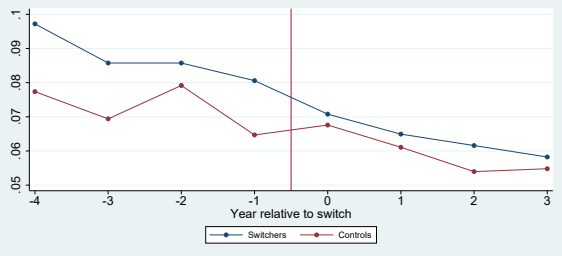
(c) Equity issues



(d) Dividends



(e) Capex



(f) % ΔAssets

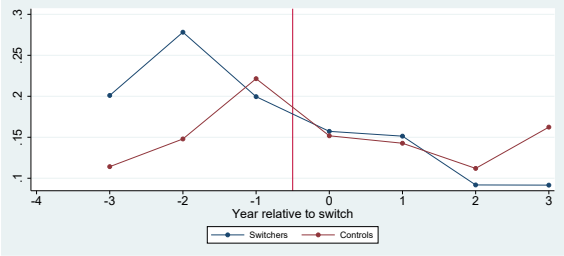
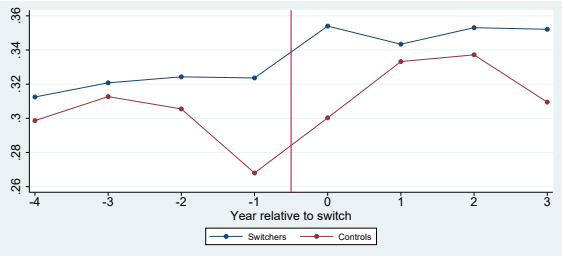


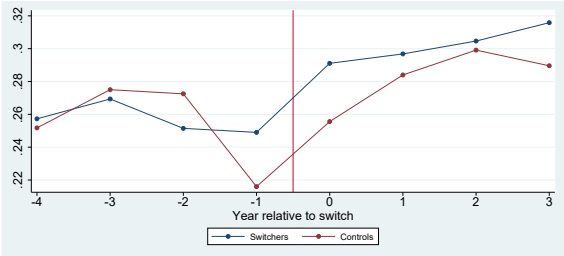
Figure 5: Trends Around ECJ-Ruling Induced Tax System Changes - non-capital raisers only

This figure presents means of various financing, distribution, and investment variables for firms in switching countries and control firms for the four years before and after a switch. The sample is restricted to non-capital-raising treated firms and their matched control firms. The means are equal-weighted by switching country.

