LUND UNIVERSITY

School of Economics and Management

How do listed non-financial companies adjust their capital structure after an increase in corporate income tax rate?

- A study on the German and French Market -

by

Anthony Reichey & Tim Wulff

23rd May 2017

Master's Programme in Corporate Financial Management

Abstract

Seminar Date: 30th May 2017

Course: BUSN79 Business Administration: Degree Project in Corporate Financial Management, 15 ECTS

Authors: Anthony Reichey & Tim Wulff

Supervisor: Niclas Andrén

Key Words: Capital structure, Leverage, Corporate income tax, Dynamic Trade-off theory, Tax shield

Purpose: The purpose of this study is to investigate how listed non-financial companies in the German and French markets adjust their leverage after corporate income tax increases.

Methodology: We performed a panel data regression analysis with a difference-in-differences approach based on Heider & Ljungqvist (2015) and Schandlbauer (2016). We used the firm size, market-to-book and tangibility as explanatory variables and tested for robustness by additionally including the following control variables: Return on assets, profitability, reported taxes / earnings.

Foundation: Basis for this thesis have been 2.222 observations from 421 different companies listed in the Prime and General Standard of Germany and France in the periods of 2001 - 2004 and 2011 - 2014 which we obtained by Capital IQ, DataStream and Thomson Reuters.

Conclusion: Companies in Germany and France significantly increase their leverage after an increase in corporate taxes. Moreover, we conclude better-capitalized companies increase their leverage, whereas worse-capitalized companies do not react as strong to the change in taxes due to a lack of financial flexibility.

Firm size, Market-to-book (only in France), and tangibility are significant explanatory variables that can be used as proxies for the leverage behaviour.

Acknowledgements

We would like to thank our dedicated supervisor Niclas Andrén for his commitment and guidance throughout the writing process as well as for his work as our Programme Director. The advice on methodological procedures, structural issues, and his constructive comments have been very helpful.

1. Table of Contents

Table of figures

1 Introduction

1.1 Background

At least since the invention of Modigliani and Miller´s capital structure theorem in 1958, much research on capital structure has been performed. It has been proven that non-financial and financial companies adjust their leverage according to theory after a tax increase, whereas they fail to adjust after a tax decrease (Admati, et al., 2015). While past research has been performed mostly on the impact of leverage in general, Schandlbauer (2016) went one step further and investigated on how better- and worse-capitalized listed financial institutions adjust their leverage respectively. This novel approach has not yet been used to explore how non-financial companies react to corporate tax increases. Whereas much empirical research has been conducted on the US market, the European market remains relatively unexplored when it comes to leverage-related studies on non-financial companies. We have chosen Germany and France because they have among the highest GDPs within the EU and are appropriate treatment and control groups respectively, as we will show later. Furthermore, our empirical approach is related to Heider & Ljungqvist (2015), who show the impact of state level tax changes on leverage decisions of non-financial companies in the US. By merging these two procedures, we devise an empirical framework against which we test for non-financial German and French firms.

1.2 Problem Discussion

According to Fama (2011), the "*big open challenge in corporate finance is to produce evidence on how taxes affect market values and thus optimal financing decisions".* We will show it has been evidently proved that taxes do affect the capital structure of companies under certain circumstances. How and when this is the case is an area of current research. When taking a closer look, it seems that taxes are sometimes but not always, a first order priority for financing decisions. Many factors influence the decision makers and some have not yet been fully researched. Graham & Harvey (2001) surveyed 392 CFOs and found that 59 % think financial flexibility is important or very important, making it one of the most considered debt policy factors. This is in line with the pecking order theory, as financial flexibility helps to avoid external financing (Myers & Majluf, 1984) but also prepares for recessions or mergers and acquisitions (Graham & Harvey, 2001). We gauge financial flexibility in accordance with Schandlbauer (2016) by dividing our sample into better- and worse-capitalized companies, and

we argue that better- capitalized companies have greater financial flexibility than worse-capitalized companies.

We will empirically highlight whether taxes do also play a significant role in capital structure decisions in Germany and France, and how better- and worse-capitalized listed non-financial companies react to increases in corporate income tax rate. This will shed more light on the German and French markets and extend the current state of the scientific knowledge through taking the current capital structure of companies into consideration.

There are several theories available that can be used to try to explain the observed behaviour in corporate finance. They all claim to be valid while partly contradicting each other. Many recent studies, such as Schandlbauer (2016) and Heider & Ljungqvist (2015), focused on the U.S. market while the German and the French markets have not received much academic attention. Due to the, sparse research on leverage for the German and French markets (compared to the U.S.), we identified a research gap. With this thesis, we want to further fill the gap by looking at these two markets and investigating on the leverage decisions of companies after a corporate income tax increase, as well as what role the current capitalization status of companies plays in such decisions.

We have decided to only investigate tax increases because no decrease in the leverage ratio is to be expected after a tax decrease. Shareholders would not have an incentive to issue new shares or buy back risky debt because the remaining debt becomes less risky and therefore the transaction would shift value from the shareholders to debtholders (Modigliani & Miller, 1958). This agency cost of debt leads to higher leverage of companies than the traditional trade-off theories would predict since it takes the incentive from shareholder to decrease debt (Admati, et al., 2013). Even in the case of an external shock, like a decrease in taxes, empirical studies (e.g., Admati, et al., 2013 and Heider & Ljungqvist, 2015) have shown that firms are biased against debt reductions and towards increases.

1.3 Research Questions

Continuing from the previously identified gap, the research questions that are investigated in this thesis are as follows:

- *How do listed non-financial firms in Germany and France adjust their leverage when corporate income tax rate increases?*
- *How do the better- and worse- capitalized listed non-financial companies react to corporate income tax increases?*

1.4 Research Purpose

We introduce the most recent and relevant taxes and capital structure related literature and answer the research questions mentioned above to close a gap of knowledge in corporate finance.

Using the OECD tax database from 2001 until 2016, we identified three corporate income tax increases in Germany and France, of which two seemed adequate for our research purpose. We use the corporate income tax increases in Germany and France because they are comparable (as we will show in chapter 3.1.1.), and while the one county had a tax increase, the other had a stable tax rate. In Germany, the tax rate rose from 38,9 % to 40,22 % on 1st January 2003, whereas the tax rate in France stayed constant at 35,43 %. In France, it increased from 36,1 % to 38,0 % on 1st January 2013, whereas the tax rate in Germany stayed constant at 30,18 %. By analysing the changes in total book leverage for the periods of 2001 - 2004 and 2011 - 2014 (i.e. two years before and one year after the respective increases in corporate income tax rate), we will show whether the companies in one country significantly increased their total book leverage relative to the companies in the other country, and whether the existing financial situation influences the capital structure decision.

To the best of our knowledge, there is no empirical study relating the capitalization of non-financial companies to the leverage decision after corporate income tax increases.

1.5 Target Group

This thesis could be of interest to researchers, companies, investors, and politicians.

It should help researchers to better understand company behaviour and trigger new research questions. Management of listed companies in Germany and France should better understand

how taxes affect the capital structure and why the current capital structure is of importance. Investors should gain a better understanding of how corporate taxes influence the company's decisions regarding taking on debt, hybrids, or equity, so they can make more informed investment decisions. Politicians should understand why the decision to increase taxes will also influence the leverage decisions of companies because this can lead to an aggregate decrease in the distance to default for the corporate sector and therefore also influence the economy.

1.6 Outline of the Thesis

In the second chapter, we will explain the theoretical background and the main theories leading to the current state of research and use them to develop our hypothesis. Chapter three will explain the methodology used, where we obtained the data, how we modified it and what kind of exclusion criteria were applied. Moreover, we will argue for which empirical model we will make use of and how we are going to conduct our analysis. In chapter four we will present the results, and interpret them, before drawing our conclusions in the final chapter.

2 Theoretical Background and Literature Review

In the following section we will introduce and discuss theories we consider most important to the understanding of capital structure decisions of companies. We will begin with the leverage irrelevance theorem, cover static and dynamic trade-off theories, and finish with pecking order theory. Using this background, we will show mainly how these theories explain the impact that tax- and non-tax factors have on the leverage decisions of companies. Thus, we will focus on the relationship between leverage and taxes.

2.1 Modigliani-Miller Theorem

Modigliani & Miller (1958) were among the first to establish a generally accepted theory of capital structure. According to them, the cash flows of a company are distributed to the share- and debtholders according to their stake in financing. Under their following conditions:

- companies have homogeneous expectations
- homogeneous business risk
- perpetual cash flows
- the capital market is perfect

Modigliani & Miller derived their first proposition as follows

"*market value of any firm is independent of its capital structure and is given by capitalizing its expected return at the rate appropriate to its class"* (Modigliani & Miller, 1958).

From Proposition one they derived their second proposition for the rate of return of a levered company:

"the expected yield of a share of stock is equal to the appropriate capitalization rate for a pure equity stream in the class, plus a premium related to financial risk"

As the investors and companies have equal access to debt, it does not matter if the investors borrow to invest in unlevered companies or if they directly invest in levered companies. If the only difference in the companies is the leverage, the result for investors should be the same. Without market constraints, it does not matter if they pay the interest for the borrowed money to purchase the unlevered company or the levered company pays its interest.

In a following paper, Modigliani & Miller (1963) extended their theory by adding the tax deductibility of interests on the company's value. As interests on debt are tax deductible, it can be beneficial to finance a company using debt instead of equity because it creates a tax shield for profitable companies. The tax shield is a factor of the tax rate and the level of debt, which can lower the cost of debt and the weighted average cost of capital. An increase in the tax rate leads to an increase in the tax shield and therefore to an increase in the market value of the firm. But Modigliani & Miller also found a personal tax penalty that fully offsets the corporate tax advantage of debt for the investor. Depending on the applicable statutory tax rules, interest income from debt is either taxed as capital gains (e.g., Germany (Bundesministerium der Justiz, 2017)) or as income (e.g., France and United States (Green & Hollifield, 2003)). In case interests are taxed as income there is a tax-disadvantage to equity when the personal tax rate of the lender is higher than the capital gains tax rate.

The theory has been well discussed and it stimulated further research relaxing the assumptions they have made.

2.2 Trade-off theory

2.2.1 Static Trade-off theory

Modigliani & Miller showed the relevance of the capital structure for the company's market value if taxes exist and they model it as a linear function of leverage. Using the linear function would imply the maximal company value is reached with an all debt company. But as an increase in debt increases the risk of bankruptcy, this can obviously not be the best scenario for a company or its shareholders (Robichek & Myers, 1966).

Kraus & Litzenberg (1973), therefore, introduced corporate taxes and bankruptcy costs to derive an optimal capital structure that maximizes the market value of the firm. According to them, the market value of a levered firm equals the market value of an unlevered firm plus the present value of the difference between the tax shield created by taking on debt and bankruptcy costs.

Miller (1977) reacted to the new trade-off theory and the critics of the Modigliani & Miller theory with a paper in 1977. He kept the spirit of the capital structure irrelevance theorem and argued that, even in a world where interests are tax deductible, the value of the firm would still be independent because bankruptcy costs are small and in equilibrium, and the costs of financing with debt or equity would be the same due to arbitrage opportunities (Wagner, 2003).

Including bankruptcy costs of any size makes the trade-off a non-linear function. It becomes a curve with a positive slope up to the point of optimal debt level, as illustrated by Meyers (1984) in Figure 1. Meyers extended the bankruptcy costs that Kraus and Litzenberg (1973) used in their model, and added the legal and administrative costs of bankruptcy, agency-, moral hazard-, monitoring-, and contracting-costs to the costs of financial distress, which can erode a company even when default is avoided.

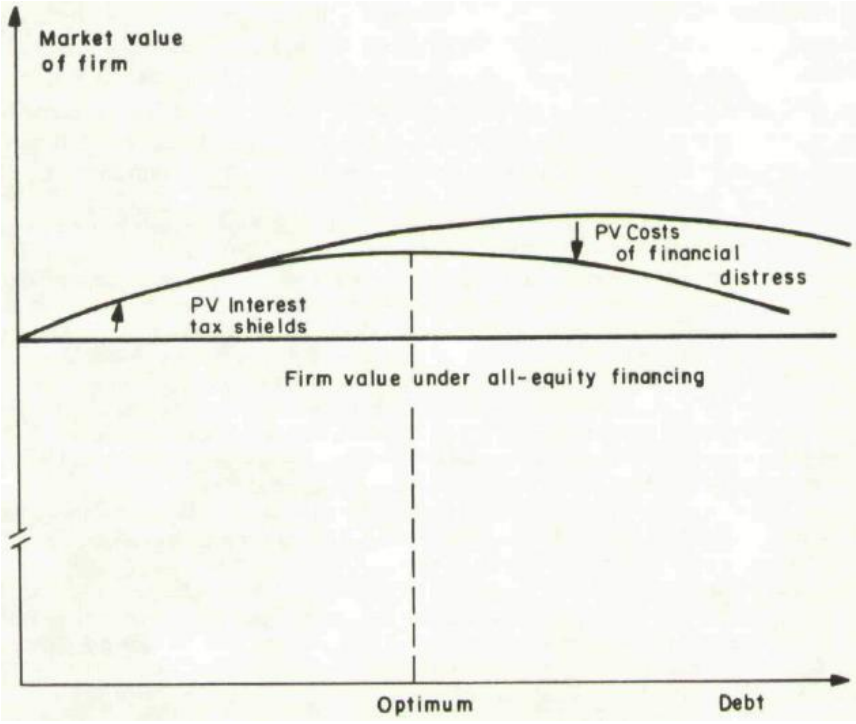

Figure 1: The static trade-off theory of capital structure

This static approach seems plausible but, as studies have shown unacceptable low R^2 (Meyers, 1984), there must be other reasons for and against the use of debt except the tax deductibility of interest and bankruptcy costs.

Bradley, et al. (1984) summarized various other leverage-related factors such as agency costs of debt, the non-debt tax shields (coming from depreciation and tax credits), the personal tax rate, the marginal bondholders tax rate, and risk (measured as volatility of firm's earnings) that will influence the leverage decision if they are significant. Furthermore, if a company has or does make losses, tax loss carryforwards might be created that provide protection against taxes or at least reduce them. In those cases, the anticipated realizable tax benefit is positive but low (Meyers, 1984).

