Debt and Taxes: The Role of Tax Avoidance

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Abstract

Empirically, the effect of corporate tax rates on leverage has been smaller than expected based on trade-off theory. In this paper, I show that tax avoidance functions as a non-debt tax shield, reducing the benefits of the debt tax shield. I find that higher tax rates cause higher non-debt tax avoidance, which crowds out the debt tax shield. Moreover, I show that the strength of the relationship between debt and tax rates depends on the level of tax avoidance. A one standard deviation higher tax rate implies 2.8 percent higher leverage for low tax avoidance firms, but has a negative effect for high tax avoidance firms.

Keywords: Capital Structure, Tax planning, Corporate Taxation, Profit Shifting

JEL codes: G32, H25, H26, K34.

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I Introduction

The theoretical relationship between corporate tax rates and leverage is well established (Modigliani and Miller, 1963; Kraus and Litzenberger, 1973). However, empirical evidence shows a weaker relationship than expected based on theory (Graham, 2006; Hanlon and Heitzman, 2010). The literature has attempted to reconcile this discrepancy by suggesting that the expected tax benefits of debt diminish when taxable profit can be negative in certain states of the world (DeAngelo and Masulis, 1980). Even when this factor is taken into account, the empirical relationship between corporate tax rates and leverage remains modest (Graham, 2006; Hanlon and Heitzman, 2010; Graham, 1996, 2000).

I propose that companies actively pursue strategies to reduce taxable profit without relying on debt (non-debt tax avoidance), which increases the number of states of the world in which taxable profit is negative, thereby reducing the value of debt tax shields. Since each taxable euro can only be avoided once, greater non-debt tax avoidance crowds out debt-based tax avoidance. Therefore, non-debt tax avoidance and the debt tax shield can act as substitutes. Given the size of total non-debt tax avoidance this effect can be sizable (Cobham and Janský, 2017; Bilicka, 2019).

The difficulty in showing the role of non-debt tax avoidance in determining the benefits of the tax shield, is the measurement of tax avoidance. Although firms around the world can engage in tax avoidance strategies, these can be difficult to identify. Therefore, I exploit a setting in which tax avoidance is observable. I use the methodology of Huizinga and Laeven (2008) to determine the incentives of multinational corporate groups to shift profits away from group members in high-tax jurisdictions, towards those in low-tax jurisdictions.

I use this incentive-to-shift to estimate the profit shifted by a large sample of European multinationals. I then use these estimates to show that more profit shifted out of a country (outbound profit shifting) is associated with lower leverage in that country, while more profit shifted into a country (inbound profit shifting) is associated with higher leverage in that country.

According to trade-off theory, firms in high-tax countries should have the highest leverage. However, in high-tax countries, the benefit of non-debt tax avoidance are also the highest. In the context of a multinational group, group members located in a high-tax country have strong incentives for outbound profit shifting. This lowers taxable profit in the high-tax country, relative to the situation without non-debt tax avoidance. As a result of this reduction in taxable profits there will be more states of the world in which taxable profit will be negative. Therefore, using a debt tax shield has less value, as there are more states of the world in which the company cannot benefit from the tax deduction on interest. Similarly, the multinational group's firms located in low-tax countries have low incentives for taking on leverage based on trade-off theory, but will receive the inbound profit shifting. This results in fewer states of the world in which profit is negative. This increases the value of the debt tax shield. Consequently, the relationship between tax rates and leverage is expected to be stronger for inbound profit shifters than for outbound profit shifters, suggesting that the impact of tax rates on leverage depends on the extent of profit shifting.

For highly taxed firms, trade-off theory predicts higher leverage to reduce taxes by using the interest shield. However, I argue that non-debt tax avoidance crowds out the debt tax shield. The benefits of non-debt tax avoidance should be strong for high-taxed companies, and weak for low-taxed companies. As a result of these opposing effects of high tax rates,

a test of trade-off theory that ignores non-debt tax avoidance can yield the weak results observed in the literature (Graham, 2006; Hanlon and Heitzman, 2010). This is particularly important if the incentive for non-debt tax avoidance dominates the trade-off theory effect, since in that case the relationship between tax rates and leverage could even be negative. In this paper, I show that the effect of tax rates on leverage is strong once I take into account the tax avoidance effect.

To examine how profit shifting affects the relationship between tax rates and leverage, I estimate this relationship across different quartiles of the profit shifting distribution. For firms in the top quartile of outbound profit shifters, the relationship between the tax rate and leverage is negative, indicating that profit shifting incentives outweigh the benefits of leverage. For firms in the top quartile of inbound profit shifters, the relationship between the tax rate and leverage is strongly positive. Due to this heterogeneity, testing trade-off theory across firms with varying levels of profit shifting would produce a weak relationship between tax rates and leverage, seemingly contradicting trade-off theory.

Moreover, different multinationals are located in different localities, which means that a firm in a country might be an inbound profit shifter for a given multinational group, while a different firm in the same country is an outbound profit shifter for a different multinational group. Therefore, for some firms in a country, the relationship between leverage and tax rates will be considerably stronger than for other firms in the same country. Failing to take into account this heterogeneity in tax avoidance creates noise in the estimates.

To show a causal link between non-debt tax avoidance and leverage, I use an exogenous shock to tax avoidance opportunities caused by a ruling of the European Court of Justice. The shock resulted from a European Court of Justice ruling that struck down anti-tax

avoidance laws in several European countries for violating EU law. As a result, multinationals in affected countries found it easier to shift profits to low-tax jurisdictions. Comparing low-taxed subsidiaries of affected and unaffected multinationals, I find that affected subsidiaries experienced a rise in inbound profit shifting after the ruling. The increase in inbound profit shifting should result in an increase in leverage and this is what I find.

To extend the analysis and ensure robustness, I perform several additional tests. I ensure that the results are not driven by changes to legislation specifically targeting debt-based tax avoidance (Blouin et al., 2014; Buettner et al., 2012; Panier et al., 2012; Chase-Dunn et al., 2000), by excluding companies from countries that introduced such rules. A different concern could be that companies lobby for tax avoidance opportunities or tax rate changes. Based on insights from Hill et al. (2013); Neretina (2020), I exclude companies most prone to lobbying and show that this does not qualitatively change the results. Lastly, I ensure that the results are not driven by endogenous entry into low-tax countries by excluding any companies not present at the start of my sample.

This paper contributes to several strands of literature. Firstly, the literature on taxes and capital structure has focused on the effects of tax rate changes (Graham, 2000; Faulkender and Smith, 2014; Heider and Ljungqvist, 2015; Huizinga et al., 2008; Rajan and Zingales, 1995) and the introduction of rules specifically targeting the use of debt for tax avoidance (Panier et al., 2012; Buettner et al., 2012). I show that failing to take into account tax avoidance will result in the effect of tax rates on leverage to be underestimated. This means that even if we see an exogenous change to tax rates, the effect on leverage will be underestimated if we do not account for tax avoidance.

Secondly, Graham and Tucker (2006) show for a sample of 44 companies, which were

caught and punished for tax evasion, that tax-evading companies have lower average debt than comparable companies. In contrast, I demonstrate that tax avoidance can influence firm leverage within a corporate group in both positive and negative directions. While the leverage will be lower for some of the firms making up a multinational, in other firms in the same multinational, leverage will in fact be higher than we would have otherwise expected. Furthermore, I show how tax avoidance heterogenously affects the predictions of trade-off theory. Importantly, I provide evidence that the relationship between non-debt tax avoidance and leverage is causal. Lastly, I show that this trade-off between different methods of reducing the taxable profit is not unique to companies engaged in illegal activities, but is observable across a broad sample of firms. Contrary to Graham and Tucker (2006), I do not find evidence for changes in leverage in the lead-up to tax-lowering activities.

II Hypothesis & Methodology

A Prior literature

Modigliani and Miller (1963) showed that there are benefits to higher leverage as a result of tax policies. Most countries allow interest payments to be deducted from income, while similar deductions are not allowed on payments to equity holders. Empirically, the effect of tax rates on leverage seems small (Graham, 2006; Hanlon and Heitzman, 2010; Graham, 1996, 2000).

DeAngelo and Masulis (1980) theoretically show that when there are non-debt tax shields, it can reduce the tax benefits of debt. Companies have to decide on their non-debt tax shields

and tax shields without knowing what the state of the world will be. An increase in non-debt tax shields decreases taxable profit, which leads to more states of the world in which this profit is negative. Since governments don't credit taxes when profits are negative, any additional deductions from taxable profits don't generate a tax benefit. Therefore, the value of the debt tax shield decreases when a company has non-debt tax shields. This means that non-debt tax shields can crowd out the debt tax shield. While this effect can be mitigated by the ability for companies to carry losses forward to future years, the value of the tax shield still declines due to the time value of money.[1] Moreover, unless the number of bad states of the world declines in the following year, they once again will in expectation not benefit from the debt tax shield. This suggests that in the long run, maintaining levels of non-debt tax avoidance and a debt tax shields that create many states of the world with negative profits is not beneficial.