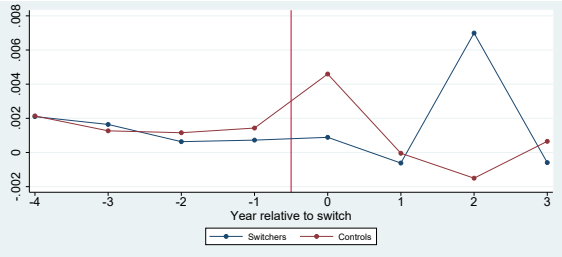
(a) Book leverage



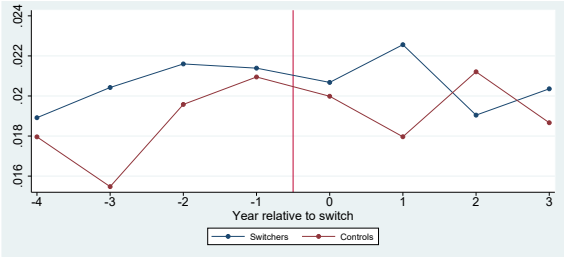
(b) Market leverage



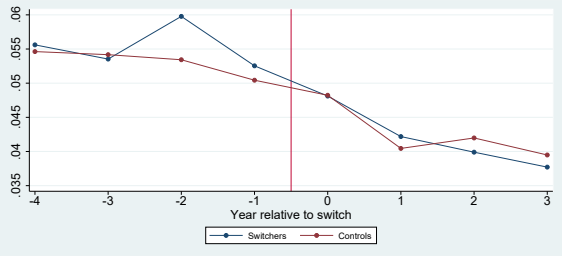
(c) Equity issues



(d) Dividends



(e) Capex



(f) % ΔAssets

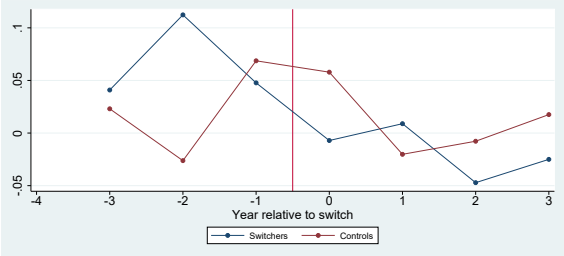


Table 1: Tax System Changes in the EU as a Result of the *Verkooijen* Ruling

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 and for the United States. The unit of observation is a country in the EU and a state in the US. The "ECJ ruling changes only" variance in Europe is variance due to the seven EU country tax system changes stemming from the *Verkooijen* ruling, 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 ruling 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 *Verkooijen* ruling.

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

Table 4: ECJ Ruling-Induced Changes in Tax Systems: Characteristics of Treated and Control Firms

This table presents summary statistics for firms in countries switching from imputation to classical tax systems due to the ECJ ruling in the *Verkooijen* case ("treated" firms). These statistics are computed as of a country's final year under an imputation system. The table also presents a comparison of the mean value of each variable for treated and control firms, where we equal-weight switching countries in computing the 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.

	Treated firms			Means (equal-weighted)	
	Mean	Median	S.D.	Treated	Control
Fundamentals					
Log (Assets)	6.454	5.517	2.906	8.067	8.043
MarketToBook	1.481	0.892	1.847	1.353	1.351
Tangibility	0.317	0.270	0.219	0.331	0.337
EBIT	0.095	0.090	0.149	0.096	0.092
EBITDA	0.151	0.141	0.155	0.152	0.150
Financial policies					
Book Leverage	0.335	0.311	0.264	0.368	0.344
Market Leverage	0.234	0.199	0.234	0.276	0.277
Equity Issues	0.077	0.000	0.207	0.069	0.051**
Debt Issues	0.019	0.000	0.120	0.033	0.013***
Dividends	0.021	0.013	0.029	0.023	0.018**
Investment					
Capital Expenditures	0.069	0.045	0.088	0.068	0.059**

Table 5: Financing Activity and ECJ Ruling-Induced Changes in Tax Systems

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 A 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. 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: All Firms					
	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends
PostSwitch	0.012*	0.015**	-0.019	0.007	-0.001
	(0.007)	(0.006)	(0.021)	(0.006)	(0.001)
Switcher * PostSwitch	0.006	0.018*	-0.040**	-0.023***	-0.004**
	(0.010)	(0.009)	(0.018)	(0.006)	(0.001)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	30,417	29,424	22,556	27,581	28,129
Adjusted R2	0.697	0.704	0.148	0.053	0.581

Panel B: Capital-Raising Firms					
	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends
PostSwitch	0.005	0.014	-0.057	-0.004	-0.003*
	(0.009)	(0.009)	(0.035)	(0.008)	(0.001)
Switcher * PostSwitch	0.027**	0.035***	-0.036	-0.047***	-0.006***
	(0.013)	(0.012)	(0.030)	(0.008)	(0.002)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	14,960	14,424	11,280	13,637	13,839
Adjusted R2	0.684	0.693	0.175	0.065	0.612

Panel C: Non-Capital-Raising Firms					
	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends
PostSwitch	0.022**	0.015*	0.013	0.020***	0.000
	(0.009)	(0.008)	(0.016)	(0.008)	(0.001)
Switcher * PostSwitch	-0.020	-0.005	-0.036**	0.004	-0.002
	(0.013)	(0.013)	(0.015)	(0.006)	(0.002)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	14,607	14,177	10,849	13,369	13,568
Adjusted R2	0.719	0.726	0.100	0.050	0.551