Because so many factors need to be considered, many studies are not able to show significant effects (e.g., Titman & Wessels, 1988; Fischer, et al., 1989; Ang & Peterson, 1986). An early author who could produce clear evidence on the influence tax shields have on the leverage decision of companies when going public was MacKie-Mason (1990). He empirically concludes: "…*changes in the marginal rate for any firm should affect financing choices*…".

Another author who contributed significant results indicating that high tax-rate firms use more leverage is Graham (1996). He argues that proxies have been used to gauge a company's tax

rate, and therefore researchers have not been able to produce stronger results. Graham (1996) instead explicitly calculates the company-specific marginal corporate income tax rates, which can lie between zero as a minimum and the statutory corporate tax rate as the maximum, and uses them to explore incremental financing decisions. Graham (1996) defines the marginal tax rate as "*the present value of current and expected future taxes paid on an additional dollar of income earned today"* and calculated them by taking into consideration the state-specific treatment of net operating losses, investment tax credits, the alternative minimum taxes[1], and the managers tax rate expectations. A high marginal tax rate is what really motivates the companies to use debt. The statutory tax rate might be high, but if the company already shields its earnings, its marginal tax rate might be low, which means the potential value of the debt tax shield is low (Graham, 1996).

The aforementioned studies show taxes do influence leverage decisions, although significant results are less common in this research area than the theory might suggest. The static one-period approach they used does not allow for target adjustments. One decade later, researchers (e.g., HAMADA, et al., 1984 and Brennan & Schwartz, 1984) have started to reconsider the impact that taxes have on the leverage of companies by applying dynamic models (Murray Z. & Goyal, 2007).

2.2.2 Dynamic Trade-off theory

An advantage of a dynamic approach is that it captures reactions of a company that might not be observable in a single period because companies do not always react immediately, nor do they react in the same way. One of the first researchers who applied a dynamic approach to investigate the trade-off between tax shields and bankruptcy costs was Hamada, et al. (1984), who showed that companies keep high level of debt to take advantage of tax shields. A few years later, Fischer, et al. (1989) used the dynamic approach to show that reaching the optimal financing with a current capital structure happens over time when exogenous transaction costs influence investment decisions. Transaction costs occur when companies recapitalize and they are proportionally higher for smaller debt issues than for larger ones. If no transaction costs would exist, companies might react immediately and adjust their leverage towards their optimal ratio, but adjustments of leverage involve costs. Small adjustments might not justify the costs, so companies delay adjustments until worthwhile (Meyers, 1984). In some previous static

[1] Additional US tax requirement. See (Burman, 2007)

studies, transaction costs have been absent, so companies have recapitalized continuously making their studies biased (Meyers, 1984).

According to the trade-off theories, companies should increase leverage when their marginal tax rate increases so they can benefit from the tax deductibility of interest payments compared to dividend payments when raising equity. Based on this we develop **Hypothesis one**:

German and French non-financial corporations increase their leverage after an increase in corporate income tax rate.

Current research

It is an ongoing challenge to prove how taxes affect funding decisions (Fama, 2011). The latest research has been able to statistically verify the connection between taxes and leverage.

While many studies focus on the United States, Dwenger & Viktor (2014) observed the German market for the period 1998 – 2001 and found that, on average, an increase in corporate taxes by 10 % would increase a company's leverage by 5 %. Faccio & Xu (2015) observed leverage responses in low tax evasion countries while examining tax changes at the corporate and personal level within 29 OECD countries by using a panel regression. They conclude "*firms tend to increase their leverage when corporate taxes or personal taxes on dividend income increase…*".

Heider & Ljungqvist (2015) have recently contributed by showing leverage responds asymmetrically to tax changes and it is path-dependent, both supporting dynamic trade-off models. While doubted in prior research (e.g., Shyam-Sunder & Myers, 1999; Heider & Ljungqvist, 2015) results indicate that taxes are a first-order determinant of U.S. firms' capital structure decisions.

Fewer researchers have investigated the impact that corporate tax changes have on the capital structure of financial institutions. Schandlbauer (2016) modified Heider & Ljungqvist´s (2015) difference-in-differences approach for the banking sector and produced significant results showing U.S. banks increase their leverage when the state corporate income tax rate increases. He compared better- and worse-capitalized banks and found that they react differently. Better-capitalized financial institutions use their financial flexibility to take advantage of the enlarged tax shield of debt and increase their leverage. On the other hand, worse-capitalized banks do

not increase leverage to the same extent, but instead shift from mezzanine funding to subordinated debt.

As Schandlbauer (2016) has shown for financial institutions in the U.S., not all companies might be in the position to responded by changing their capital structure. Better-capitalized companies might have the financial flexibility to increase their leverage, but worse-capitalized companies might react less because they have leverage ratios above their target or they are financially constrained. Although non-financial companies usually have diverse characteristics as compared to financial institutions (like lower leverage ratios and weaker regulatory forces), this assumption might also be valid for them. Therefore, we developed

Hypothesis two:

Better capitalized non-financial companies in Germany and France increase their total book leverage significantly stronger whereas worse-capitalized firms lever up less strong after a corporate income tax increase.

2.3 Pecking order theory

According to the pecking order theory, firms prefer internal finance and adapt their target dividend ratios according to their investment opportunities. When external finance is needed, companies prefer debt, then hybrid securities, and equity as a last resort. The main difference to the trade-off theory is that there is no target debt-to-equity mix. The leverage levels are just cumulative external financing needs (Meyers, 1984).

This suggests a company will not adjust the level of debt to take advantage of a tax shield as it would first prefer the internally generated funds and only take on external debt or equity if they are not sufficient to cover existing investment opportunities. Balancing the costs and benefits of debt like in the trade-off theory becomes, according to this perspective, a second-order priority (Shyam-Sunder & Myers, 1999). The costs of relying on external financing, such as administrative-, underwriting-, under-pricing- or asymmetric information costs are, avoided if the company generates enough internally generated funds. In case internally generated funds are not available in sufficient amounts, companies prefer debt instead of equity because they follow the rule “issue safe securities before risky ones” (Meyers, 1984).

The following example illustrates a disadvantage of equity financing compared to debt financing. If a company's shares are undervalued, it will only issue equity if the net present value of the project is higher than the undervaluation of its shares because otherwise the current shareholders will be worse off. This goes at cost of the intrinsic value of the company because a positive net-present-value project has been rejected. On the other hand, if the company's shares are overvalued, the management would always issue equity even though debt is available, creating a universe in which investors would only invest if the debt capacity of the company is reached because they know about the asymmetric information motivating the management. Instead, the internal funds and debt instead are less affected by information sensitivity, and therefore are cheaper than equity (Graham, 2000).

As several studies (e.g., Baker & Wurgler, 2002) have shown, companies try to time the market and issue shares when they think the price for their stock is high. This behaviour contradicts the static trade-off theory as an increase of the stock price means the company value increases and therefore the debt-to-value ratio falls. Following the trade-off theory, companies should issue debt. On the other hand, manager behaviour seems to contradict the pecking order theory as well when they prefer share issues because of high prices (Meyers, 1984). Investors should understand the manager motivation and bid lower prices on new shares to adjust for the bad news signal.

We close this chapter with the statement of Meyers (1984): "*The capital structure is a puzzle"*. The existing theories as well as the observed behaviour partially contradict each other. Many variables influence company decisions on increasing, not changing, or decreasing the funds; where to take them (public or private); and which forms of fund to choose (debt, hybrid securities or equity).

3 Methodology

The methodological approach for this study depends mainly on the problem definition and the research questions that we aim to answer. For its investigative purpose, we use a panel data set. By structuring the data into a panel both cross-sectional and time-series dimensions are covered. This allows to test and analyse more complex and extensive datasets (Brooks, 2014). A panel dataset can be either unbalanced or balanced. A balanced one has the same number of observations both in the cross-section as well as in the time-series dimension. For our study, we deal with an unbalanced panel since many companies are not listed in all observation periods. First, panel data controls for individual heterogeneity by observing the same entities over time. Thus, it is possible to isolate the influence of permanent, entity-specific characteristics which means that we can control for unobserved explanatory variables. Therefore, panel data structure mitigates endogeneity biases caused by omitted variables. Second, it is also controlled for time-specificity by isolating time-specific occurrences that affect all entities. Moreover, sorting into better- and worse-capitalized firms and changing the event window can be proceeded more efficiently in a panel data structure. In conclusion, this leads to more observations, variation, and higher efficiency.

The simplest way to handle panel data is to estimate a pooled regression. But most important, pooling the data has a severe limitation since it implicitly assumes the average values of the variables and the relationship between them are constant over time and across all cross-sectional units in the sample (Brooks, 2014). Furthermore, by treating the data just as a bigger cross-section, information about time dimension as well as the cross-sectional relationships are lost, i.e. the advantages mentioned above would be diminished by using a pooled regression. Therefore, we decided to exclude the option to run a pooled regression beforehand.

Empirically identifying the effect of taxes on capital structure is challenging because of a wide range of endogeneity difficulties which must be controlled for (Heider & Ljungqvist, 2015). According to Robert & Whited (2012) there are basically two different causes for endogeneity problems that are relevant for our data set. First, omitted variables refer to those variables that should be included in the explanatory variables but for various reasons are not. Second, measurement error as a source of endogeneity occurs often since in most corporate finance studies proxies are used for unobservable or difficult to quantify variables. Any discrepancy between true values and used proxies leads to measurement error deviations. Many empirical corporate finance studies compare outcomes of two or more groups before and after a treatment. For example, Bertrand & Mullainathan (2003) compare the behaviour of firms in U.S. states

passing antitakeover laws with those in states without these. The quantity of interest in such studies is the causal effect of binary variables on outcome variables as discussed in Robert & Whited (2012). Particularly, the consequences and impacts from unobserved variables which have a severe explanatory power on the outcome variable is a common problem in corporate finance studies. For our dataset endogeneity caused by omitted variables is rather an issue than measurement error caused endogeneity, since the data sources used are quite reliable and accounting principles guarantee trustful data. To mitigate these endogeneity problems caused by omitted variables the panel data set can be specified as follows: **fixed effects or random effects specifications**.

In the **fixed effects specification,** the disturbance term (u_{it}) is defined as:

$$u_{it} = \mu_i + v_{it} \quad (1)$$

Where μ_i is the cross-sectional specific effect which stays constant over time (time invariant) and v_{it} which is the time varying disturbance term.

The **fixed effects specification** thus has a straightforward dummy variable interpretation and can be written as:

$$y_{it} = \beta x_{it} + \mu_1 D1_i + \mu_2 D2_i + \cdots + \mu_N DN_i + u_{it} \quad (2)$$

where DN is the dummy for the respective cross-sectional unit and μ_N are the coefficients to be estimated. This Least Squares Dummy Variable is just an ordinary regression which can be estimated by Ordinary Least Squares (OLS) (Brooks, 2014).

An alternative to fixed effects specification is the **random effects specification**. While the fixed effects specification is most easily viewed as modelling cross-sectional unit specific intercepts, the random effects specification can be interpreted as modelling cross-sectional specific error terms.

$$y_{it} = \alpha + \beta x_{it} + u_{it}$$

$$with\, u_{it} = \mu_i + v_{it}$$

For random effects the following requirements must be fulfilled:

- Both parts of the error term must follow normal distribution: $\mu_i \sim N\left(0, \sigma_\mu^2\right)$ $v_{it} \sim N(0, \sigma_v^2)$
- μ_i and v_{it} are independent of x_{it}
- μ_i are independent of v_{it}

Particularly, the requirement that each part of the error term is independent of any explanatory variable in the regression is in practice difficult to fulfil.

In general, random effects specification should be preferred since fewer parameter need to be estimated compared to the Least Squares Dummy Variable for the fixed effects.

To decide which effects specification to use we run a Hausman-test. This test enables to determine whether the explanatory variables are correlated with the error term and whether all other requirements are fulfilled. The Hausman-test indicates a highly significant Chi-Square test statistic that no random effects specification can be used for our panel dataset (see figure 2). We tested for random effects in the cross-section as well as in the time-series dimension. Neither of those specifications can be applied for our regressions.

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	36.209838	6	0.0000

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	53.678949	6	0.0000

Figure 2: Results of Hausman-test for random effects specification

In the next step, we test for fixed effects specifications in the cross-section as well as in the time-series dimension. A redundant fixed effects test is used to verify whether and which fixed effects specification can be applied. Due to the significant test statistics the results indicate that fixed effects can be only used in the cross-section dimension and not for the time-series dimension (see figure 3).

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	12.502808	(193,171)	0.0000
Cross-section Chi-square	1007.430666	193	0.0000
Period F	1.239089	(1,171)	0.2672
Period Chi-square	2.678623	1	0.1017
Cross-Section/Period F	12.471045	(194,171)	0.0000
Cross-Section/Period Chi-square	1008.339909	194	0.0000

Figure 3: Results of the fixed effects redundant test – cross-section and time-series dimension

For simplification reasons, we ran both the Hausman- as well as the redundant fixed effects test once for the whole dataset including both periods from 2001-2004 and 2011-2014.

By using the cross-section fixed effects specification all cross-section variation is already incorporated by additional dummy variables. Thus, the cross-sectional headquarter dummy which distinguishes firm's tax authority must be removed. Otherwise these two dummy variables would be nearly perfectly correlated and bias our regression estimations. By adding cross-section fixed effects, we also incorporate for industry-specific effects. "*This ensures that we are comparing treated and control firms operating in the same industry, allowing us to difference away unobserved time-varying industry shocks to post-treatment trends in leverage. Moreover, we condition on firm-specific explanatory covariates of leverage (such as firm size and tangibility) that could cause trends to diverge post-treatment for reasons unrelated to corporate tax increases*" (Schandlbauer, 2016). Furthermore, we included White diagonal standard errors & covariance to control for heteroscedasticity. Basically, that changes the way standard errors are computed. Hence, they no longer rely on constant error variance. The coefficient estimates as well as the residuals are not impacted by this procedure. Furthermore, the cross-sectional dimension is quite large since there are a lot of companies included in our sample. The consequence is that many degrees of freedom are used up. To overcome this problem and making our regression more efficient the White diagonal standard errors & covariance specification is used.