Cobham and Janský (2017) show that worldwide tax avoidance benefits exceed half a trillion. While, little is known about the choice of tax avoidance method, every taxed euro can only be avoided once. Huizinga and Laeven (2008) show that multinationals avoid taxes by shifting profits from high-tax firms to low-tax firms within their corporate structure.

B Hypotheses

I predict that when more profit is shifted out of a country, there will be more states of the world in which taxable profit is negative. Since there are now more states of the world in which there is no benefit to be gained from the debt tax shield, the expected value of the

[1]Several EU countries have introduced loss carryforward limits. For instance, the German limitation introduced in 2004, allows a maximum of 60% of the profits in a year to be offset by losses from previous years. This means that a company with 10 million in losses from the past and 10 million in profits this year, can only utilize 6 million of the past losses.

debt tax shield is lowered, relative to a world without non-debt tax avoidance. The reduction in the value of the debt tax shield results in lower leverage.

Huizinga and Laeven (2008) show that while profit is shifted out of the high-tax countries, it is shifted into low-tax countries. This results in a reduction in taxable profit in high-tax countries, while increasing taxable profit in low-tax countries. Therefore, profit shifting leads to more states of the world with negative profit for high-taxed companies. This reduces the benefit of the debt tax shield, and therefore results in lower leverage, relative to a world without profit shifting.

Hypothesis 1: Non-debt tax avoidance crowds out the debt tax shield

However, it simultaneously leads to fewer states of the world with negative profit for low-taxed companies, since the profit is moved into these companies. Therefore, the benefits of the tax shield increase in the low-taxed company.

Hypothesis 2: The relationship between tax rates and leverage is stronger for inbound profit-shifting companies.

Since Huizinga and Laeven (2008) predict that high-taxed companies shift profit out, and low-taxed companies shift profit in, the above hypotheses contrast strongly with the predictions of trade-off theory (Kraus and Litzenberger, 1973; Modigliani and Miller, 1963). The outbound profit shifting by high-taxed companies will reduce their taxable profit, lowering the value of the debt tax shield in exactly those countries in which trade-off theory predicts it to be high. The inbound profit shifting in the low-taxed companies increases the taxable profit, increasing the value of the debt tax shield in the countries trade-off theory predicts this value to be low. Therefore, when testing trade-off theory on a broad sample of firms, we

underestimate the effect of tax rates on leverage in the presence of non-debt tax avoidance. Once adequately taking into account the role of non-debt tax avoidance, the relationship between debt and tax rates should be stronger.

C Empirical strategy

1 Profit shifting

In order to determine the effect of tax avoidance on leverage, I first need to identify tax avoidance. Tax avoidance is hard to observe, but multinational's profit shifting is largely observable. Therefore, I use multinationals in this paper.

I estimate profit shifting using the methodology from Huizinga and Laeven (2008), who use an incentive-to-shift variable. The construction of this variable is discussed in the data section. In line with the literature, I indicate the incentive-to-shift with the letter 'C' (Huizinga and Laeven, 2008). A positive value of C indicates that the tax rate in that country is high, relative to tax rates faced by the same multinational group in the other countries it is active in. A negative value indicates that it wants to move profit into that country, because the tax rate is relatively low. Following Huizinga and Laeven (2008), I use the natural log of EBIT as a measure of profit shifted. This methodology will show the degree of profit shifting resulting from the incentive to shift, by using the following regression equation:

$$Ln(EBIT)_{ict} = \beta_1 C_{ict} + \beta_x \mathbf{X}_{ict} + \beta_z \mathbf{Z}_{ct} + \phi_{ic} + \xi_t + \epsilon_{ict} \tag{1}$$

where 'i' indicates the multinational group, 'c' the country, and 't' the year. Control variables are similar to those used in Huizinga and Laeven (2008), which include ln(labor costs), ln(fixed assets), interest rates, and ln(GDP per capita). Contrary to the usual industry fixed effects, I include a multinational fixed effect and year-fixed effects. This allows me to estimate how the differences in incentive-to-shift across the firms within the multinational's group structure affect the profit shifted in the multinational. The coefficient of interest is β_1. I expect a negative coefficient, which implies that profit is shifted out of firms which face relatively high-tax rates, and into relatively low-taxed firms.

As a second method of determining profit shifting, I use an exogenous shock caused by a ruling of the European Court of Justice (2006). Schenkelberg (2018) shows that this ruling impacted profit shifting. This ruling was related to so-called Controlled-foreign-company (CFC) rules. These rules impose an additional tax on profits made by foreign subsidiaries in low-tax countries. For instance, the UK government will tax profits made by an Irish subsidiary (12.5% tax rate) of an English parent (30% tax rate) with an additional 17.5% tax rate, but an Austrian subsidiary (25% tax rate) of the same parent will not face any additional tax. The purpose of these rules is to limit the benefits of shifting profit to low-tax countries. However, the European Court of Justice (2006) ruled that these CFC rules violate the free movement of capital in the EU. Therefore, EU countries can no longer apply these rules to subsidiaries in other EU countries.

I use a difference-in-difference approach to estimate the effect of the shock on profit shifting. The treated companies are the low-taxed EU subsidiaries of EU parent companies from countries with CFC rules. Denmark, Germany, Lithuania, Norway, Portugal, the United

Kingdom, and Sweden had such rules in place.[2] I expect an increase in profit shifted into these low-taxed subsidiaries, as the CFC rules are now lifted. The European Court of Justice (2006) ruling only applies to relations between EU parent and EU subsidiaries, therefore the control companies are subsidiaries in the same low-taxed EU countries but owned by parent companies from non-EU countries with CFC rules (Australia, Canada, Japan, New Zealand, the United States, and South Korea).

2 Leverage

Hypothesis 1 poses that non-debt tax avoidance crowds out leverage. Using the estimates for profit shifting, I employ two different methodologies to estimate the effect on leverage. First, I take the point estimates on the incentive-to-shift (β_1 in Equation 1) and multiply it with the value 'C' takes for that firm. β_1 is the within multinational estimate of the effect that 'C' has on profit shifted. Multiplying this with 'C' gives me the profit shifted by that multinational in and out of each country it operates in, which is unique to each firm in each multinational. I then estimate the effect of this profit shifted on leverage. A positive value of profit shifted indicates that profit is shifted into the firm, while a negative value indicates profit was shifted out. Hypothesis 1 suggests that inbound profit shifting results in higher leverage, while outbound profit shifting results in lower leverage. Therefore, I expect a positive effect of the profit shifted on leverage. I use the following regression equation:

$$Leverage_{ict} = \beta_1 \text{Profit shifted}_{ict} + \beta_x \mathbf{X}_{ict} + \beta_z \mathbf{Z}_{ct} + \gamma_i + \zeta_t + \epsilon_{ict} \tag{2}$$

[2]Spain, France, and Finland did as well, but they changed their rules in anticipation of the European Court of Justice (2006) ruling.

where c indicates the country, t time and i the multinational. β_1 captures the effect predicted in Hypothesis 1. $\mathbf{X}$ is a vector of company-level control variables which includes tangibility, profitability, size, and depreciation (Rajan and Zingales, 1995). $\mathbf{Z}$ is a vector of country-level controls, which includes the domestic corporate tax rates, ln(GDP per capita), and interest rates. I define leverage as interest-bearing debt over total assets. Following Faulkender and Smith (2014), I include year and multinational fixed effects to capture how within multinational differences in in- and outbound profit shifting affect leverage in the multinational. Moreover, Faulkender and Smith (2014) argue that both tax rates and variation in international operations are highly autocorrelated, making the use of multinational fixed effects preferable. [3] Standard errors are clustered at the multinational level, as tax avoidance decisions within a multinational are correlated (Huizinga et al., 2008). I also use an alternative specification using bootstrapped errors clustered at the same level.

Second, I use the shock caused by the European Court of Justice (2006). The ruling made it easier to shift profit into low-tax subsidiaries. Hypothesis 1 suggests that this increase in inbound profit shifting should cause an increase in leverage. Therefore, I investigate the effect of the shock on leverage, expecting a positive coefficient.[4]

Hypothesis 2 states that the relationship between leverage and tax rates is different for different levels of non-debt tax avoidance. Therefore, I split my sample into 4 groups based on the level of profit shifting obtained using Equation 1. These are highest quartile

[3] This is also true in my sample, as the time series standard deviations for C and the tax rate are 0.016, 0.005. The within multinational-year standard deviations are 0.07 and 0.05 respectively.