Table 6: Financing Activity and ECJ Ruling-Induced Changes in Tax Systems, Before and After

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 A 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. All regressions include year fixed effects. Unlike in Table 5, the regressions do not include firm fixed effects, which allows us to include *Switcher* as a separate explanatory variable. 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: All Firms					
	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends
Switcher	-0.008	-0.017	0.023	0.012***	0.004***
	(0.015)	(0.015)	(0.015)	(0.004)	(0.002)
PostSwitch	-0.014	-0.012	-0.033**	0.003	0.001
	(0.013)	(0.012)	(0.014)	(0.005)	(0.001)
Switcher * PostSwitch	0.007	0.019*	-0.028*	-0.022***	-0.003**
	(0.011)	(0.011)	(0.015)	(0.005)	(0.001)
Fixed effects	Year	Year	Year	Year	Year
Observations	30,417	29,426	22,699	27,620	28,160
Adjusted R2	0.012	0.048	0.029	0.028	0.021

Panel B: Capital-Raising Firms					
	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends
Switcher	-0.021	-0.016	0.026	0.036***	0.006***
	(0.019)	(0.017)	(0.024)	(0.006)	(0.002)
PostSwitch	-0.010	-0.006	-0.049**	0.006	0.000
	(0.018)	(0.015)	(0.024)	(0.007)	(0.002)
Switcher * PostSwitch	0.029**	0.031**	-0.024	-0.048***	-0.005***
	(0.014)	(0.013)	(0.024)	(0.008)	(0.002)
Fixed effects	Year	Year	Year	Year	Year
Observations	14,960	14,426	11,350	13,649	13,848
Adjusted R2	0.022	0.060	0.027	0.045	0.023

Panel C: Non-Capital-Raising Firms					
	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends
Switcher	-0.002	-0.016	0.016	-0.014***	0.003
	(0.020)	(0.019)	(0.011)	(0.004)	(0.002)
PostSwitch	-0.018	-0.018	-0.020***	0.000	0.003
	(0.017)	(0.015)	(0.008)	(0.005)	(0.002)
Switcher * PostSwitch	-0.012	0.002	-0.028**	0.006	-0.001
	(0.014)	(0.014)	(0.011)	(0.006)	(0.002)
Fixed effects	Year	Year	Year	Year	Year
Observations	14,607	14,177	10,910	13,388	13,585
Adjusted R2	0.006	0.038	0.032	0.032	0.022

Table 7: Sensitivity of Change in Financing Activity to ECJ Ruling-Induced Changes in Tax Systems and Tax Advantage of Increasing Debt

This table presents year-by-year estimates of the difference in financing variables for countries switching from imputation to classical systems as a result of the *Verkooijen* ruling and control firms. 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 A for definitions of the dependent variables. The indicator *Switcher* is one for firms in countries that switched and zero for control firms. The indicator $YearS + k$, $k = -4, -3, ..., 2, 3$, is one for observations in year k relative to the switch year and zero otherwise. Year $S - 1$ is the omitted year in the regressions. Panel A reports results for the full sample. Panel B reports results for capital-raising firms (those raising positive net capital the year before the switch). 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: All Firms					
	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends
Year(S-4)	-0.009	0.009	0.072***	0.003	-0.003
	(0.014)	(0.015)	(0.024)	(0.011)	(0.002)
Year(S-3)	-0.001	0.013	0.063***	0.006	-0.004**
	(0.011)	(0.012)	(0.024)	(0.009)	(0.002)
Year(S-2)	-0.008	-0.004	0.094***	-0.006	-0.003**
	(0.007)	(0.008)	(0.032)	(0.008)	(0.001)
Year(S)	0.014***	0.018***	-0.035*	0.011	-0.002*
	(0.005)	(0.006)	(0.018)	(0.007)	(0.001)
Year(S+1)	0.013**	-0.004	0.023*	0.005	-0.000
	(0.006)	(0.006)	(0.013)	(0.006)	(0.001)
Year(S+2)	0.007	0.005	-0.006	0.005	-0.001
	(0.006)	(0.006)	(0.011)	(0.005)	(0.001)
Switcher * Year(S-4)	-0.024*	-0.036***	0.062**	-0.022**	-0.003*
	(0.014)	(0.013)	(0.028)	(0.010)	(0.002)
Switcher * Year(S-3)	-0.020*	-0.004	0.053**	-0.017*	-0.000
	(0.012)	(0.012)	(0.021)	(0.010)	(0.002)
Switcher * Year(S-2)	-0.012	-0.012	-0.021	-0.006	-0.000
	(0.008)	(0.008)	(0.038)	(0.010)	(0.001)
Switcher * Year(S)	-0.004	0.007	-0.025	-0.039***	-0.003**
	(0.007)	(0.007)	(0.020)	(0.011)	(0.001)
Switcher * Year(S+1)	-0.010	0.014	-0.036*	-0.030***	-0.004***
	(0.011)	(0.009)	(0.018)	(0.010)	(0.002)
Switcher * Year(S+2)	-0.007	0.007	-0.013	-0.030***	-0.005**
	(0.012)	(0.012)	(0.022)	(0.009)	(0.002)
Switcher * Year(S+3)	-0.005	-0.005	-0.018	-0.030***	-0.006***
	(0.012)	(0.014)	(0.023)	(0.010)	(0.002)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	30,417	29,424	22,556	27,581	28,129
Adjusted R2	0.698	0.705	0.155	0.054	0.583