In general, a difference-in-differences (DD) approach is applied when some subjects undergo a treatment and some do not. Hereby, the problem of omitted developments is mitigated by comparing two groups of firms during the same period (Jang, 2016). The DD approach is a merged procedure where single difference estimators are put together. First, a single cross-sectional difference after treatment method is applied when there is no data on pre-treatment outcomes available (e.g., Garvey & Hanka, 1999). Second, treatment effects can be estimated by comparing the pre-treatment situation with the post-treatment situation of a specific group of firms. These two approaches complement each other. By comparing the different time series effects, the problem of unobserved differences between two different groups of firms by looking at the same firms before and after the change in corporate income tax rate, is mitigated (Roberts & Whited, 2012).

The basic regression model in levels for the DD estimator is given by the following equation:

$$y = \beta_0 + \beta_1 d * p + \beta_2 d + \beta_3 p + u$$

where *d* is the treatment assignment variable equal to one if the firms headquarter is in Germany zero when the firm's HQ is in France. *P* is the post-treatment indicator which is equal to one in the year after the tax change and zero in the year before the tax change. Including the variable *d* controls for permanent differences between the treatment and control groups; *p* controls for trends common to both treatment and control group. β_1, which represents the DD estimator, captures the variation in the change in leverage experienced by firms in Germany relative to the change in leverage experienced by firms in France (Roberts & Whited, 2012).

Essentially important for the validity of the model is the zero-correlation assumption between the German and French firms (parallel trend assumption). That means that without a treatment effect impact on leverage would have been the same for both treated and untreated firms.

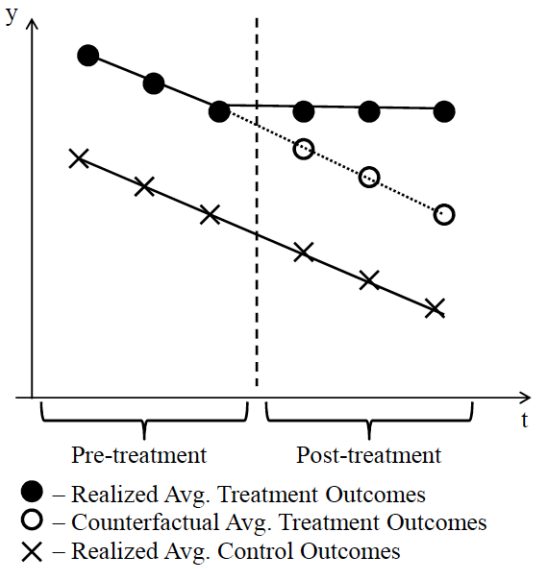

Figure 4: Difference-in-Differences intuition by Robert & Whited (2012)

To control for these circumstances two mitigation approaches are applied for our thesis: First, cross-section fixed effects are applied. Second, we include explanatory, leverage-related variables to diverge trends that we identify after treatment which are unrelated to corporate income tax changes (Heider & Ljungqvist, 2015). The cross-sectional variation differences between French and German firms are fully captured by the location dummy.

Several studies show that macroeconomic factors should be also taken into consideration. Korajczyk & Levy (2003) found that tax rises are more likely when there is a state deficit. To control for variation at the country level we include a country-specific dummy variable to capture full variation among Germany and France. Thus, it is not required to include additional macroeconomic variables in our regression analysis.

3.1 Data and assumptions

In the following section, we introduce our dataset and our assumptions that we made to conduct our methodological approach.

3.1.1 Macro financial data - Country matching

We investigate on the behaviour of companies affected by a corporate income tax increase in one country while comparing with a peer group of firms with its tax jurisdiction in another country with stable corporate taxes during this period and vice versa for another period.

This approach allows us to test our two hypotheses made for two different markets, which gives our results a higher level of reliability as well as validity.

Following Heider & Ljungqvist (2015) we assume economies close to each other are likely to correlate with each other. We therefore compared all countries next to Germany as a control group considering the changes in tax rate, level of GDP, unemployment rate and number of listed firms. We figure out that France is the best match with respect to these criteria.

Germany had an increase in corporate tax rates from 38,90 % in 2002 to 40.22 % in 2003 while France had a stable corporate income tax rate of 35,43 % during this period. On 1st January 2013 France instead increased its tax rate from 36,10 % to 38 % while the German rate stayed constant at 30,18 %. This makes the two countries perfect control groups regarding the tax rate development.

Using yearly OECD (2017) observations for the period of 2001 – 2004 we calculated average unemployment rates for France and Germany of 8,37 % and 8,19 % respectively. Germany decreased its unemployment rate to an average of 5,26 % in the period from 2011 to 2014 while it in France increased to 9,89 %. The GDP of both countries developed in line while Germany's was on a higher level as figure 5 shows. Multiplying the population (Worldbank, 2016) and the number of listed companies per million people (FRED, 2016) for the eight years from 2001 - 2004 and 2011 - 2014 shows France has on average 669 and Germany 695 companies listed on all the countries stock exchanges. Figure 6 shows the yearly development.

From the macro financial perspective this makes France and Germany to two good treatment and control groups.

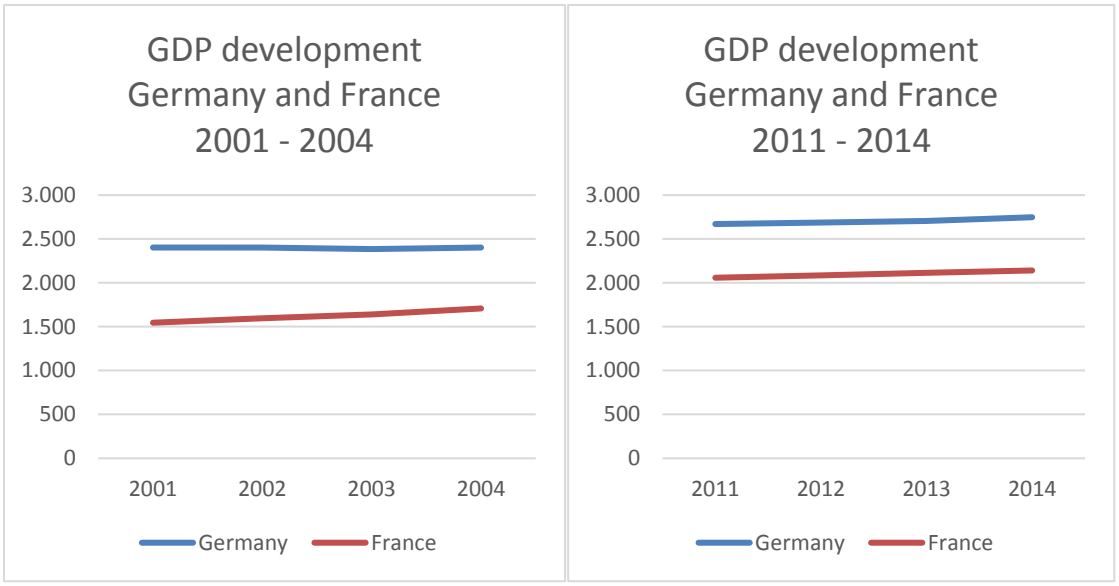

Figure 5: GDP total, in mEURO at constant prices, Calendar Adjusted

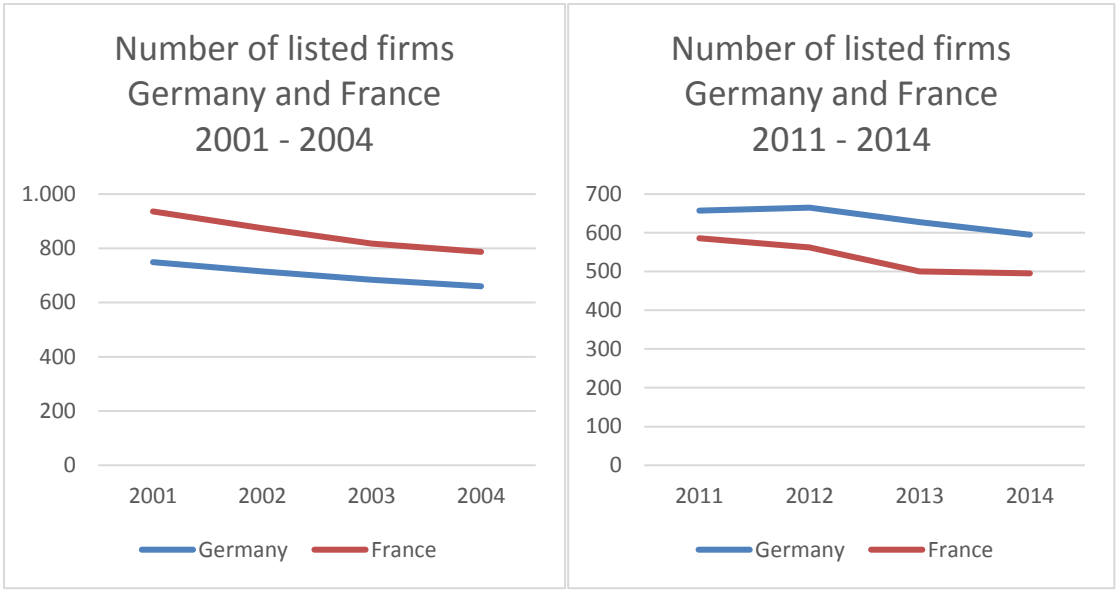

Figure 6: Number of Listed Companies, Annual, Not Seasonally Adjusted

3.1.2 Stock exchanges

While both countries have more than one stock exchange we have chosen the biggest ones to represent each country respectively.

The "Deutsche Börse" Frankfurt represents 85% of the German stock market (deutsche-boerse, 2017) and is therefore chosen as the marketplace representing Germany. After the merger of the biggest French stock market Bourse de Paris with Euronext in 2000, Euronext is the leading pan-European marketplace (EURONEXT, 2016). We have therefore selected Euronext Paris to represent listed non-financial French firms in this study.

3.1.3 Headquarters

We assume the companies are taxed in the country where the headquarter is. According to § 1 KStG (Bundesministerium der Justiz, 2017), companies with headquarter or the management in Germany are unlimited taxable in Germany. According to § 2 KStG (Bundesministerium der Justiz, 2017), companies without these characteristics but with domestic income are limited taxable. The French government applies the same approach (Hellio & Thill, 2002). Unlimited taxable means that all income of a company is taxable at the domestic country no matter where the income is generated while limited taxability means that income generated in the domestic country is taxed (Kraft & Kraft, 2009). Additionally, it is worth mentioning firms with a headquarter in a specific country and operating income outside of this country will be taxed in the foreign country. Because governments try to avoid double taxations companies receive tax reductions to the same amount the companies have already paid in the foreign country. The headquarter therefore seems to be an important indicator for companies applicable tax rate.

3.1.4 Taxes

The OECD tax database provides a list of the corporate income tax rates for France and Germany from levels per country on a yearly base (OECD, 2017) which we have used for the period of two years before and after the respective corporate income tax increase. The announcement date of the tax increase would be assumed to be the point in time where the companies effectively start to react with a change in leverage. Because the announcement is publicly discussed well before officially announced this date is not precisely quantifiable through a review of news. Furthermore, some companies might anticipate the tax increase and act before the official announcement due to information asymmetries. We have therefore decided to follow the approach Schandlbauer (2016) and use the effective date of the tax increase which was 1st January 2003 in Germany and 1st January 2013 in France respectively.

3.1.5 Company related information

Standard & Poor's "Capital IQ" fundamentals annual database was used to extract the dependent variables and the firm-specific explanatory variables of companies listed in Germany and France.

As explained by Heider & Ljungqvist (2015) the headquarters in Capital IQ are not fully reliable since they present the current country of the company´s headquarter for all historic years. This would bias our analysis if a company has moved within the period we examine as companies might appear to be affected by a tax increase although they are not or vice versa. To circumvent this, we collected the historic headquarter from Thomson Reuters and replaced the Capital IC headquarter to capture these movements.

Capital IQ´s Security Daily provides the year-end market value of equity which was needed to calculate the market-to-book ratios. While matching the two databases by name and year it turned out that some observations were missing. These then have been looked up manually by using DataStream.

3.2 Exclusions and Final Sample Selection

After extracting all the data to Excel we used the filter function to scan our dataset for anomalies and outliers. All firms with a negative market-to-book ratio as well as all firms with negative leverage ratio have been excluded from our sample. Additionally, all firms with leverage ratios larger than one have been excluded, since total assets should be always larger than debt.

As we assume the company is taxed where the headquarter is located we have excluded companies with headquarter outside of France and Germany based on the collected headquarters from Thomson Reuters.

As Bradley et al. (1984) point out there seems to be a systematic relationship between regulation and financial leverage. Regulation constraints the freedom to decide on leverage. Utility and financial sector firms typically are highly regulated and have very high leverage ratios so we follow Bradley´s approach and exclude the sectors from further analysis using the Global Industry Classification numbers (GIC Sectors: 40 and 55).

As Capital IQ contains company information for years in which the company is not listed we have company specific information like leverage without market values. We have excluded companies that do not have market values of equity after cross-checking with DataStream whether they were listed or not. For companies which were listed but have no market values of equity in Capital IQ the respective missing figures are calculated based on DataStream.

Additionally, by analysing the data we identified that some of the cross-sectional units (firms) had more than one observation for the same time-series dimension. These firms changed their

fiscal year ends, thus we removed the mid-year observations and kept the fiscal-year end observation to avoid a double counting bias in our dataset.

3.3 Preparation of Variables

For the regression analysis, the dependent as well as the explanatory variables need to be prepared. This section contains definition and computation of dependent and independent variables as a preparation for our regression analysis.

3.3.1 Dependent Variable

Short-term, long-term, or total leverage can be used to measure the ratio of debt a company uses to fund its operations. While Heider & Ljungqvist (2015) argue that short term leverage is commonly used for working capital and is therefore unlikely to react to tax changes they still find robust results using it. Schandlbauer (2016) on the other hand, concludes worse-capitalized firms partially increase their short-term debt as a response to tax increases, so short term debt needs to be included in our study. In general, firms can adjust their debt structure more flexible and time efficient by borrowing short-term debt. Diamond (1991) found that lots of companies, especially the less financially constrained ones, only rely on short-term debt. Particularly, making use of a credit revolver can be more convenient for firms to satisfy short-term financial obligations.

Long term debt provides a higher tax shield than short term debt because it has a higher yield than short term debt. According to Heider & Ljungqvist (2015), it is therefore more likely to be used as a reaction to a tax increase.