[4] Note that, the coefficient found while estimating the profit shifted is the average treatment effect. Contrary to the results obtained using the Huizinga and Laeven (2008) method, the average treatment effect is the same for all treated companies. Including an estimate of the amount of profit shifted by treated companies is therefore no different from simply running a difference-in-difference with leverage as the dependent variable

inbound shifters, middle quartile inbound shifters, middle quartile outbound shifters, and highest quartile outbound shifters. I interact these categories with the domestic tax rate and estimate the effect of tax rates on leverage for the different subgroups.

As an additional test, I use one-off changes in tax rates to show how these changes impact inbound and outbound profit shifters differently. This is effectively a difference-in-difference approach, using tax rate changes as shocks. Firms in countries with a tax change are treated, while firms in countries without a tax change are control companies. Hypothesis 2 suggests that the change in tax rates should impact inbound profit-shifting companies more strongly than outbound profit-shifting companies.

III Data and summary statistics

A Accounting Data

In order to observe profit shifting, I map the group structure of a large sample of European multinationals.[5] One of the major benefits of using EU multinationals is that they are part of a common internal market in which the taxable effects of actions between parent and subsidiary firms are regulated by EU laws. This ensures uniform withholding taxes and double taxation rules for the companies in my sample.

Mapping the group structure and the profit shifting of these multinationals requires accounting and ownership data, which I obtain from the Orbis database. I use the historical files from Orbis and link every parent company to its subsidiaries, and each of those is then

[5] A multinational is any company showing accounting data in more than one country. Most of these companies are not listed companies.

linked with their own subsidiaries, and so on (Kalemli-Ozcan et al., 2015). The dataset starts in 2005 and ends in 2011. The ownership data quality greatly improved from 2005 onwards. Moreover, ending the sample in 2011 ensures that the period of high uncertainty about the future of profit shifting, caused by the OECD research committee on Base Erosion and Profit Shifting OECD (2014) is not included in the sample. Moreover, this period includes the shock caused by the European Court of Justice (2006), which will allow for a clean identification of the crowding out of debt by non-debt tax avoidance.

Following Huizinga and Laeven (2008) and Brok (2024), I aggregate all accounting data at the multinational-country-year level to ensure that multinationals with many subsidiaries don't dominate the data sample[6]. Because I use this method of aggregation, I use unconsolidated accounts to observe profit being shifted within the multinational.

For the shock caused by the European Court of Justice (2006) the important unit of observation is the subsidiary of a treated or control parent. Therefore, a slightly different dataset is used for the difference-in-difference estimates. This dataset looks at the individual firms, rather than the data aggregated at the multinational-country level. This allows me to identify the particular low-taxed firms that have a parent in a country that had a CFC rule. To establish pre-trends, I add the 2004 year to the data.[7] Any firms not observed during the year of the shock and the two prior years is dropped from the sample. If a subsidiary has multiple parent companies, it is included in the treated group if one of those parents is from a treated country.

[6]A multinational with three entities in the Netherlands and two in Belgium will show up in the data as one observation in the Netherlands and one in Belgium.

[7]The ownership data before 2005 is incomplete. This makes it hard to map the entire group structure of multinationals, but I can identify specific parent-subsidiary pairs that were affected by the treatment.

B Variable definition

The Huizinga and Laeven (2008) measure of incentive-to-shift ('C') is unique for each multinational-country-year observation and captures how high the domestic tax rate is relative to the foreign tax rates faced by that multinational. The authors define it as follows:

$$C = \frac{1}{(1 - Tax_{ct})} \times \frac{\sum_{c \neq k}^{N} \left(\frac{sales_{ict}}{1 - Tax_{ct}} \times (Tax_{kt} - Tax_{ct}) \right)}{\sum_{c=1}^{N} \left(\frac{sales_{ict}}{1 - Tax_{ct}} \right)} \tag{3}$$

where c indicates the country, t time and i the multinational. The measure is a sales weighted average of tax differences within a multinational. C is positive for the firms that have an incentive to shift profit out and is negative for the firms that should receive that foreign profit.

Control variables are defined in Table 1.

C Summary statistics

The variables used in this paper are defined in Table 1. Table 2 shows the summary statistics for the two different samples. Panel A shows the statistics for the sample using the incentive-to-shift (Huizinga and Laeven (2008) methodology for estimating profit shifting).

The incentive to shift is on average close to 0. This is by design, as the firms that make up a multinational have an incentive to shift profit to other firms in the same multinational.

The sample covering the shock created by the European Court of Justice (2006) ruling consists of companies that are smaller. This makes sense since this sample is not aggregated

at the multinational-country-year level. Moreover, the tax rate faced by the companies in this sample is on average 12 percentage points lower. This can be explained by the fact that the shock exclusively affected subsidiaries in low-tax countries. Despite being located in low-tax countries, these companies are not just letterbox firms, they have 11 percentage points higher levels of tangibility compared to the incentive-to-shift sample.

IV Results

To estimate the effect of profit shifting on leverage, I first need to estimate profit shifting. I capture profit shifting using the natural log of EBIT. A multinational has an incentive to move profit from firms which are highly taxed, towards firms that have a lower tax rate. Therefore, a higher incentive to shift ('C') should result in the multinational shifting profit out of that country and move it to a country where the multinational has a negative incentive to shift.

Table 3 shows the results from Equation 1. I find the expected negative coefficient on the incentive-to-shift variable. A 1 standard deviation higher incentive-to-shift (0.083) is associated with 12.14% lower EBIT.

Hypothesis 1 suggests that higher non-debt tax avoidance is associated with lower leverage. In Table 4, I investigate this hypothesis. Column 1 shows the effect of the tax rate on leverage without taking into account the crowding out of the debt tax shield. The literature finds a wide range of estimates for the marginal tax rate, usually weaker than theory would predict (Graham, 2006; Hanlon and Heitzman, 2010). I find that there is no significant effect of the domestic tax rate on leverage.

In columns 2 and 3, I turn to investigating hypothesis 1. I use the point estimates from the regressions in Table 3 to estimate the profit shifted for each company. Positive levels of profit shifted indicate profit being shifted into the country, whereas negative values indicate profit being shifted out of the country. Hypothesis 1 suggests inbound profit shifted increases the capacity for debt tax shields. Firms shifting profits out face decreasing capacity for debt tax shields. This implies profit shifted should have a positive coefficient. This is exactly what I find. In Table 3, I found that 1 standard deviation lower incentive-to-shift was associated with 12.14% higher profit shifted. A 12.14% inbound (outbound) profit shifted is associated with 1.5 percentage points higher (lower) leverage.

Moreover, the coefficient on the domestic tax rate suggests that ignoring the profit being shifted leads to biased estimates of the marginal tax rate. It can be seen that the domestic tax rate now is significant and increases in size by a factor of 6. The effect of a 1 standard deviation higher tax rate (0.068) is 2 percentage points higher leverage when taking into account profit shifting. Whereas it was 0.3 percentage points when ignoring profit shifted. This can help explain the weak effects of tax rates on leverage commonly found in the literature (Graham, 2006; Hanlon and Heitzman, 2010).

In Column 3, I use clustered bootstrapped standard errors from 2500 samples.

A Exogenous shock

To rule out alternative explanations and establish a causal link, I turn to the European Court of Justice (2006) ruling. I expect that when the ruling made it easier to shift profits to low-tax subsidiaries, the EBIT in these low-tax subsidiaries goes up. First, I establish

common trends before the shock, using the methodology suggested by Angrist and Pischke (2013). Figure 1 shows how being in the treated and control group affects EBIT for each year before and after the shock. The treated firms are the low-tax subsidiaries of parent firms which were affected by the European Court of Justice (2006) ruling. The control group are the low-tax subsidiaries of parent firms from countries outside the EU, which had CFC rules but were unaffected by the ruling. We can see that the trends for the two groups are not significantly different before the shock happens in 2006.

Column 1 of Table 5 shows the treatment effect. As can be seen, the treated companies did see an increase in profit shifted into the low-tax subsidiaries. The shock resulted in a 17% increase in profit shifted to low-taxed subsidiaries. This is comparable to the effect of a 1.5 standard deviation lower 'C' found in Table 3. Since the average tax rate of the low-taxed subsidiaries is 12 percentage points (1.77 standard deviations) lower than the average tax rate in the incentive-to-shift sample, this is both qualitatively and quantitatively comparable to the results in Table 3.

Next, I show that the same substitution between non-debt and debt-based tax avoidance as observed in tables 3 and 4 is observed when the European Court of Justice (2006) ruling was issued. Figure 2 shows that there were no different trends between control and treated group before the shock. Column 2 of Table 5 shows that the shock results in a 3.1 percentage points increase in leverage for those subsidiaries. This shows that, in line with the findings in Table 3, an increase in inbound profit shifting results in an increase in leverage.