Table 7: Financing Activity and ECJ Ruling-Induced Changes in Tax Systems: Difference-in-Difference (continued from previous page)

Panel B: Capital-Raising Firms					
	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends
Year(S-4)	-0.002	0.023	0.109***	0.006	-0.003
	(0.020)	(0.021)	(0.041)	(0.017)	(0.003)
Year(S-3)	0.006	0.024	0.077*	0.014	-0.005**
	(0.016)	(0.018)	(0.042)	(0.013)	(0.002)
Year(S-2)	-0.004	0.001	0.139***	-0.001	-0.002
	(0.010)	(0.012)	(0.052)	(0.012)	(0.002)
Year(S)	0.017**	0.025***	-0.053*	0.013	-0.002*
	(0.007)	(0.008)	(0.030)	(0.011)	(0.001)
Year(S+1)	0.013*	-0.004	0.024	0.012	-0.000
	(0.007)	(0.008)	(0.021)	(0.008)	(0.001)
Year(S+2)	0.008	0.012	-0.023	-0.000	0.000
	(0.007)	(0.009)	(0.017)	(0.007)	(0.001)
Switcher * Year(S-4)	-0.069***	-0.079***	0.008	-0.076***	-0.006**
	(0.021)	(0.019)	(0.045)	(0.016)	(0.002)
Switcher * Year(S-3)	-0.066***	-0.040**	0.001	-0.076***	-0.002
	(0.018)	(0.018)	(0.036)	(0.017)	(0.002)
Switcher * Year(S-2)	-0.046***	-0.044***	-0.104	-0.056***	-0.002
	(0.012)	(0.013)	(0.063)	(0.015)	(0.002)
Switcher * Year(S)	-0.011	0.001	-0.062*	-0.100***	-0.006***
	(0.009)	(0.009)	(0.034)	(0.016)	(0.002)
Switcher * Year(S+1)	-0.016	0.011	-0.084***	-0.092***	-0.007***
	(0.013)	(0.012)	(0.028)	(0.015)	(0.002)
Switcher * Year(S+2)	-0.017	-0.004	-0.051	-0.089***	-0.008***
	(0.014)	(0.016)	(0.037)	(0.013)	(0.003)
Switcher * Year(S+3)	-0.018	-0.016	-0.063*	-0.087***	-0.008***
	(0.015)	(0.019)	(0.038)	(0.014)	(0.003)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	14,960	14,424	11,280	13,637	13,839
Adjusted R2	0.687	0.696	0.183	0.078	0.614

Table 8: Financing Activity and ECJ Ruling-Induced Changes in Tax Systems: Difference-in-Difference