We use total book leverage as it is most common in leverage research and it captures both the long- and short-term debt. We defined total book leverage, according to Heider & Ljungqvist (2015), as the "*sum of long-term debt (Compustat item dltt) and short-term debt (Compustat item dlc), over the book value of assets (Compustat item at)*".

3.3.2 Firm-Specific Explanatory Variables

We used the three most common variables in capital structure literature: firm size, market-to-book, and tangibility as explanatory variables because they have proven to be most significant (see e.g., Welch, 2011 and Frank & Goyal, 2009). We will shortly define them and mention

their typical relation to leverage before we use the underlying theories to interpret them in the context of our results in chapter 4.

Firm size

"The natural logarithm of total assets (Compustat item at)" (Heider & Ljungqvist, 2015) is used to gauge the firm size.

Graham & Harvey (2001) found firm size to have a significant effect on the capital structure. Larger companies often have less information asymmetries, lower costs of financial distress and they might be more sophisticated regarding the knowledge about corporate financial theories (Graham & Harvey, 2001). Earlier research has found a positive relationship between debt and firm size (e.g., Rajan & Zingales, 1995 and Frank & Goyal, 2009). Large, more mature firms with better reputations in debt markets face lower debt-related agency costs. Thus, the trade-off theory predicts larger, more mature firms to have relatively more debt.

Market-to-book

We calculate the Market-to-book ratio by *"(fiscal year-end closing price times common shares [cshpri], long-term debt [dltt], short-term debt [dlc] – deferred taxes and investment tax credits [txditc]) / total assets [at]*" (Heider & Ljungqvist, 2015).

Most capital structure literature (e.g., Smith & Watts, 1992; Barclay, et al., 1995) shows a negative relationship between market-to-book and leverage.

Tangibility

The more valuable the company's assets are as a collateral the lower the borrowing costs should be (Graham, 2000). Tangible assets usually are more valuable as collateral (Chan & Kanatas, 1985) so we use tangibility as an explanatory variable. Tangibility "is *defined as net property, plant, and equipment (Compustat: ppent), over the book value of assets (Compustat: at)*" (Heider & Ljungqvist, 2015). Researchers have found a positive relationship between tangibility and leverage (e.g., Hall, 2012; Korteweg, 2010).

3.3.3 Robustness Variables

The following variables are used for robustness tests. Including additional control variables verifies the validity of our regression results. We will give a brief explanation of the respective variables and theories supporting their relevance for our empirical approach.

Return on assets (ROA)

While profitability has often been used as an explanatory variable in leverage studies (e.g., Welch, 2011; Frank & Goyal, 2009), ROA has been highly insignificant in our regressions (see appendix 9). We therefore have decided to use ROA as a robustness variable rather than already including it in our ordinary regression. It is defined like in Heider & Ljungqvist (2015) as "*operating income before depreciation (Compustat: oibdp) over the book value of assets (Compustat: at)*". High profit companies may have a high marginal tax rate implying they have a greater incentive to borrow and take advantage of the tax shield (Heider & Ljungqvist, 2015). Jensen & Meckling (1976) find companies with high profitability to have a high leverage.
Loss-making companies on the other hand might create tax-loss carryforwards reducing the marginal tax rate and therefore reducing the motivation to react on tax increases. According to Graham (1996), a net operating loss dummy (we use profitability) provides a reasonable proxy for the corporate tax status.

Profitable

Like Kester (1986), Baskin (1989) and other researchers have shown the more profitable a firm within an industry the less it borrows, making the leverage ratio an inverse function of a company's profitability (Myers, 1989). Whether firms are profitable or not is determined by using ROA as an indicator. When ROA is negative the dummy variable equals zero, when ROA is positive the value is one.

Reported taxes / Earnings before taxes

While the marginal tax rate of the companies would have a higher explanatory power (see section 2.2) the effective tax rate is a simplification that should be sufficient as a robustness test variable. We estimate the effective tax rate by dividing Income Taxes - Total (Compustat: TXT) by Pre-tax Income (Compustat: PI).

3.3.4 Better and worse capitalized companies

We follow a slightly modified approach related to Schandlbauer (2016) and use total book leverage as a measurement for better- and worse-capitalization of non-financial firms. First, we calculate the median of total book leverage for our treated as well as for our control group separately. Hence, due to separation we incorporate for cross-country differences in total-book leverage between Germany and France. This is essentially important since German firms traditionally take on less debt than companies in France (see section 4.1). Second, we consider all firms above median total book leverage as worse-capitalized and all firms with a lower leverage than median as better-capitalized respectively. Schandlbauer (2016) used equity-to-total assets as an indicator to distinguish between these two categories. We used total book leverage rather than an equity measurement factor since our dataset has missing observations for some market-to-book variables. Thus, our approach fits more given the data provided by Capital IQ. Furthermore, *total book leverage* as our main dependent variable gives a more accurate approximation when it comes to evaluating two different-capitalized groups of companies.

3.4 Final specification of our regression

By adding up the results of our methodology and research approach we come up with the following final specification for our regression analyses. We get evidence that fixed effects can be used to capture variation in the cross-section dimension. Instead of using the headquarter dummy the full variation of cross-section differences is captured by cross-section fixed effects dummy variables which we choose in EViews.

Additionally, identified explanatory variables which were used by many leverage studies make the regression more efficient. The most important part with regards to our research question is the DD-estimator which consists of the shock dummy (0 before and 1 after an increase in corporate tax rate) times the headquarter dummy that determines the tax jurisdiction of the respective firms (0 for France and 1 for Germany).

$$Total\ book\ leverage = \beta_1 + \beta_2 * shock\ dummy * hq\ dummy + \beta_3 * shock\ dummy + \beta_4 * Firm\ size + \beta_5 * Market\ to\ book\ ratio + \beta_6 * Tangibility + u_{it}$$

Moreover, it is essentially important to make sure which kind of significance t-test we make use of to test our hypotheses. Our two hypotheses were introduced in section 2.2. For both we test only for an increase. That means we use one-sided t-tests for all our regression analyses.

The output statistics from EViews are based on two-sided test. Thus, we manually calculated and adjust the significance levels by using the Microsoft Excel function NORMSDIST in our respective tables in chapter 4.1.

3.5 Validity and Reliability of the Model

We assume companies pay the statutory tax rate of the country where the headquarter is located. This is obviously over-simplistic. The TUI AG for example is listed in Germany and in our sample as the headquarter is in Berlin and Hannover. According to their Financial statements (TUI AG, 2016), they operate in 180 countries all over the world and have a tax burden of 24,62 % while the statutory tax rate in Germany is 30,18 %. A change in Germany´s statutory tax rate would affect the company but this might only be marginal. Our assumption does not hold for single, especially for multinational companies, and it might lead to imprecise results as they pay taxes in several jurisdictions. However, using the unique National Establishment Time Series database for the United States, Heider & Ljungqvist (2015) have shown that the average firm has most of the operations in its home state so they conclude this simplification is an innocuous approximation. As there is no comparable database including the historical location data for subsidiaries, branches and plants for France and Germany available to test this assumption, we apply the same approximation and argue that if it is convincing enough for the leading researchers on this field we will not further challenge their assumption at this point and trust their results. Unarguable we received significant results using the headquarters assumptions so we conclude the approximation Heider & Ljungqvist made holds for our sample as well.

Moreover, our methodological approach is based on simplifying assumptions regarding the effective announcement date. As previous studies like Heider & Lundqvist (2015) and Schandlbauer (2016) showed it is nearly impossible to investigate when firms have received information about a tax increase. Corporate income tax changes are mostly discussed by law makers prior to their respective effective date. Hence, it can be expected that firms know about the tax increase prior to the final enactment. However, the exact determination of timing of this knowledge is in practice difficult to derive (Schandlbauer, 2016). Particularly, information asymmetries among firms about potential corporate income tax changes often occur. Therefore, our approximation that all firms obtain information on the effective date at the beginning of the new year might bias our results to some extent. Although, it is tough to verify when firms react with regards to leverage decisions after receiving information. Thus, the “reaction” effect and

the mentioned information asymmetries might balance out each other. Thus, the approximation of choosing the effective date at the 1st January seems the most plausible one.

Heider & Ljungqvist (2015) highlighted that cross-country studies are often criticized for comparing apples with oranges: treatment and control groups in the sample might be different with respect to unobserved variables which could affect leverage decision. Single-countries studies seek to sidestep this problem. We allow for country-specific differences by adding firm-specific fixed effects which capture the local variation. But there might be other impact factors in which the firms of the respective countries might differ. These issues are directly linked to omitted variable biases which causes endogeneity. We directly address this issue by including fixed cross-section effects and thus mitigate influences of omitted variables.

4 Results and Analysis

In this section, we show our results, critically evaluate, analyse, and interpret significant values. Finally, we will conclude on the hypothesis and summarize our study. The full length EViews reports can be found in the appendix.

4.1 Descriptive Statistics

To get a comprehensive overview and an intuition of the distribution of the variables included in our panel data regression, tables 7 & 8 contain the summary statistics for German and French listed non-financial firms respectively. All the variables that are introduced in the last section are included.

Descriptive statistics German companies	total book leverage	shock dummy	firm size	market-to-book	profitable	reported taxes / Earnings before taxes	ROA	tangibility
Mean	0,2039	0,4978	3,9868	1,2374	0,7124	0,1307	0,0154	0,1772
median	0,1417	0,0000	3,9782	0,8321	1,0000	0,1256	0,0633	0,0847
max	0,9208	1,0000	10,0747	12,8932	1,0000	26,5714	1,0552	0,9454
minimum	0,0000	0,0000	-1,9519	0,0226	0,0000	-61,8000	-3,2826	0,0000
std. Dev	0,2137	0,5003	1,7032	1,3661	0,4529	2,3369	0,2533	0,2084

Figure 7: Descriptive Statistics: German listed non-financial firms.

Figure 7 contains descriptive statistics on the explanatory variables and the dependent variable. All the variables are calculated as defined in the previous section. Total book leverage is the dependent variable, all the other are explanatory variables. The table gives an overview over the descriptive statistics of German listed non-financial firms in our sample.

Descriptive statistics French companies	total book leverage	shock dummy	firm size	market-to-book	profitable	reported taxes / Earnings before taxes	ROA	tangibility
Mean	0,2185	0,5066	5,4556	1,0662	0,8454	0,1771	0,0662	0,1696
median	0,1995	1,0000	5,0286	0,7651	1,0000	0,2922	0,0847	0,1310
max	0,9371	1,0000	11,3090	22,6818	1,0000	47,2963	1,4112	0,9449
minimum	0,0000	0,0000	-0,2562	0,0497	0,0000	-63,2500	-1,2660	0,0000
std. Dev	0,1689	0,5002	2,4388	1,1832	0,3617	2,7409	0,1654	0,1644

Figure 8: Descriptive Statistics: French listed non-financial firms

Figure 8 contains descriptive statistics on the explanatory variables and the dependent variable. All the variables are calculated as defined in the previous section. Total book leverage is the dependent variable, all the other are explanatory variables. The table gives an overview over the descriptive statistics of German listed non-financial firms in our sample.

For the first variable *Total book leverage* it can be concluded that French firms have higher leverage ratios than German firms. Whereas the mean values are not that far away from each other, the median values indicate the difference in leverage between German and French firms. This discrepancy has led us to separate our sample when it comes to deciding which firms are better- and which are worse-capitalized (see section 3.3.4).

From the descriptive statistics of *firm size*, it can be derived that firms in Germany are on average smaller than those in France. This variable which is calculated by taking the natural logarithm of total assets can be negative which is indicated by the minimum values since firms with total assets < 1 million Euro will lead to a negative result.

From the *market-to-book* ratio it can be concluded that German firm's equities are on average 1,24 times as much worth than what their respective book value of equity indicates. For French firms this ratio is on average slightly lower, which is indicated by the lower mean and also median value.

Profitable is on average slightly larger for French firms. The median for this dummy variable is not really interpretable, since this variable can just be either 1 or 0.

Reported taxes / Earnings before taxes is a proxy for the effective tax rate. The descriptive statistics results indicate that on average French firms have a higher effective tax rate compared to German companies.

The *return on assets* of French firms is on average 6,6 %, whereas German firms make on average 1,5 %.

Last, *tangibility* as an indicator for the ability to take on more debt. It is on average slightly higher in Germany. That means companies in Germany have more asset collateralization opportunities.

4.2 Results and Interpretation

The results, evaluations and interpretations of our panel data regression analyses are described in this section.

4.2.1 Tax increase in Germany

Germany - All companies	2002 - 2003			2001 - 2004		
Variable	Coefficient	Std. Error	t-statistic	Coefficient	Std. Error	t-statistic
Shock-*Headquarter Dummy	0,0426**	0,0199	2,1446	0,0194	0,0155	1,2529
Shock Dummy	-0,0121	0,0105	-1,1564	-0,0139**	0,0066	-2,0923
Firm size	0,1426**	0,0756	1,8871	0,0148	0,0211	0,7003
Market-to-book	-0,0348	0,0398	-0,8749	0,0001	0,0001	0,8982
Tangibility	0,6945**	0,3616	1,9204	0,3022**	0,1378	2,1931

Figure 9: Panel data regression analysis 2002 – 2003 and 2001 – 2004

*Yearly observations on total book leverage are regressed on the illustrated variables above. Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5-%-level and, results with * are statistically significant at the 10-%-level. All variables are measured as defined in the methodology section at the year-ends respectively.*

Interpretation of Difference-in-Differences Estimators

We ran two regressions where we included two years and four years around the increase in corporate income tax rate respectively. We decided to not only look at the year after the tax increase but the next two years after because of the before explained possibility of delayed reactions on tax increases because of transaction costs (see chapter 2.2.2). As it can be seen from the 2002 – 2003 difference-in-differences estimator the coefficient is significant at the 5 % confidence interval (p-value 0,0334). That means that relative to French firms German companies will rise their total book leverage by 4,26 % one year after an increase in corporate income tax rate. By including the period from 2001 to 2004, we compare the change in total book leverage two years before the tax change with two years after the change. All listed non-financial companies in Germany increased their total book leverage insignificantly two years after the corporate tax increase. A reason might be that the companies in our study are all listed companies and therefore no small companies are included which might make the transaction

costs neglectable because they are relatively small for bigger issuances. These outcomes are in line with what Heider & Ljungqvist (2015) found. By comparing non-financial corporations within the United States, they conclude that firms will lever up significantly one year after a corporate tax increase, whereas they found no significant effects after two years.

