Universidad Cardenal Herrera-CEU

Departamento de Economía y Empresa

ESSAYS ON CAPITAL STRUCTURE

TESIS DOCTORAL

Presentada por:
José Antonio Clemente Almendros
Dirigida por:
Dr. Francisco Sogorb Mira

VALENCIA
2016

JOSE ANTONIO CLEMENTE ALMENDROS

ESSAYS ON CAPITAL STRUCTURE

TESIS DIRIGIDA POR EL DR. FRANCISCO SOGORB MIRA, PROFESOR DE LA UNIVERSIDAD CARDENAL HERRERA-CEU

DEPARTAMENTO DE ECONOMÍA Y EMPRESA

UNIVERSIDAD CARDENAL HERRERA-CEU

2016

ACKNOWLEDGEMENTS

This PhD thesis is not merely the result of my own particular endeavour. I received support, assistance and help from many people, in a number of different ways, to complete this research project. I am really grateful to all of them, as without their inestimable encouragement and support, I would never have been able to finish this dissertation.

Firstly, I would like to sincerely thank my supervisor, Dr. Francisco Sogorb-Mira, for his support, guidance and direction from the very first moment. Throughout the entire thesis, he shared with me not only his valuable expertise and research insights but also his own priceless time, helping me to develop a rigorous academic work incorporating his advice and suggestions.

I would also like to thank Professor Gonzalo Rubio from the CEU Cardenal Herrera University for believing in me and for opening the door for me to the world of academic research. I would also like to express my gratitude to Professor José López Gracia from the University of Valencia for allowing me to participate in various doctoral seminars and for his constant words of encouragement.

Furthermore, I wish to thank several professors because each one, in their own way, have also helped me: Pankaj Sinha from the University of Delhi, Juan M. Villa-Lora from the University of Manchester, Juan Sanchís-Llopis from the University of Valencia, and Anna Toldrá-Simats from the Carlos III University. Similarly, I would like to thank some practitioners that have also helped me: Carlos Garrido from Standard and Poor's, Juan Ayuso from Banco de España, Domingo García from Bolsas y Mercados Españoles, Antonio Ruiz-López from Garrigues, Luisa Giménez Domenech from Gimenez Domenech Asesores SL and Miguel García-Posada from Banco de España. Lastly, I want to thank the participants of the XXII Finance Forum at the University of Zaragoza in 2014, the participants of the Research Seminar at the Department of Economic Structure, University of Valencia, in 2015, the participants of the XXIII Finance Forum at the Pontificia de Comillas University, Madrid, in 2015, the XVIII AECA Annual Meeting at the Polytechnic University of Cartagena in 2015, as well as the participants of the 6th Global Innovation and Knowledge Academy (GIKA) Conference, Valencia, in 2016 for their helpful comments and suggestions.

I would especially like to draw attention to my family, my mother Dolores, and my sisters, María del Pilar and Juana María whom I deeply thank for all their unconditional love, support, patience, understanding and encouragement during this difficult, long journey. The education and values instilled by my parents, Rufino and Dolores, have guided me, once more, in this demanding task.

Finally, and most importantly, I would like to thank my wife Sonia and my daughters Laura and Alba for accompanying me on this long and hard journey. They have always been there for me, patiently helping and encouraging me, giving me their unlimited and absolute love, but also suffering my absences and enduring my fatigue. This dissertation is dedicated to Sonia, Laura and Alba.

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

CHAPTER 1: THE EFFECT OF TAXES ON THE DEBT POLICY OF SPANISH LISTED COMPANIES

CHAPTER 2: HOW MUCH DO THE TAX BENEFITS OF DEBT ADD TO FIRM VALUE? EVIDENCE FROM SPANISH LISTED COMPANIES

CHAPTER 3: DEBT CONSERVATISM AND CORPORATE TAXES IN SPANISH LISTED COMPANIES

CHAPTER 1: THE EFFECT OF TAXES ON THE DEBT POLICY OF SPANISH LISTED COMPANIES

CHAPTER 2: HOW MUCH DO THE TAX BENEFITS OF DEBT ADD TO FIRM VALUE? EVIDENCE FROM SPANISH LISTED COMPANIES

CHAPTER 3: DEBT CONSERVATISM AND CORPORATE TAXES IN SPANISH LISTED COMPANIES

INTRODUCTION

What factors influence firms' capital structure? And more specifically, do taxes affect corporate financing decisions? The answers to these questions have yet to be conclusively resolved.

The factors that affect capital structure policy decision-making can be grouped into three categories: taxes, contracting costs and information costs.

Taxes play an important role in capital structure because interest payments can be deducted from corporate profits; adding debt to a firm's capital structure therefore lowers its expected tax liability and increases its after-tax cash flow. Having corporate debt may then offer a tax advantage. Regarding contracting costs, whatever the tax benefits of higher leverage, they must be set against the greater probability and higher expected costs of financial distress (direct and indirect expenses related to the bankruptcy process, such as the loss in value that results from cutbacks in promised investment when the firm gets into financial trouble). According to this viewpoint, the optimal capital structure is one in which the next euro of debt is expected to provide an additional tax subsidy that offsets the resulting increase in the expected cost of financial distress. Finally, and related to information costs, corporate executives often have better information about the value of their companies than outside investors. An awareness of this information "gap" between managers and investors has led to the formulation of three distinct but related theories of financing decisions: market timing, signalling and pecking order.

This dissertation focuses on the influence of taxes on corporate debt and the value of the corporate tax shield.

What makes the capital structure debate especially intriguing is that the theories lead to different and sometimes conflicting conclusions. In particular, there are a great deal of empirical studies about whether or not an optimal corporate capital structure exists and which try to identify the factors that may affect it. The results are ambiguous and this is puzzling. There are many possible explanations for this ambiguity: econometric issues, the inclusion or omission of a certain kind of information in the form of control or dummy variables, incorrect model formulation, incorrect calculations, and so on. More specifically, some research has found evidence consistent with tax benefits having a positive relationship with financial leverage and adding to firm value. However, some of this evidence is ambiguous because non-tax explanations or econometric issues cloud interpretations. If the tax benefits of debt do in fact add to firm value, an important unanswered question is why firms do not use more debt, especially large, profitable firms. Are these companies failing to optimize or are there costs and other influences that have not been adequately modelled?

Great importance is currently placed on taxes and tax systems. Essentially, there are two factors explaining this importance. The first factor is how Spanish firms are being financed. The particular problem of the Spanish economy is not so much the size of financial debt as the fact that it is almost exclusively bank debt. SMEs dominate the business landscape in Spain, and Spanish debt is typically bank debt. This, along with the current delicate state of many financial institutions and the absence of effective alternatives to refinance debts, is causing many companies to either stagnate or to collapse entirely. One of the causes influencing the prevalence of financing via loans rather than capital formulas is the lack of fiscal neutrality in the treatment of interest. The tax deductibility of corporate interest paid on borrowed funds received is decisive. Limits to such deductions have recently been incorporated into Spanish tax law in an attempt to address this imbalance. Some countries are examining the possibility of treating dividends as a form of interest paid on equity financing, so that they can also be tax deductible for companies. The second factor concerns the need for new studies that shed light on the relationship between regulation and financial decisions, and therefore, the impact of fiscal policies[1]. This need arises from the process of fiscal convergence currently underway within the Eurozone meaning that regulation has proven to be a critical factor in companies' preference for either debt financing or equity financing (European financial market reforms, US quantitative easing policy).

In short, according to theory there should be a positive relationship between taxes and debt in companies. However, the empirical evidence for this positive relationship has not been conclusive.

Our work is centred on the link between taxes and capital structure theory, and addresses some of the main approaches of capital structure empirical research. The relevant literature for each essay is discussed in the corresponding chapter.

[1] Bris, A., 2012, "Las cuestiones pendientes en finanzas corporativas", *Revista de Bolsas y Mercados Españoles*, 193, 44-47.

Our research provides evidence of a positive relationship between taxes and financial corporate debt, showing that taxes are not a second-order effect in leverage decisions, and are important to the firm value. An important issue to consider is that the use of an incorrect proxy to gauge a specific company tax status could explain why many financial research papers fail to show that tax factors play an important role in corporate decisions. To the best of our knowledge, this is the first attempt in Spain to calculate both the estimated marginal tax rate and its influence on financial debt, and the value of the corporate tax shield for Spanish companies.

Marginal tax rates can be defined as the present value of current and expected future taxes paid on an additional unit of income earned today. The concept plays an important role in corporate finance, due to the fact that it accounts for the dynamic behaviour of corporate taxes, such as net operating losses that can be carried forward to offset future net income. In addition, it is related to the tax rate attributable to a specific company's activity, so using the specific simulated marginal tax rate in capital structure empirical research offers the advantage of accounting for the tax regime rules in a way that other static tax proxies do not. However, the fact that it entails quite complex calculations may explain why it is almost never explicitly calculated. Additionally, the marginal tax rate helps us to build the interest-deduction benefit functions of any company in any year, in order to estimate both the gross and net tax benefits as a percentage of firm value, and then to measure the value loss due to conservative corporate debt policy. It indicates that the tax benefits of debt appear to be significantly unexploited. In our different essays, we have calculated the simulated marginal tax rate as a proxy.

We study the effects of corporate taxation on both capital structure decision-making and firm value, in three essays, each with a specific goal. Our results also provide insight into this issue within the context of the European Union, and especially in Spain. A key issue is that we calculate the specific simulated marginal tax rate and the specific interest-deduction benefit function for all the companies in our sample.

In our first essay, we attempt to show the impact of corporate taxation on firms' capital structure in Spain. Our contribution to the existing literature is to calculate the simulated marginal tax rate for Spanish companies and to use it to show how taxes affect corporate debt policy in a particular period characterized by an economic and financial crisis. These three issues lead to the following hypotheses:

- *Hypothesis 1. "Since higher marginal tax rates raise the value of tax savings, marginal tax rates should be positively related to firms' debt policy"*
- *Hypothesis 2. "Non–debt tax shields on a stand-alone basis, should be positively related to firms' debt policy, while non-debt tax shields weighted by the probability of bankruptcy, should be negatively related to firms' debt policy"*
- *Hypothesis 3. "Companies affected by the new thin-capitalization rule reduce their leverage ratio after the reform more than those companies that are not affected"*.

One distinction is that we focus solely on financial debt, excluding those liabilities that do not depend on the effect of corporate taxation. Our results indicate that capital structure choices are positively affected by taxes, whereas non-debt tax shields and the probability of bankruptcy are negatively related to firms' debt policy. Furthermore, the 2012 Spanish corporate tax reform did not affect the level of financial debt.

Interest expense deductions from taxable income produce a tax saving referred to as the tax benefits of debt. The consequences of these tax benefits with respect to firm valuation are a matter of debate and controversy; the valuations obtained through the empirical evidence for this tax benefit vary considerably, and in some cases are even negative. Using different methodologies, our second essay contributes to the literature by calculating the value of this tax saving, also called a tax shield, and showing the extent of the resulting increase in firm value, both with and without considering personal taxes, since the latter may offset the tax benefit of debt. Under the simulation approach and using the simulated marginal tax rates, we estimate the interest-deduction benefit functions for individual firms. As predicted, we also show how the marginal tax benefits of debt decline as more debt is added. In addition, we argue that some companies may be considered underleveraged if they take on a lower level of financial debt than that which would allow them to take full advantage of the tax shield.

Finally, although our evidence supports the fact that debt tax benefits add to firm value, in our third essay, we conduct additional research to explain the apparently conservative debt policy of many firms and shed light on the "conservative leverage puzzle". Firstly, we estimate the marginal default costs of debt in order to contrast them with the marginal benefits of debt. Secondly, we investigate whether non-debt tax shields substitute for financial interest expense deductions. We use different proxies in order to capture the effects of those non-debt tax shield factors, and relate them to the kink variable, which is the proxy we use to measure whether companies are using the tax benefits of financial debt. Accordingly, we formulate the following hypotheses:

- *Hypothesis 1. "Companies use debt conservatively when their costs of debt are high"*
- *Hypothesis 2. "Companies use debt conservatively when they have non-debt tax shields at their disposal"*

Through the comparison between the marginal benefits and financial distress costs, we assess the net effect of firms' leverage, and subsequently aim to explain the apparent under-leveraged status. A positive relationship between non-debt tax shields and our kink would help explain why some companies appear not to take advantage of the tax benefits of debt. We show that the apparent underutilization of the tax benefits of debt is not in fact the case, proving that financial distress costs and non-debt tax shields are important and affect capital structure decision-making. Furthermore, we demonstrate that there is no single combination of factors that explains the above conclusion.

This thesis includes three essays, which are empirical studies, each focusing on a different aspect of the effect of taxes on capital structure choice. In the following paragraphs, we outline the methodology used in each of the essays.

Our empirical analysis focuses on a sample of Spanish listed firms for the period 2007-2013. We sourced the data from Sistema de Análisis de Balances Ibéricos (SABI), a database managed by Bureau Van Dijk and Informa D&B, S.A., and from the Spanish Securities and Exchange Commission (CNMV). Both sources provided us with the accounting information from firms' financial statements. Financial market information comes from the stock market bulletins of the Spanish Stock Exchange and Bloomberg, while information regarding the companies' rating was obtained from Standard & Poor's. The starting year of 2007 was not chosen randomly. The incorporation of IFRSs into the 2007 Spanish General Accounting Plan (GAP) accounts for temporary differences which include not only time differences (included in the old 1990 GAP) between taxable income and accounting profit before tax deriving from different timing criteria used to determine these two results, but also other factors. Accordingly, figures from 2007 GAP and those from 1990 GAP are not directly comparable. This is critical when calculating the marginal tax rate. We use listed companies because we need information on market data to calculate dependent and explanatory variables. Another reason is that detailed information for tax purposes is gathered only in the annual report, and this accounting statement is not available on the SABI database; it is in fact accessible from the CNMV registries, but only for listed companies. Specifically, the annual report provides an explanation and numerical reconciliation of the income tax expense obtained by multiplying total recognized income and expense, as opposed to profit or loss, by the applicable tax rates.

In our first essay, we estimate the simulated marginal tax rate examining the dynamic behaviour of taxes in the specific context of Spanish tax law. For our primary estimation, we use a static panel data with fixed effects. An important issue to resolve when testing the influence of taxes on capital structure decisions is the endogeneity of the tax status, which may produce a spurious correlation between the level of financial debt and, in our case, the marginal tax rate. We follow two main approaches in order to resolve this issue in our context. We use the simulated marginal tax rate, but before financing decisions, and we also utilize the simulated marginal tax rate based on pre-tax income, but lagged one period. Additionally, we test the robustness of our main empirical evidence, considering the effect of leverage status, the current statutory corporate tax rate status and size. To check whether the Spanish corporate tax reform of 2012 affected firms' capital structure, we use the difference-in-differences approach and two matching procedures, namely, the kernel propensity score and the nearest neighbour matching approach.

As already explained previously, the questions we aim to answer in the second essay are as follows: How much does firm value increase by? And, how valuable are tax shields? To answers both questions, three main approaches are usually used in the empirical literature: event studies, panel/cross-section regressions, and simulations. These approaches produce a wide range of estimates, some of which are prone to identification problems. We only focus on the last two approaches. In the regression approach, we use both linear and non-linear panel data models. In the simulation approach, we estimate the interest-deduction benefit functions for all companies of our sample in each year, and by integrating the area under this function, the capitalized tax benefits of debt are calculated as a percentage of a firm's market value for each company in each year.

Additionally, we examine the effect of personal taxes on the value of the tax shield. In order to check the robustness of our main results, we use an alternative proxy for both earnings and debt. Despite the fact that the results in both approaches are qualitatively similar, those from the regression approach should be taken with caution, due to certain econometric issues.

As part of our empirical research into the apparently conservative debt policy of some firms in our sample, our primary methodology in the third essay is a panel data ordered Probit, where the dependent variable is the companies' ratings. By mapping the relationship between company leverage and expected distress costs, we estimate the predicted values of ratings and hence the default probabilities in order to then calculate the financial distress costs of incremental debt. Secondly, we use a censored panel data Tobit model. In this case, we use the kink variable as a dependent variable in order to measure how conservative a company is in terms of its use of financial debt. We use different proxies to capture the effects of factors other than the debt tax shield on financial leverage, which enable a specific company to reduce its tax bill. To further explore the possibility that causal recipes of our control variables may influence the kink, we follow the fuzzy-set qualitative comparative analysis. All the variables are calibrated using a specific subroutine in the fsQCA (fuzzy set Qualitative Comparative Analysis) software program. We use the fsQCA methodology to elaborate a "truth table" and estimate the relevant recipes for our dependent variables. After applying the fsQCA approach, we are able to identify individual cases in specific models relevant to our research.

CHAPTER 1: THE EFFECT OF TAXES ON THE DEBT POLICY OF SPANISH LISTED COMPANIES

1.1. Introduction

A large body of research has examined the effects of corporate taxation. Although the results of empirical models vary significantly, the majority of this research does find that, to some degree, taxes influence a broad range of corporate financial decisions such as financing policy, investment policy or corporate reorganization and hedging[2]. The magnitude of these effects and their overall impact on the economy are still under debate. Notwithstanding, the most significant obstacle a policy maker confronts in deciding on the tax treatment of corporate debt and equity financing is that the impact of taxation on corporate financial policy is not entirely understood. In addition, Graham (2013) finds that many studies prove that taxes influence financing decisions; however, this effect is not always strong. Likewise, he concludes that more research is needed for a better understanding of the influence of taxes on capital structure, particularly related to time-series effects. Therefore, whether and to what extent taxation affects the choice of capital structure is still an unsettled topic, and thus without question deserves further study.

The main objective of this study is to analyse the relationship between taxes and debt financing using panel data on Spanish listed companies. More specifically, we focus on how the deductibility of debt interest affects the capital structure of firms. Our empirical analysis is based on a sample of Spanish listed firms for the period 2007-2013. We test the hypothesis that companies have a tax incentive to use debt financing rather than equity financing because interest paid is tax-deductible while dividends paid to shareholders are not. Besides, we use the Shevlin (1990) and Graham (1996a) expected marginal tax rate approach to examine the effects of tax on the debt policies of Spanish firms. In addition, we test the non-debt tax shields hypothesis which considers other tax shelters different from the interest allowances. In the time period analysed, the Corporate Tax Income Law was reformed and this fact might have influenced the debt policy of Spanish listed companies. For that reason, we test for a tax reform effect and consider this shock as a quasi natural experiment for our research.

[2] A detailed review of the literature on the role of taxes in corporate finance is provided by Graham (2008 and 2013).