B Implications for trade-off theory

The literature has found an under-reaction of leverage to marginal tax rates (Hanlon and Heitzman, 2010; Graham, 2006). Table 4 column 1 confirms this result, showing a modest, insignificant coefficient on the effect of the domestic tax rate on leverage. However, including the amount of profit shifted, significantly impacts the coefficient on the domestic tax rate. There are three compounding effects that result in this underestimation.

First, ignoring profit shifting results in an overestimation of the value of debt tax shields. Higher tax rates create a positive effect on leverage through the trade-off theory, but also create a higher incentive-to-shift. Hypothesis 1 suggests the resulting profit shifting is negatively related to leverage. In Table 6, I further investigate how profit shifting affects the relationship between corporate income tax rates and leverage. This is a direct test of hypothesis 2, which states that the relationship between tax rates and leverage is stronger for inbound profit shifters than for outbound profit shifters. In order to test this hypothesis, I create dummies indicating the quartile of the profit shifting distribution a firm is part of. I then interact the domestic corporate income tax rate with these quartile dummies. The highest inbound profit shifters should show the strongest relationship between tax rates and leverage, whereas the highest outbound profit shifters should show the opposite.

Table 6 Columns 2 and 3 show the result. In line with the prediction, I find that inbound profit shifters have a significantly stronger relationship between tax rates and leverage than the sample average. On the other hand, the strongest outbound profit shifters show a small negative relationship between tax rates and leverage. The results suggests that for every 1 percentage point increase in tax rates, leverage goes up by 0.41 percentage points for

the strongest inbound profit shifters. In Table 4, I found that the average effect was 0.004 percentage points when ignoring profit shifting, or 0.29 percentage points when taking into account profit shifting. Relative to the sample average, the relationship between tax rates and leverage is one-and-a-half times stronger for strong inbound shifters, but negative for the outbound shifters.

Second, the crowding out of debt tax shields is not the same for all firms in a multinational. The firms shifting out profit will see more debt being crowded out, but the firms shifting in profit will see less debt being crowded out. Therefore, the leverage of high 'C' firms should be less sensitive to tax rates than the leverage of low 'C' firms. In a naive regression of leverage on marginal tax rates (as in column 1 of Table 4), the estimated coefficient is an average of those for high and low 'C' firms. This is particularly problematic considering that high 'C' firms are high-taxed firms, which under trade-off theory should be the firms increasing their leverage the most.

This problem can be illustrated by looking at the average tax rates of the profit-shifting quartiles. The average marginal tax rate in the quartile of highest outbound profit shifters is 35.6%, while the average marginal tax rate in the quartile of highest inbound profit shifters is 22.5% (Table 7). Therefore, the results in Table 6 suggest that the strongest relationship between tax rates and leverage are found for the companies with the lowest average marginal tax rates. This means that when there is non-debt tax avoidance, we expect the leverage of high-tax firms to be less responsive to tax rates than the leverage of low-tax firms, exactly the opposite of the predictions of trade-off theory (Kraus and Litzenberger, 1973; Modigliani and Miller, 1963).

Third, the definition of high- and low-tax firm is different for each multinational. A

multinational with firms in Germany (41% tax rate) and Sweden (28% tax rate) obtains a benefit from shifting profit into Sweden. A multinational with firms in Sweden and Poland (19% tax rate) benefits from shifting profit out of Sweden. As a consequence, for the first multinational, the marginal tax rate in Sweden should strongly affect Swedish leverage, while for the second multinational it should not. When averaging out these effects for a variety of multinationals, facing a variety of tax rates and opportunities for tax avoidance, the estimate will become noisy.

The importance of this point can be observed by looking at the prevalence of countries in each of the quartiles. Germany is in the high outbound quartile 76% of the time (Table 8). Hungary and Poland are both in the high inbound quartile more than 80% of the time. However, Belgium can be found in three quartiles with similar frequencies. This shows that firms in the same country can find themselves in different quartiles of the profit-shifting distribution.

The importance of this point can be shown by looking at the effect of a tax rate change on leverage. To show that inbound and outbound profit shifters react differently to tax rate changes, I investigate the effect of changes in tax rates on leverage. To ensure a clean shock, any firms from countries with multiple tax rate changes are excluded. Moreover, I exclude firms from countries with tax rate changes early in the sample (2005-2006), as I cannot establish the trend before the shock. Similarly, tax rate changes late in the sample (2011) are excluded, as I cannot observe the post-shock period. This leaves tax changes in Germany, Denmark, the United Kingdom, Italy, and Portugal. All of these changes occurred at the start of 2008 and all of them were tax decreases. I further restrict the sample by excluding any firms that do not provide accounting information both before and after 2008.

Table 9 shows the results. Column 1 shows the effect of the shock on treated firms relative to control firms, when ignoring profit shifting. In line with Column 1 of Table 4, I do not find a significant effect of the tax rate change on leverage, suggesting a violation of trade-off theory. However, in Column 2, I interact the shock with an indicator variable for being an inbound profit shifter. When this variable takes a value of zero, the firm is an outbound profit shifter and avoids its taxes using profit shifting. If the variable takes a value of one, the firm is an inbound profit shifter and does not avoid taxes using profit shifting instead relying of debt tax shields. The decrease in tax rates will lower the benefits of having these debt tax shields. However, the tax rate drop can create incentives to switch from outbound to inbound profit shifting.[8] Therefore, I enforce that the firm must be an inbound profit shifter in the year of observation as well as in the prior year, to be included in the analysis.

I find that for inbound profit shifters, the reduction in tax rates is associated with lower leverage, whereas for the outbound profit shifters, I find no significant effect. This is in line with the results found in Table 6. Figures 3 and 4 show the effect over time, clearly showing no difference between treated and control groups before the shock, while for the inbound group a significant effect is seen after the shock.

These three effects combined suggest that ignoring non-debt tax planning will result in a noisy and underestimated relationship between leverage and tax rates.

[8]The exact change in the incentive-to-shift depends on how many of the countries with tax rate changes the multinational is active in, as well as the different sizes of these tax rate changes in the five countries.

V Robustness

A Endogenous entry

A potential concern is that multinationals can enter into specific countries for purposes related to tax avoidance. To ensure such endogenous entry is not driving my results, I drop any observation that entered the sample after the start. Moreover, for the purposes of calculating the incentive-to-shift variable, I use the sales the multinational made in each country at the start of the sample, instead of updating it annually. These two adjustments ensure that there is no endogenous entry or expansion that drives the results. Table 10 shows the results. The results are qualitatively unaffected.

For the shock I have imposed that companies need to be present for the 2 years prior to the shock, this rules out that entry drives the results in the difference-in-difference estimation.

B Lobbying

A potential concern is that companies can lobby for a tax rate change. Companies might not be reacting to the tax rate changes, as much as tax rate changes are reacting to these companies. This reverse causality concern is mitigated by the fact that I measure leverage at the end of the year and tax rates at the start of the year.

However, to formally test for this concern I use insight from the literature on the determinants of lobbying. Hill et al. (2013) shows that the main determinant for lobbying is the size of the company. Neretina (2020) shows that only a small subset of companies can effectively lobby for policy changes and trade associations are not effective at representing smaller companies in the lobbying process.

Detailed data on which companies lobbied on specific laws is not available in most European countries. To ensure my results are not driven by lobbying, I omit the largest third of firms from my sample and rerun the regressions. Table 11 shows the results are qualitatively unaffected.

C Tax base

Kawano and Slemrod (2012) argue that not only tax rates, but also differences in the tax base can be important to take into account. In the context of leverage several anti-tax avoidance tools are important to discuss. A popular anti-tax avoidance tool used by governments are Thin-capitalization and Earning-stripping rules. These rules target debt-based tax avoidance by putting a hard cap on the deductibility of interest when a company has a leverage ratio beyond a given cap, or when interest payments exceed a percentage of earnings.

Germany switched from a leverage ratio to interest/ebit restriction in 2007. I exclude Germany from this year onward. In 2006, France made a similar change and Belgium introduced a tax deduction on equity, putting it on comparable footing with debt. Both are excluded.

Moreover, the 2006 court case by the European Court of Justice (2006), which I use in the difference-in-difference, could drive the other results. Therefore, I exclude affected firms using the method and group structure data from Brok (2024). Table 11 shows the results are qualitatively unaffected.

Non of the subsidiaries in the shock sample were affected by these tax base changes.

D Additional tests

1 Regulation and effectiveness of the judicial system

Rodano et al. (2016) show that court functioning can affect leverage. I include several measures obtained from the Fraser institute to control for this. I include proxies for the impartiality of courts, legal enforcement of contracts, legal system & property rights, regulatory burden, business regulation, and the integrity of the legal system.