Firm size

Firm size captures a variety of things that can affect the leverage ratio. Like mentioned in the trade-off theory section (section 2.2), debt issuance comes with transaction costs and they are relatively smaller for bigger issues. Additionally, public corporate debt is traded in large blocks making debt issuances more attractive for large firms (Wald, 1999). Bigger companies are supposed to have lower distress costs because of better diversification (Rajan & Zingales, 1995), they are assumed to be more transparent, therefore have lower cost of debt but on the other hand they are more prone to agency problems (Agrawal & Knoeber, 1996).

In line with our expectation firm size has a positive coefficient at a 5 % confidence level for the period 2002 – 2003, indicating larger companies tend to lever up more than smaller companies.

Market-to-book

This explanatory variable is not statistically significant in either of these two periods.

Tangibility

Tangibility is significant at a 5 % confidence level for the period 2002- 2003 as well as for the 2001 – 2004 period. With a positive coefficient of 0,695 and 0,302 respectively, indicating that the more net PPE, relative to book value of assets a company has the stronger the increase of total book leverage after a corporate tax rate increase. This is in line with our expectation resulting out of prior research (e.g., Hall, 2012 and Korteweg, 2010). In research this is often related to the *collateral hypothesis* which relates to the traditional trade-off theory in that collateralizable assets are more likely to maintain their value in bankruptcy or liquidation if the firm itself fails, and therefore creditor's losses will be smaller if the firm fails (Odgen, et al., 2003). Schwartz & Aronson (1967) found evidence that debt ratios vary substantially across industries, and tend to be higher in industries in which a larger portion of the constituent firm's assets consist of PP&E. Supporting evidence was found by Long & Malitz (1985) who provide

findings that leverage is negatively related to capitalized research and development expenses i.e. intangible assets. Moreover, firms with more tangible assets have better collateralization opportunities and thus lower costs of borrowing.

4.2.2 Tax increase in France

France - All companies	2012 - 2013			2011 - 2014		
Variable	Coefficient	Std. Error	t-statistic	Coefficient	Std. Error	t-statistic
Shock-*Headquarter Dummy	0,0171**	0,0103	1,6640	0,0116	0,0095	1,2188
Shock Dummy	0,0037	0,0056	0,6543	0,0060	0,0052	1,1529
Firm size	0,0400**	0,0207	1,9262	0,0344***	0,0135	2,5373
Market-to-book	0,0111	0,0097	1,1520	0,0100**	0,0051	1,9629
Tangibility	0,2508*	0,1683	1,4901	0,2673***	0,1099	2,4314

Figure 10: Panel data regression analysis 2012 – 2013 and 2011 – 2014
*Yearly observations on total book leverage are regressed on the illustrated variables above. Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5-%-level and, results with * are statistically significant at the 10-%-level. All variables are measured as defined in the methodology section at the year-ends respectively.*

In France, there was a tax increase with the effective date of 1st January 2013, whereas the tax rate in Germany was constant over the whole testing period from 2011 to 2014. Thus, we analyse how listed non-financial firms in France react to this change compared to German listed non-financial firms which act as a control group for our testing procedure. Obviously, this tests our results from 2001 to 2004 for robustness and consistency. Additionally, we investigate on a country with a comparable macroeconomic environment to get more evidence to decide about our hypotheses. To make our analyses comparable we choose the same additional explanatory variables as we have chosen for the German corporate income tax increase. From the first regression, it can be inferred that listed non-financial firms in France significantly took on more debt after a tax rise. The DD-estimator coefficient is at least at the 5 % confidence level significant and the coefficient itself is positive. One year after an increase in corporate income tax, French listed non-financial firms lever up relative to German firms by around 1,71 % which is slightly less than how German firms lever up relative to French firms in the period 2002 - 2003.

By comparing the effects on total book leverage two years after an increase in corporate income tax rate for listed non-financial firms in France, it can be concluded that there is no significant effect due to this event. The DD-estimator is highly insignificant. Thus, firms in France just lever up one year after our specified event rather than adjusting their leverage structure after

two years as well. This is in line with current research by Heider & Ljungqvist (2015) who concluded that listed non-financial firms in the US increase their leverage immediately after one year rather than after two years. For their estimations, they tested different measurements of leverage, where they include long-term as well short-term debt to investigate robustness of their results.

Firm size

As in the regression for the tax increase in Germany above firm size is significant at a 5 % confidence level which again indicates that larger firms make more use of additional debt than smaller firms one year after an increase in corporate income tax rate. This effect is even more significant two years after this event, which is indicated by the highly significant coefficient estimate of the variable *firm size*.

Market-to-book

The market-to-book ratio two years after an increase in corporate income tax rate has a positive coefficient of 0,01 and is significant at a 5 % level.

As Myers (1977) states the present value of a company is the sum of the market value of the assets in place and the present value of future investment opportunities. If a positive net-present-value project returns only benefit to the debtholders the management may choose not to invest because the shareholders do not benefit. As the company can choose to invest or not, the investment opportunities can be regarded as an option. The probability the firm exercises the option depends on the size of the obligations towards the debtholders. The higher the debt, the less the probability to invest. Thus, companies with high investment opportunities should borrow less. Therefore, the optimal leverage ratio is lower for high market-to-book companies and the correlation between market-to-book ratio and leverage is commonly referred to as to be negative in capital structure literature. Our results are contradicting as they are positive.

Chen & Zhao (2006) deliver an explaination. They find the relation to be non-monotonic and significantly positive for most firms in their study. Chen & Zhao (2006) divided the companies in subsamples and found a significant positive relationship for low and medium market-to-book firms and a significant negative relationship for the high market-to-book firms. The negative relationship found in other literature might be driven by a small fraction of companies with a very high market-to-book ratio. German and French companies historically have on average

lower market-to-book ratios than U.S. companies (Dumay, 2010), that have mostly been subject of studies. Considering the lower market-to-book ratios in our sample our findings are in line with the study of Chen & Zhao (2006). The trade-off theory does not fully manage to explain the behaviour as higher market-to-book companies have lower borrowing costs, but on the other hand they also have high growth opportunities and thus should have low target leverage ratios (Chen & Zhao, 2006). The pecking order theory delivers the better explanation when extended by the market-timing-hypothesis (Baker & Wurgler, 2002). Low to medium market-to-book ratios do not have much retained earnings (i.e. not very profitable) and they follow the pecking order by using debt especially when debt is cheaper. Companies characterised by high market-to-book ratios on the other hand have more retained earnings and therefore use less debt or they time the market and issue highly valued equities (Chen & Zhao, 2006).

Tangibility

In line with prior mentioned research as well as our findings from observing the German tax increase the tangibility variable for both periods from 2011 - 2014 and 2012 – 2013 respectively is significant with a positive coefficient.

4.2.3 Better and Worse capitalized companies

In order to compare how total book leverage of better- and worse-capitalized firms is affected by an increase in corporate income tax rate we distinguish again between the corporate income tax increase in Germany (effective date: 1st January 2003) and France (1st January 2013). We focus on the DD-estimator since the effects of other explanatory variables are already mentioned in the chapter above and are not of importance to answer our second research question. For the full regression results please see Appendix 1 - 8. We distinguish between better- and worse-capitalized firms by setting a filter in EViews. CAPITALIZATION_STATUS=1 indicates that we filter for well-capitalized firms, whereas CAPITALIZATION_STATUS=0 means that just the worse-capitalized firms are selected.

Tax increase in Germany

Our regression analyses for the German corporate income tax increase show that there is a significant effect on total book leverage for well-capitalized firms one year as well as two years after a tax increase. From the coefficient estimates it can be concluded that well-capitalized

firms on average increase their total book leverage relative to French companies by 4,9 % one year after the event and by 3,6 % two years after. The increase in leverage we find for the German market is in line with Dwenger & Viktor (2014). In their study, German companies increased their leverage by on average 5 % after a tax increase of 10 %. After the tax increase by 3,39 % in 2003 (from 38,9 % to 40,22 %) all German companies increased their total book leverage relative to French firms like mentioned in section 4.2.1. by 4,3 % and the tax increase of the better capitalized companies shown in figure 11 is with 4,9 % even stronger.

For worse-capitalized firms we find a slightly significant effect on total book leverage due to an increase in corporate income taxes one year after this event since the respective DD coefficient estimates are significant at the 10 % level. Whereas, we found no significant effect two years after this event. Thus, even financially more constraint firms levered up due to an increase in corporate income taxes. But the effect is quite low compared to well-capitalized companies and the DD-estimator is just slightly significant at the 10 % level.

Better-capitalized companies	2002 - 2003			2001 - 2004		
Independent Variable	Coefficient	Std. Error	t-statistic	Coefficient	Std. Error	t-statistic
Shock-*Headquarter Dummy	0,0491**	0,0228	2,1571	0,0364**	0,0173	2,1035

Figure 11: Panel data regression analysis of better-capitalized companies 2002 – 2003 and 2001 – 2004
Yearly observations on total book leverage are regressed on the illustrated variables above. Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5-%-level and, results with * are statistically significant at the 10-%-level. All variables are measured as defined in the methodology section at the year-ends respectively.

Worse-capitalized companies	2002 - 2003			2001 - 2004		
Independent Variable	Coefficient	Std. Error	t-statistic	Coefficient	Std. Error	t-statistic
Shock-*Headquarter Dummy	0,0231*	0,0169	1,3656	0,0227	0,0207	1,0982

Figure 12: Panel data regression analysis of worse-capitalized companies 2002 – 2003 and 2001 – 2004
Yearly observations on total book leverage are regressed on the illustrated variables above. Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5-%-level and, results with * are statistically significant at the 10-%-level. All variables are measured as defined in the methodology section at the year-ends respectively.

Tax increase in France

The regressions which are used to investigate the effect of an increase in corporate income tax rate on total book leverage of better- and worse-capitalized French companies indicate quite similar results as these from our observation period in Germany from 2001 to 2004. By looking at the regression estimates of well-capitalized French firms one and two years after the event, it can be concluded that these firms significantly (at the 5 % and 1 % confidence level

respectively) increase their total-book leverage relative to German firms. This underlines our hypothesis as well as our results from the German market. Particularly, it can be inferred that firms increase their total book leverage after an increase in corporate income tax rate by 3,7 % after one year and 2,7 % relative to German firms respectively. This indicates, like the German observation period, that the two-year effect is weaker than one year after the event i.e. well-capitalized firms respond immediately and stronger within the first year to increases in corporate income taxes. Whereas, we find no significant effects for worse-capitalized firms in France. This is in line with Schandlbauer (2016) who also had positive significant results for better-capitalized financial companies in the U.S. and lower but positive insignificant results for the worse-capitalized companies. He created the intuition, supported by his and our results, that worse-capitalized companies are financially constrained and thus do not have the flexibility to react.

Better capitalized companies	2011 - 2014			2011 - 2014		
Independent Variable	Coefficient	Std. Error	t-statistic	Coefficient	Std. Error	t-statistic
Shock-*Headquarter Dummy	0,0368***	0,0157	2,3435	0,0272**	0,0147	1,8445

Figure 13: Panel data regression analysis of better-capitalized companies 2012 – 2013 and 2011 – 2014
Yearly observations on total book leverage are regressed on the illustrated variables above. Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5-%-level and, results with * are statistically significant at the 10-%-level. All variables are measured as defined in the methodology section at the year-ends respectively.

Worse-capitalized companies	2011 - 2014			2011 - 2014		
Independent Variable	Coefficient	Std. Error	t-statistic	Coefficient	Std. Error	t-statistic
Shock-*Headquarter Dummy	-0,0009	0,0065	-0,1330	-0,0019	0,0057	-0,3360

Figure 14: Panel data regression analysis of worse-capitalized companies 2012 – 2013 and 2011 – 2014
Yearly observations on total book leverage are regressed on the illustrated variables above. Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5-%-level and, results with * are statistically significant at the 10-%-level. All variables are measured as defined in the methodology section at the year-ends respectively.

4.3 Robustness Tests

Lu & White (2014) already classified robustness checks as a common exercise in empirical studies. Robustness tests were most commonly conducted by varying the dependent variable i.e. testing similar dependent variables instead of the selected one or by adding further control variables which make the regression more efficient and underline the results. In general, "*if the coefficients are plausible and robust, this is commonly interpreted as evidence of structural validity"* (Lu & White, 2014).

In order to test for robustness of empirical results there are many options of conducting such a test. Researchers try to show the same results in different time periods, in different datasets, by using different sets of variables, using different functional forms (linear or non-linear, logit or probit etc.), using different transformations of data (levels, differences, logarithms etc.), using different estimations methods and different dependent variables (Hoover, 2006).

We decided to include further control variables to test our results for robustness. These three variables which are already introduced in section 3.3.3 are the following: *Return on assets*, *Profitable*, *Reported taxes / Earnings before taxes*.

Therefore, our final robustness panel data regression specification looks as follows:

$$Total\ book\ leverage = \beta_1 + \beta_2 * shock\ dummy * hq\ dummy + \beta_3 * shock\ dummy + \beta_4 * Firm\ size + \beta_5 * Market\ to\ book\ ratio + \beta_6 * Tangibility + \beta_7 * ROA + \beta_8 * Profitable + \beta_9 * \frac{Reported\ taxes}{EBT} + u_{it}$$

In our robustness test framework, we solely focus on the impact of including the variables mentioned above on the DD-estimator i.e. the effect of an increase in corporate income tax rate on total book leverage.

Thus, the DD-estimator coefficients are compared before and after including the three additional explanatory variables. In the following figures 15 & 16 the respective differences are illustrated:

Germany – 1st January 2003	2002 - 2003		2001 - 2004	
Variable: Shock-*HQ dummy DD-Estimator	Ordinary regression	Robustness regression	Ordinary regression	Robustness Regression
All firms	0,0426**	0,0462**	0,0194	0,0255*
Well-capitalized firms	0,0491**	0,0520***	0,0363**	0,0378**
Worse-capitalized firms	0,0231*	0,0197	0,0227	0,0297*

Figure 15: Germany 2001-2004: Ordinary vs. Robustness regressions

These figures illustrate the differences between the coefficient estimates of the Difference-in-Differences estimator from our ordinary regression and robustness regression where three additional variables are included. In this overview, the focus is solely on the DD-estimator. For a detailed overview over the regressions see Appendix 9. Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5-%-level and, results with * are statistically significant at the 10-%-level.