The meta-study of the existing empirical studies conducted by Feld, Heckemeyer and Overesch (2013) concludes that capital structure choices are indeed positively affected by taxes, an effect which is also quantitatively relevant. Tax rates are shown to be correlated with corporate capital structure choices, which suggests that firms may increase value through optimal debt choice. The trade-off theory of capital structure offers a theoretical explanation to the relationship between corporate debt policy and taxes. Specifically, this theory argues that firms determine their optimal debt ratio by comparing the present value of additional tax savings and of the additional expected cost of financial distress caused by a marginal increase in debt. There has been relatively limited empirical research into the effects of marginal corporate tax on debt policy, despite its clear significance. In this regard, Graham (1996a), as well as the subsequent studies, found that marginal corporate tax rate does influence the debt policies of U.S. firms[3]. In countries other than the U.S., Alworth and Arachi (2001) conducted a similar analysis using a data panel on Italian firms and found a positive relationship between firm-specific marginal tax rates and Italian firms' debt policy. In addition, Kunieda, Takahata and Yada (2011), Hartmann-Wendels, Stein and Stöter (2012) and Sinha and Bansal (2013) obtained analogous results for Japanese, German and Indian firms, respectively. To the best of our knowledge, there have been no empirical studies to date on the effects of simulated marginal tax rates on debt policy in Spain.

This paper contributes to the existing literature on the impact of corporate taxation on firms' capital structure, further developing the contributions of previous literature in different ways. Firstly, we provide additional empirical evidence on the relationship between taxes and debt financing. In contrast with other papers, our measure of leverage includes only financial debt and directly excludes other liabilities such as trade payables, which mainly depend on business transactions and not on the effect of corporate taxation. Secondly, our findings shed some light on this issue in the European Union, which has received little attention to date in the literature. Moreover, International Financial Reporting Standards were adopted in Spain on January 1st 2007, which allows meaningful comparison between our results and those from other economies that have also implemented these international standards. Thirdly, we take

[3] A comprehensive survey of related literature can be found in Graham (2003, 2008 and 2013).

into account the Spanish corporate tax reform in 2012, as an exogenous shock, which enacted a new thin-capitalization rule[4] limiting the tax deductibility of financing expenses. Applying a difference in differences approach, we analyse the potential impact of the abovementioned reform. Finally, we study a special period partially characterized by a severe economic and financial crisis that has dramatically affected Mediterranean countries such as Spain.

Our findings show that marginal tax rates significantly affect the debt policy of Spanish firms. The results confirm the significance of corporate taxes in company financing decisions considering the uniqueness of the Spanish tax provisions. Furthermore, the existence of non-debt tax shields constitutes an alternative to the use of debt as a tax shelter. The corporate tax income reform approved by the Spanish Government in 2012 do not seem to affect our findings, despite of the different matching methodologies applied. As expected, there is a stronger relationship between taxes and debt policy in less levered companies.

The remainder of the paper is structured as follows. The next Section analyses the theoretical framework of the study and presents the hypotheses to be tested. Subsequently, the Spanish corporate tax legislation is described in Section 1.3., including the new thin-capitalization rule. In Section 1.4., we examine the empirical model specification, define the variables used, and explain the estimation of companies' marginal corporate tax rates. Thereafter, Section 1.5. provides a description of our sample and analyses descriptively the tax data. The econometric methodology and the results are discussed in Section 1.6. Several robustness checks are presented in Section 1.7. and the final Section draws some concluding remarks.

1.2. Theoretical foundation and hypotheses development

Modigliani and Miller (1963) were the first to introduce the idea that corporate taxation affects the capital structure of firms. In particular, they proved that when corporate

[4] Thin capitalization refers to when a company is financed with a high level of debt relative to equity. In turn, thin capitalization rules imply that a company that has too much debt compared to equity will be denied fiscal deductions for part of its interest payments, or that part of interest payments will be reclassified as dividends and will not obviously be considered as fiscal deductions.

income is taxed and debt interest is a deductible expense, firm value can be increased by using debt financing rather than funding entirely with equity. In this context, the increase in a firm's value is due to the debt tax shield. The question of why debt financing has traditionally received favourable tax treatment whereas equity financing has not, seems likely to be the result of historical forces at the time the tax rules were being developed, rather than any weighty economic reasoning pertaining to contemporary economic or business circumstances (Strebulaev and Whited 2012).

Earlier empirical articles did not find convincing evidence that taxation affected firms' financial policy (see for example, Bradley, Jarrell and Kim 1984; Titman and Wessels 1988). These discouraging results led Myers (1984) to state in his renowned *Presidential Address* to the American Finance Association that "we don't know how firms choose their capital structures as there is no study clearly demonstrating that a firm's tax status has predictable, material effects on its debt policy". The meta-analysis by Feld *et al.* (2013) suggests that very small or even negative tax estimates found in the studies do not accurately reflect debt response to taxes. It seems difficult to conduct an effective analysis of a direct relationship between tax rates and debt policy, as most large corporations have the same statutory tax rate[5]. In most developed countries, the statutory tax laws do not demonstrate any substantial variation in corporate statutory tax rates over the years and across firms. In the absence of variation in tax rates through time and across companies, we can only presume a similar debt policy for each company, which is not the case, or we may end up with contradictory results.

Due to asymmetric tax treatment of corporate profits and losses, the (expected) marginal tax rate may not be equal to the statutory tax rate. Specifically, although the statutory tax rate is applied when the taxable income of a company is positive, no corporate tax is imposed when the taxable income is negative. Even in cases where a company actually pays zero tax in a year due to incurred losses, its marginal tax rate may be non-zero. In such a case the marginal tax rate is equal to the discounted value of the taxes paid on the marginal unit of income in the first year where the firm is expected to have positive

[5] Statutory tax rates are those percentage rates established by the tax law. Conversely, marginal tax rates relate to the tax rate attributable to the specific company's activity and to explicit decisions that may involve taxes paid (or saved) and income received (or expenses paid) over several years; they can be defined as the present value of current and expected future taxes paid on an additional unit of income earned today.

taxable income. Likewise, losses can typically be carried forward and carried backward in the corporate tax system, which leads to differences in the marginal tax rates. This dynamic dimension of taxes makes it necessary to forecast future taxable income in order to estimate current-period tax rates and tax incentives.

Recognizing the existence of loss carried forward and carried backward in the U.S. corporate tax system, Mackie-Mason (1990) analysed the effects of the marginal tax rate on debt policy. He found that when a company has loss carried forward and investment tax credit (i.e., another tax shield), it is less likely to raise capital by new debt issue. Since both existing loss carried forward and investment tax credit are substitutes for new debt issue in terms of tax savings, this result is consistent with the trade-off theory.

Shevlin (1990) implemented the Monte Carlo method using a simple linear projection of taxable income based on actual past data to simulate future taxable income. Then, using simulated taxable income series and applying U.S. corporate tax law, he estimated the (expected) marginal tax rates of individual firms. Also using this approach, Graham (1996a) analysed the effects of marginal tax rate on U.S. firms' debt policy. He found a positive relationship between the firm-specific marginal tax rate and the change in debt ratio.

Most tax and capital structure research uses data drawn from financial statements rather than data from actual tax returns (Gordon and Lee 2001; Contos 2005). Graham and Mills (2006) found that simulated tax rates based on financial statement data are very highly correlated with tax variables based on tax return data.

Conversely, there are other empirical studies using statutory tax rates or average / effective tax rates as proxies for marginal tax rates (see *inter alia* Bradley *et al.* 1984; Trezevant 1992; Shum 1996; Sogorb-Mira 2005; De Jong, Rezaul and Thuy 2008). These substitutes for tax rates, however, are problematic in that they introduce a significant downward bias in estimates if potential endogeneity bias is not dealt with. Accordingly, Feld *et al.* (2013) state that the simulated marginal tax rates suggested by Graham (1996a) offer the advantage of avoiding a significant downward bias in estimation. Furthermore, Graham (1996b) and Plesko (2003) show that the simulation approach is the best available proxy of the “true” marginal tax rate. In particular, it is preferable to simply using variables that are assumed to be highly correlated with marginal tax rates, such as statutory tax rates, dummies which indicate whether a firm is reporting losses or trichotomous variables, such as those used in Byoun (2008) or Gropp (2002).

Our first and main hypothesis follows directly from the theoretical rationale and empirical evidence discussed previously, and is formulated as: *“Since higher marginal tax rates raise the value of tax savings, marginal tax rates should be positively related to firms’ debt policy”* (Hypothesis 1).

DeAngelo and Masulis (1980) introduced the idea of tax shield substitution, which contends that holding investment (and hence expected income) constant, debt interest competes with other allowable deductions as tax shelter. For example, if a more generous tax rule increases the firm’s depreciation allowance, then the firm’s optimal level of debt should decrease due to its lower value as a tax shield. Therefore, firms can substitute non-debt tax shields for debt tax shields. Following this rationale, firms with a large amount of non-debt tax shields will have lower levels of debt than firms with a small amount of non-debt tax shields. According to the debt substitution hypothesis, there should be a negative relationship between non-debt tax shields and debt usage.

In this context, Mackie-Mason (1990) highlights the fact that the tax shield substitute hypothesis of DeAngelo and Masulis (1980) is more applicable to firms that are close to being tax exhausted (i.e., firms that have a high probability of losing the deductibility of their tax shields). Trezevant (1992) refers to this as the tax exhaustion hypothesis. Moreover, Mackie-Mason (1990) takes issue with DeAngelo and Masulis (1980) by pointing out that firms with more profitable projects tend to have larger amounts of both depreciation and borrowing, and therefore non-debt tax shields may have a positive rather than a negative association with leverage. In order to identify the effect of debt substitution on tax exhaustion and profitability, Mackie-Mason (1990) proposes considering not only non-debt tax shields but also the probability of bankruptcy. It is likely that non-debt tax shields are a debt substitute for companies near bankruptcy and therefore near to tax exhaustion. Conversely, financially healthy companies that are far from tax exhaustion may jointly exploit both debt and non-debt tax shields.

Hence our second hypothesis can be formulated as: *"Non–debt tax shields on a stand-alone basis, should be positively related to firms' debt policy and non-debt tax shields, weighted by the probability of bankruptcy, should be negatively related to firms' debt policy"* (Hypothesis 2).

In the area of public finance, recent debate about corporate tax reform has focused on the consequences of asymmetric tax treatment of equity and debt financing. U.S. and European fiscal authorities have considered limiting the ability of companies to deduct interest payments from taxable income, as well as calling for equal treatment of equity and debt. Some examples are the Comprehensive Business Income Tax (CBIT) proposal by the U.S. Treasury, the Mirrlees Review proposals for the U.K. tax system or the Resolution of the ECOFIN Council Meeting of June 8, 2010, which recommended to European Union member states the adoption of thin-capitalization rules. The reason for this is that the tax-favoured status of debt has reduced tax revenue collection and supposedly encouraged a "debt bias" whereby tax incentives encourage companies to use extra debt. In this regard, it is believed that excessive use of debt financing increases firms' probability of becoming financially distressed and thereby exacerbates or perhaps even causes economic downturns. According to Mooij (2011), although the existence of debt in the capital structure did not cause the financial crisis, excessive leverage makes firms more vulnerable to economic shocks and therefore debt bias might have contributed to the extent of the crisis.

A stream of empirical research have examined the impact of taxes on the financing decisions of firms using tax reforms as natural experiments. In this sense, changes in the tax system are used as exogenous shocks to analyse whether companies respond as predicted by theory. Representative work in this field includes, but is not limited to, Alworth and Arachi (2001), An (2012), Panier, Pérez-González and Villanueva (2013), Doidge and Dyck (2015), Faccio and Xu (2015), and Heider and Ljungqvist (2015). A particular area within this area deals with the relationship between thin capitalization rules or other interest deduction restrictions and company capital structure decisions. Alberternst and Sureth (2015), and Dreßler and Scheuering (2015) investigate empirically the impact of introducing a limitation to the interest fiscal deductibility in the course of the German corporate tax reform of 2008. They all find evidence for the impact of such thin capitalization rule on companies´ debt ratio; specifically, companies that are affected by the interest barrier reduce their leverage typically more than companies that are not affected. Conversely, Blouin, Huizinga, Laeven and Nicodème (2014) examine the impact of thin capitalization rules that limit the tax deductibility of interest on the capital structure of the foreign affiliates of U.S. multinationals in 54 countries. In line with previous studies, they carve out a significant debt-reducing effect of different thin-capitalization rules on foreign partners´ debt.

Based on the abovementioned discussion and taking the opportunity that offers the Spanish corporate tax reform in 2012, we state our third and last hypothesis: *"Companies affected by the new thin-capitalization rule reduce their leverage ratio after the reform more than those companies that are not affected"* (Hypothesis 3).

1.3. The Spanish corporate tax setting

The regulation of corporate tax in Spain is contained in the Consolidated Text of the Corporate Income Tax Law, approved by Legislative Royal Decree 4/2004, of March 5th, and in the Corporate Income Tax Regulation approved by Royal Decree 1777/2004, of July 30th.

Corporate tax is determined by the statutory tax rate times taxable income. The Spanish legislator reduced the statutory tax rate from 32.5% for fiscal year 2007 to 30% for fiscal years 2008-2013.On the other hand, corporate taxable income is defined as the difference between period revenues and period expenses[6]. Business expenses are deductible if they are properly recorded and supported. By contrast with other countries, Spanish corporate income tax treats income resulting from the transfer of assets in the same way as other income. Accordingly, such income is generally added to (deducted from) regular business income to compute the taxable income.

Corporate taxable income is based on the income disclosed in the financial statements and accounting records, adjusted in accordance with tax principles. The 2007 Spanish General Accounting Plan approved by Royal Decree 1514/2007, of November 16th

[6] The tax period is the company´s business year. The annual tax return must be declared and the tax paid within 25 days following the six months after the end of the business year.

differentiates between the current income tax expense (income) and the deferred income tax expense (income). The total tax expense or income is the sum of these two items, which should nonetheless be quantified separately. On the one hand, the current income tax expense is the amount payable by the company as a result of income tax settlements for a given year. Conversely, the deferred income tax expense reflects in essence the recognition and settlement of deferred tax assets and liabilities. A deferred tax asset or liability represents the increase or decrease in taxes payable or refundable in future years as a result of temporary differences and any net operating loss or tax credit carry-forwards that exist at the reporting date. Its value is computed with reference to financial reporting standards for book income and tax rules for taxable income. For instance, deferred tax assets can be created by the tax authority recognizing revenues and/or expenses outside of the times set out in the accounting standards. In Spain "tax effect accounting", which includes the concept of net tax deferred assets, was first introduced in fiscal year 2007.

As in the majority of developed economies, the Spanish corporate tax system treats profits and losses asymmetrically and allows carryover of corporate losses. The Spanish tax code allows companies to carry forward losses to offset taxable income in future years, but unlike in other countries such as the U.S., Spanish firms cannot "carry back" current losses to receive a tax refund for taxes paid in recent years.

On March 30th, 2012, the Spanish Government approved several tax measures with effect from fiscal years beginning from January 1st, 2012[7]. Among such measures, the tax reform introduced new rules affecting the deductibility of financial expenses. In particular, it derogated the former Spanish thin-capitalization regime and replaced it by a broader rule that stablishes limitations to the deductibility of financial expenses incurred in excess of a given percentage of a Spanish borrower´s adjusted operating profits.

Under the new tax regime, all net financial expenses (i.e. excess of financial expenses in respect of financial income) incurred by a Spanish corporate taxpayer in a given year

[7] These measures were included in Royal Decree Law 12/2012.

that exceed 30% of such company´s annual operating profits[8] will be non-deductible for corporate tax purposes. Notwithstanding, there is a floor level to the previous limitation, and it is fixed at 1 million euros of net financial expenses. Hence, net financial expenses less or equal to 1 million euros shall be tax-deductible regardless of the level of a company´s operating profits in a given year.

Net financial expenses that are not tax-deductible in a given year due to the limitation explained above, may be carried over and deducted in the 18 subsequent years of the fiscal year in which such non-deductible amounts were generated.

Finally, the new thin-capitalization rule is not applicable to those corporate taxpayers that do not belong to a Group of companies (i.e. independent companies), unless more than 10% of such company´s total net financial expenses derive from either: (1) leverage that such company has with people or entities that hold an interest, directly or indirectly, of at least 20% in such company; or (2) leverage that such company has with creditors in which such company holds an interest, directly or indirectly, of at least 20%.

1.4. Model and variables

1.4.1. Model

Our baseline model establishes debt policy as a function of several tax variables and control variables. We use a static model of leverage because we are not interested in an economic model of the dynamic adjustment towards an optimal level of leverage. Its specification is:

$$\Delta LEV_{it} = \beta_0 + \sum_{j=1}^{m} \beta_j \cdot \text{TAX VARIABLES}_{jit} + \sum_{k=1}^{n} \beta_k \cdot \text{CONTROL VARIABLES}_{kit} + \\ + \eta_i + \eta_t + \varepsilon_{it} \quad [1]$$

[8] They basically correspond to earnings before interest, taxes, depreciation and amortization (EBITDA) with certain adjustments. For more information on this issue, refer to Royal Decree Law 12/2012.

Where LEV_{it} is a measure of leverage of firm *i* in year *t*; **TAX VARIABLES** represents the vector of tax explanatory variables; **CONTROL VARIABLES** denotes the vector of control variables; η_i represents time–invariant unobservable firm–specific effects (e.g., management performance, reputation, etc.); η_t represents time–specific effects which are common to all firms and may change over time (e.g., macroeconomic conditions); and ε_{it} is the disturbance term.

Each variable, both dependent and independent, is discussed in detail below. Specifically, we examine and propose some proxies for debt, taxes and non-debt tax shields, since taxation and debt are the focus of our paper. This is a key issue since the specific explanatory variables used in any study significantly influence tax effects; omitted variable biases are indeed quantitatively important (Feld *et al.* 2013).

1.4.2. Debt policy measures

A common issue in capital structure studies is identifying the appropriate measure of leverage. Two approaches have been developed in the study of the effects of the marginal tax rate on firms' debt policy:

- On the one hand, according to the *incremental approach*, the debt ratio is not an efficient measure of leverage as the dependent variable, since it is the cumulative result of decisions taken over many years and thus may not fully reflect changes in economic conditions. Therefore, when studying the effects of the marginal tax rate on firms' debt policy, it is more instructive to examine incremental financing decisions rather than simply widely-used debt ratios. The fact that important debt policy decisions in corporations may take a long time to be implemented supports this line of research. Studies that take this approach include Graham (1996a, 1996b), Shum (1996), Gropp (1997), Alworth and Arachi (2001), Kunieda *et al.* (2011), Hartmann-Wendels *et al.* (2012) and Sinha and Bansal (2013).

- On the other hand, the *cumulative approach* proposes the use of debt level ratio as the dependent variable. In this case, tax proxies are adjusted in some way in order not to produce a spurious relationship with debt policy. As will be discussed later on in Section 1.5., the potential endogeneity problem of the marginal tax rate is avoided by using before-financing tax proxies. Studies that support this approach include Graham *et al.* (1998), Graham (2000), Bartholdy and Mateus (2011) and Hartmann-Wendels *et al.* (2012).