2 Employment protection

Serfling (2016); Simintzi et al. (2014) show that employment protection can have an impact on leverage as a result of a trade-off between operating leverage and financial leverage. To control for labor market regulations, I include proxies for hiring and firing regulation, centralized bargaining, and general labor market regulations from the Fraser Institute.

3 Tax compliance

To rule out that I am picking up cultural aversions to tax compliance, I add a proxy for tax compliance from the Fraser Institute.

4 Bankruptcy law

Countries can differ in the strength of creditor rights. Prior literature has shown that this can affect leverage (La Porta et al., 1997). To control for this, I use a measure based on La Porta et al. (1997) and Djankov et al. (2007) which measures the strength of creditor rights in a country. I use the adjusted version published by the World Bank and used in Safavian

and Sharma (2007).[9] This version is more granular and therefore has time series variation. The main results are qualitatively unchanged.

Table 12 shows the results. The main results are qualitatively unchanged.

E Standard errors

The main specifications cluster the standard errors at the multinational level. In an alternative specification I cluster at the multinational-year level. Tables 13 and 14 show that the results are qualitatively unaffected.

VI Conclusion

This paper shows that non-debt tax avoidance crowds out debt tax shields. Using two different methods for estimating non-debt tax avoidance, I establish that companies do indeed use other methods to avoid taxes. I then use the predicted tax avoided to show that higher non-debt tax avoiders use less debt for the purpose of tax shields.

Since high-taxed firms have the most incentive to use both debt and non-debt tax shields, this casts a new light on the fact that empirically we see limited responses of leverage to tax rates (Hanlon and Heitzman, 2010; Graham, 2006). The firms we would expect to have the highest leverage based on tax rates, also are the ones we expect to have the highest non-debt tax avoidance. Since the two can act as substitutes, we overestimate the effect of tax rates on leverage for those firms.

On the other hand, we underestimate the effects of tax rates on leverage for low-taxed

[9]Source: Doing Business Report, (no longer) available at http://www.doingbusiness.org.

firms, as they have the most incentive to be on the receiving end of tax avoidance strategies that involve shifting profit from one country to another. I show that once we take into account these incentives for non-debt tax avoidance, the relationship between tax rates and leverage are far stronger.

Tables and figures

Figure 1: Common trend analysis profit shifting

This figure shows the effect of being in the treated group over time. The y-axis shows the estimated coefficient of being in the treated group in a year on Ln(EBIT). 2006 is the year of the shock, 2005 is used as the baseline. The dashed line indicates the 5% confidence interval.

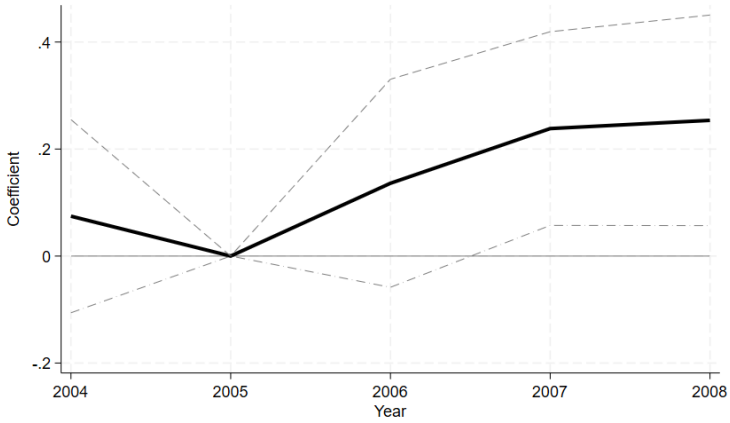

Figure 2: Common trend analysis leverage

This figure shows the effect of being in the treated group over time. The y-axis shows the estimated coefficient of being in the treated group in a year on Leverage. 2006 is the year of the shock, 2005 is used as the baseline. The dashed line indicates the 5% confidence interval.

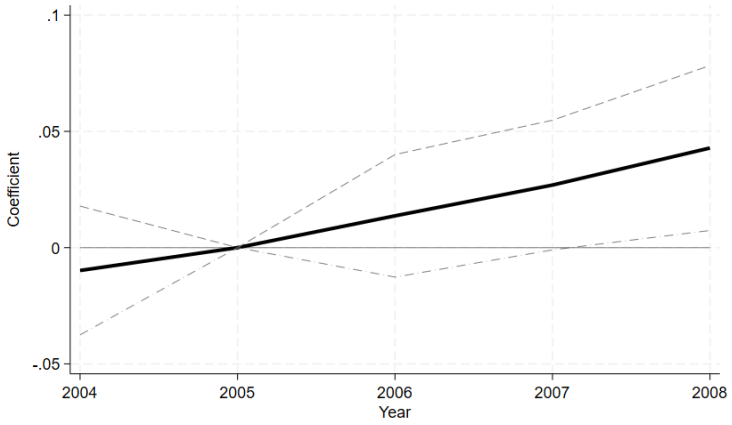

Figure 3: Dynamic effect of the 2008 tax change

This figure shows the effect of treated relative to control firms for the 2008 tax rate changes. The y-axis shows the estimated coefficient of being in the treated group in a year on Leverage. 2007 is used as the baseline. The dashed line indicates the 5% confidence interval.

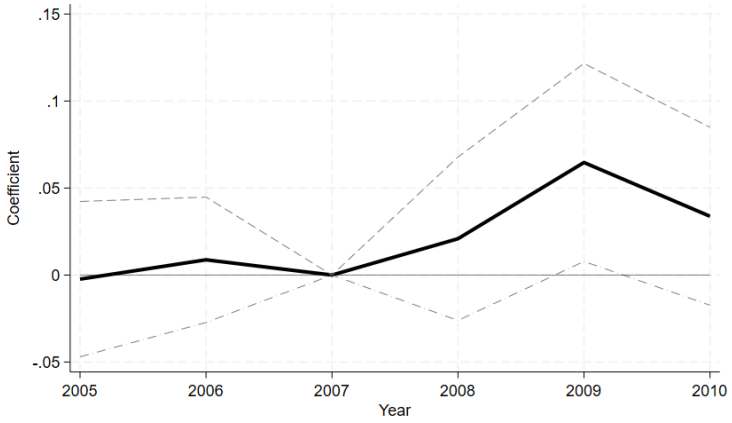

Figure 4: Dynamic effect of the 2008 tax change inbound shifters

This figure shows the effect for inbound profit shifting treated relative to control firms for the 2008 tax rate changes. The y-axis shows the estimated coefficient of being in the treated group in a year on Leverage. 2007 is used as the baseline. The dashed line indicates the 5% confidence interval.

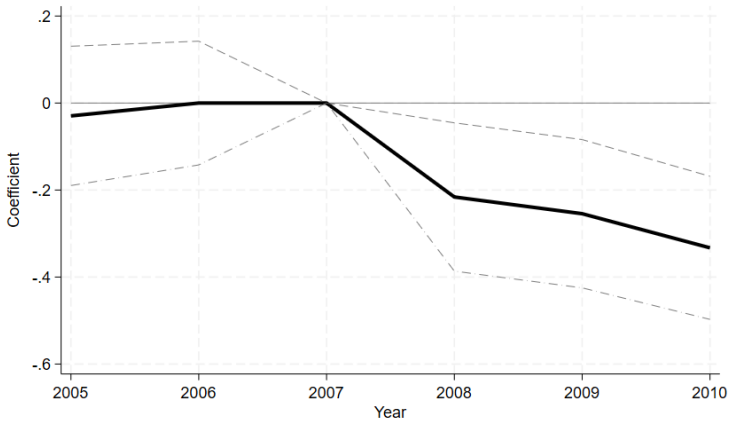

Table 1: **Variable definitions**

This table provides an overview of the variables used throughout this paper. i indicates the multinational company, c indicates the country, t indicates time, and N indicates the total number of countries the multinational is active in.