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 A 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
PostSwitch	-0.009	0.000	-0.004	0.001	-0.003
	(0.008)	(0.008)	(0.024)	(0.006)	(0.002)
Switcher * PostSwitch	0.026**	0.027**	-0.077**	-0.009	-0.004*
	(0.012)	(0.013)	(0.031)	(0.006)	(0.002)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	10,853	10,440	8,161	9,884	10,242
Adjusted R2	0.706	0.697	0.140	0.053	0.577

Panel B: Partial Imputation Countries					
	Book Leverage	Market Leverage	Equity Issues	Debt Issues	Dividends
PostSwitch	-0.002	0.016	-0.048	-0.004	0.001
	(0.011)	(0.010)	(0.064)	(0.011)	(0.002)
Switcher * PostSwitch	-0.012	0.004	-0.009	-0.033***	-0.004***
	(0.011)	(0.012)	(0.026)	(0.008)	(0.001)
Fixed effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Observations	19,564	18,984	14,395	17,697	17,887
Adjusted R2	0.692	0.712	0.200	0.056	0.590

Table 9: Change in Investment Around ECJ Ruling-Induced Changes in Tax Systems

This table presents difference-in-differences estimates of the change in investment 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 A 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. 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: All firms		
	Capital Expenditures	Δ Assets
PostSwitch	0.000	-0.014
	(0.003)	(0.019)
Switcher * PostSwitch	-0.008***	-0.081***
	(0.003)	(0.018)
Fixed effects	Firm & Year	Firm & Year
Observations	27,262	25,824
Adjusted R2	0.403	0.127

Panel B: Capital-Raising Firms		
	Capital Expenditures	Δ Assets
PostSwitch	-0.004	-0.021
	(0.004)	(0.026)
Switcher * PostSwitch	-0.014***	-0.136***
	(0.004)	(0.026)
Fixed effects	Firm & Year	Firm & Year
Observations	13,462	12,701
Adjusted R2	0.425	0.150

Panel C: Non-Capital-Raising Firms		
	Capital Expenditures	Δ Assets
PostSwitch	0.006*	-0.005
	(0.004)	(0.022)
Switcher * PostSwitch	-0.002	-0.025
	(0.004)	(0.019)
Fixed effects	Firm & Year	Firm & Year
Observations	13,228	12,425
Adjusted R2	0.377	0.104

Table 10: Change in Investment Around ECJ Ruling-Induced Changes in Tax Systems, Before and After

This table presents difference-in-differences estimates of the change in investment 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 A 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. All regressions include year fixed effects. Unlike in Table 5, the regressions do not include firm fixed effects, which allows us to include *Switcher* as a separate explanatory variable. 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: All firms		
	Capital Expenditures	Δ Assets
Switcher	0.007**	0.054***
	(0.003)	(0.012)
PostSwitch	-0.002	-0.006
	(0.003)	(0.015)
Switcher * PostSwitch	-0.006**	-0.082***
	(0.003)	(0.017)
Fixed effects	Year	Year
Observations	27,315	25,869
Adjusted R2	0.047	0.120

Panel B: Capital-Raising Firms		
	Capital Expenditures	Δ Assets
Switcher	0.015***	0.095***
	(0.005)	(0.019)
PostSwitch	-0.003	0.003
	(0.004)	(0.020)
Switcher * PostSwitch	-0.013***	-0.140***
	(0.004)	(0.025)
Fixed effects	Year	Year
Observations	13,483	12,719
Adjusted R2	0.053	0.140

Panel C: Non-Capital-Raising Firms		
	Capital Expenditures	Δ Assets
Switcher	-0.002	0.014
	(0.004)	(0.013)
PostSwitch	-0.002	-0.014
	(0.004)	(0.018)
Switcher * PostSwitch	0.000	-0.024
	(0.004)	(0.018)
Fixed effects	Year	Year
Observations	13,252	12,449
Adjusted R2	0.044	0.104

A 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.
Repurchases	Cash spent on the purchase of common stock divided by total assets.
FDeficit	Financing deficit 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.
Δ Sales	Percentage year-over-year change in total assets.
Depreciation	Depreciation 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.

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