In turn, Welch (2011) argues that debt-to-asset ratio is an inappropriate measure for capturing changes in leverage, especially when the ratio is to be used for capital structure studies, because total assets include non-financial liabilities, meaning that non-financial liabilities are thus treated the same as equity. In its place, Welch (2011) proposes the use of debt-to-capital employed ratio in such studies and therefore ignores non-financial liabilities such as trade payables, which mainly depend on business transactions and not on the effect of corporate income taxation.

In line with the previous rationale, this study employs two measures of leverage by considering incremental debt level in the numerator and capital employed in the denominator, thus:

- LEV_1 is the first difference in long-term book debt divided by the sum of long-term book debt and market value of equity.

- LEV_2 is the same as LEV_1 but using the lagged value of the denominator[9].

1.4.3. Tax variables

Testing the impact of taxes on company financing decisions is arduous and open to criticism. The main difficulty lies in finding an appropriate proxy for the company-specific marginal tax rate, as its “true” value is not observable. The computation of the

[9] We have also considered alternative leverage measures, including only debt financing. Unreported results remain qualitatively and quantitatively the same as those obtained in Section 1.6.

marginal tax rate requires two sets of information: (i) the tax code treatment of net operating losses, and (ii) the managers' expectations as to future income flows. We estimate the marginal tax rates of Spanish firms by the Monte Carlo method using Sinha and Bansal (2012) algorithm, which follows several stages. Firstly, we need a forecast of future income flows based on managers' expectations. The model proposed by Shevlin (1990) can be used to generate the proxy for managers' expectations, and is based on the assumption that pre-tax income follows a random walk with drift[10]. That is,

$$\Delta TI_{it} = \mu_{it} + \varepsilon_{it} \qquad [2]$$

ΔTI_{it} being the first difference in pre-tax income (i.e. taxable income) of company *i* in year *t*, μ_{it} is the sample mean of ΔTI_{it} and ε_{it} is a normally distributed random variable with zero mean and variance equal to that of ΔTI_{it} over the sample period. Although Shevlin (1990) uses historical mean and variance of taxable income, we follow Graham (1996b) and Alworth and Arachi (2001) for estimating the drifts and white noises of equation [2] in order to avoid a reduction in the number of years available for estimation. We use taxable income series calculated from the actual financial data for individual firms in our sample, and consider the entire horizon of the carry-forward sample. As Spanish tax code allows 15 years of loss carry-forward, we simulate future income for 15 years.

In absence of access to corporate tax returns, reported accounting figures must be used to infer taxable income. Due to the fact that accounting income does not necessarily equals taxable income, the former should be adjusted to take into account timing or temporary differences. These differences are categorized as taxable temporary differences (i.e. deferred tax liabilities) and deductible temporary differences (i.e. deferred tax assets). The former will result in higher tax payments or lower recoverable tax in future reporting periods, while the latter will result in lower tax payments or

[10] Blouin, Core and Guay (2010) also simulate marginal tax rates but with a different assumption of future taxable income. While Shevlin (1990) adopts a random walk assumption, Blouin *et al.* (2010) use a mean-reverting process (namely, non-parametric procedure) to simulate future taxable income. Previous empirical evidence has proved insignificant differences between the final MTR estimates under both procedures (see, for instance, Ko and Yoon 2011).

higher recoverable tax in future reporting periods. As a result, we calculate taxable income as follows,

$$TI_{it} = EBT_{it} - \frac{\Delta \text{Net tax deferred assets}_{it}}{\text{Statutory tax rate}_t} \quad [3]$$

Where *EBT* is earnings before taxes, and net tax deferred assets is the difference between deferred tax assets and deferred tax liabilities coming from the balance sheet[11]. We divide the subtrahend term by the corporate statutory tax rate in order to come up with a gross measure of tax base.

Secondly, using the simulated taxable income, we calculate the corporate tax bill (T_{it}) with the statutory tax rates and the loss carry-forward rules of the Spanish corporate tax system.

Thirdly, we obtain the present value of the corporate tax bill:

$$PV(T_i) = \sum_{t=2007}^{2013+\text{Carryforward}} \frac{T_{it}}{(1+R)^{t-2007}} \quad [4]$$

Where T_{it} is the corporate tax bill and *R* is the discount rate[12].

After adding one euro to the taxable income values used above, we recalculate the annual corporate tax bills. We consider increase in taxable income for the initial period of the simulation time horizon as in Shevlin (1990) and Graham (1996a). We then compute once more the present value of the new corporate tax bills:

$$PV(T_i') = \sum_{t=2007}^{2013+\text{Carryforward}} \frac{T_{it}'}{(1+R)^{t-2007}} \quad [5]$$

[11] See Section 1.3. for more information.
[12] Although Shevlin (1990) and Graham (1996a) use the corporate bond rates of individual firms, we use the internal rate of return of 10-year government bonds for all firms (http://www.afi.es/infoanalistas/indicesAfi/mostrarIndicesAfi.asp) as not all Spanish listed firms issue long-term bonds,.

Fourthly, we take the difference between the present values of equations [4] and [5] in order to obtain a single value of the marginal tax rate.

Fifthly, we repeat the process 10,000 times and the average of these simulated marginal tax rates is the (expected) marginal corporate tax rate (*MTR*) of firm *i*[13]. Averaging these marginal tax rates should represent managers' expectation of the marginal tax rate. This simulation process is carried out for all companies in the sample.

As will be discussed in Section 1.5., we also calculate another series of (expected) marginal corporate tax rates based on an alternative measure of income: earnings before interest and taxes. We thus obtain two series of marginal tax rates: the after-interest *MTR*, simply denoted *MTR*, and the pre-interest *MTR*, which we designate *MTREBIT*.

We have also computed a non-debt tax shield variable (*NDTS*), which is the first difference in book depreciation[14] divided by the sum of lagged book total debt plus lagged market equity value. In addition, we have calculated an interaction variable (*NDTS*RISK*) which is *NDTS* multiplied by a bankruptcy probability index[15].

1.4.4. Control variables

The different theories of capital structure suggest that, besides taxes, there are several other determinants of debt policy (Frank and Goyal 2009). On the basis of our data set we also use the following variables, described below, as control variables in our regression analysis.

- Probability of bankruptcy (*RISK*): we use a bankruptcy probability index based on accounting ratios, which is a variant of Altman (1968) *Z-Score*. In line with Mackie-Mason (1990) and Graham (1996a) we calculate this variable as total

[13] While Shevlin (1990) and Graham (1996a) only repeat this procedure 50 times for each firm, we repeat this simulation 10,000 times for each firm to obtain more stable results.
[14] Although NDTS has often included both depreciation and investment tax credit in previous U.S. studies (see Bradley *et al.* 1984; and Mackie-Mason 1990), we include only depreciation, as investment tax credit is less important in the Spanish corporate tax system than in the U.S. corporate tax system.
[15] See the next subsection relating to control variables for a description of this bankruptcy probability index.

assets divided by the sum of 3.3 times *EBIT*, 1.0 times *sales*, 1.4 times *retained earnings* and 1.2 times *working capital*. The trade-off theory of capital structure predicts that if the bankruptcy probability of a firm is higher, then the expected cost of financial distress is also higher, and the firm tends to reduce its debt ratio accordingly.

- Tangibility (*TANG*): we compute the percentage of tangible assets over total assets. If a higher tangibility ratio implies a lower probability of bankruptcy, the trade-off theory predicts that firms with higher tangibility ratios will tend to have higher debt ratios. This is in line with an emphasis on the agency cost of debt, as tangible assets can easily be used as collateral for debt.
- Size (*SIZE*): we use the natural logarithm of total assets. Since the bankruptcy probability of larger firms is lower due to their more widely-diversified business, the trade-off theory predicts that larger firms will have higher debt ratios.
- Profitability (*PROF*): we calculate the ratio of earnings before interest, taxes, depreciation and amortization (i.e. EBITDA) to total assets. Profitable companies generate more cash than less profitable firms do for a given leverage level, and they face lower probability of default and lower expected costs of financial distress. Moreover, profitable firms find interest tax shields more valuable. Consequently, the trade-off theory expects that more profitable firms will be more financially indebted. Furthermore, the use of more debt in more profitable firms will help generating less agency costs coming from managers in their discretionary use of internal funds.
- Growth opportunities (*TOBIN´S Q*): we use the market to book total assets ratio. The increase in leverage to finance future growth opportunities might lead to underinvestment. Growth increases costs of financial distress, reduces free cash problems and exacerbates debt-related agency problems. Therefore, the theory of capital structure expects a negative relation between debt level and growth opportunities.

Table A-1.1. in the Appendix provides a summary of the definitions of the dependent and explanatory variables.

1.5. Data and descriptive analysis

The data used in this paper come from three sources. Sistema de Análisis de Balances Ibéricos (SABI), a database managed by Bureau Van Dijk and Informa D&B, S.A., and the Spanish Securities and Exchange Commission (CNMV), provide the accounting information from annual accounts, while financial market information comes from the quotation bulletins of the Spanish Stock Exchange.

Our sample comprises Spanish listed companies with information for the seven-year period spanning 2007 to 2013. We focus on listed companies due to the fact that we need information on market data to calculate dependent and explanatory variables. Besides, detailed information for tax purposes is gathered only on the annual report, and this accounting statement is not available on SABI database; instead, it is actually accessible at CNMV registries but only for listed companies. On the other hand, we concentrate on this particular period because the necessary data for estimating firm-specific marginal tax rates using the method of Shevlin (1990) and Graham (1996a) have only been available since fiscal year 2007 in Spain[16]. Furthermore, International Financial Reporting Standards (IFRSs) were implemented in Spain on January 1st 2008. The adoption of these IFRSs allows comparing our results from the capital structure of Spanish listed companies with those from other markets that have also adopted IFRSs.

As per standard practice in the empirical literature, we disregard financial institutions, utilities and governmental enterprises since these types of companies are intrinsically different in terms of the nature of their operations and financial accounting information. We also excluded companies with negative equity, i.e. near-bankrupt firms. Overall, we have a data panel containing 88 companies.

Table A-1.2. in the Appendix includes several key figures describing our firm´s sample and compares them with those of the population of large corporate tax payers (LCTP) in Spain with a total income higher than 180 million Euros[17]. As reported, the relevance and representativeness of our sample is noteworthy. For instance, both total assets and

[16] As in many other countries, data based on financial statements do not reflect tax accounting conventions and companies' actual tax incentives. See Section 1.3. for more information.

[17] For comparison purposes, we focus on non-financial companies and total income that exceeds 180 million Euros as our sample has a mean total income of 557 million Euros.

total debt comprise approximately one fifth of the population data, with a similar coverage for financial expense. In the case of tax expense, our sample represents a maximum of almost 90% of the population data in 2012 and a minimum of 11% a year before. As far as earnings is concerned, around half of the earnings before interest and taxes (EBIT) of the population is covered by our sample data, and around one third in the cases of earnings before taxes (EBT) and net income.

In order to reduce the effect of outliers, all variables are winsorized at 0.5% in each tail of the distribution. Table 1.1. presents summary statistics of the dependent and explanatory variables.

TABLE 1.1.: DESCRIPTIVE STATISTICS

Category	Variables	Mean	Median	St. Dev.	Min.	Max.	Skewness	Kurtosis
Leverage Variables	LEV_1	-0.0141	0	0.2426	-1.9579	0.6200	-3.9433	30.0301
	LEV_2	0.0244	0	0.2103	-0.6421	1.3844	3.0173	20.6345
Tax Variables	*MTR*	0.1793	0.1889	0.0768	0.0004	0.2998	-0.4471	2.2473
	MTREBIT	0.1818	0.1909	0.0798	0.0002	0.3000	-0.5247	2.4316
	NDTS	0.00003	0.00002	0.0047	-0.0314	0.0213	-1.5581	19.9957
	*NDTS*RISK*	-0.0045	0.00005	0.0617	-0.9430	0.1390	-12.1201	171.0720
Control Variables	*RISK*	4.3280	1.2984	40.8161	-110.4586	428.6164	8.3677	86.4585
	TANG	0.1086	0.0341	0.1632	0.0000	0.8453	2.1855	8.1530
	SIZE	20.5022	20.4598	1.9402	16.0249	25.6336	0.3070	2.6411
	PROF	0.0551	0.0472	0.0980	-0.4259	0.4714	0.1009	10.1035
	TOBIN´S Q	1.6096	1.2607	1.2974	0.2986	8.8846	3.3323	16.3729

Table A-1.1. in the Appendix provides definitions of all the variables.

The average annual growth in company debt was equal to -1.41% of capital employed and 2.44% of lagged capital employed. The average of the estimated marginal tax rates of all firms is 17.93% (18.18% for *MTREBIT*), which is much lower than the statutory tax rate (32.50% for fiscal year 2007 and 30.00% for fiscal year 2008 onwards). This gap is caused by asymmetrical tax treatment of profits and losses and by the loss carry-forward provision in the Spanish corporate tax system. The standard deviation of the marginal tax rates is 7.68% (7.98% for *MTREBIT*), implying that there is moderate variation in the marginal tax rates of all firms.

The probability of bankruptcy measure averages about 4.33 for all firm-year observations, but values are widely dispersed (standard deviation of 40.82). The average size of the companies included in the sample is approximately €802 million in terms of market value of assets. Besides, the average profitability of our sample amounts to 5.51%, and the market to book ratio shows a 1.61 average value.

We have calculated the correlation matrix and, additionally, we have performed a multicollinearity test using the Variance Inflation Factor (*VIF*). Results are reported in Table A-1.3. in the Appendix, and the low *VIF* values suggest that there is no collinearity among the variables considered.

Table 1.2. shows average statistics on the two alternative measures of the marginal tax rate of the sampled firms.

TABLE 1.2.: TIME EVOLUTION OF *MTR* AND *MTREBIT*

Year	*MTR* Mean	*MTREBIT* Mean	*MTR* Median	*MTREBIT* Median	*MTR* Minimum	*MTREBIT* Minimum	*MTR* Maximum	*MTREBIT* Maximum
2008	0.2045	0.2087	0.2174	0.2155	0.0987	0.1064	0.2794	0.2799
2009	0.1995	0.2013	0.2033	0.2099	0.0616	0.0299	0.2980	0.2998
2010	0.1829	0.1846	0.1913	0.1902	0.0438	0.0080	0.2988	0.2999
2011	0.1745	0.1768	0.1815	0.1834	0.0189	0.0025	0.2994	0.2999
2012	0.1688	0.1716	0.1764	0.1797	0.0083	0.0006	0.2997	0.3000
2013	0.1649	0.1679	0.1728	0.1755	0.0040	0.0002	0.2998	0.3000
2008-2013	**0.1793**	**0.1818**	**0.1889**	**0.1909**	**0.0040**	**0.0002**	**0.2998**	**0.3000**

MTR is the marginal tax rate estimated as per Shevlin (1990) and Graham (1996a), and *MTREBIT* is the marginal tax rate estimated using earnings before interest and taxes as per Graham *et al.* (1998).

In order to compare the previous figures with other traditional tax measures, we have calculated *ETR* which is the ratio of taxes paid on profits to pre-tax income, excluding extraordinary and discontinued items, as well as *ETRb*, whose numerator is taxes accrued on profits and has the same denominator as the preceding ratio. Table 1.3. reports average statistics on these two other measures of the effective tax rate of the sampled firms.

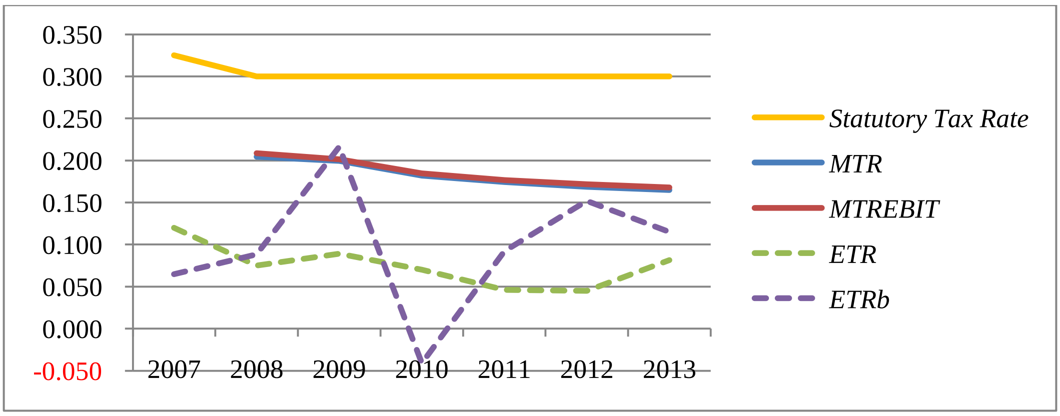
TABLE 1.3.: TIME EVOLUTION OF *ETR* AND *ETRb*

Year	*ETR* Mean	*ETRb* Mean	*ETR* Median	*ETRb* Median	*ETR* Minimum	*ETRb* Minimum	*ETR* Maximum	*ETRb* Maximum
2007	0.1208	0.0649	0.0409	0.1147	0.0000	-2.5467	0.5953	1.9553
2008	0.0750	0.0885	0.0000	0.0929	0.0000	-4.4166	0.4550	4.2640
2009	0.0893	0.2162	0.0000	0.1352	0.0000	-2.0200	1.0819	3.4771
2010	0.0702	-0.0410	0.0000	0.0691	0.0000	-4.4166	1.0819	1.4811
2011	0.0460	0.0921	0.0000	0.0726	0.0000	-2.2445	0.3284	3.7596
2012	0.0450	0.1519	0.0000	0.0531	0.0000	-1.5034	0.2912	4.2640
2013	0.0817	0.1149	0.0000	0.0766	0.0000	-4.4166	1.0819	4.2640
2007-2013	**0.0754**	**0.0982**	**0.0000**	**0.0811**	**0.0000**	**-4.4166**	**1.0819**	**4.2640**

ETR is taxes paid on profits divided by pre-tax book income, excluding extraordinary and discontinued items. *ETRb* is taxes accrued on profits divided by pre-tax book income, excluding extraordinary and discontinued items.

Figure 1.1. shows the time evolution of the statutory tax rate, *MTR*, *MTREBIT*, *ETR* and *ETRb*.

FIGURE 1.1.: TIME EVOLUTION OF *MTR, MTREBIT, ETR, ETRb* AND *STATUTORY TAX RATE*



During the period 2007-2013, statutory tax rates remained mostly stable. Conversely, from 2008 onwards, there is an increasing number of companies with losses (i.e. pre-tax book income and *EBIT*<0). Simultaneously, the number of companies with *MTR* and *MTREBIT* below 10% increases. Overall, there is a downward trend in both *MTR* and *MTREBIT*.