Variable	Description	Source
Ln(EBIT)_{ict}	The natural log of earnings before interest and taxes in the entity. $Ln(\text{EBIT})_{ict}$.	Orbis Database
$Leverage_{ict}$	Measures the liabilities compared to total assets of the entity. $\frac{\text{non-equity liabilities}_{ict} - \text{non-interest carrying debt}_{ict}}{\text{total assets}_{ict}}$	Orbis Database
$Tangibility_{ict}$	Measures the tangible assets of an entity. Proxies for collateral and financing needs. $\frac{\text{tangible fixed assets}_{ict}}{\text{total assets}_{ict}}$	Orbis Database
$Depreciation_{ict}$	Measures a companies depreciation normalized by sales. It proxies the size of non-debt tax-shields. $\frac{\text{depreciation}_{ict}}{\text{sales}_{ict}}$	Bureau van Dijk's Orbis Database
Size_{ict}	The natural log of total assets. Proxies for the size of companies. $Ln(\text{Total assets})_{ict}$	Orbis Database
$Profitability_{ict}$	Measures entity profitability, defined as return on assets. $\frac{\text{EBIT}_{ict}}{\text{total assets}_{ict}}$	Orbis Database
$\text{Fixed assets}_{ict}$	The natural log of fixed assets in the entity. $Ln(\text{Fixed assets})_{ict}$	Orbis Database
Labor costs_{ict}	The natural log of labor costs in the entity. $Ln(\text{Labor costs})_{ict}$	Orbis Database
$\text{Interest rate}_{ct}$	Country level risk free interest rate.	Thomson Reuters Datastream
$Ln(\text{GDP capita})_{ct}$	Natural log of the annual GDP per capita.	World Bank Data
$\text{Domestic tax rate}_{ct}$	Marginal corporate tax rate.	E&Y Worldwide Corporate Tax Guide
$\text{Incentive-to-shift}_{ict}$	Incentive-to-shift as used for the profit shifting equations. $\frac{1}{(1-Tax_{ct})} \times \frac{\sum_{c \neq k}^{N} \frac{sales_{ict}}{(1-Tax_{ct})} \times (Tax_k - Tax_{ct})}{\sum_{c=1}^{N} \frac{sales_{ict}}{(1-Tax_{ct})}}$.	E&Y Worldwide Corporate Tax Guide

Table 2: **Summary statistics**

This table presents the summary statistics for all variables. The variables are defined in Table 1.

Variable	Obs	Mean	Std. Dev.	Min	Max
Panel A: Incentive-to-shift sample					
Leverage	49,732	.502	.239	.013	.963
Domestic tax rate	49,732	.304	.068	.1	.406
C	49,732	-.022	.083	-.320	.483
Size	49,732	9.821	2.827	4.403	17.194
Tangibility	49,732	.175	.197	0	.863
Depreciation	49,732	.012	.042	0	.474
Profitability	49,732	.109	.108	.000	.549
Ln(EBIT)	49,732	7.087	2.830	1.135	15.048
Ln(Fixed assets)	49,732	7.786	3.663	0	16.596
Ln(Labor costs)	49,732	8.069	2.465	2.890	14.645
Panel B: shock sample					
Leverage	10,246	.333	.253	.008	.985
Domestic tax rate	10,246	.183	.024	.125	.34
Size	10,246	8.290	1.568	2.303	10.405
Tangibility	10,246	.284	.244	0	.929
Depreciation	10,246	.040	.063	0	.479
Profitability	10,246	.108	.157	-.378	.795
Ln(EBIT)	8,682	6.071	1.953	0	10.825
Ln(Fixed assets)	8,682	6.729	2.313	0	11.709
Ln(Labor costs)	8,682	6.711	1.625	.693	11.311

Table 3: **Profit shifting**

This table presents the results from Equation 1. The dependent variable is the log of EBIT, while the variable of interest is the incentive-to-shift (C) (Huizinga and Laeven, 2008). Controls are the log of fixed assets, the log of labor costs, the log of GDP per capita, and interest rates. Year and multinational fixed effects are included. Standard errors are clustered at the multinational level. ***, **, and * indicate statistical significance at 1%, 5%, and 10% statistical significance levels, respectively.

	Ln(EBIT)
	1
C	-1.463***
	(0.124)
Ln(Fixed assets)	0.233***
	(0.007)
Ln(Labor costs)	0.649***
	(0.011)
Ln(GDP per capita)	-0.101***
	(0.020)
Interest rate	0.013
	(0.009)
Observations	49,732
R-squared	0.862
Year FE	Yes
Multinational FE	Yes

Table 4: **Leverage**

The dependent variable in all columns is leverage. Columns 2 and 3 include the profit shifted into or out of the country. Control variables are firm profitability, tangibility, depreciation, Size, Ln(GDP per capita), interest rate, and the domestic tax rate. These variables are defined as in Table 1. Year and multinational fixed effects are included. In columns 1 and 2 the standard errors are clustered at the level of the multinational. Column 3 uses standard errors from 2500 bootstrapped samples clustered at the multinational level. ***, **, and * indicate statistical significance at 1%, 5%, and 10% statistical significance levels, respectively.

	1	2	3
Profit shifted		0.124***	0.124***
		(0.035)	(0.035)
Domestic tax rate	0.043	0.292***	0.292***
	(0.035)	(0.078)	(0.080)
Size	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)
Tangibility	-0.038***	-0.038***	-0.038***
	(0.009)	(0.009)	(0.009)
Depreciation	-0.064	-0.063	-0.063
	(0.041)	(0.041)	(0.042)
Profitability	-0.296***	-0.295***	-0.295***
	(0.014)	(0.014)	(0.014)
Ln(GDP per capita)	0.055***	0.053***	0.053***
	(0.003)	(0.003)	(0.004)
Interest	0.016***	0.017***	0.017***
	(0.002)	(0.002)	(0.002)
Observations	49,732	49,732	49,732
R-squared	0.468	0.468	0.468
Year FE	Yes	Yes	Yes
Multinational FE	Yes	Yes	Yes

Table 5: **Exogenous shock**

This table presents the results for the shock caused by the European Court of Justice (2006). Column 1 shows the effect for profit shifting. Controls are the log of fixed assets, the log of labour costs, GDP per capita, and interest rates. Column 2 shows the effect for leverage. Control variables are firm profitability, tangibility, depreciation, size, Ln(GDP per capita), interest rate, and the domestic tax rate. These variables are defined as in Table 1. Parent-subsidiary pair and year fixed effects are included. Standard errors are clustered at the parent-subsidiary pair. ***, **, and * indicate statistical significance at 1%, 5%, and 10% statistical significance levels, respectively.

	1	2
	Profit shifting	Leverage
Treatment	0.171**	0.031**
	(0.080)	(0.013)
Ln(Fixed assets)	0.065**	
	(0.027)	
Ln(Labor cost)	0.453***	
	(0.056)	
Size		0.060***
		(0.008)
Tangibility		0.065**
		(0.029)
Depreciation		-0.021
		(0.089)
Profitability		-0.172***
		(0.019)
Ln(GDP per capita)	0.626***	-0.074**
	(0.185)	(0.030)
Interest rate	0.095***	-0.006
	(0.031)	(0.004)
Observations	8,682	10,246
R-squared	0.882	0.825
Year FE	Yes	Yes
Parent-subsidiary FE	Yes	Yes

Table 6: **Tax rate by quartile**

This table presents the breakdown of the average marginal tax rate by quartile of the profit shifting distribution. Column 1 shows the baseline effect from Table 4. Control variables are firm profitability, tangibility, depreciation, size, Ln(GDP per capita), interest rate, and the domestic tax rate. These variables are defined as in Table 1. Year and multinational fixed effects are included. In columns 1 and 2 the standard errors are clustered at the level of the multinational. Column 3 uses standard errors from 2500 bootstrapped samples clustered at the multinational level. ***, **, and * indicate statistical significance at 1%, 5%, and 10% statistical significance levels, respectively.

	1	2	3
Highest quartile outbound		-0.398***	-0.398***
*domestic tax rate		(0.106)	(0.106)
Domestic tax rate	0.043	-0.135	-0.135
	(0.035)	(0.093)	(0.092)
Middle quartile inbound		0.477***	0.477***
*domestic tax rate		(0.092)	(0.091)
Highest quartile inbound		0.543***	0.543***
*domestic tax rate		(0.108)	(0.109)
Highest quartile outbound		0.121***	0.121***
		(0.037)	(0.037)
Middle quartile inbound		-0.173***	-0.173***
		(0.030)	(0.030)
Highest quartile inbound		-0.182***	-0.182***
		(0.034)	(0.034)
Size	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
Tangibility	-0.038***	-0.038***	-0.038***
	(0.009)	(0.009)	(0.009)
Depreciation	-0.064	-0.059	-0.059
	(0.041)	(0.040)	(0.042)
Profitability	-0.296***	-0.291***	-0.291***
	(0.014)	(0.013)	(0.013)
Ln(GDP per capita)	0.055***	0.042***	0.042***
	(0.003)	(0.004)	(0.004)
Interest rate	0.016***	0.022***	0.022***
	(0.002)	(0.002)	(0.002)
Observations	49,732	49,732	49,732
R-squared	0.468	0.472	0.472
Year FE	Yes	Yes	Yes
Multinational FE	Yes	Yes	Yes

Table 7: **Tax rate by quartile**

This table presents the breakdown of the average marginal tax rate by quartile of the profit shifting distribution. Quartile 1 has the most outbound profit shifting, while quartile 4 has the most inbound profit shifting.