France – 1st January 2013	2012 - 2013		2011 - 2014	
Variable: Shock-*HQ dummy DD-Estimator	Ordinary regression	Robustness regression	Ordinary regression	Robustness Regression
All firms	0,0171**	0,0198**	0,0116	0,0124
Well-capitalized firms	0,0368***	0,0374***	0,0272**	0,0251**
Worse-capitalized firms	-0,0009	-0,0002	-0,0019	-0,0022

Figure 16: France 2011-2014: Ordinary vs. Robustness regressions

These figures illustrate the differences between the coefficient estimates of the Difference-in-Differences estimator from our ordinary regression and robustness regression where three additional variables are included. In this overview, the focus is solely on the DD-estimator. For a detailed overview over the regressions see Appendix 9. Results with *** are statistically significant at the 1-%-level, results with ** are statistically significant at the 5-%-level and, results with * are statistically significant at the 10-%-level.

From the results presented in figures 15 & 16 it can be concluded that the significance levels of the Difference-in-Differences estimators are mostly robust with our results. For most of the coefficient estimates the robustness tests indicate slightly higher coefficients which are more statistically significant. Moreover, the statistically insignificant coefficients are also mostly insignificant in the robustness regressions. We identified three deviations in figure 15 which we think are worth mentioning:

In our ordinary regressions for worse-capitalized firms in Germany one year after the event we received a slightly significant coefficient estimate, whereas our robustness test indicates no statistically significant DD-estimator. This result indicates what we already mentioned in the last section; financially constraint firms are less likely to lever up their total book leverage after an increase in corporate income tax rate.

Furthermore, our ordinary regression analyses differ from the robustness tests performed for worse-capitalized firms in Germany two years after the event. In the robustness regression, the DD-estimator is slightly significant, whereas there is no significant effect in our ordinary regression. This indicates that even financially constraint firms lever up two years after an increase in corporate income tax rate. In general, the robustness regression is more reliable for our study, since it includes more variables i.e. more explanatory power.

Moreover, by looking at the regressions where all firms are included in Germany we received a significant result in our robustness regression

By comparing the statistically significant coefficients the effects of an increase in corporate income tax rate are slightly stronger than in the ordinary regressions. This can be interpreted as a result of adding more explanatory power through additional control variables to the regression. This robustness analysis verifies the estimations from our regressions and underlines the significance of the respective DD-estimators.

5 Conclusion

The last chapter summarizes our findings, highlights practical implications, and recommends future research questions.

5.1 Concluding Discussion

By performing panel data regression analyses with a difference-in-differences approach based on Heider & Ljungqvist (2015) and Schandlbauer (2016), we have been able to produce significant results supporting our first hypothesis.

Corporate income tax increase 1st January 2003 in Germany: Non-financial listed German companies increase their total book leverage by 4,26 % relative to French non-financial listed companies one year after a rise in corporate income tax rate from 38,9 % to 40,22%. Whereas, we find no statistically significant values two years after this tax rate increase.

Corporate income tax increase 1st January 2013 in France: Non-financial listed French firms increase their total book leverage by 1,71 % relative to German non-financial listed companies one year after a rise in corporate income tax rate from 36,1 % to 38 %. Whereas, we find no statistically significant values two years after this tax increase.

These results are in line with what Heider & Ljungqvist (2015) found and support our first hypothesis that firms will lever up after an increase in corporate income tax rate. Thus, the first hypothesis does not have to be rejected.

Furthermore, supporting our second hypothesis, we found significant results indicating better- and worse- capitalized companies react differently to the tax increase. We found that non-financial listed firms in both Germany and France significantly increase their total book leverage relative to the respective control group, one as well as two years after a rise in corporate income tax rate. While better-capitalized companies have the financial flexibility to increase their leverage we have only found only a slightly significant, weak increase in the worse-

capitalized companies one year after the tax increase in Germany, according to our ordinary regression. By including further control variables for our robustness check, the statistically significant effect after one year disappears, whereas a small significant (10 % confidence level) effect after two years appears (figure 15). These effects are solely observable for weak-capitalized German firms relative to French firms. In general, the robustness regression is more reliable for our study, since it includes more variables, i.e. more explanatory power. An explanation Schandlbauer (2016) offered for the behaviour of financial institutions in the U.S. could also explain what we observed. Worse-capitalized companies might already be financially constrained or operate at a leverage ratio above their target, and therefore do not adjust their leverage as strongly as better-capitalized companies. Therefore, they lose the possibility to increase the company´s market value through the tax shield. Thus, our empirical results mostly verify the second hypothesis as well.

While there are several theories like Modigliani & Miller´s irrelevance theorem, the static and dynamic trade-off-theory, and the pecking order theory, when trying to explain the financial decisions of non-financial companies, there is not any single all-encompassing theory that can explain all decisions. As our data indicates, the existing capital structure (i.e. expressed as better- or worse-capitalized companies) influences the companies' decision to adjust the leverage after the tax increase. Therefore, the dynamic trade-off theory seems to explain the observed behaviour most appropriately.

5.2 Practical Implications

The knowledge about the effect a corporate income tax increase can have on the tax shield, and therefore the market value of the company, should influence the decision of companies and investors on using straight debt, hybrid capital, or equity in order to fund a company. On average, companies seem to act in line with theory and increase their leverage to benefit from the increased tax shield, but when dividing the sample into subcategories as we did, the outcome differs. While we have shown that worse capitalized companies do not react as strongly as better-capitalized companies to tax increases, on average the leverage of the corporate sector seems to increase after a tax increase.

All else equal, this increase in leverage will lead to an increase in the corporate sector's probability of default. While the increase in leverage is significant, it appeared to be on a low

level. The effect on the overall risk of the economy might not be high enough to be considered by politicians as an influencing factor when deciding about corporate income tax changes.

5.3 Future Research

As the tax shield can increase the market value of companies, better-capitalized companies should increase their market value after the corporate income tax increase. It would be interesting to compare better- and worse-capitalized companies to find out by how much better-capitalized companies can improve their market value after a corporate income tax increase, and show how much value can be added by maintaining the financial flexibility to react to external shocks like a tax increase. On the other hand, it would be interesting to see how much the lack of financial flexibility costs the worse-capitalized companies when forgoing the possibility of increasing the market value by making use of the tax shield.

The aggregate increase in the liabilities of the corporate sector of Germany and France might have an impact on the probability of default of the corporate sector when applying a Merton Model. While the leverage increase in our study is only about 4,26 % for German non-financial listed firms relative to French firms, and 1,71 % for French non-financial listed firms relative to German firms, it might then have a stronger macroeconomic impact when considering the interdependencies, particularly to the financial sector. Thus, it would be worth analysing the macroeconomic effects for the respective countries.

Moreover, it would be worth applying our approach to other European countries, i.e. increasing the number of cross-sections as well as time-series to verify our results. The larger scale and extent of such a study could bring more reliability to our results and would be able to test for robustness of our empirical results.

Appendix

Appendix 1: Regression German tax increase well-capitalized firms 2002 - 2003

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/03/17 Time: 11:40
Sample: 2002 2003 IF CAPITALIZATION_STATUS=1
Periods included: 2
Cross-sections included: 106
Total panel (unbalanced) observations: 183
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.049141	0.022781	2.157107	0.0343
SHOCK_DUMMY	-0.012049	0.013370	-0.901186	0.3705
FIRM_SIZE	0.127839	0.064882	1.970330	0.0526
MARKET_BOOK	-0.058057	0.033624	-1.726642	0.0885
TANGIBILITY	0.350422	0.423141	0.828145	0.4103
C	-0.376636	0.239188	-1.574647	0.1197

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.920181	Mean dependent var	0.110645
Adjusted R-squared	0.798236	S.D. dependent var	0.128363
S.E. of regression	0.057658	Akaike info criterion	-2.588268
Sum squared resid	0.239363	Schwarz criterion	-0.641531
Log likelihood	347.8266	Hannan-Quinn criter.	-1.799160
F-statistic	7.545860	Durbin-Watson stat	4.692308
Prob(F-statistic)	0.000000		

Appendix 2: Regression German tax increase worse-capitalized firms 2002 - 2003

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/03/17 Time: 11:40
Sample: 2002 2003 IF CAPITALIZATION_STATUS=0
Periods included: 2
Cross-sections included: 106
Total panel (unbalanced) observations: 185
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.023104	0.016919	1.365628	0.1762
SHOCK_DUMMY	0.001002	0.009271	0.108072	0.9142
FIRM_SIZE	0.052058	0.056037	0.928998	0.3559
MARKET_BOOK	0.026873	0.031514	0.852743	0.3966
TANGIBILITY	0.537644	0.400846	1.341272	0.1839
C	-0.104294	0.340215	-0.306553	0.7600

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.972834	Mean dependent var	0.352710
Adjusted R-squared	0.932451	S.D. dependent var	0.161040
S.E. of regression	0.041855	Akaike info criterion	-3.225523
Sum squared resid	0.129633	Schwarz criterion	-1.293310
Log likelihood	409.3609	Hannan-Quinn criter.	-2.442445
F-statistic	24.09046	Durbin-Watson stat	4.625000
Prob(F-statistic)	0.000000		

Appendix 3: Regression German tax increase well-capitalized firms 2001 - 2004

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/03/17 Time: 11:45
Sample: 2001 2004 IF CAPITALIZATION_STATUS=1
Periods included: 4
Cross-sections included: 138
Total panel (unbalanced) observations: 384
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.036365	0.017288	2.103481	0.0365
SHOCK_DUMMY	-0.022015	0.007691	-2.862453	0.0046
FIRM_SIZE	0.039425	0.023729	1.661461	0.0979
MARKET_BOOK	0.000110	6.47E-05	1.699351	0.0905
TANGIBILITY	0.040572	0.057016	0.711598	0.4774
C	-0.071538	0.105103	-0.680651	0.4967

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.807481	Mean dependent var	0.105224
Adjusted R-squared	0.694047	S.D. dependent var	0.124486
S.E. of regression	0.068857	Akaike info criterion	-2.234625
Sum squared resid	1.142648	Schwarz criterion	-0.763423
Log likelihood	572.0481	Hannan-Quinn criter.	-1.651082
F-statistic	7.118504	Durbin-Watson stat	2.925142
Prob(F-statistic)	0.000000		

Appendix 4: Regression German tax increase worse-capitalized firms 2001 - 2004

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/03/17 Time: 11:46
Sample: 2001 2004 IF CAPITALIZATION_STATUS=0
Periods included: 4
Cross-sections included: 127
Total panel (unbalanced) observations: 367
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.022748	0.020714	1.098209	0.2732
SHOCK_DUMMY	0.003248	0.008026	0.404638	0.6861
FIRM_SIZE	-0.009689	0.030981	-0.312748	0.7547
MARKET_BOOK	0.009842	0.025334	0.388504	0.6980
TANGIBILITY	0.514736	0.173851	2.960796	0.0034
C	0.273209	0.190988	1.430507	0.1539

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.869843	Mean dependent var	0.352630
Adjusted R-squared	0.797288	S.D. dependent var	0.157776
S.E. of regression	0.071037	Akaike info criterion	-2.177675
Sum squared resid	1.185855	Schwarz criterion	-0.773021
Log likelihood	531.6033	Hannan-Quinn criter.	-1.619562
F-statistic	11.98869	Durbin-Watson stat	2.320716
Prob(F-statistic)	0.000000		

Appendix 5: Regression French tax increase well-capitalized firms 2012 - 2013

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/03/17 Time: 11:35
Sample: 2012 2013 IF CAPITALIZATION_STATUS=1
Periods included: 2
Cross-sections included: 176
Total panel (unbalanced) observations: 308
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.036820	0.015712	2.343475	0.0207
SHOCK_DUMMY	-0.004659	0.008417	-0.553473	0.5809
FIRM_SIZE	0.029518	0.067320	0.438478	0.6618
MARKET_BOOK	-0.004932	0.016739	-0.294675	0.7687
TANGIBILITY	0.490210	0.284743	1.721589	0.0876
C	0.088688	0.381245	0.232628	0.8164

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.947818	Mean dependent var	0.355703
Adjusted R-squared	0.873858	S.D. dependent var	0.152000
S.E. of regression	0.053985	Akaike info criterion	-2.710812
Sum squared resid	0.370125	Schwarz criterion	-0.518773
Log likelihood	598.4650	Hannan-Quinn criter.	-1.834333
F-statistic	12.81540	Durbin-Watson stat	4.631579
Prob(F-statistic)	0.000000		

Appendix 6: Regression French tax increase worse-capitalized firms 2012 - 2013

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/03/17 Time: 11:36
Sample: 2012 2013 IF CAPITALIZATION_STATUS=0
Periods included: 2
Cross-sections included: 188
Total panel (unbalanced) observations: 332
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	-0.000866	0.006515	-0.132955	0.8944
SHOCK_DUMMY	0.005710	0.005127	1.113765	0.2673
FIRM_SIZE	0.001708	0.008940	0.191034	0.8488
MARKET_BOOK	0.000700	0.002929	0.238928	0.8115
TANGIBILITY	0.087948	0.108277	0.812248	0.4180
C	0.038170	0.036569	1.043784	0.2984

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.919598	Mean dependent var	0.058530
Adjusted R-squared	0.808539	S.D. dependent var	0.056480
S.E. of regression	0.024713	Akaike info criterion	-4.270949
Sum squared resid	0.084895	Schwarz criterion	-2.058928
Log likelihood	901.9776	Hannan-Quinn criter.	-3.388796
F-statistic	8.280277	Durbin-Watson stat	4.579310
Prob(F-statistic)	0.000000		

Appendix 7: Regression French tax increase well-capitalized firms 2011 - 2014

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/03/17 Time: 11:34
Sample: 2011 2014 IF CAPITALIZATION_STATUS=1
Periods included: 4
Cross-sections included: 214
Total panel (unbalanced) observations: 624
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.027190	0.014741	1.844541	0.0658
SHOCK_DUMMY	-0.002683	0.008191	-0.327572	0.7434
FIRM_SIZE	0.037166	0.032806	1.132917	0.2579
MARKET_BOOK	0.029161	0.024611	1.184880	0.2368
TANGIBILITY	0.383021	0.162711	2.353994	0.0190
C	0.036957	0.180676	0.204551	0.8380