Figure1.2. shows the distribution of simulated marginal tax rates (*MTRs*) for all sampled firms from 2007 to 2013 and an aggregation across all years in the sample. The data indicate that there is a substantial variation in the marginal tax rate across firms and over time. In any given year, none of the firms have *MTRs* equal to the top statutory tax rate, about 10% of firms have *MTRs* below 5%, while the rest have *MTRs* ranging between 5% and the highest rate (i.e. 29.98%). The relatively large percentage of low tax rates is due to the fact that over 35% of the observations in the sample represent firms with negative taxable income. Furthermore, a significant percentage of firms has low *MTRs* (<10%) in 2010 (20% of firms) and 2013 (23% of firms). This is probably because approximately 24% and 37% of the sampled firms experienced losses (i.e. pre-tax book income lower than zero) in 2010 and 2013, respectively.

FIGURE 1.2.: *MTR* DISTRIBUTION

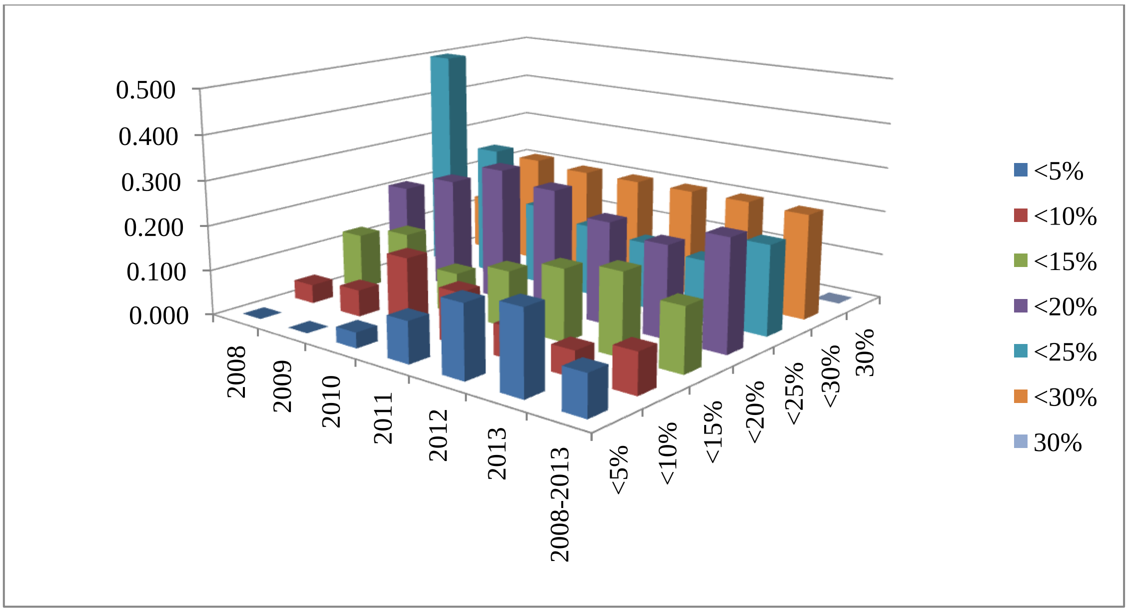
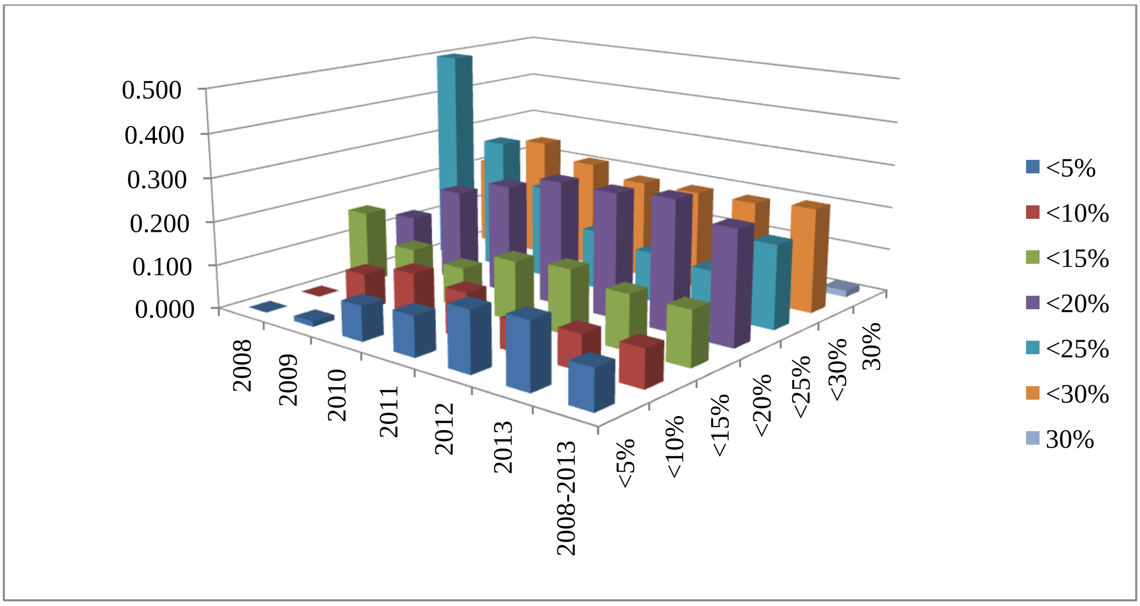


Figure 1.3. depicts the distribution of simulated marginal tax rates, calculated using earnings before interest and taxes as the base for taxable income (*MTREBITs*) for the sampled firms from 2007 to 2013, and an aggregation across all years in the sample. The data reveal substantial variation in the marginal tax rate across firms and over time. In any given year, about 2% of the firms have *MTREBITs* equal to the top statutory tax rate, about 10% have *MTREBITs* below the 5%, while the rest have *MTREBITs* ranging between 5% and the highest rate (i.e. 30%). The cross-sectional variation in tax rates occurs because of the carry-forward features of the tax code. The relatively large percentage of low tax rates is due to the fact that over 27% of the observations in the sample represent firms with negative taxable income.

FIGURE 1.3.: *MTREBIT* DISTRIBUTION



1.6. Empirical strategy and results

As Roberts and Whited (2013) state in their survey paper, the most important and pervasive issue confronting studies in empirical corporate finance is endogeneity. In the case of testing the impact of taxes on companies' financing decisions, the difficulty stems from the fact that any measure of marginal tax rates based on actual balance sheet data is not exogenous. This is due to the marginal tax rate´s dependence on past financing decisions: the higher the leverage ratio, the lower the taxable income and the expected marginal tax rates because of the interest deductibility. This may result in a negative relationship between leverage ratios and estimated marginal tax rates even if high taxes encourage companies to use debt as a financing instrument. Consequently, the endogeneity of the tax status may produce a spurious correlation between the leverage ratio and the marginal tax rate, making it difficult, if not virtually impossible, to draw causal inferences.

As discussed in Section 1.2., we have formulated three empirical hypotheses for our research. The correct testing of these hypotheses requires the overcoming of the endogeneity issue, and as such we apply two different methodologies: regression approach and difference in differences approach. Both of them will allow us to test Hypotheses 1 and 2, and the latter one will be used in order to test Hypothesis 3.

1.6.1. Regression approach

Conventionally, there have been two possible solutions to the endogeneity problem in the empirical literature (Graham *et al.* 1998). The first resembles a traditional way of implementing an endogenous regressor in econometrics, that is, using the lagged value of the simulated marginal tax rate as an explanatory variable. In turn, since the simulated marginal tax rate based on the pre-tax income (and after interest) already incorporates the firm's leverage choices, a second possible solution to the endogeneity problem uses income before interest to compute marginal tax rates. Therefore, this second strategy considers the contemporaneous value of the marginal tax rate as an explanatory variable but simulated on a before-financing basis, i.e. with earnings before interest. Our empirical research will use the latter solution to avoid the endogeneity of marginal tax rates. Notwithstanding, we will check as a robustness test the instrumental variable solution.

As there is an incremental basis to our dependent variable, we use – as per Graham (1996a) - the changes in possible determinants as explanatory variables, except for the variables *MTREBIT, NDTS*RISK* and *RISK.* Therefore, our model equation [1] is now as follows:

$$\Delta LEV_{it} = \beta_0 + \beta_1 \cdot MTREBIT_{it} + \beta_2 \cdot NDTS_{it} + \beta_3 \cdot NDTS_{it} * RISK + \beta_4 \cdot RISK_{it} + \\ + \beta_5 \cdot \Delta TANG_{it} + \beta_6 \cdot \Delta SIZE_{it} + \beta_7 \cdot \Delta PROF_{it} + \beta_8 \cdot \Delta TOBIN\acute{}S\,Q_{it} + \eta_i + \eta_t + \varepsilon_{it}$$

Where LEV_{it} is a measure of leverage of firm *i* in year *t*; *MTREBIT* represents the marginal tax rate estimated with earnings before interest and taxes; *NDTS* is the non-debt tax shield variable; *RISK* is the probability of bankruptcy variable; *TANG* is the tangibility variable; *SIZE* denotes the natural logarithm of total assets; *PROF* is the return on assets ratio; *TOBIN´S Q* is the market to book assets ratio; η_i represents time–invariant unobservable firm–specific effects; η_t represents time–specific effects which are common to all firms and may change over time; and ε_{it} is the disturbance term.

Table 1.4. shows the estimation results of our regression model for both leverage measures LEV_1 and LEV_2.

TABLE 1.4.: ESTIMATION RESULTS OF THE CAPITAL STRUCTURE MODEL FROM EQUATION [1]

Explanatory Variables	LEV_1	LEV_2
MTREBIT	2.1882** (0.938)	1.0784 (0.975)
NDTS	1.2645 (1.601)	1.5358 (1.724)
*NDTS*RISK*	-0.3945*** (0.073)	-0.1220 (0.091)
RISK	-0.0005* (0.000)	-0.0008* (0.000)
TANG	0.2438* (0.129)	0.2392* (0.136)
SIZE	0.2811*** (0.077)	0.2189*** (0.076)
PROF	0.2976* (0.1704)	0.2962 (0.2475)
TOBIN´S Q	-0.1589*** (0.045)	-0.0831*** (0.017)
Observations	434	434
R-Squared Within	0.2003	0.1206
Wald test (F-statistic)	10.59 (0.000)	5.79 (0.000)
Hausman test (χ^2)	17.44 (0.026)	8.11 (0.423)

Fixed–effect regression coefficients estimated from Equation [1] with robust standard errors in brackets. Table A-1.1. in the Appendix provides definitions of all the variables. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels. Wald test statistic refers to the null hypothesis that all coefficients of the explanatory variables are equal to zero. Hausman test refers to the null hypothesis of both fixed effects and random effects being equivalent.

In the case of the regression for LEV_1, with the exception of *NDTS* all parameter estimates have the expected signs and are statistically significant. The Wald test confirms the significance of the overall regression equation. Conversely, the results of the Hausman test enable us to reject the hypothesis regarding the absence of correlation between the unobservable effects and the explanatory variables and, thereby, we consider the individual effects as fixed. To address the economic significance of the estimated coefficient of 2.1882 on *MTREBIT* reported in Table 1.4., consider the impact on leverage policy resulting from a movement from average *MTREBIT* of 0.1818 (see Table 1.1.) to the maximum for the sample period (0.3000). All else equal, a hypothetical firm with a marginal tax rate of 30.00% would increase the use of net debt (i.e. the change in its debt ratio) by 25.86%, compared to an identical firm with a marginal tax rate of 18.18%.

When LEV_2 is used as dependent variable, the most important difference from the previous results is that *MTREBIT* is no longer statistically significant. Therefore, we partially confirm our Hypothesis 1 whereby debt policy and marginal tax rates are positively related. Moreover, the results in the case of dependent variable LEV_1 support our Hypothesis 2 regarding non-debt tax shields. Control variables show the typical and expected coefficient signs.

1.6.2. Difference in differences approach

An alternative approach to overcome the endogeneity problem of the tax status in capital structure research, is to look for exogenous changes in tax laws, and then analyse how companies react to those changes by adjusting their debt ratios. In this sense we have controlled for the effects that may arise from the changes coming from the 2012 Spanish corporate tax income reform. For that reason, we use a difference in differences approach (DiD)[18] and divide our firms´ sample into a treatment group and a control

[18] We refer to Roberts and Whited (2013) for an in depth review of econometric techniques aimed at addressing endogeneity problems, including techniques such as DiD that rely on a clear source of exogenous variation. The DiD strategy is adequate to estimate the effect of important changes in the economic environment or changes in government policy (Lemmon and Roberts, 2010).

group. We design the treatment group by identifying those companies that are likely to be affected by the new thin-capitalization rule. Accordingly, the classification criteria relates to the following:

- A company is included in the treatment group if its net financial expenses exceed 30% of EBITDA, considering net interest expense surpasses 1 million euros, and it is considered as a fiscal group.
- A company is assigned to the control group if it does not meet the previous criteria.

The main characteristics of the companies of both treatment and control groups are reported in Table A-1.4. in the Appendix. On average, the treatment group shows a 23.61% points larger debt level than the control group. It is expected that the treatment group has a higher absolute value of leverage than the control group. Treatment group companies must have correspondingly high interest expenses to ensure that the tax deductibility restriction applies, while companies in the control group will not incur in such high interest allowances. In this respect, the aim of the tax reform to target highly indebted companies is attained. Additionally, the average marginal tax rate is higher in the treatment group, and these companies show a riskier position than their non-treated counterparts. Furthermore, treated companies have both a lower average tangibility and average profitability compared with control group firms.

Under the DiD approach, also known as “interaction among dummy variables”, we construct two dummy variables: the first one is called *TREATED* which is equal to 1 if the company belongs to the treatment group and zero otherwise; the second one is called *TAX_REFORM* which is equal to 1 for fiscal years 2012 and 2013 (i.e. after the implementation of the corporate tax reform) and 0 for all the preceding fiscal years. The resulting DiD model with the inclusion of the two new dummy variables is:

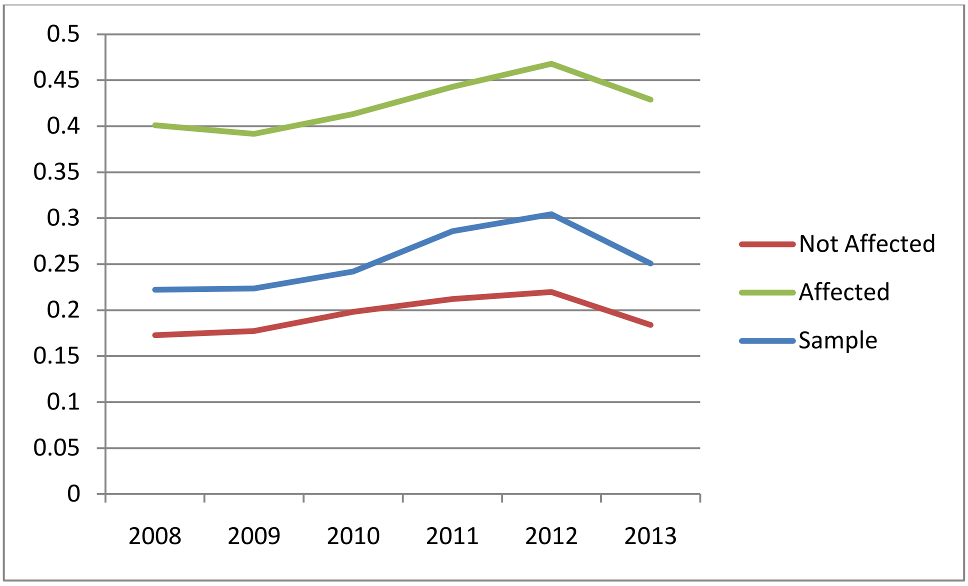
$$\Delta \mathrm{LEV}_{\mathrm{it}} = \beta_0 + \beta_1 \cdot TREATED_{\mathrm{it}} + \beta_2 \cdot TAX\_REFORM_{\mathrm{it}} + \beta_3 \cdot TREATED_{\mathrm{it}} \cdot TAX\_REFORM_{\mathrm{it}}$$
$$\sum_{\mathrm{j=1}}^{\mathrm{m}} \beta_{\mathrm{j}} \cdot \mathrm{TAX\ VARIABLES}_{\mathrm{jit}} + \sum_{\mathrm{k=1}}^{\mathrm{n}} \beta_{\mathrm{k}} \cdot \mathrm{CONTROL\ VARIABLES}_{\mathrm{kit}} + \eta_{\mathrm{i}} + \eta_{\mathrm{t}} + \varepsilon_{\mathrm{it}} \qquad [6]$$

Where the dependent variable, and tax and control variables have been identified before in Equation [1]; η_i is the fixed effect for company i; η_t is the fixed effect for year t; and ε_{it} is the residual term. The interaction term *TREATED*TAX_REFORM* equals 1 when company i belongs to the treatment group and year t is 2012 or 2013; conversely, it is equal to zero otherwise. The β_3 coefficient in Equation [6] offers us the DiD estimate of the treatment effect, namely the change in the debt ratio of the treatment group and that of the control group before and after the tax reform came into effect. We expect this coefficient to be negative and statistically significant.

To be able to identify the expected post-reform reaction, it is necessary that there is a parallel trend of the dependent variable of the two groups of companies (namely, treatment and control) prior the reform. The exogenous shock that is the limitation to the tax deductibility of financial expenses, is supposed to affect only the treatment group. Consequently, we expect an adjustment of the debt policy in the treatment group. In terms of the direction of the post-reform response, it is expected that companies in the treatment group reduce their leverage position more strongly than those counterparts in the control group.

As discussed, the parallel trend assumption requires similar trends in the outcome variable during the pre-reform time period for both treatment group companies and their non-treated counterparts. In our case, this assumption translates into similar changes in the leverage ratio for the treatment and control groups prior to 2012. It is worth mentioning that the parallel trend assumption does not require that the indebtedness level be the same across the two groups or the two time periods, as these distinctions are differenced out in the estimation. Figure 1.4. illustrates the time evolution of the debt level scaled by total assets of both treatment (i.e. companies affected by the tax reform) and control (i.e. companies not affected by the tax reform) groups.

FIGURE 1.4.: DEBT LEVEL TIME EVOLUTION OF TREATED VS. CONTROL COMPANIES



The mean debt level of the entire sample increases slightly throughout the whole period. Overall, an increase of approximately 2.86% from 22.20% in 2008 to 25.06% in 2013 can be observed. Regarding treatment group companies, they increase their mean leverage by 2.80% from 40.09% in 2008 to 42.89% in 2013. Conversely, not affected or control group companies increase their mean debt level by a lower 1.10% from 17.27% in 2008 to 18.37% in 2013. On a closer examination, the mean leverage reaches a maximum of 46.79% (21.97%) for treated (non-treated) companies in 2012. It is noteworthy to underline that there is a significant decrease in the mean debt level of 3.90% (3.60%) for the treatment (control) group from 2012 to 2013. From a simple descriptive perspective, Figure 4 shows that on average companies affected by the 2012 corporate tax reform reduce their debt ratio after the reform to a larger extent than their not affected counterparts.