	Average tax rate
Q1	0.356
Q2	0.330
Q3	0.301
Q4	0.225

Table 8: **Quartile distribution by country**

This table presents the breakdown of observations by country and quartile of the profit shifting distribution. Quartile 1 has the most outbound profit shifting, while quartile 4 has the most inbound profit shifting.

	Q1	Q2	Q3	Q4	Total
Austria	28	33	96	371	528
Belgium	1,173	1,041	1,451	116	3,781
Bulgaria	0	0	13	155	168
Czech Republic	55	54	184	1,158	1,451
Germany	2,998	770	172	9	3,949
Denmark	0	2	11	3	16
Estonia	21	27	305	311	664
Spain	1,891	3,348	2,174	296	7,709
Finland	109	214	763	665	1,751
France	2,227	1,851	1,362	160	5,600
Hungary	23	136	183	1,626	1,968
Great Britain	357	673	2,465	1,531	5,026
Ireland	0	2	4	46	52
Italy	2,822	1,352	434	0	4,608
Luxembourg	12	53	161	83	309
Latvia	0	0	2	22	24
Netherlands	28	88	295	180	591
Norway	140	723	721	726	2,310
Poland	12	106	217	2,004	2,339
Portugal	435	1,314	824	146	2,719
Romania	6	58	202	2,187	2,453
Slovakia	2	20	12	180	214
Sweden	70	571	374	471	1,486
Slovenia	3	8	1	4	16
Total	12,412	12,444	12,426	12,450	49,732

Table 9: **Tax rate decrease**

This table presents the effect of tax rate decrease in five countries in 2008. The treated firms are those located in Germany, Denmark, the UK, Italy, and Portugal, whereas the control firms are located in countries that did not change their tax rates during the sample period. The model is saturated with the interaction between treated group indicator and inbound, as well as treated period and inbound, the coefficients are not displayed. Control variables are firm profitability, tangibility, depreciation, size, Ln(GDP per capita), interest rate, and the domestic tax rate. These variables are defined as in Table 1. Year and multinational fixed effects are included. The standard errors are clustered at the level of the multinational. ***, **, and * indicate statistical significance at 1%, 5%, and 10% statistical significance levels, respectively.

	1 Leverage	2 Leverage
Treatment * Inbound		-0.150***
		(0.055)
Treatment	0.035	0.046
	(0.023)	(0.030)
Inbound	0.001	0.037
	(0.016)	(0.029)
Profit shifted	0.093	0.082
	(0.071)	(0.072)
Domestic tax rate	0.119	0.176
	(0.297)	(0.302)
Size	0.017***	0.017***
	(0.002)	(0.002)
Tangibility	0.013	0.010
	(0.029)	(0.028)
Depreciation	0.079	0.098*
	(0.053)	(0.052)
Profitability	-0.089***	-0.086***
	(0.029)	(0.029)
Ln(GDP per capita)	0.113***	0.110***
	(0.022)	(0.022)
Interest rate	0.053***	0.052***
	(0.007)	(0.007)
Observations	4,806	4,806
R-squared	0.491	0.494
Year FE	Yes	Yes
Multinational FE	Yes	Yes

Table 10: **Endogenous entry**

This table presents the results from robustness tests. The regressions are the same as those in Table 4, but any multinational that entered into new countries is excluded. For the calculation of 'C', the sales contributions of the firms in different countries are set to the value at the start of the sample. The controls are the same as in the original regressions. These variables are defined as in Table 1. Standard errors are clustered at the level of the multinational. ***, **, and * indicate statistical significance at 1%, 5%, and 10% statistical significance levels, respectively.

	1 Ln(EBIT)	2 Leverage	3 Leverage	4 Leverage
C	-1.474***			
	(0.148)			
Profit shifted			0.455***	
			(0.106)	
Highest quartile outbound				-0.542***
*domestic tax rate				(0.141)
Domestic tax rate		-0.093**	0.940***	-0.231*
		(0.040)	(0.218)	(0.132)
Middle quartile inbound				0.415***
*domestic tax rate				(0.127)
Highest quartile inbound				0.571***
*domestic tax rate				(0.146)
Highest quartile outbound				0.176***
				(0.049)
Middle quartile inbound				-0.150***
				(0.042)
Highest quartile inbound				-0.193***
				(0.048)
Size		0.002**	0.001	0.001
		(0.001)	(0.001)	(0.001)
Tangibility		-0.052***	-0.052***	-0.049***
		(0.011)	(0.011)	(0.011)
Depreciation		-1.043***	-1.043***	-1.039***
		(0.113)	(0.114)	(0.113)
Profitability		-0.401***	-0.399***	-0.391***
		(0.016)	(0.016)	(0.016)
Ln(GDP per capita)	-0.106***	0.053***	0.048***	0.040***
	(0.020)	(0.004)	(0.004)	(0.004)
Interest rate	0.020	0.006**	0.009***	0.015***
	(0.013)	(0.002)	(0.003)	(0.003)
Ln(Fixed assets)	0.225***			
	(0.007)			
Ln(Labor costs)	0.623***			
	(0.012)			
Observations	39,249	39,249	39,249	39,249
R-squared	0.846	0.465	0.465	0.469
Year FE	Yes	Yes	Yes	Yes
Multinational FE	Yes	Yes	Yes	Yes

Table 11: **Robustness**

This table presents the results from robustness tests. Columns 1 and 2 show the effects when omitting the largest multinationals to test for lobbying power (Neretina, 2020). Columns 3 and 4 and Columns 5 and 6 show the effect when countries with a change in thin-capitalization or CFC rule are excluded. Control variables are as in the original regressions. These variables are defined as in Table 1. Standard errors are clustered at the level of the multinational. ***, **, and * indicate statistical significance at 1%, 5%, and 10% statistical significance levels, respectively.

	1 Lobby	2 Lobby	3 Thin-capitalization	4 Thin-capitalization	5 CFC	6 CFC
Profit shifted		0.227**		0.163***		0.154***
		(0.091)		(0.037)		(0.038)
Domestic tax rate	0.008	0.288**	0.120***	0.488***	0.122***	0.431***
	(0.061)	(0.127)	(0.037)	(0.091)	(0.039)	(0.085)
Size	0.008***	0.008***	0.006***	0.005***	0.006***	0.006***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Tangibility	-0.113***	-0.113***	-0.040***	-0.041***	-0.036***	-0.036***
	(0.016)	(0.016)	(0.010)	(0.010)	(0.010)	(0.010)
Depreciation	-0.030***	-0.030***	0.007	0.007	0.011	0.011
	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Profitability	-0.241***	-0.241***	-0.063***	-0.063***	-0.107***	-0.106***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.031)	(0.031)
Ln(GDP per capita)	0.043***	0.041***	0.055***	0.053***	0.054***	0.052***
	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)
Interest rate	0.007**	0.008**	0.018***	0.019***	0.017***	0.017***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	22,196	22,196	36,611	36,611	41,484	41,484
R-squared	0.572	0.572	0.483	0.483	0.472	0.472
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Multinational FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 12: **Additional controls**

This table presents the same regressions as Table 4, but with additional controls for effectiveness of the judicial system, labor market regulation,business regulation, tax compliance, and creditor rights. The other control variables are as in the original regressions and are defined as in Table 1. Standard errors are clustered at the level of the multinational. ***, **, and * indicate statistical significance at 1%, 5%, and 10% statistical significance levels, respectively.

	1 Ln(EBIT)	2 Leverage
Profit shifting		0.100***
		(0.034)
Domestic tax rate		0.343***
		(0.085)
C	-1.534***	
	(0.181)	
Size		0.004***
		(0.001)
Tangibility		-0.037***
		(0.009)
Depreciation		-0.063
		(0.041)
Profitability		-0.292***
		(0.013)
Ln(GDP per capita)	0.316***	0.003
	(0.042)	(0.009)
Interest rate	0.028**	0.007***
	(0.012)	(0.002)
Ln(Fixed assets)	0.224***	
	(0.007)	
Ln(Labor costs)	0.657***	
	(0.011)	
Impartial courts	-0.149***	-0.025***
	(0.020)	(0.003)
Integrity of the legal system	0.051***	0.005*
	(0.018)	(0.003)
Legal enforcement of contracts	-0.093***	0.017***
	(0.014)	(0.003)
Creditor rights	0.103***	0.001
	(0.008)	(0.001)
Legal System & Property Rights	-0.042	0.046***
	(0.029)	(0.005)
Hiring regulations and minimum wage	0.028***	-0.016***
	(0.006)	(0.001)
Centralized collective bargaining	0.071***	-0.021***
	(0.010)	(0.002)
Labor market regulations	-0.193***	0.048***
	(0.022)	(0.004)
Regulatory Burden	-0.016*	0.001
	(0.010)	(0.002)
Tax compliance	0.008	0.016***
	(0.010)	(0.002)
Business regulations	0.060	-0.041***
	(0.045)	(0.008)
Observations	49,667	49,667
R-squared	0.864	0.480
Year FE	Yes	Yes
Multinational FE	Yes	Yes

Table 13: **Firm clustered standard errors**

This table presents the same regressions as Table 4, but with standard errors clustered at the level of the multinational-country level. The control variables are as in the original regressions and are defined as in Table 1. ***, **, and * indicate statistical significance at 1%, 5%, and 10% statistical significance levels, respectively.