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.863225	Mean dependent var	0.357717
Adjusted R-squared	0.789602	S.D. dependent var	0.159321
S.E. of regression	0.073079	Akaike info criterion	-2.124882
Sum squared resid	2.162940	Schwarz criterion	-0.567964
Log likelihood	881.9632	Hannan-Quinn criter.	-1.519873
F-statistic	11.72504	Durbin-Watson stat	1.997323
Prob(F-statistic)	0.000000		

Appendix 8: Regression French tax increase worse-capitalized firms 2011 - 2014

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/03/17 Time: 11:34
Sample: 2011 2014 IF CAPITALIZATION_STATUS=0
Periods included: 4
Cross-sections included: 229
Total panel (unbalanced) observations: 662
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	-0.001927	0.005733	-0.336044	0.7370
SHOCK_DUMMY	0.003027	0.004106	0.737089	0.4615
FIRM_SIZE	0.010851	0.005488	1.977021	0.0487
MARKET_BOOK	0.003849	0.002112	1.822512	0.0691
TANGIBILITY	0.249028	0.064869	3.838940	0.0001
C	-0.017547	0.021531	-0.814955	0.4156

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.800386	Mean dependent var	0.058312
Adjusted R-squared	0.691718	S.D. dependent var	0.055544
S.E. of regression	0.030840	Akaike info criterion	-3.849203
Sum squared resid	0.407073	Schwarz criterion	-2.260242
Log likelihood	1508.086	Hannan-Quinn criter.	-3.233399
F-statistic	7.365418	Durbin-Watson stat	2.137754
Prob(F-statistic)	0.000000		

Appendix 9: Robustness Tests for all panel data regressions (1. Germany / 2. France)

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 18:09
Sample: 2002 2003
Periods included: 2
Cross-sections included: 194
Total panel (unbalanced) observations: 368
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.046224	0.020036	2.307048	0.0223
SHOCK_DUMMY	-0.013674	0.010914	-1.252828	0.2120
FIRM_SIZE	0.147591	0.076064	1.940355	0.0540
MARKET_BOOK	-0.027677	0.041317	-0.669855	0.5039
PROFITABLE	-0.028433	0.033488	-0.849061	0.3971
TANGIBILITY	0.658496	0.383150	1.718639	0.0875
ROA__RETURN_ON_ASSETS_	0.066012	0.100996	0.653607	0.5143
REPORTED_TAXES___EARNING	-0.014596	0.004481	-3.257148	0.0014
C	-0.588698	0.369302	-1.594082	0.1128

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.943525	Mean dependent var	0.232335
Adjusted R-squared	0.875143	S.D. dependent var	0.189372
S.E. of regression	0.066915	Akaike info criterion	-2.269063
Sum squared resid	0.743280	Schwarz criterion	-0.123865
Log likelihood	619.5075	Hannan-Quinn criter.	-1.416797
F-statistic	13.79782	Durbin-Watson stat	4.205714
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 18:11
Sample: 2002 2003 IF CAPITALIZATION_STATUS=1
Periods included: 2
Cross-sections included: 106
Total panel (unbalanced) observations: 183
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.052003	0.022079	2.355332	0.0214
SHOCK_DUMMY	-0.012493	0.012929	-0.966274	0.3373
FIRM_SIZE	0.130824	0.063624	2.056205	0.0435
MARKET_BOOK	-0.045556	0.032008	-1.423278	0.1592
PROFITABLE	-0.039529	0.032859	-1.203010	0.2331
TANGIBILITY	0.146365	0.430937	0.339643	0.7352
ROA__RETURN_ON_ASSETS_	0.104989	0.102397	1.025315	0.3088
REPORTED_TAXES___EARNING	-0.032390	0.020063	-1.614405	0.1110
C	-0.356189	0.245725	-1.449546	0.1517

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.927586	Mean dependent var	0.110645
Adjusted R-squared	0.808995	S.D. dependent var	0.128363
S.E. of regression	0.056100	Akaike info criterion	-2.652841
Sum squared resid	0.217157	Schwarz criterion	-0.653489
Log likelihood	356.7350	Hannan-Quinn criter.	-1.842406
F-statistic	7.821738	Durbin-Watson stat	4.692308
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 18:12
Sample: 2002 2003 IF CAPITALIZATION_STATUS=0
Periods included: 2
Cross-sections included: 106
Total panel (unbalanced) observations: 185
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.019726	0.017899	1.102097	0.2741
SHOCK_DUMMY	-0.003785	0.008913	-0.424629	0.6724
FIRM_SIZE	0.056053	0.042584	1.316300	0.1923
MARKET_BOOK	0.040834	0.041293	0.988893	0.3261
PROFITABLE	0.050720	0.069165	0.733320	0.4658
TANGIBILITY	0.432058	0.316956	1.363148	0.1771
ROA__RETURN_ON_ASSETS_	-0.387098	0.167380	-2.312695	0.0236
REPORTED_TAXES___EARNING	-0.013406	0.003296	-4.067311	0.0001
C	-0.115639	0.242264	-0.477325	0.6346

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.978196	Mean dependent var	0.352710
Adjusted R-squared	0.943495	S.D. dependent var	0.161040
S.E. of regression	0.038281	Akaike info criterion	-3.412995
Sum squared resid	0.104043	Schwarz criterion	-1.428559
Log likelihood	429.7020	Hannan-Quinn criter.	-2.608752
F-statistic	28.18880	Durbin-Watson stat	4.625000
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 18:10
Sample: 2001 2004
Periods included: 4
Cross-sections included: 210
Total panel (unbalanced) observations: 751
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.025520	0.015528	1.643439	0.1009
SHOCK_DUMMY	-0.014666	0.006500	-2.256257	0.0245
FIRM_SIZE	0.020762	0.020955	0.990785	0.3222
MARKET_BOOK	0.000176	0.000705	0.249257	0.8033
PROFITABLE	-0.050634	0.023812	-2.126374	0.0339
TANGIBILITY	0.294628	0.130266	2.261740	0.0241
ROA__RETURN_ON_ASSETS_	0.007264	0.067514	0.107591	0.9144
REPORTED_TAXES___EARNING	0.000793	0.001040	0.762229	0.4463
C	0.107159	0.112044	0.956395	0.3393

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.869362	Mean dependent var	0.226127
Adjusted R-squared	0.816176	S.D. dependent var	0.188087
S.E. of regression	0.080642	Akaike info criterion	-1.959924
Sum squared resid	3.466152	Schwarz criterion	-0.618424
Log likelihood	953.9515	Hannan-Quinn criter.	-1.443048
F-statistic	16.34557	Durbin-Watson stat	2.264550
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 18:13
Sample: 2001 2004 IF CAPITALIZATION_STATUS=1
Periods included: 4
Cross-sections included: 138
Total panel (unbalanced) observations: 384
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.037838	0.016853	2.245142	0.0257
SHOCK_DUMMY	-0.022075	0.007690	-2.870665	0.0045
FIRM_SIZE	0.041890	0.024803	1.688907	0.0925
MARKET_BOOK	-7.74E-05	0.000786	-0.098415	0.9217
PROFITABLE	-0.005147	0.024803	-0.207535	0.8358
TANGIBILITY	0.040942	0.055594	0.736442	0.4622
ROA__RETURN_ON_ASSETS_	-0.018977	0.077037	-0.246340	0.8056
REPORTED_TAXES___EARNING	0.001131	0.000645	1.751768	0.0811
C	-0.077367	0.108693	-0.711793	0.4773

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.808151	Mean dependent var	0.105224
Adjusted R-squared	0.691269	S.D. dependent var	0.124486
S.E. of regression	0.069169	Akaike info criterion	-2.222487
Sum squared resid	1.138671	Schwarz criterion	-0.720419
Log likelihood	572.7174	Hannan-Quinn criter.	-1.626701
F-statistic	6.914220	Durbin-Watson stat	2.924235
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 18:13
Sample: 2001 2004 IF CAPITALIZATION_STATUS=0
Periods included: 4
Cross-sections included: 127
Total panel (unbalanced) observations: 367
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.029737	0.020697	1.436804	0.1521
SHOCK_DUMMY	0.001048	0.007657	0.136817	0.8913
FIRM_SIZE	-0.010874	0.031664	-0.343414	0.7316
MARKET_BOOK	0.014642	0.021856	0.669938	0.5036
PROFITABLE	-0.061364	0.049915	-1.229359	0.2202
TANGIBILITY	0.484660	0.176581	2.744699	0.0065
ROA__RETURN_ON_ASSETS_	-0.129004	0.174470	-0.739403	0.4604
REPORTED_TAXES___EARNING	-0.002514	0.008557	-0.293747	0.7692
C	0.351215	0.184907	1.899415	0.0588

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.879562	Mean dependent var	0.352630
Adjusted R-squared	0.809999	S.D. dependent var	0.157776
S.E. of regression	0.068773	Akaike info criterion	-2.238932
Sum squared resid	1.097306	Schwarz criterion	-0.802355
Log likelihood	545.8441	Hannan-Quinn criter.	-1.668135
F-statistic	12.64410	Durbin-Watson stat	2.312437
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 17:44
Sample: 2012 2013
Periods included: 2
Cross-sections included: 333
Total panel (unbalanced) observations: 640
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.019830	0.010269	1.931081	0.0544
SHOCK_DUMMY	0.001078	0.005714	0.188601	0.8505
FIRM_SIZE	0.042262	0.024180	1.747809	0.0815
MARKET_BOOK	0.011662	0.009831	1.186261	0.2365
PROFITABLE	-0.038979	0.023550	-1.655171	0.0989
TANGIBILITY	0.179705	0.167420	1.073378	0.2840
ROA__RETURN_ON_ASSETS_	-0.007102	0.027182	-0.261286	0.7941
REPORTED_TAXES___EARNING	0.001939	0.000673	2.881095	0.0042
C	-0.013698	0.121286	-0.112939	0.9102

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.950289	Mean dependent var	0.201545
Adjusted R-squared	0.893761	S.D. dependent var	0.186638
S.E. of regression	0.060833	Akaike info criterion	-2.456756
Sum squared resid	1.106509	Schwarz criterion	-0.079630
Log likelihood	1127.162	Hannan-Quinn criter.	-1.534078
F-statistic	16.81104	Durbin-Watson stat	4.155844
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 17:43
Sample: 2012 2013 IF CAPITALIZATION_STATUS=1
Periods included: 2
Cross-sections included: 176
Total panel (unbalanced) observations: 308
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.037439	0.015545	2.408373	0.0175
SHOCK_DUMMY	-0.005511	0.008312	-0.663080	0.5085
FIRM_SIZE	0.028669	0.060638	0.472800	0.6372
MARKET_BOOK	-0.002941	0.018674	-0.157506	0.8751
PROFITABLE	-0.033186	0.036184	-0.917153	0.3608
TANGIBILITY	0.444988	0.287463	1.547983	0.1242
ROA__RETURN_ON_ASSETS_	-0.075857	0.131495	-0.576877	0.5651
REPORTED_TAXES___EARNING	-4.19E-05	0.003420	-0.012264	0.9902
C	0.131166	0.340443	0.385280	0.7007

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.949864	Mean dependent var	0.355703
Adjusted R-squared	0.875872	S.D. dependent var	0.152000
S.E. of regression	0.053552	Akaike info criterion	-2.731332
Sum squared resid	0.355612	Schwarz criterion	-0.502961
Log likelihood	604.6252	Hannan-Quinn criter.	-1.840327
F-statistic	12.83749	Durbin-Watson stat	4.631579
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 17:41
Sample: 2012 2013 IF CAPITALIZATION_STATUS=0
Periods included: 2
Cross-sections included: 188
Total panel (unbalanced) observations: 332
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	-0.000208	0.006650	-0.031308	0.9751
SHOCK_DUMMY	0.005004	0.005241	0.954791	0.3414
FIRM_SIZE	0.005461	0.011943	0.457223	0.6482
MARKET_BOOK	0.000889	0.003005	0.295894	0.7678
PROFITABLE	-0.004587	0.014268	-0.321465	0.7484
TANGIBILITY	0.089579	0.107289	0.834930	0.4052
ROA__RETURN_ON_ASSETS_	-0.007873	0.010880	-0.723614	0.4705
REPORTED_TAXES___EARNING	0.000365	0.000327	1.117808	0.2656
C	0.026934	0.047750	0.564056	0.5736

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.920072	Mean dependent var	0.058530
Adjusted R-squared	0.805470	S.D. dependent var	0.056480
S.E. of regression	0.024911	Akaike info criterion	-4.258791
Sum squared resid	0.084394	Schwarz criterion	-2.012386
Log likelihood	902.9593	Hannan-Quinn criter.	-3.362926
F-statistic	8.028378	Durbin-Watson stat	4.579310
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 17:44
Sample: 2011 2014
Periods included: 4
Cross-sections included: 357
Total panel (unbalanced) observations: 1286
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.012354	0.009563	1.291824	0.1967
SHOCK_DUMMY	0.005129	0.005259	0.975364	0.3296
FIRM_SIZE	0.038512	0.014969	2.572822	0.0102
MARKET_BOOK	0.009952	0.005087	1.956605	0.0507
PROFITABLE	-0.002244	0.014979	-0.149838	0.8809
TANGIBILITY	0.266744	0.110204	2.420462	0.0157
ROA__RETURN_ON_ASSETS_	-0.019769	0.022383	-0.883193	0.3774
REPORTED_TAXES___EARNING	0.000266	0.000382	0.695541	0.4869
C	-0.033510	0.071846	-0.466409	0.6410

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.872559	Mean dependent var	0.203591
Adjusted R-squared	0.822192	S.D. dependent var	0.190531
S.E. of regression	0.080342	Akaike info criterion	-1.971229
Sum squared resid	5.944901	Schwarz criterion	-0.506889
Log likelihood	1632.500	Hannan-Quinn criter.	-1.421509
F-statistic	17.32386	Durbin-Watson stat	1.855157
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 17:45
Sample: 2011 2014 IF CAPITALIZATION_STATUS=1
Periods included: 4
Cross-sections included: 214
Total panel (unbalanced) observations: 624
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	0.025062	0.014671	1.708253	0.0884
SHOCK_DUMMY	-0.002060	0.008209	-0.250975	0.8020
FIRM_SIZE	0.036802	0.033006	1.115022	0.2655
MARKET_BOOK	0.029145	0.024908	1.170117	0.2426
PROFITABLE	0.019654	0.030901	0.636017	0.5251
TANGIBILITY	0.395146	0.167758	2.355459	0.0190
ROA__RETURN_ON_ASSETS_	-0.098222	0.121920	-0.805628	0.4209
REPORTED_TAXES___EARNING	-0.000498	0.000656	-0.758367	0.4487
C	0.025014	0.183638	0.136215	0.8917