In order to validate statistically whether there was a parallel trend of the dependent variable between treatment and control groups in the pre-reform period (i.e. before fiscal year 2012), we carry out a placebo test as in Almeida, Campello, Laranjeira and Weisbenner (2011). The three time windows chosen are prior to the 2012 corporate tax reform, and can be regarded as a placebo reform in 2011. The DiD placebo test is implemented in two ways, namely without and with covariates (Villa 2012). Tables 1.5. and 1.6. report respectively the results of this test.

TABLE 1.5.: DID PLACEBO TEST WITHOUT COVARIATES

		2010-2011	2009-2011	2008-2011
	Treatment	0.413	0.392	0.401
Pre-reform	Control	0.198	0.177	0.173
	Difference	0.215*** (0.058)	0.215*** (0.055)	0.228*** (0.054)
	Treatment	0.443	0.443	0.443
Post-reform	Control	0.213	0.213	0.213
	Difference	0.230*** (0.051)	0.230*** (0.048)	0.230*** (0.048)
DiD	Treatment / Control	0.015 (0.077)	0.016 (0.073)	0.002 (0.072)

The treatment group is defined as companies affected by the tax reform, while the control group includes companies not affected by the reform. DiD is the difference between the average differences for the two groups of firms. Robust standard errors are in brackets. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels.

TABLE 1.6.: DID PLACEBO TEST WITH COVARIATES

		2010-2011	2009-2011	2008-2011
	Treatment	-0.115	-0.056	0.370
Pre-reform	Control	-0.294	-0.261	-0.027
	Difference	0.179*** (0.054)	0.205*** (0.052)	0.397*** (0.148)
	Treatment	-0.081	0.042	0.190
Post-reform	Control	-0.269	-0.235	-0.005
	Difference	0.188*** (0.049)	0.193*** (0.046)	0.195*** (0.051)
DiD	Treatment / Control	0.009 (0.070)	-0.012 (0.067)	-0.202 (0.155)

The treatment group is defined as companies affected by the tax reform, while the control group includes companies not affected by the reform. DiD is the difference between the average differences for the two groups of firms. Robust standard errors are in brackets. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels.

None of the DiD coefficients are statistically significant; in other words, the difference in leverage ratios between treatment and control groups is insignificant for every year considered prior to the 2012 tax reform. This implies that the analysed companies do not differ in the financial behaviour and all the companies react in the same way. This finding constitutes evidence that there is a parallel trend between the two groups in the years before the tax reform.

Table 1.7. presents the results of the difference in differences estimation using the matched sample. It shows the average difference between the post-reform period and the pre-reform period for the treatment and control groups. We have considered two time windows in the analysis.

TABLE 1.7.: DID WITHOUT COVARIATES

		2011-2012	2011-2013
	Treatment	0.443	0.443
Pre-reform	Control	0.213	0.213
	Difference	0.230*** (0.054)	0.230*** (0.049)
	Treatment	0.468	0.429
Post-reform	Control	0.220	0.184
	Difference	0.248*** (0.053)	0.245*** (0.052)
DiD	Treatment / Control	0.018 (0.076)	0.015 (0.072)

The treatment group is defined as companies affected by the tax reform, while the control group includes companies not affected by the reform. DiD is the difference between the average differences for the two groups of firms. Robust standard errors are in brackets. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels.

The DiD estimates point out that, in spite of the higher decline in the mean debt level from 2012 to 2013 of the treatment companies compared to the group companies (see Figure 4), the change in leverage of the affected firms is not different from that of the control firms. This finding does not confirm our Hypothesis 3.

Finally, Table 1.8. depicts the estimation results of our difference in difference regression model coming from Equation [6].

TABLE 1.8.: REGRESSION ESTIMATION RESULTS UNDER THE DID APPROACH

Explanatory Variables	LEV_1	LEV_1
TREATED	0.0381 (0.043)	0.0475 (0.039)
TAX_REFORM	-0.0525* (0.030)	0.0077 (0.031)
*TREATED*TAX_REFORM*	-0.0271 (0.070)	-0.0174 (0.061)
MTREBIT		2.4026** (1.071)
NDTS		1.2475 (1.611)
*NDTS*RISK*		-0.3902*** (0.071)
RISK		-0.0006** (0.000)
TANG		0.2343* (0.129)
SIZE		0.2779*** (0.078)
PROF		0.3018* (0.171)
TOBIN´S Q		-0.1570*** (0.044)
Observations	528	434
R-Squared Within	0.0166	0.2027
Wald test (F-statistic)	1.74 (0.164)	7.67 (0.000)
Hausman test (χ^2)	3.48 (0.323)	17.57 (0.092)

Fixed-effect regression coefficients estimated from Equation [6] with robust standard errors in brackets. *TREATED* is a dummy variable that takes the value of 1 if the firm is affected by the 2012 corporate tax reform; *TAX_REFORM* is a dummy variable that takes the value of 1 for data after the tax reform. Table A-1.1. in the Appendix provides definitions of the rest of the variables. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels.

The interaction term, *TREATED*TAX_REFORM*, captures to what extent companies in the treatment group adjust their leverage when they are affected by the 2012 tax reform. The coefficient of this interaction term has turned out to be statistically non-significant. Therefore, our Hypothesis 3 is not confirmed which can be interpreted as there does not seem to exist a tax reform effect.

As far as the rest of estimates is concerned, the signs and significance of the coefficients remain qualitative and quantitatively alike to those encountered in Table 1.4. Consequently, Hypotheses 1 and 2 are again confirmed.

1.7. Robustness of results

In order to assess the robustness of our previous empirical evidence, we perform six different tests.

Firstly, in the regression approach that we have applied in the preceding Section, a pre-interest income measure of the marginal tax rate was used in order to confront the endogeneity problem. This solution evades the effect of financing decisions, and thus alleviates the non-exogeneity tax status of companies. Nevertheless, there still could exist biases in this measure due to potential earnings manipulation from managers in order to influence the marginal tax rate and hence, the company´s debt policy. Consequently, as a robustness check we have instrumented the leverage dependent variable with its lag. Table 1.9. presents the results of this new estimation and corroborate our previous findings.

TABLE 1.9.: ESTIMATION RESULTS OF THE CAPITAL STRUCTURE MODEL FROM EQUATION [1] WITH LAGGED MTR

Explanatory Variables	LEV_1	LEV_2
LAGGED_MTR	1.2749* (0.748)	0.2994 (0.681)
NDTS	1.6540 (2.015)	2.7423 (2.121)
*NDTS*RISK*	-0.3945*** (0.099)	-0.1254 (0.089)
RISK	-0.0005* (0.000)	-0.0008* (0.000)
TANG	0.3186** (0.156)	0.3508** (0.143)
SIZE	0.2588*** (0.080)	0.1742** (0.077)
PROF	0.4226** (0.172)	0.4298 (0.273)
TOBIN´S Q	-0.1553*** (0.047)	-0.0761*** (0.016)
Observations	370	370
R-Squared Within	0.2025	0.1293
Wald test (F-statistic)	8.70 (0.000)	5.09 (0.000)
Hausman test (χ^2)	21.12 (0.007)	7.24 (0.511)

Fixed–effect regression coefficients estimated from Equation [1] with robust standard errors in brackets. Table A-1.1. in the Appendix provides definitions of the variables. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels. Wald test statistic refers to the null hypothesis that all coefficients of the explanatory variables are equal to zero. Hausman test refers to the null hypothesis of both fixed effects and random effects being equivalent.

Secondly, the relationship between marginal tax rates and debt policy could be influenced by the leverage status of the companies. Specifically, the positive effect of taxation on leverage should be stronger for less levered firms, which presumably have more incentive to increase their debt. In order to test this issue we calculate a dummy variable (*DUMMY_LEV*) that equals 1 if the debt ratio is below the median and 0 otherwise. Furthermore, we introduce in the regression *MTREBIT*DUMMY_LEV* which is an interaction term resulting from the multiplication of the dummy variable *DUMMY_LEV* and the *MTREBIT* variable. Table 1.10. contains the estimation results and shows that the coefficient associated with the interaction term is only statistically significant for the dependent variable LEV_1. Its positive sign indicates a more intense positive effect of taxes on debt for firms with a less levered status. The effect of *MTREBIT* on debt policy is now 2.3832 + 1.1026x*DUMMY_LEV*. For more levered firms, *DUMMY_LEV* is equal to 0, and therefore the effect of *MTR* is 2.3832. Conversely, for less levered firms *DUMMY_LEV* equals 1, hence the effect of *MTR* is 3.4858.

TABLE 1.10.: ESTIMATION RESULTS OF THE CAPITAL STRUCTURE MODEL FROM EQUATION [1] CONTROLLING FOR LEVERAGE

Explanatory Variables	LEV_1	LEV_2
MTREBIT	2.3832*** (0.787)	1.4537 (0.964)
NDTS	1.7853 (1.226)	2.1034 (1.493)
*NDTS*RISK*	-0.4016*** (0.067)	-0.1384* (0.083)
RISK	-0.0005* (0.000)	-0.0007** (0.000)
TANG	0.1671 (0.144)	0.1617 (0.147)
SIZE	0.2807*** (0.071)	0.2207*** (0.075)
PROF	0.2669* (0.140)	0.2696 (0.217)
TOBIN´S Q	-0.1330*** (0.032)	-0.0662*** (0.018)
DUMMY_LEV	-0.4800*** (0.162)	-0.2301*** (0.081)
*MTREBIT*DUMMY_LEV*	1.1026* (0.627)	0.0956 (0.434)
Observations	434	434
R-Squared Within	0.3067	0.1869
Wald test (F-statistic)	14.00 (0.000)	11.49 (0.000)
Hausman test (χ^2)	108.55 (0.000)	22.77 (0.012)

Fixed–effect regression coefficients estimated from Equation [1] with robust standard errors in brackets. Table A-1.1. in the Appendix provides definitions of the variables. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels. Wald test statistic refers to the null hypothesis that all coefficients of the explanatory variables are equal to zero. Hausman test refers to the null hypothesis of both fixed effects and random effects being equivalent.

Thirdly, if managers make decisions based on their firm's current statutory tax status, higher debt figures would be observed for companies with greater differences between their statutory tax rate and marginal tax rate. Therefore, we construct a *TAX DIFFERENCE* variable as per Graham (1996a) and Sinha and Bansal (2013), which is the result of the statutory tax rate minus the marginal tax rate. According to this rationale, we expect this tax difference variable to be positively related to debt usage if companies make tax-based leverage decisions based on their statutory tax rates. Conversely, the coefficient on this variable will be zero or non-significant if firms make tax-based leverage decisions based exclusively on simulated marginal tax rates. We have used the lagged values of this variable. Table 1.11. reports the estimation results and shows companies make debt decisions based on their marginal tax rate and not the statutory tax rate.

TABLE 1.11.: ESTIMATION RESULTS OF THE CAPITAL STRUCTURE MODEL FROM EQUATION [1] CONTROLLING FOR STATUTORY TAX RATE

Explanatory Variables	LEV_1	LEV_2
TAX DIFFERENCE	-1.1921 (0.834)	-0.0960 (0.735)
NDTS	1.5809 (2.037)	2.7679 (2.114)
*NDTS*RISK*	-0.3872** (0.096)	-0.1204 (0.089)
RISK	-0.0004* (0.000)	-0.0007* (0.000)
TANG	0.3189** (0.156)	0.3440** (0.141)
SIZE	0.2574*** (0.079)	0.1745*** (0.077)
PROF	0.4280** (0.172)	0.4338 (0.272)
TOBIN´S Q	-0.1584*** (0.046)	-0.0778*** (0.164)
Observations	370	370
R-Squared Within	0.2004	0.1288
Wald test (F-statistic)	11.97 (0.000)	11.70 (0.000)
Hausman test (χ^2)	19.26 (0.014)	7.22 (0.513)

Fixed–effect regression coefficients estimated from Equation [1] with robust standard errors in brackets. Table A-1.1. in the Appendix provides definitions of the variables. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels. Wald test statistic refers to the null hypothesis that all coefficients of the explanatory variables are equal to zero. Hausman test refers to the null hypothesis of both fixed effects and random effects being equivalent.

Fourthly, we implicitly assume that the magnitudes of the marginal effects of the marginal tax rates on firms' debt policy are the same for all firms. However, it is possible for instance, that the debt policy of firms which have more Chief Financial Officers (CFOs) with in-depth knowledge of modern corporate finance theory, may be more strongly influenced by marginal tax rates. To explore such possibilities and as a last check on our results, we add an interaction variable *MTR*ΔSIZE* to the regression analysis. It is based on the assumption that larger firms would have more CFOs with greater knowledge of modern corporate finance theory. The estimation results of the regression with *MTR*ΔSIZE* are shown in Table 1.12. The coefficient of the interactive term turns out to be not statistically significant. Consequently, it does not seem reasonable to infer that the marginal tax rates affect debt policy more in the case of firms believed to have more CFOs with better understanding of modern corporate finance theory.

TABLE 1.12.: ESTIMATION RESULTS OF THE CAPITAL STRUCTURE MODEL FROM EQUATION [1] CONTROLLING FOR BETTER KNOWLEDGE OF CORPORATE FINANCE THEORY

Explanatory Variables	LEV_1	LEV_2
MTREBIT	-1.5550 (5.559)	3.0352 (6.874)
NDTS	1.2178 (1.600)	1.5601 (1.706)
*NDTS*RISK*	-0.3914*** (0.073)	-0.1236 (0.089)
RISK	-0.0005* (0.000)	-0.0007** (0.000)
TANG	0.2384* (0.126)	0.2420* (0.133)
SIZE	0.2683*** (0.081)	0.2255*** (0.088)
PROF	0.3014* (0.172)	0.2941 (0.244)
TOBIN´S Q	-0.1584*** (0.045)	-0.0832*** (0.168)
*MTREBIT*SIZE*	0.1834 (0.269)	-0.0959 (0.312)
Observations	434	434
R-Squared Within	0.2017	0.1210
Wald test (F-statistic)	9.26 (0.000)	8.39 (0.000)
Hausman test (χ^2)	17.51 (0.025)	5.72 (0.679)

Fixed–effect regression coefficients estimated from Equation [1] with robust standard errors in brackets. Table A1.1. in the Appendix provides definitions of the variables. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels. Wald test statistic refers to the null hypothesis that all coefficients of the explanatory variables are equal to zero. Hausman test refers to the null hypothesis of both fixed effects and random effects being equivalent.

Fifthly, the DiD approach requires that the examined groups of companies (namely, treatment and control groups) should be very similar in their characteristics and only differ in the examined property, that in our case is the leverage ratio. In order to avoid biases in the results, we additionally implement in our DiD approach two different matching procedures: the kernel propensity score matching approach (Angrist and Pischke 2008; Villa 2012), and the nearest neighbour matching approach (Abadie, Drukker, Herr and Imbens 2004; Abadie and Imbens 2006; Kahle and Stulz 2013). The results of these new matching estimations are reported in Table 1.13.

TABLE 1.13.: DID WITH COVARIATES

		2011-2012	2011-2013
Pre-reform	Treatment	-0.076	0.164
	Control	-0.270	-0.028
	Difference	0.194*** (0.053)	0.191*** (0.050)
Post-reform	Treatment	-0.023	0.165
	Control	-0.258	-0.035
	Difference	0.235*** (0.050)	0.200*** (0.050)
DiD	Treatment / Control	0.041 (0.069)	0.009 (0.068)
Kernel propensity score matching	Treatment / Control	0.063 (0.086)	0.038 (0.081)
Nearest neighbor matching (ATT)	Mahalanobis Distance	0.132 (0.090)	-0.049 (0.083)

The treatment group is defined as companies affected by the tax reform, while the control group includes companies not affected by the reform. DiD is the difference between the average differences for the two groups of firms. Kernel propensity score matching is the difference in differences estimator derived of a kernel function matching. Nearest neighbor matching (ATT) is the Abadie-Imbens bias-corrected average treated effect matching estimator. Robust standard errors are in brackets. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels.

Once more, the difference in differences estimates, regardless the matching procedure, are not statistically significant. Consequently, we find no differences in the financial behaviour between the treatment and control groups.

Lastly, we check whether companies that apply the special tax system stablished at Basque Country and Navarre (i.e. Basque and Navarre leasehold system) behave in a different manner than their counterparts in the rest of Spain. Accordingly, we now consider as the treatment group to those Spanish companies affected by the 2012 Spanish tax reform, and as the control group to those Basque and Navarre companies from our original sample. Unreported analysis based on the DiD approach reveals that though Spanish affected companies reduced their leverage ratio considerably more than their Basque and Navarre counterparts after the reform, the differential behavior is not statistically significant[19].

1.8. Concluding remarks

This paper provides empirical evidence on the statistical and economic impact of taxes on debt policy, using a data panel of Spanish listed companies covering the period 2007-2013. It is the first empirical analysis of the relationship between firm-specific marginal tax rates and leverage measures of individual firms in Spain.

We follow the Graham (1996a) and Shevlin (1990) methodology for computing company-specific marginal tax rates, relying on the non-linearity of corporate tax schedules resulting from company losses and the ensuing tax provisions (carry-forward rules). This procedure accounts for the fact that firms may report losses. If so, that tax shield cannot be used immediately and will offset future positive taxable income. Furthermore, we control for the endogeneity problem stemming from the reverse causality between debt and taxes. We circumvent this problem by basing our marginal tax rate measure on income before the relevant financing decisions. Our results indicate that there is a positive relationship between the firm-specific marginal tax rates and the leverage ratio increase of Spanish firms.

In addition, we have also tested the non-debt tax shields hypothesis. Our findings indicate that firms with greater amounts of non-debt tax shields have lower levels of debt, substituting debt tax shields for other tax allowances such as depreciation expenses.

[19] Results are available upon request.

We have examined the impact of taxes on the financing decisions of firms using the Spanish corporate tax reform of 2012 as a “quasi-experiment”. Accordingly, we identify companies that would in theory have been affected by the new thin-capitalization rule, and compare their financing behaviour to a group of companies that were not affected. Our empirical results with a difference in differences approach do not confirm a tax reform effect, and thus there are appear not to be significant differences between the debt policy of potential affected firms and their non-affected counterparts.

Last, and as expected, we have found that less levered firms tend to use debt tax shields more intensively as they are more likely to increase debt.

Our study is no exception when it comes to limitations. Access to tax related data is a complex issue in most developed countries. In Spain, the taxable income of corporations and therefore deferred tax assets and liabilities has been explicitly included in financial statements from fiscal year 2007 onwards which makes the time horizon of our study relatively short. As more historical tax data become available, we expect improved results and availability of more accurate values for marginal tax rates. Furthermore, the effect of taxes on companies´ debt policy might be conditioned by time issues as previous research indicate that financing choices are mostly long-term decisions and companies adapt their structure only very slowly (Fama and French 2012).