	1	2	3
	Leverage	Leverage	Leverage
Profit shifted		0.124***	0.124***
		(0.035)	(0.034)
Domestic tax rate	0.043	0.292***	0.292***
	(0.033)	(0.078)	(0.078)
Size	0.004***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)
Tangibility	-0.038***	-0.038***	-0.038***
	(0.009)	(0.009)	(0.009)
Depreciation	-0.064	-0.063	-0.063
	(0.046)	(0.046)	(0.046)
Profitability	-0.296***	-0.295***	-0.295***
	(0.013)	(0.013)	(0.014)
Ln(GDP per capita)	0.055***	0.053***	0.053***
	(0.003)	(0.003)	(0.004)
Interest	0.016***	0.017***	0.017***
	(0.002)	(0.002)	(0.002)
Observations	49,732	49,732	49,732
R-squared	0.468	0.468	0.468
Year FE	Yes	Yes	Yes
Multinational FE	Yes	Yes	Yes

Table 14: **Firm clustered standard errors**

This table presents the same regressions as Table 6, but with standard errors clustered at the level of the multinational-country level. The control variables are as in the original regressions and are defined as in Table 1. ***, **, and * indicate statistical significance at 1%, 5%, and 10% statistical significance levels, respectively.

	1	2	3
	Leverage	Leverage	Leverage
Highest quartile outbound		-0.398***	-0.398***
*domestic tax rate		(0.096)	(0.110)
Domestic tax rate	0.043	-0.135	-0.135
	(0.033)	(0.085)	(0.096)
Middle quartile inbound		0.477***	0.477***
*domestic tax rate		(0.083)	(0.098)
Highest quartile inbound		0.543***	0.543***
*domestic tax rate		(0.097)	(0.115)
Highest quartile outbound		0.121***	0.121***
		(0.033)	(0.038)
Middle quartile inbound		-0.173***	-0.173***
		(0.027)	(0.032)
Highest quartile inbound		-0.182***	-0.182***
		(0.031)	(0.036)
Size	0.004***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
Tangibility	-0.038***	-0.038***	-0.038***
	(0.009)	(0.009)	(0.009)
Depreciation	-0.064	-0.059	-0.059
	(0.046)	(0.045)	(0.045)
Profitability	-0.296***	-0.291***	-0.291***
	(0.013)	(0.013)	(0.014)
Ln(GDP per capita)	0.055***	0.042***	0.042***
	(0.003)	(0.004)	(0.004)
Interest	0.016***	0.022***	0.022***
	(0.002)	(0.002)	(0.002)
Observations	49,732	49,732	49,732
R-squared	0.468	0.472	0.472
Year FE	Yes	Yes	Yes
Multinational FE	Yes	Yes	Yes

References

Angrist, Joshua David and Jörn-Steffen Pischke (2013), *Mostly Harmless Econometrics: an Empiricists Companion*. Cram101 Publishing.

Bilicka, Katarzyna Anna (2019), "Comparing uk tax returns of foreign multinationals to matched domestic firms." *American Economic Review*, 2921–2953.

Blouin, Jennifer, Harry P. Huizinga, Luc A.H. Laeven, and Gaetan Nicodeme (2014), "Thin capitalization rules and multinational firm capital structure." *CentER Discussion Paper*, 2014-007.

Brok, Peter (2024), "Debt and taxes: the role of corporate group structure." *Review of Finance*, 28(6), 2051–2082.

Buettner, Thiess, Michael Overesch, Ulrich Schreiber, and Georg Wamser (2012), "The impact of thin-capitalization rules on the capital structure of multinational firms." *Journal of Public Economics*, 96, 930–938.

Chase-Dunn, Christopher, Yukio Kawano, and Benjamin D. Brewer (2000), "Trade globalization since 1795: Waves of integration in the world-system." *American Sociological Review*, 77–95.

Cobham, Alex and Petr Janský (2017), "Global distribution of revenue loss from tax avoidance." *WIDER Working paper*, 2017/55.

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

Djankov, Simeon, Caralee McLiesh, and Andrei Shleifer (2007), "Private credit in 129 countries." *Journal of Financial Economics*, 84(2), 299–329.

European Court of Justice (2006), "Judgement from september 12." C-196/04 ECR 2006 I–07995.

Faulkender, Michael W. and Jason M. Smith (2014), "Taxes and leverage at multinational corporations." *Journal of Financial Economics*, 122(1), 1–20.

Graham, John R. (1996), "Proxies for the corporate marginal tax rate." *Journal of Financial Economics*, 42(2), 187–221.

Graham, John R. (2000), "How big are the tax benefits of debt?" *Journal of Finance*, 55(5), 1901–1941.

Graham, John R. (2006), "A review of taxes and corporate finance." *Foundations and Trends in Finance*, 1(7), 573–691.

Graham, John R. and Alan L. Tucker (2006), "Tax shelters and corporate debt policy." *Journal of Financial Economics*, 81(3), 563–594.

Hanlon, Michelle and Shane Heitzman (2010), "A review of tax research." *Journal of Accounting and Economics*, 127–178.

Heider, Florian and Alexander Ljungqvist (2015), "As certain as debt and taxes: Estimating the tax sensitivity of leverage from state tax changes." *Journal of Financial Economics*, 118(3), 684–712.

Hill, Matthew D., G. Wayne Kelly, G. Brandon Lockhart, and Robert A. Van Ness (2013), "Determinants and effects of corporate lobbying." *Financial Management*, 42(4), 931–957.

Huizinga, Harry and Luc Laeven (2008), "International profit shifting within multinationals: A multi-country perspective." *Journal of Public Economics*, 92(5-6), 1164–1182.

Huizinga, Harry P., Luc A.H. Laeven, and Gaetan Nicodeme (2008), "Capital structure and international debt shifting." *Journal of Financial Economics*, 88, 80–118.

Kalemli-Ozcan, Sebnem, Bent Sorensen, Carolina Villegas-Sanchez, Vadym Volosovych, and Sevcan Yesiltas (2015), "How to construct nationally representative firm level data from the orbis global database." *NBER Working paper*.

Kawano, Laura and Joel Slemrod (2012), "The effect of tax rates and tax bases on corporate tax revenues: Estimates with new measures of the corporate tax base." *NBER Working Paper*.

Kraus, Alan and Robert H. Litzenberger (1973), "A state-preference model of optimal financial leverage." *Journal of Finance*, 28, 911–922.

La Porta, Rafael, Florencio Lopez de Silanes, Andrei Shleifer, and Robert Vishny (1997), "Legal determinants of external finance." *Journal of Finance*, 52, 1131–1150.

Modigliani, Franco and Merton H. Miller (1963), "Corporate income taxes and the cost of capital: A correction." *American Economic Review*, 53, 433–443.

Neretina, Ekaterina (2020), "Lobbying externalities and competition." *working paper*.

OECD (2014), "Limiting base erosion involving interest deductions and other financial payments, action 4 - 2015 final report."

Panier, Frederic, Francisco Pérez-González, and Pablo Villanueva (2012), "Capital structure and taxes: What happens when you (also) subsidize equity?" *working paper*.

Rajan, Raghuram G., and Luigi Zingales (1995), "What do we know about capital structure? some evidence from international data." *Journal of Finance*, 50, 1421–1460.

Rodano, Giacomo, Nicolas Serrano-Velarde, and Emanuele Tarantino (2016), "Bankruptcy law and bank financing." *Journal of Financial Economics*, 120(2), 363–382.

Safavian, Mehnaz and Siddharth Sharma (2007), "When do creditor rights work?" *Journal of Comparative Economics*, 35(3), 484–508.

Schenkelberg, Sabine (2018), "The cadbury schweppes judgment and its implications on profit shifting activities within europe." *mimeo*.

Serfling, Matthew (2016), "Firing costs and capital structure decisions." *The Journal of Finance*, 71(5), 2239–2286.

Simintzi, Elena, Vikrant Vig, and Paolo Volpin (2014), "Labor protection and leverage." *The Review of Financial Studies*, 28(2), 561–591.