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.864341	Mean dependent var	0.357717
Adjusted R-squared	0.789763	S.D. dependent var	0.159321
S.E. of regression	0.073051	Akaike info criterion	-2.123465
Sum squared resid	2.145278	Schwarz criterion	-0.545220
Log likelihood	884.5212	Hannan-Quinn criter.	-1.510169
F-statistic	11.58969	Durbin-Watson stat	1.972573
Prob(F-statistic)	0.000000		

Dependent Variable: TOTAL_BOOK_LEVERAGE
Method: Panel Least Squares
Date: 05/02/17 Time: 17:45
Sample: 2011 2014 IF CAPITALIZATION_STATUS=0
Periods included: 4
Cross-sections included: 229
Total panel (unbalanced) observations: 662
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHOCK_DUMMY*HQ_DUMMY	-0.002210	0.005653	-0.391000	0.6960
SHOCK_DUMMY	0.003233	0.004095	0.789662	0.4302
FIRM_SIZE	0.011168	0.006357	1.756782	0.0797
MARKET_BOOK	0.003726	0.002151	1.731979	0.0840
PROFITABLE	0.006512	0.008972	0.725816	0.4684
TANGIBILITY	0.244114	0.065211	3.743423	0.0002
ROA__RETURN_ON_ASSETS_	-0.004656	0.008514	-0.546881	0.5847
REPORTED_TAXES___EARNING	-0.000164	0.000224	-0.733874	0.4634
C	-0.022584	0.023991	-0.941372	0.3470

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.801015	Mean dependent var	0.058312
Adjusted R-squared	0.690519	S.D. dependent var	0.055544
S.E. of regression	0.030900	Akaike info criterion	-3.843291
Sum squared resid	0.405792	Schwarz criterion	-2.233959
Log likelihood	1509.129	Hannan-Quinn criter.	-3.219592
F-statistic	7.249298	Durbin-Watson stat	2.128654
Prob(F-statistic)	0.000000		

References

Admati, A. R., DeMarzo, P. M., Hellwig, M. F. & Pfleiderer, P. C., 2013. The leverage ratchet effect. *ax Planck Institute for Research on Collective Goods Research Paper Series.*

Agrawal, A. & Knoeber, C. R., 1996. Firm performance and mechanisms to control agency problems between managers and shareholders. *Journal of financial and quantitative analysis* , 31(03), pp. 377-397.

Ang, J. S. & Peterson, D. R., 1986. Optimal debt versus debt capacity: A disequilibrium model of corporate debt behavior. *Research in finance,* Volume 6, pp. 51-72.

Baker, M. & Wurgler, J., 2002. Market timing and capital structure. *The journal of finance,* 57(1), pp. 1-32.

Barclay, M. J., Smith, C. W. & Watts, R. L., 1995. The determinants of corporate leverage and dividend policies. *Journal of applied corporate finance* , 7(4), pp. 4-19.

Baskin, J., 1989. An empirical investigation of the pecking order hypothesis. *Financial management,* pp. 26-35.

Bertrand, M. & Mullainathan, S., 2003. Enjoying the quiet life? Corporate governance and managerial preferences. *Journal of Political Economy,* Volume 111, pp. 1043-1075.

Bradley, M., Jarrell, G. A. & Kim, E., 1984. On the existence of an optimal capital structure: Theory and evidence. *The journal of Finance,* 39(3), pp. 857-878.

Braudel, F., 1982. *Civilization and Capitalism, 15th-18th Century: The perspective of the world.* 3 ed. s.l.:Univ of California Press.

Brennan, M. J. & Schwartz, E. S., 1984. Optimal financial policy and firm valuation. *The journal of finance,* 39(3), pp. 593-607.

Brooks, C., 2014. *Introductory Econometrics for Finance.* 3rd Edition ed. Cambridge: Cambridge University Press.

Bundesministerium der Justiz, 2017. *www.gesetze-im-internet.de.* [Online]
Available at: https://www.gesetze-im-internet.de/kstg_1977/__1.html
[Accessed at 13 04 2017].

Bundesministerium der Justiz, 2017. *www.gesetze-im-internet.de.* [Online]
Available at: https://www.gesetze-im-internet.de/estg/__20.html
[Accessed 24 04 2017].

Burman, L. E., 2007. *www.urban.org.* [Online]
Available at: http://webarchive.urban.org/publications/901051.html
[Accessed 08 05 2017].

Chan, Y.-S. & Kanatas, G., 1985. Asymmetric valuations and the role of collateral in loan agreements. *Journal of money, credit and banking,* 17(1), pp. 84-95.

Chen, L. & Zhao, X., 2006. On the relation between the market-to-book ratio, growth opportunity, and leverage ratio. *Finance Research Letters,* 3(4), pp. 253-266.

Chetty, R., 2013. Yes, Economics Is a Science. *New York Times,* 20 10.

deutsche-boerse, 2017. *www.deutsche-boerse.com.* [Online]
Available at: http://deutsche-boerse.com/dbg-en/about-us/frankfurt-stock-exchange
[Accessed 12 04 2017].

Diamond, D., 1991. Debt Maturity strcuture and liquidity risk. *Quarterly Journal of Economics,* Volume 106.3, pp. 709-737.

Dumay, J., 2010. An examination of two grand-theories of IC as barriers to the use of IC concepts. *Academic Conferences Limited,* p. 146.

Dwenger, N. & Viktor, S., 2014. Financial leverage and corporate taxation: Evidence from German corporate tax return data. *International tax and public finance,* 21(1), pp. 1-28.

EURONEXT, 2016. *www.euronext.com.* [Online]
Available at: https://www.euronext.com/en/agilityforgrowth
[Accessed 13 04 2017].

Faccio, M. & Xu, J., 2015. Taxes and capital structure. *Journal of Financial and Quantitative Analysis,* 50(03), pp. 277-300.

Fama, E., 2011. My life in Finance. *Annual Review of Financial Economics ,* Volume 3, pp. 819-843.

Fama, E. & French, K., 1998. Taxes, Financing Decisions and Firm Value. *Journal of Finance,* Volume 53, pp. 819-843.

Fischer, E. O., Heinkel, R. & Zechner, J., 1989. Dynamic capital structure choice: Theory and tests. *The Journal of Finance,* Volume 44.1, pp. 19-40.

Frank, M. & Goyal, V., 2009. Capital structure decisions: which factors are reliably important?. *Financial Management ,* Volume 38, pp. 1-37.

FRED, 2016. *www.fred.stlouisfed.org.* [Online]
Available at: https://fred.stlouisfed.org/series/DDOM01FRA644NWDB
[Accessed 22 04 2017].

Garvey, G. T. & Hanka, G. R., 1999. Capital structure and corporate control: The effect of antitakover statutes on firm leverage. *Journal of Finance,* Volume 54, pp. 519-546.

Graham, J. R., 1996. Debt and the marginal tax rate. *Journal of financial Economics,* 41(1), pp. 41-73.

Graham, J. R., 2000. How Big Are the Tax Benefits of Debt?. *The Journal of Finance,* 55(5), pp. 1901-1941.

Graham, J. R. & Harvey, C. R., 2001. The theory and practice of corporate finance: Evidence from the field. *Journal of financial economics,* 60(2), pp. 187-243.

Green, R. C. & Hollifield, B., 2003. The personal-tax advantages of equity. *Journal of Financial Economics,* 67(2), pp. 175-216.

Hall, T. W., 2012. The collateral channel: Evidence on leverage and asset tangibility.. *Journal of Corporate Finance,* 18(3), pp. 570-583.

Hamada, R., Kane, A., Marcus, A. J. & McDonald, R. L., 1984. How big is the tax advantage to debt?. *The Journal of Finance,* Volume 39.3, pp. 841-853.

Heider, F. & Ljungqvist, A., 2015. As certain as debt and taxes: Estimating the tax sensitivity of leverage from state tax changes. *Journal of Financial Economics ,* Volume 118, pp. 684-712.

Hellio, F. & Thill, P.-S., 2002. *Steuern in Frankreich.* 2 ed. Köln: Verlag Dr. Otto Schmidt.

Hoover, K. D., 2006. Fragility and robustness in econometrics: Introduction to the symposium. *Journal of Economic Methodology ,* 13(2), pp. 159-160.

Jang, K. Y., 2016. The effect of TARP on the propagation of real estate shocks: Evidence from geographically diversified banks. *Journal of Banking & Finance.*

Jensen, M. C. & Meckling, W. H., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of financial economics,* 3(4), pp. 305-360.

Kester, W. C., 1986. Capital and ownership structure: A comparison of United States and Japanese manufacturing corporations. *Financial management ,* pp. 5-16.

Korajczyk, R. & Levy, A., 2003. Capital structure choice: macroeconomic conditions and financial constraints. *Journal of Financial Economics ,* Volume 68, pp. 75-109.

Korteweg, A., 2010. The net benefits to leverage. *The Journal of Finance,* 65(6), pp. 2137-2170.

Kraft, C. & Kraft, G., 2009. *Grundlagen der Unternehmensbesteuerung.* 3 ed. Wiesbaden: Gabler GWV Fachverlage.

Kraus, A. & Litzenberg, R. H., 1973. A state-preference model of optimal financial leverage. *The journal of finance,* 28(4), pp. 911-922.

Long, M. & Malitz, I. B., 1985. Investment patterns and financial leverage. *Corporate Financial Structures in the US ,* pp. 325-352.

Lu, X. & White, H., 2014. Robustness checks and robustness tests in applied economics. *Journal of Econometrics ,* 178(1), pp. 194-206.

Luyendijk, J., 2015. *Don't let the Nobel prize fool you. Economics is not a science.* [Online] Available at: https://www.theguardian.com/commentisfree/2015/oct/11/nobel-prize-economics-not-science-hubris-disaster
[Accessed 02 05 2017].

MacKie-Mason, J. K., 1990. Do taxes affect corporate financing decisions?. *The journal of finance,* 45(5), pp. 1471-1493.

Meyers, S. C., 1984. The capital structure puzzle. *The journal of finance,* Volume 39.3, pp. 574-592.

Miller, M. H., 1977. Debt and taxes. *the Journal of Finance,* 32(2), pp. 261-275.

Modigliani, F. & Miller, M. H., 1958. The cost of capital, corporate finance and the theory of investment. *The American Economic Review,* pp. 261-297.

Modigliani, F. & Miller, M. H., 1963. Corporate income taxes and the cost of capital: a correction. *The American economic review ,* Volume 53.3, pp. 433-443.

Murray Z., F. & Goyal, V. K., 2007. *Trade-off and pecking order theories of debt.* [Online] Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract-id=670543 [Accessed 06 04 2017].

Myers, S. C., 1977. Determinants of corporate borrowing. *Journal of financial economics* , 5(2), pp. 147-175.

Myers, S. C., 1989. Still searching for optimal capital structure. *Are the distinctions between debt and equity disappearing?,* pp. 80-95.

Myers, S. C. & Majluf, N. S., 1984. "Corporate financing and investment decisions when firms have information that investors do not have. *Journal of financial economics* , 13(2), pp. 187-221.

Odgen, J., Jen, F. & O'Connor, P., 2003. *Advanced Corporate Finance - Policies and Strategies.* first edition ed. New Jersey: Pearson Education.

OECD, 2017. *www.stats.oecd.org.* [Online] Available at: http://stats.oecd.org//Index.aspx?QueryId=58204 [Accessed 12 04 2017].

Rajan, R. G. & Zingales, L., 1995. What do we know about capital structure? Some evidence from international data. *The journal of Finance* , 50(5), pp. 1421-1460.

Roberts, M. & Whited, T., 2012. Endogeneity in Empirical Corporate Finance. In: *Handbook of the Economics of Finance.* s.l.:s.n.

Robichek, A. A. & Myers, S. C., 1966. Problems in the theory of optimal capital structure. *Journal of Financial and Quantitative Analysis* , 1(02), pp. 1-35.

Schandlbauer, A., 2016. How do financial institutions react to a tax increase?. *Journal of Financial Intermediation,* pp. 1-21.

Schwartz, E. & Aronson, J. R., 1967. Some surrogate evidence in support of the concept of optimal financial structurey. *Journal of Finance* , Volume 22.1, pp. 10-18.

Shyam-Sunder, L. & Myers, S. C., 1999. Testing static tradeoff against pecking order models of capital structure. *Journal of financial economics,* 51(2), pp. 219-244.

Smith, C. W. & Watts, R. L., 1992. The investment opportunity set and corporate financing, dividend, and compensation policies. *Journal of financial Economics,* 32(3), pp. 263-292.

Stulz, R. M., 1990. Managerial discretion and optimal financing policies. *Journal of financial Economics,* 26(1), pp. 3-27.

Titman, S., 1984. The effect of capital structure on a firm's liquidation decision. *Journal of Financial Economics,* Volume 13, pp. 137-151.

Titman, S. & Wessels, R., 1988. The determinants of capital structure choice. *The Journal of finance,* 43(1), pp. 1-19.

TUI AG, 2016. *www.tuigroup.com.* [Online]
Available at: https://www.tuigroup.com/damfiles/default/tuigroup-15/de/investoren/6_Finanzberichte-und-Praesentationen/Finanzberichte/2016/TUI_GB_2015-16_mitMagazin.pdf-b91cec0ffb863cacfe1f863b592e4b69.pdf
[Accessed 02 05 2017].

Wagner, M., 2003. *How Does it Pay to be Green?: An Analysis of the Relationship Between Environmental and Economic Performance at the Firm Level and the Influence of Corporate Environmental Strategy Choice.* Germany: Tectum Verlag .

Wald, J. K., 1999. How firm characteristics affect capital structure: an international comparison. *Journal of Financial research*, 22(2), pp. 161-187.

Welch, I., 2011. Two common problems in capital structure research: The financial-debt-to-asset ratio and issuing activity versus leverage changes. *International Review of Finance,* 11(1), pp. 1-17.

Worldbank, 2016. *www..worldbank.org.* [Online]
Available at: http://data.worldbank.org/indicator/SP.POP.TOTL?locations=DE
[Accessed 22 04 2017].