Moreover, the marginal tax rates may either overstate or understate the fiscal benefit of debt financing according to whether, at the personal level, interest income is taxed at a higher or lower rate than returns from common stocks. Therefore, an interesting future line of research would be to analyse whether not only corporate taxes but also personal taxes affect corporate financing decisions in Spain. Another issue worth noting is the fact that the findings may be strongly influenced by the use of listed as opposed to unlisted firms, since listed firms can raise capital more easily thanks to the less severe agency problems and asymmetric information (López-Gracia and Sogorb-Mira 2014). As a result, it would also be interesting to evaluate the relation between firm leverage and taxation using a dataset of unlisted companies.

Finally, it is very important to understand whether managers consider tax related features of a particular source of finance or not. All other factors affecting capital structure are internal to a company, but taxes may be exogenously determined and used to control a company's actions to some extent. In terms of tax policy, our findings prove that asymmetric treatment of equity and debt in the Spanish corporate tax system distorts the debt policies of Spanish listed companies. Despite of considering the new thin-capitalization rule stablished by Spanish government in 2012, we have not a found a clear effect on the debt policy of Spanish listed companies due to the limitation of financing expenses. Therefore, policy makers might be encouraged to revise and re-evaluate corporate tax reform in order to consider the inequality in tax treatment of debt and equity financing in Spain.

1.9. References

- Abadie, A. and Imbens, G. W., 2006, "Large sample properties of matching estimators for average treatment effects", *Econometrica,* 74 (1), 235-267.

- Abadie, A., Drukker, D., Herr, J. L. and Imbens, G. W., 2004, "Implementing matching estimators for average treatment effects in Stata", *Stata Journal,* 4, 290-311.

- Alberternst, S. and Sureth, C., 2015, "The effect of taxes on corporate financing decisions – Evidence from the German interest barrier". *Unpublised Working Paper*, No. 8, Centre for Tax and Accounting Research.

- Almeida, H., Campello, M., Laranjeira, B. and Weisbenner, S., 2011, "Corporate debt maturity and the real effects of the 2007 credit crisis", *Critical Finance Review,* 1 (1), 3-58.

- Altman, E., 1968, "Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy", *The Journal of Finance*, 23, 589-609.

- Alworth, J. and Arachi, G., 2001, "The effect of taxes on corporate financing decisions: evidence from a panel of Italian firms", *International Tax and Public Finance,* 8, 353-376.

- An, Z., 2012, "Taxation and capital structure: empirical evidence from a quasi-experiment in China", *Journal of Corporate Finance,* 18, 683-689.

- Angrist, J. D. and Pischke, J. S., 2008, "Mostly harmless econometrics: an empiricist´s companion", Princeton University Press.

- Bartholdy, J. and Mateus, C., 2011, "Debt and taxes for private firms", *International Review of Financial Analysis*, 20, 177-189.

- Blouin, J., Core, J. E. and Guay, W., 2010, "Have the tax benefits of debt been overestimated?", *Journal of Financial Economics,* 98, 195-213.

- Blouin, J., Huizinga, H., Laeven, L. and Nicodème, G., 2014, "Thin capitalization rules and multinational firm capital structure", *Unpublished Working Paper,* WP/14/12, International Monetary Fund.

- Bradley, M., Jarrell, G. and Kim, E., 1984, "On the existence of an optimal capital structure: theory and evidence", *The Journal of Finance,* 39, 857-878.

- Byoun, S., 2008, "How and when do firms adjust their capital structures toward targets", *The Journal of Finance,* 63 (6), 3069-3096.

- Contos, G., 2005, "An essay on the effects of taxation on the corporate financial policy", *98th Annual Conference on Taxation,* National Tax Association, Miami, Florida, USA.

- De Jong, A., Rezaul, K. and Thuy, T. N., 2008, "Capital structure around the world: the roles of firm– and country– specific determinants", *Journal of Banking and Finance*, 32, 1954-1969.
- DeAngelo, H. and Masulis, R., 1980, "Optimal capital structure under corporate and personal taxation", *Journal of Financial Economics*, 8 (1), 3-29.
- Doidge, C. and Dyck, A., 2015, "Taxes and corporate policies: evidence from a quasi natural experiment", *The Journal of Finance*, 70 (1), 45-89.
- Dreßler, D. and Scheuering, U., 2015,"Empirical evaluation of interest barrier effects", *Discussion Paper*, No. 12-046, ZEW.
- Faccio, M, and Xu, J., 2015, "Taxes and capital structure", *Journal of Financial and Quantitative Analysis*, 50 (3), 277-300.
- Fama, E. F, and French, K. R., 2012, "Capital structure choices", *Critical Finance Review*, 1 (1), 59-101.
- Feld, L. P., Heckemeyer, J. H. and Overesch, M., 2013, "Capital structure choice and company taxation: a meta-study", *Journal of Banking and Finance*, 37, 2850-2866.
- Frank, M. Z, and Goyal, V. K., 2009, "Capital structure decisions: which factors are reliably important?", *Financial Management*, 38, 1-37.
- Gordon, R. H. and Lee, Y., 2001, "Do taxes affect corporate debt policy? Evidence from U.S. corporate tax return data", *Journal of Public Economics*, 82, 195-224.
- Graham, J. R., 1996a, "Debt and the marginal tax rate", *Journal of Financial Economics*, 41, 41-73.
- Graham, J. R., 1996b, "Proxies for the marginal tax rate", *Journal of Financial Economics*, 42, 187-221.
- Graham, J, R., 2000, "How big are the tax benefits of debt?", *The Journal of Finance*, 55 (5), 1901-1941.
- Graham, J. R., 2003, "Taxes and corporate finance: A review", *Review of Financial Studies*, 16, 1075-1129.
- Graham, J. R., 2008, "Taxes and corporate finance", In: Eckbo, B. E. (Ed), *Handbook of Corporate Finance*, Empirical Corporate Finance, North-Holland Elsevier, Volume 2, Chapter 11, 59-133.
- Graham, J. R., 2013, "Do taxes affect corporate decisions? A review", In: Constantinides, G. M., Harris, M. and Stulz, R. M. (Eds) *Handbook of the Economics of Finance*, North-Holland Elsevier, Volume 2, Part A, Chapter 3, 123-210.
- Graham, J. R. and Mills, L., 2008, "Using tax return data to simulate corporate marginal tax rates", *Journal of Accounting and Economics*, 46 (2-3), 366-388.

- Graham, J. R., Lemmon, M. L. and Schallheim, J. S., 1998, "Debt, leases, taxes, and the endogeneity of corporate tax status", *The Journal of Finance*, 53 (1), 131-162.
- Gropp, R. E., 1997, "The effect of expected effective corporate tax rates on incremental financing decisions", *Unpublished Working Paper*, No 46, International Monetary Fund.
- Gropp, R. E., 2002, "Local taxes and capital structure choice", *International Tax and Public Finance* 9 (1): 51-71.
- Hartmann-Wendels, T., Stein, I. and Stöter, A., 2012, "Tax incentives and capital structure choice: evidence from Germany", *Discussion Paper*, No 18, Deutsche Bundesbank.
- Haugen, R. A. and Senbet, L. W., 1986, "Corporate finance and taxes: a review", *Financial Management*, 15 (3), 5-21.
- Heider, F. and Ljungqvist, A., 2015, "As certain as debt and taxes: estimating the tax sensitivity of leverage from State tax changes", *Journal of Financial Economics*, 118 (3), 684-712.
- Kahle, K. M. and Stulz, R. M., 2013, "Access to capital, investment and the financial crisis", *Journal of Financial Economics*, 110, 280-299.
- Ko, J. K. and Yoon, S., 2011, "Tax benefits of debt and debt financing in Korea", *Asia-Pacific Journal of Financial Studies*, 40, 824-855.
- Kunieda, S., Takahata, J. and Yada, H., 2011, "Japanese firms' debt policy and tax policy", *Discussion Paper Series*, Nº 2011-11, Hitotsubashi University, Tokyo.
- Lemmon, M. and Roberts, R., 2010, "The response of corporate financing investment to changes in the supply of credit", *The Journal of Financial and Quantitative Analysis*, 45 (3), 555-587.
- López-Gracia, J. and Sogorb-Mira, F., 2014, "Sensitivity of external resources to cash flow under financial constraints", *International Business Review*, 23, 920-930.
- Mackie–Mason, J. K., 1990, "Do taxes affect corporate financing decisions?", *The Journal of Finance*, 45 (5), 1471-1493.
- Modigliani, F. and Miller, M. H., 1963, "Corporate income taxes and the cost of capital: a correction", *The American Economic Review*, 53 (2), 433-443.
- Mooij, R. A., 2011, "The tax elasticity of corporate debt: a synthesis of size and variations", *Unpublished Working Paper*, WP/11/95, International Monetary Fund.
- Myers, S. C., 1984, "The capital structure puzzle", *The Journal of Finance*, 39, 575-592.
- Panier, F., Pérez-González, F. and Villanueva, P., 2013, "Capital structure and taxes: what happens when you (also) subsidize equity?", *Unpublished Manuscript*, Stanford University.

- Pfaffermayr, M., Stöckl, M. and Winner, H., 2008, "Capital structure, corporate taxation and firm age", *Oxford University Centre for Business Taxation*, WP 08/29.

- Plesko, G. A., 2003, "An evaluation of alternative measures of corporate tax rates", *Journal of Accounting and Economics*, 35, 201-226.

- Roberts, M. R. and Whited, T. M., 2013, "Endogeneity in empirical corporate finance", In: Constantinides, G. M., Harris, M. and Stulz, R. M., (Eds) *Handbook of the Economics of Finance*, North-Holland Elsevier, Volume 2, Part A, Chapter 7, 493-572.

- Shevlin, T., 1990, "Estimating corporate marginal tax rates with asymmetric tax treatment of gains and losses", *Journal of the American Taxation Association*, 12, 51-67.

- Shum, P. M., 1996, "Taxes and corporate debt policy in Canada: an empirical investigation", *Canadian Journal of Economics*, 29, 556-572.

- Sinha, P. and Bansal, V., 2012, "Algorithm for calculating corporate marginal tax rate using Monte Carlo simulation", *MPRA Paper No 40811*, University Library of Munich, Germany.

- Sinha, P. and Bansal, V., 2013, "Capital structure puzzle: the interrelationship between leverage, taxes and other micro economic factors", *MPRA Paper No 49878*, University Library of Munich, Germany.

- Sogorb-Mira, F., 2005, "How SME uniqueness affects capital structure: evidence from a 1994-1998 Spanish data panel", *Small Business Economics* 25, 447-457.

- Strebulaev, I. A. and Whited, T. M., 2012, "Dynamic models and structural estimation in corporate finance", *Foundations and Trends in Finance*, 6, 1-163.

- Titman, S. and Wessels, R., 1988" The determinants of capital structure choice", *The Journal of Finance*, 43, 1-19.

- Trezevant, R., 1992, "Debt financing and tax status", *The Journal of Finance*, 47, 1557-1568.

- Villa, J. M., 2012, "Simplifying the estimation of difference in differences treatment effects with Stata", *MPRA Paper No 43943*, University Library of Munich, Germany.

- 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), 1-17.

1.10. Appendix

TABLE A-1.1.: DEFINITION OF VARIABLES

Variables	Definition
LEV_1	First difference in long-term book debt divided by the sum of long-term book debt and market value of equity
LEV_2	The same as LEV_1 but using the lagged value of the denominator
MTR	Marginal tax rate estimated as per Shevlin (1990) and Graham (1996a) approach
MTREBIT	Marginal tax rate estimated with earnings before interest and taxes as per Graham *et al.* (1998) approach
NDTS	First difference in book depreciation divided by the sum of lagged book total debt plus lagged market equity value
RISK	1 / [(3.3*EBIT/Total Assets) + (1.0*Sales/Total Assets) + (1.4*Retained Earnings/Total Assets) + (1.2*Working Capital/Total Assets)]
TANG	Percentage of tangible assets over total assets
SIZE	Natural logarithm of total assets
PROF	Ratio of earnings before interest, taxes, depreciation and amortization to total assets
TOBIN´S Q	Market to book ratio of total assets

TABLE A-1.2.: DESCRIPTION AND RELEVANCE OF OUR FIRM´S SAMPLE VS LARGE CORPORATE TAX PAYERS (LCTP)

Item		2007	2008	2009	2010	2011	2012	2013
No. of Firms	Sample	88	88	88	88	88	88	88
	LCTP	1,235	1,167	1,012	1,019	1,036	1,027	994
Total Assets	Sample (%)	17.5%	18.6%	20.8%	21.5%	21.4%	21.5%	21.3%
	LCTP (€)	1,564,448,678,140	1,608,358,176,263	1,541,479,551,651	1,565,923,557,759	1,592,298,080,322	1,559,391,980,480	1,548,200,225,350
Turnover	Sample (%)	4.5%	7.2%	7.5%	7.2%	7.0%	7.7%	7.7%
	LCTP (€)	759,521,288,292	725,754,031,745	627,818,023,932	682,716,429,389	696,746,127,101	706,676,592,120	721,892,432,788
EBIT	Sample (%)	n/a	46.0%	50.1%	34.8%	47.2%	61.1%	29.8%
	LCTP (€)	n/a	34,582,592,229	40,112,302,894	45,682,304,877	42,811,119,239	23,090,271,935	43,605,838,379
Total Debt	Sample (%)	15.4%	18.8%	22.1%	22.7%	22.5%	22.6%	23.4%
	LCTP (€)	938,392,556,548	836,077,681,397	772,496,868,114	778,144,024,252	792,741,546,669	773,158,280,828	701,409,019,765
Financial Expense	Sample (%)	12.3%	17.5%	20.0%	22.2%	22.9%	23.7%	27.3%
	LCTP (€)	-56,891,769,992	-44,069,868,852	-31,037,807,355	-28,013,136,304	-30,103,560,892	-31,124,638,855	-28,435,598,825
EBT	Sample (%)	n/a	31.8%	26.3%	18.7%	31.5%	14.8%	14.2%
	LCTP (€)	n/a	54,027,897,630	68,144,530,196	71,655,853,214	53,318,506,735	23,422,966,570	46,205,741,840
Tax Expense	Sample (%)	15.6%	51.4%	16.2%	15.7%	11.0%	89.8%	48.0%
	LCTP (€)	10,911,761,225	-2,147,427,517	-5,484,132,694	-5,472,108,067	-4,788,633,501	-451,531,669	-1,690,653,833
Net Income	Sample (%)	24.4%	38.8%	30.0%	21.9%	33.3%	32.5%	18.5%
	LCTP (€)	10,911,761,225	49,755,616,836	63,594,564,782	65,861,841,962	48,699,931,853	23,022,393,908	43,823,580,882

Source: Agencia Estatal de la Administración Tributaria (AEAT), Estadística por partidas del impuesto sobre sociedades, Years 2007, 2008, 2009, 2010, 2011, 2012 and 2013, and own elaboration.

TABLE A-1.3.: CORRELATION MATRIX AND VARIANCE INFLATION FACTORS

	LEV_1	LEV_2	*MTR*	*MTREBIT*	*NDTS*	*RISK*	*TANG*	*SIZE*	*PROF*	*TOBIN´S Q*
LEV_1	1.0000									
LEV_2	0.7689 (0.0000)	1.0000								
MTR	0.0778 (0.0953)	0.0256 (0.5838)	1.0000							
MTREBIT	0.0510 (0.2749)	0.0002 (0.9964)	0.7470 (0.0000)	1.0000						
NDTS	0.1068 (0.0141)	0.1297 (0.0028)	0.0357 (0.4450)	0.0044 (0.9253)	1.0000					
RISK	-0.0044 (0.9198)	-0.0573 (0.1905)	0.0364 (0.4384)	0.0424 (0.3665)	-0.0252 (0.5658)	1.0000				
TANG	0.0735 (0.0916)	0.0155 (0.7218)	-0.0293 (0.5309)	-0.0929 (0.0463)	0.1807 (0.0000)	-0.0420 (0.3015)	1.0000			
SIZE	0.0299 (0.4943)	-0.0198 (0.6508)	-0.0151 (0.7460)	0.1051 (0.0240)	-0.0232 (0.5956)	-0.0066 (0.8804)	-0.2637 (0.0000)	1.0000		
PROF	0.1459 (0.0008)	0.0197 (0.6515)	0.0534 (0.2527)	-0.0128 (0.7848)	0.0430 (0.3244)	-0.0300 (0.4600)	0.1485 (0.0002)	0.2214 (0.0000)	1.0000	
TOBIN´S Q	-0.0414 (0.3436)	-0.0894 (0.0404)	0.1018 (0.0288)	0.0527 (0.2589)	-0.0800 (0.0669)	-0.0289 (0.5101)	-0.1536 (0.0004)	0.2919 (0.0000)	0.4775 (0.0000)	1.0000
VIF			**2.38**	**2.39**	**1.04**	**1.00**	**1.15**	**1.21**	**1.33**	**1.36**

Significance levels in brackets. Table A-1.1. provides definitions of all the variables.

TABLE A-1.4.: CHARACTERISTICS OF TREATMENT GROUP VERSUS CONTROL GROUP

Variable	Treatment Group	Control Group	Mean difference t-test
Debt to assets market value	0.4292	0.1931	0.2361***
MTREBIT	0.1925	0.1780	0.0146*
NDTS	0.0003	-0.0001	0.0004
*NDTS*RISK*	-0.0149	-0.0009	-0.0140**
RISK	10.5602	1.6695	8.8907**
TANG	0.0752	0.1160	-0.0408***
SIZE	20.3903	20.1353	0.2550
PROF	0.0112	0.0702	-0.0591***
TOBIN´S Q	1.0587	1.8060	-0.7473***

This table compares the means of key variables between companies assigned to the treatment group and companies included in the control group. Table A-1.1. provides definitions of the variables. The last column on the right hand side show the result of a t-test if the mean values between the treatment group and the control group are statistically equal. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels.

CHAPTER 2: HOW MUCH DO THE TAX BENEFITS OF DEBT ADD TO FIRM VALUE? EVIDENCE FROM SPANISH LISTED COMPANIES

2.1. Introduction

The tax benefits of debt are the tax savings that result from deducting interest from taxable earnings. By deducting one euro of interest, a firm reduces its tax liability by the marginal corporate tax rate. Since Modigliani and Miller (1963) hypothesized that the tax benefits of debt increase a firm's value, the implications of the debt tax shield on firm valuation and capital structure has attracted attention as well as debate among the financial community. But how much does firm value increase by? And, accordingly, how valuable are tax shields? Despite being key questions in corporate finance, there are surprisingly few settled answers. Theory provides a range of predictions while the existing empirical evidence is mixed and sufficiently puzzling that Fama (2011) argues that a major unresolved challenge in corporate finance is to produce evidence on how taxes affect market values and thus optimal financing decisions.

Different approaches have generated controversy on the implicit benefits of debt. For instance, Miller (1977) pointed out that personal taxes might compensate for the tax benefit of debt. In addition, Fama and French (1998) maintained that it remains unclear as to whether debt tax shields improve firms' value, and found a significant negative relationship between debt and firms' value, contrary to expectations. They attributed the findings of positive relationships in previous research, to potential failure to control for profitability. In an effort to avoid this problem, Kemsley and Nissim (2002) ran reverse regressions of profitability on firms' value and debt, and found significant tax benefits of debt. Furthermore, Graham (2000) used firm-level financial statement data and proved that firms derive substantial tax benefits from debt. More recently, Blouin, Core and Guay (2010), have stated that the tax benefits of debt might be smaller than previously suggested, due to a biased estimation of marginal tax rates.

Nowadays, the assessment of the debt tax shield is of ever greater importance, due to circumstances such as the large increase in corporate borrowing, the worldwide generalized trend in changes in tax codes, as well as the growing importance of valuation in corporate transactions such as M&As, Venture Capital, and so on. (Cooper and Nyborg, 2007). Notwithstanding its implications, there is still no unanimous consensus as to the relevance of debt tax shields. As Graham (2008) states, the evidence to support the idea that tax benefits add to firm value is ambiguous because non-tax explanations or econometric issues might cloud interpretation. In this sense, additional cross-sectional and/or panel data regression research, which investigates the market value of the tax benefits of debt, would be helpful in terms of clarifying or confirming the interpretation of existing cross-sectional regression analysis.

Accordingly, the main purpose of this study is to estimate the value of the debt tax shield for Spanish listed companies in the period 2007-2013. Specifically, we calculate corporate marginal tax rates to simulate the interest deduction benefit functions for individual firms, and use them to estimate the tax-reducing value of each incremental euro of interest expense as in Graham (2000). We also estimate reverse regressions in which we regress future profitability on debt, following the Kemsley and Nissim (2002) approach. This estimation procedure addresses the potential correlation between debt and the value of operations along non-tax dimensions such as growth, financial distress and size.

Our findings clearly show that there is a clear fiscal advantage to using debt financing. In our sample, we find the tax benefit of debt equals 6.4% of firm value, meaning that the median firm at its leverage ratio is worth 6.4% more than the same firm with no debt in its capital structure. After accounting for reductions for personal taxes, we find that the tax benefit of debt under the marginal benefit curve is 2.1% of firm value. Under the regression approach, the net debt tax shield reaches 13.6% of firm value.

Debt tax shield valuation attempts to capture the value of the tax savings from interest payments. There has been relatively limited empirical research that seeks to assess the value of the debt tax shield, despite its clear significance, and most empirical studies on the value of the debt tax shield have focused on U.S. firms. Debt tax shield literature has produced a wide range of estimates, some of which are subject to non-tax explanations or identification challenges[20]. A summary of key references regarding this issue is shown in Table 2.1.

[20] To circumvent these problems, Graham (2003) calls for new research that uses market prices and exploits events where the tax interpretation is unambiguous; an obvious problem is that such events are rare. A comprehensive survey of related literature on the different tax shield valuation approaches can be found in Graham (2003), Graham (2008), Graham (2013) and Hanlon and Heitzman (2010).

TABLE 2.1.: EMPIRICAL EVIDENCE ON THE VALUE OF THE DEBT TAX SHIELD

Authors	Gross Benefit	Net Benefit	Country
Masulis (1983) (a)	40% of debt value		U.S.A.
Kaplan (1989) (b)		5.4% – 53.1% of equity value	U.S.A.
Engel, Erikson and Maydew (1999) (c)	28% of issue size		U.S.A.
Graham (2000)	9.7% of firm value	4.3% of firm value	U.S.A.
Kemsley and Nissim (2002)		10% (40%) of firm (debt) value	U.S.A.
Jiang (2004)		41% of debt value	Japan
Jiang (2004) (d)		64% of debt value	U.K.
Jiang (2004)		-22% of debt value	Germany
Jiang (2004) (e)		11% of debt value	U.S.A.
Korteweg (2010)		5.5% of firm value	U.S.A.
Van Binsbergen *et al.* (2010) (f)	10.4% of asset value		U.S.A.
Ko and Yon (2011) (g)	5.2% (5.5%) of firm value	1.9% (2.0%) of firm value	Korea
Sarkar (2014)	0.6% - 7.2% of equity value		U.S.A.
Doidge and Dyck (2015)	4.6% of firm value		Canada

(a) He regressed stock returns on the change in debt in exchange offers, and found a debt coefficient statistically indistinguishable from the top statutory corporate tax rate at that time; (b) the lower estimates assume that leveraged buyout debt is repaid in eight years and that personal taxes offset the benefit of corporate tax deductions; conversely, the higher estimates assume that leveraged buyout debt is permanent and that personal taxes provide no offset; (c) they examined a capital structure transaction involving two securities that were nearly identical except for their tax treatment, namely trust preferred stock and traditional preferred stock; (d) this relatively large estimated value of the debt tax shield corresponds to the 1993-1999 period, excluding the years 1997-1999 when the U.K. government adopted a series of reforms of tax credits and corporation tax payments, at which time the estimate for debt tax shield diminishes to 17% of debt value; (e) this data corresponds to the period 1993-1999 when Jiang (2004) carried out a cross-country comparison; nevertheless, he also found a 34% (40%) debt tax shelter value for U.S. industrial firms (non-regulated industrial firms) between 1965 and 1999; (f) they simulated tax benefit functions using the Graham (2000) approach; (g) the estimates are based on the Graham (2000) (Blouin *et al.*, 2010) simulation approach.

The three main approaches to assess the impact of debt tax shield are based on panel / cross-section regression, event studies and simulation. Firstly, cross-sectional studies provide estimates that vary from debt offering no value (Fama and French, 1998), to debt tax shields having a value of 5.5% of firm value (Korteweg, 2010), to 10% (40%)

of firm (debt) value (Kemsley and Nissim, 2002) so that there is almost no room for personal taxes and/or debt costs to have an effect (Graham, 2008 and 2013). Secondly, event studies that examine price reactions around changes in debt policy often find a significant value to debt (Masulis, 1983 and Kaplan, 1989) but face an identification challenge when controlling for information effects that coincide with the tax event. Other event studies that are free from information effects are often limited to small samples that may be not representative (Engel *et al.*, 1999). Thirdly, some of the more recent and influential estimates of the value of debt tax shields are based on accounting data and simulation methods. In this respect, Graham (2000) found that the gross tax benefit of debt is worth 9.7% of firm value. Van Binsbergen, Graham and Yang (2010) updated Graham (2000) estimates and found that the gross tax benefits of debt averaged about 10.4% of firm value. Graham (2000) is one of the few papers that attempts to differentiate gross debt tax shields (i.e. without including personal taxes) and net debt tax shields (i.e. including personal taxes; he finds that the value of debt tax shields is as low as 4.3% of firm value after personal taxes). Graham (2013) states that the empirical magnitude of the personal tax penalty, and therefore the potential impact on the value of tax shields, is yet to be conclusively determined.

In countries other than the U.S., Jiang (2004) found significant debt tax shelters for Japanese firms (41% of debt value) and U.K. firms (63% of debt value), but not for either Australian firms or Canadian firms. Conversely, Jiang (2004) found a significantly negative debt tax shelter value of 22% of debt value for German firms and explains this shocking result as due to the relative magnitude of the corporate tax rate and personal tax rates on interest income, dividend income and capital gains in the German tax system. Ko and Yon (2011) conducted an analysis using a data panel on Korean firms and found a gross (net) debt benefit of 5.2% (1.9%) of firm value. In addition, Doidge and Dyck (2015) obtained a figure of 4.6% of firm value for Canadian firms. To the best of our knowledge, however, to date no empirical study on this subject has been carried out in Spain and only one has in Europe (the abovementioned Jiang, 2004).

Our study contributes to the previous literature in several regards. First, we find new results for the estimation of the value of tax shields comparing two approaches, namely simulation and regression approaches. Furthermore, we provide empirical evidence within a European context, and for the first time for Spanish firms. Second, we use panel data econometrics for our regression approach combining linear and non-linear estimations, thus fully exploiting our data. Third, the findings of the present study demonstrate that though the fiscal benefits of debt are relevant, they are also sensitive to the valuation approach chosen. Last, the effects of personal taxes on debt tax shields might be relevant and could offset much of the fiscal advantage of debt financing.

The remainder of the paper is organized as follows. In the next Section, we discuss the simulation approach based on the procedure in Graham (2000), while Section 2.3. deals with the regression approach based on Kemsley and Nissim (2002) proposals. Section 2.4. presents the data for the study and the descriptive analysis regarding the key variables. The empirical results are discussed in Section 2.5. Several robustness tests are presented in Section 2.6. and the final Section provides some concluding remarks.

2.2. Simulation approach

2.2.1. The value of the debt tax benefit

The value of the debt tax shield is the present value of the tax savings from interest expense (Cooper and Nyborg, 2006). In a Modigliani and Miller (1963) context, that is with perpetual debt and assuming interest tax shields are completely utilized, the capitalized tax benefit of debt can be simplified to the marginal corporate tax rate times the amount of debt. That is,

$$\frac{t_c \cdot r_d \cdot D}{r_d} \qquad [1]$$

where t_c is the marginal corporate tax rate, r_d is the interest rate on debt and D is the amount of debt.

An important reservation about this approach is that it does not consider personal income taxes, as pointed out by Miller (1977). With personal taxes, the capitalized tax benefit of debt can be computed as follows,

$$\frac{\left[\left(1-t_p\right)-\left(1-t_c\right)\cdot\left(1-t_e\right)\right]\cdot r_d\cdot D}{\left(1-t_p\right)\cdot r_d} \qquad [2]$$

where t_p and t_e are both marginal personal tax rates that are applied to interest and equity income, respectively. Note that if both t_p and t_e are zero (or they are equal), then Equation [2] is simplified to the Modigliani and Miller (1963) set up (i.e. Equation [1]).

Equity income includes both dividends and capital gains. The personal marginal tax rates on these income streams may differ, and capital gains tax could be deferred by investors not realizing the gains. Therefore, the marginal personal equity tax rate should be a mixture of dividends and capital gains tax rates. Following Gordon and Mackie-Mason (1990), the personal equity tax rate might be calculated as:

$$t_e = d\cdot t_p + (1-d)\cdot t_p\cdot\gamma \qquad [3]$$

where d is the dividend pay-out ratio and γ is an adjustment factor that takes into account the possible deferral of taxes on capital gains and the time value of money of the capitalized taxes[21].

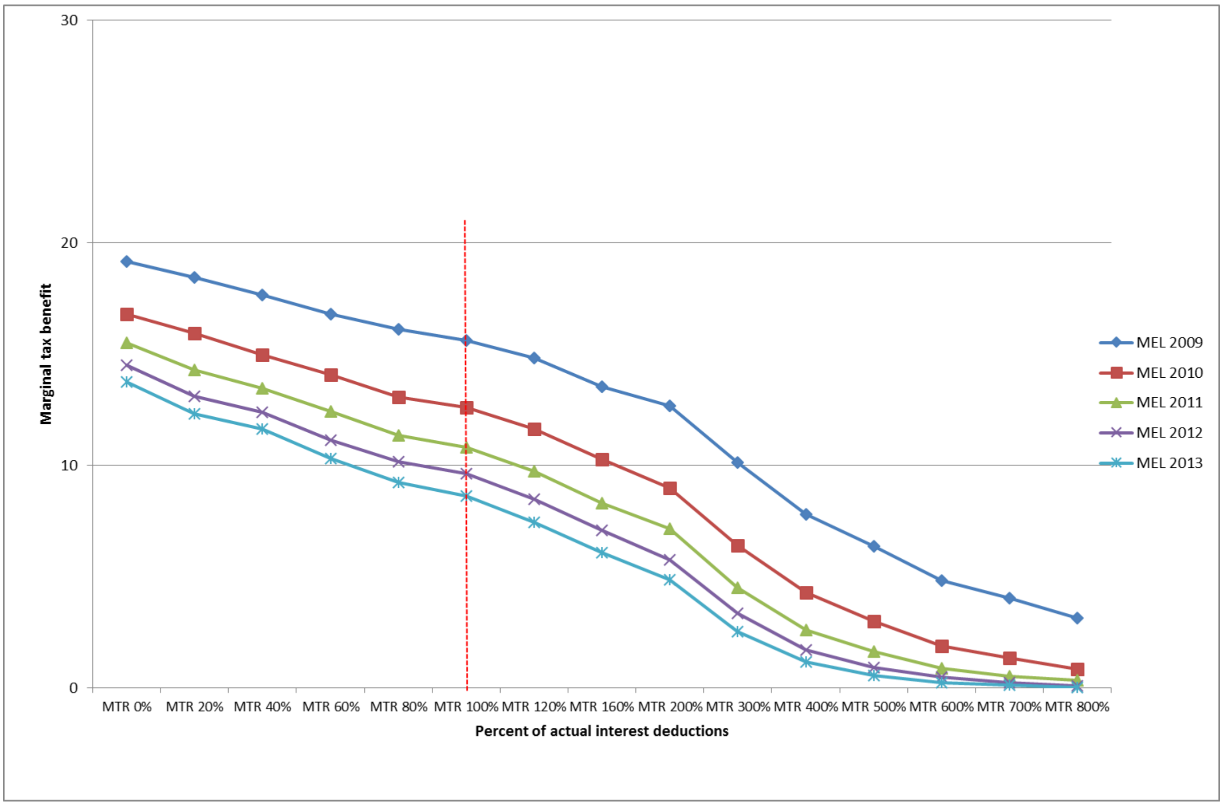
Graham (2000, 2001) simulates interest deduction benefit functions and uses them to estimate the tax-reducing value of each incremental euro of interest expense. The tax benefits of debt are estimated by integrating the area under the tax benefit function, which relates marginal tax rates to interest deductions. The process of establishing the tax benefit function follows different stages. First, $MTRit^{0\%}$ is estimated for firm i in year t[22]. This is the marginal tax rate based on taxable income assuming the firm has zero debt and therefore no interest deductions. Second, new marginal tax rates are estimated with different percentages (p%) of the actual interests paid: $MTRit^{p\%}$, where

[21] This adjustment factor is established at 0.25 following Gordon and Mackie-Mason (1990), Graham (1999), Graham (2000), and Green and Hollifield (2003).
[22] As in Graham, Lemmon and Schallheim (1998), we estimate marginal tax rates with pre-financing earnings and assuming that EBIT follows a pseudo-random walk process with a drift (see Clemente-Almendros and Sogorb-Mira (2015) for details).

p% ranges from 20% to 800%[23]. Third, the firm's tax benefit function is derived by connecting the previous estimated marginal tax rates with each level of interest.

Marginal tax benefits of debt decline as more debt is added because the probability increases with each incremental euro of interest that it will not be fully valued in every potential scenario. Figure 2.1. depicts an example of the tax benefit function in different years for a representative firm of our sample, namely, Meliá Hotels International, S.A. (MEL).

FIGURE 2.1.: TAX BENEFIT FUNCTION FOR MELIÁ HOTELS INTERNATIONAL, S.A. (MEL)



The integration of the area under the tax benefit curve up to the level of actual interest expense reveals the debt tax benefit. In order to determine the firm's annual debt tax shield, for each year and for each firm we measure the area under the firm's tax benefit function up to 100% of annual interest multiplied by actual interest payments. We then

[23] The exact numbers are 20%, 40%, 60%, 80%, 100%, 120%, 160%, 200%, 300%, 400%, 500% 600%, 700% and 800%.

estimate the capitalized tax benefits of debt assuming that the debt tax shield computed at the end of year t will be maintained over the following years. The interest rate on debt for each firm, computed as the quotient between interest expenses and debt, is used as the discount rate. Finally, we calculate firm value as the sum of market value of equity and book value of financial debt.

2.2.2. The kink

Graham (2000) offers an empirical measure of companies' underutilization of debt and calls this measure the kink. It is defined as the maximum amount of interest deductions a firm could charge before facing any decline in the marginal tax benefit of debt relative to the actual interest charge the firm incurred given its current debt. In short, it is the point at which the tax benefit curve starts to slope downwards. We fix the magnitude of the decline in the tax benefit curve at 25 basis points[24]. The extent to which debt is used to minimize tax payments determines the classification of firms' debt policy as either aggressive or conservative. Accordingly, an aggressive firm with positive earnings before interest and taxes would issue just enough debt to ensure that earnings after interest but before taxes are zero, whereas a conservative firm would issue less debt and therefore face positive taxes. As a result, a firm's debt financing policy could be considered as aggressive (conservative) when its kink is smaller (larger) than one[25].

The kink could be computed as a ratio where the numerator is the maximum interest that could be deducted for tax purposes before expected marginal benefits begin to decline, and the denominator is actual interest incurred (Caskey, Hughes and Liu, 2012):

$$\text{Kink}=\frac{\text{Target Interest}}{\text{Actual Interest}} \qquad [4]$$

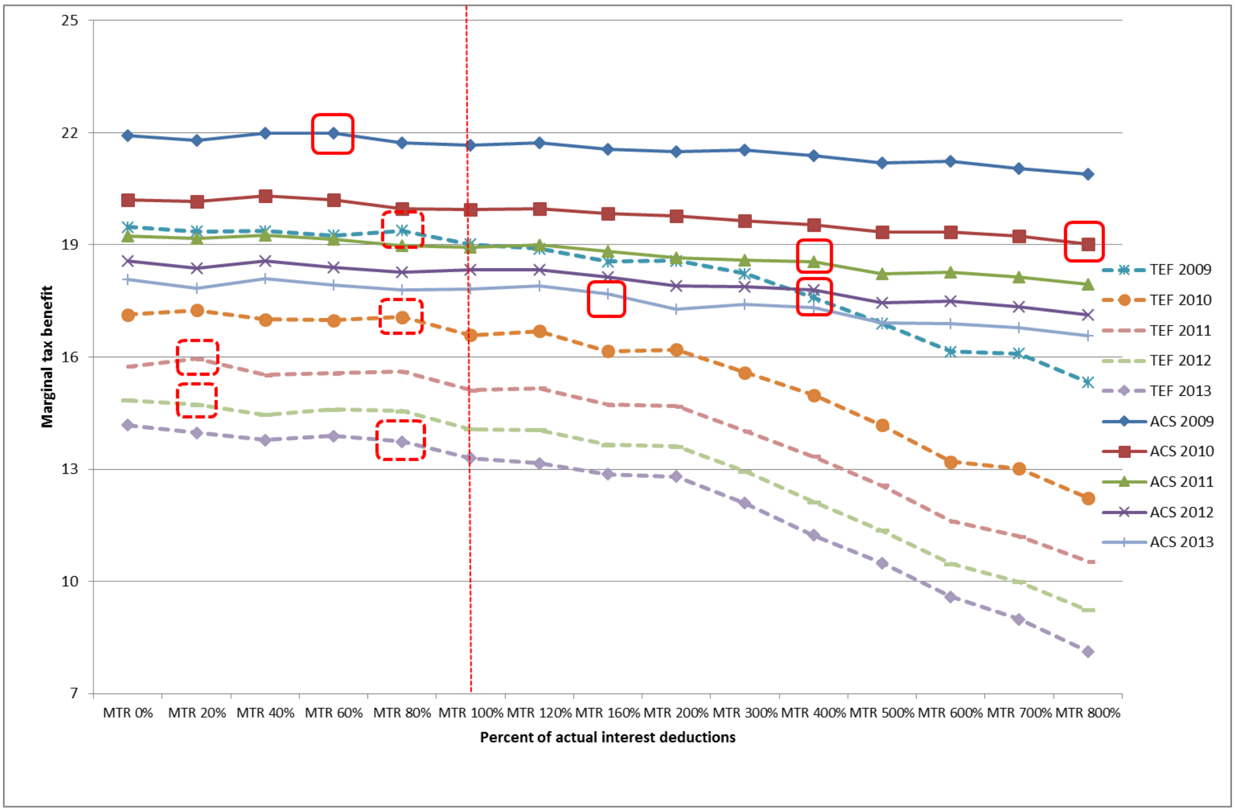
[24] Graham (2000), Blouin *et al.* (2010) and Van Binsbergen *et al.* (2010) define the kink as the first interest increment at which the firm has a decline in its marginal tax rate of at least 50 basis points. We decided to lower this required level in order to capture more variability in our data.

[25] This characterization is based on the tax benefit of debt without considering its cost. Therefore, an aggressive-conservative debt policy in this context does not necessarily imply sub-optimality.

where Target Interest is the point at which the firm's tax benefit function starts to slope down as the firm uses more debt.

Figure 2.2. shows the tax benefit functions of two example firms, namely, Telefónica, S.A. (TEF) and Actividades de Construcción y Servicios, S.A. (ACS).

FIGURE 2.2.: THE KINK FOR TELEFÓNICA, S.A. (TEF) AND ACTIVIDADES DE CONSTRUCCIÓN Y SERVICIOS, S.A. (ACS)



For example, in the year 2013, although the tax benefit curve of TEF starts to decline at 80% actual interest (i.e. a kink of 0.8), the ACS curve kinks at 160% (i.e. kink of 1.6). In this case, the kink of TEF denotes that the marginal tax benefits resulting from the firm's incremental interest are less than what the firm has received from its current interest. For ACS on the other hand, even when interest payments multiply by 1.6 times, the firm can still enjoy tax benefits at the marginal tax rate. ACS will remain at the flat part of its tax benefit curve even if it increases debt to 160% of the current level.

Underleveraged firms forgo significant tax savings that would have been available if they had increased their debt levels to their kink. Nevertheless, Graham (2000) maintains that firms with large kinks should remain on the flat part of their tax benefit functions, even when their income declines, in order to be called "conservative" in terms of their debt usage. Besides, if two "conservative" firms have the same kink but one has more volatile earnings than the other does, then the firm with more volatile earnings has a less conservative policy since the probability of entering the downward sloping part of the tax benefit function (aggressive debt policy) in the future, is higher for this firm than for the firm with lower volatility. Accordingly, it is necessary to calculate a new measure of the kink to account for this fact. Following Graham (2000), this complementary kink measure called the standardized kink, will reflect the length of the flat part of the tax benefit function per unit of income volatility. Specifically, we compute this standardized measure of the kink as,

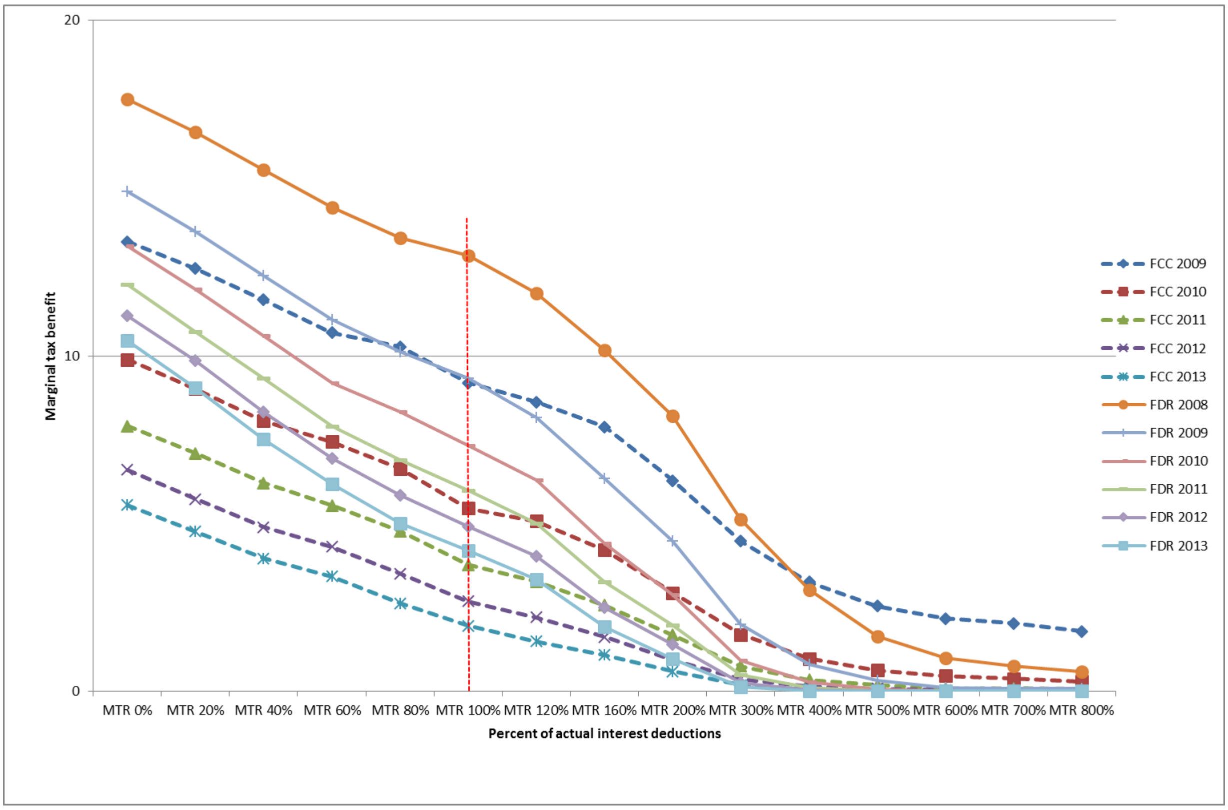
$$\text{Standardized Kink}=\frac{\text{Interest Expense at the Kink}}{\text{Standard Deviation of EBIT}} \qquad [5]$$

2.2.3. Zero tax benefit of debt

We identify the level of interest expense at which the tax benefit of debt becomes zero, and call it ZeroBen.

Figure 2.3. displays the tax benefit functions of two example firms, namely, Fomento de Construcciones y Contratas, S.A. (FCC) and Fluidra, S.A. (FDR).

FIGURE 2.3.: ZEROBEN FOR FOMENTO DE CONSTRUCCIONES Y CONTRATAS, S.A. (FCC) AND FLUIDRA, S.A. (FDR)



In 2013, ZeroBen is 700% and 400% for FCC and FDR, respectively. The economic interpretation of these figures is that FCC and FDR could use seven and four times, respectively, their actual interest before the marginal benefit reaches zero.

2.3. Regression approach

2.3.1. Forward specification

Considering corporate taxes, Modigliani and Miller (1963) established the valuation of a leveraged firm as follows,

$$V_L = V_U + t_c \cdot D \qquad [6]$$

where V_L is the market value of the leveraged firm, V_U is the market value of the unleveraged firm, t_c is the corporate marginal tax rate and D is the debt level.

If we also take into account personal taxes, Equation [6] will still be valid; although corporate marginal tax rate is substituted by a mixture of corporate and personal tax rates as explained in Miller (1977). That is,

$$V_L = V_U + \left[1 - \frac{(1-t_c)\cdot(1-t_e)}{(1-t_p)}\right]\cdot D \qquad [6\ bis]$$

where t_e and t_p are both marginal personal tax rates that are applied to equity and interest income, respectively.

Miller and Modigliani (1966) used cross-sectional two-stage least squares regressions and estimated a positive and significant market value for the debt tax shield within the electric utility industry. Taking a different approach, Fama and French (1998) suggested estimating Equation [6] by regressing V_L on debt interest, dividends, and a proxy of V_U. Specifically, they measured V_L as the excess of market value over book assets, and proxied V_U with several control variables such as current earnings, assets and R&D expenses, as well as future changes in these same variables[26]. A positive coefficient on the interest explanatory variable would be evidence of positive tax benefits of debt. Contrary to expectations, Fama and French (1998) found in their regressions either non-significant or negative estimated coefficients on interest. As a result, they interpreted this evidence as being inconsistent with debt tax benefits having a first-order effect on firm value. They attributed this contradictory evidence to a mismeasurement of V_U, and the interest variable including information about earnings that was not captured by control variables.

Kemsley and Nissim (2002) endeavoured to circumvent the V_U measurement problem with two alternative proposals. In the first, they proxied V_U with the present value of the expected operating income,

[26] All the regression variables were deflated by total assets.

$$V_U = \frac{E(FOI)}{\rho} = \frac{E(EBIT \cdot (1 - t_c))}{\rho} \qquad [7]$$

where E() is the expected operator, FOI is future operating income, EBIT is earnings before interest and taxes[27], and ρ is the capitalization rate.

Combining Equations [6] and [7], we derive:

$$V_L = \frac{E(FOI)}{\rho} + t_c \cdot D \qquad [8]$$

And from Equation [8], the following model specification is developed:

$$V_{L_{it}} = \beta_0 + \beta_1 \cdot \frac{E(FOI)_{it}}{\rho_{it}} + \beta_2 \cdot D_{it} + \eta_i + \varepsilon_{it} \qquad [9]$$

where β_2 represents the estimated value for the debt tax shield; η_i absorbs firm–specific effects, and ε_{it} is the disturbance term.

The model drawn from Equation [9] has two drawbacks. First, debt is likely to be correlated with the value of operations (i.e. E(FOI) and ρ) along several non-tax dimensions, and therefore β_2 would be biased. Second, using the market value of the firm as the dependent variable instead of the market-to-book ratio might preclude considering risk issues related to ρ and expectations about growth in operating income. Thus, in order to circumvent these measurement problems, Kemsley and Nissim (2002) suggest a second alternative to the forward specification, called the reverse specification.

Empirical estimation of Equation [9] entails certain assumptions about expected future earnings (E(FOI)) and the capitalization rate (ρ). Specifically, we proxy E(FOI) as EBIT times one minus marginal corporate tax rate. Conversely, we consider ρ as a constant and thus do not include any specific controls for the capitalization rate. In line with Kemsley and Nissim (2002), we deflate the intercept and all explanatory variables by

[27] The use of EBIT as the basis of valuation is strictly valid only when the underlying real assets are assumed to be perpetual. In such a case, EBIT and cash flow are one and the same (Modigliani and Miller, 1963).

total assets in order to address the issue of heteroskedasticity[28]. Consequently, the empirical specification of Equation [9] is now as follows:

$$\frac{V_{L_{it}}}{\text{Total Assets}_{it}} = \frac{\beta_0}{\text{Total Assets}_{it}} + \beta_1 \cdot \frac{E(FOI)_{it}}{\text{Total Assets}_{it}} + \beta_2 \cdot \frac{D_{it}}{\text{Total Assets}_{it}} + \eta_i + \varepsilon_{it} \qquad [10]$$

2.3.2. Reverse specification

The reverse specification proposal switches the variables in Equation [6], moving V_U to the left-hand side and V_L to the right-hand side of the equation. The resulting relation is:

$$V_U = V_L - \text{coefficient} \cdot D \qquad [11]$$

Now, adopting Equation [8] as per Equation [11], and operating for E(FOI),

$$E(FOI) = \rho \cdot (V_L - t_c \cdot D) \qquad [12]$$

Finally, from Equation [12] we derive the following specification model:

$$E(FOI)_{it} = \beta_0 + \beta_1 \cdot \rho_{it} \cdot (V_{L_{it}} - \beta_2 \cdot D_{it}) + \eta_i + \varepsilon_{it} \qquad [13]$$

where β_2 represents the estimated value for the debt tax shield; η_i absorbs firm–specific effects, and ε_{it} is the disturbance term.

The model of Equation [13] overcomes the two limitations of the forward model. First, placing E(FOI) on the left-hand side of [13] transfers the measurement error in the proxy for E(FOI) to the dependent variable, allowing the regression residual to capture the random component of the error. Second, moving V_L to the right-hand side of Equation [13] controls for all market information concerning expected operating earnings and ρ.

[28] Fama and French (1998) deflated all the explanatory variables but not the intercept; this choice implies that all regression variables in Equation [10] are converted into ratios. The inverse of the deflator is included to mitigate scale effects (Easton and Sommers, 2003); including a scaled intercept avoids the correlation between the explanatory and the independent variables due to variation in the scaling variable, in this case, total assets (Roychowdhury, 2006). In our research, FOI may be correlated with debt, and both increase in size.

Equation [13] shows a non-linear relationship among the parameters, and there are essentially two ways to estimate it: by using a linear transformation of the equation and by using non-linear least squares (Hoaglin, 2003; McGuirre *et al.*, 2014). If we consider ρ as a constant and deflate the intercept and all the explanatory variables by total assets, we can set up the following linear specification of Equation [13],

$$\frac{E(FOI)_{it}}{\text{Total Assets}_{it}} = \frac{\beta_0}{\text{Total Assets}_{it}} + \beta_1 \cdot \frac{V_{Lit}}{\text{Total Assets}_{it}} + \beta_2 \cdot \frac{D_{it}}{\text{Total Assets}_{it}} + \eta_i + \varepsilon_{it} \qquad [14]$$

In this method, the estimate for the debt tax shield is calculated as the quotient between $-\beta_2$ and β_1. Using market value as an explanatory variable allows us to control for ρ, although we need to assume market efficiency (Penman, 1996). On the other hand, we need a proxy for expected future earnings and, as in the forward specification, we use EBIT multiplied by one minus the marginal corporate tax rate.

The second way of estimating Equation [13] is directly by non-linear least squares. Now, instead of considering ρ as a constant, we express the capitalization rate as a linear function of several observable instruments associated with risk and growth. Specifically, we use four variables: the industry median beta of operations (β_U) (Miller and Modigliani, 1966); the market-to-book ratio of operations or the quotient between the market value of operations ($V_L - \beta$ D) and net operating assets (NOA) (Fama and French, 1992, and Penman, 1996); size measured as the natural logarithm of NOA; and the natural logarithm of operating liabilities (OL) (Hoaglin, 2003, and McGuirre *et al.*, 2014). To control for any direct relation between E(FOI) and the abovementioned variables, we also include these variables in additive form in the regression (Kemsley and Nissim, 2002). Finally, to control for industry effects, we replace the intercept in Equation [13] with industry dummies. As a result, we come up with the next empirical specification:

$$E(FOI)_{it} = \left[\beta_0 + \beta_1 \cdot \beta_U + \beta_2 \cdot \frac{V_{Lit} - \beta \cdot D_{it}}{NOA_{it}} + \beta_3 \cdot \ln\left(NOA\right)_{it} + \beta_4 \cdot \ln\left(OL\right)_{it}\right] \cdot \left(V_{Lit} - \beta \cdot D_{it}\right) + \\ + \sum_{i=1}^{8} \gamma_{1i} \cdot Dummy\_Industry_i + \gamma_2 \cdot \frac{V_{Lit} - \beta \cdot D_{it}}{NOA_{it}} + \gamma_3 \cdot \ln\left(NOA\right)_{it} + \gamma_4 \cdot \ln\left(OL\right)_{it} + \varepsilon_{it} \quad [15]$$

The net tax benefit from a euro of debt, i.e. the debt tax shield, is represented by β. Equation [15] is estimated using non-linear least-squares as it is non-linear in the parameters. To tackle the possible effects of heteroskedasticity, we weight the observations by the reciprocal of the square of total assets, which is consistent with deflating the entire equation by total assets.

2.4. Data and descriptive statistics

2.4.1. Sample selection

The data used in this paper come from four sources. Sistema de Análisis de Balances Ibéricos (SABI), a database managed by Bureau Van Dijk and Informa D&B, S.A., and the Spanish Securities and Exchange Commission (CNMV), provide the accounting information from annual accounts, while financial market information comes from the quotation bulletins of the Spanish Stock Exchange and Bloomberg.

As is standard in the empirical literature, financial institutions, utilities and governmental enterprises are disregarded because these types of companies are intrinsically different in the nature of their operations and financial accounting information. Overall, we have a data panel containing 88 companies. In order to mitigate the effect of outliers, all variables are winsorized at 0.5% in each tail of the distribution.

2.4.2. Descriptive statistics

Table 2.2. presents summary statistics for the simulation approach tax variables (Panel A) along with the regression approach key variables (Panel B).

TABLE 2.2.: DESCRIPTIVE STATISTICS

Variables	Mean	Median	St. Dev.	Min.	Max.
			PANEL A		
$MTR^{0\%}$	0.1784	0.1910	0.0824	0.0002	0.3000
$MTR^{100\%}$	0.1737	0.1879	0.0840	0.0003	0.3000
Kink	3.0765	1.0000	3.2265	0.0000	8.0000
ZeroBen	7.9100	8.0000	0.5697	2.0000	8.0000
			PANEL B		
V_L	1.6302	1.1687	1.5939	0.2043	11.6750
OI	0.0299	0.0241	0.0772	-0.3506	0.3919
NOA	1.0552	0.9310	1.9869	0.1800	23.7903
OL	0.1398	0.0718	0.1757	0.0009	0.8200
β_U	0.4812	0.4204	0.3382	-0.0775	1.4212
D	0.3497	0.3222	0.2293	0	0.9202

Table A-2.1. in the Appendix provides definitions of all the variables. V_L, OI, NOA, OL and D are all deflated by total assets.

In Panel A of Table 2.2., we observe that the mean value of the before-financing marginal tax rate is 17.37% (17.84% assuming the firm has no interest deductions), with a maximum value of 30% (maximum value for the statutory tax rate) and a standard deviation of 8.40% (8.24%). The average firm's marginal tax benefit begins to slope downward when its interest reaches 310% of the current level.

As shown in Panel B of Table 2.2., the average firm finances 35% of its assets with financial debt and 14% with operating liabilities. The market value of the firm (without considering operating liabilities) is 163% of the book value of total assets.

2.5. Empirical results

2.5.1. The value of the debt tax shield

First, it is interesting to analyse the time evolution of debt financing and interest expenses of our sample, which is displayed in Table 2.3.

TABLE 2.3.: CAPITAL STRUCTURE AND INTEREST EXPENSES

Years	Debt €	Interest Expenses €	Equity €	Debt / Equity	Obs.
2008	62,166,838.78	2,808,300.40	111,436,072.36	55.8%	22
2009	171,393,461.72	6,220,856.45	301,837,548.49	56.8%	82
2010	178,504,893.85	6,227,984.92	285,586,357.89	62.5%	85
2011	178,977,685.08	6,894,896.82	259,899,056.12	68.9%	86
2012	175,344,940.99	7,393,591.06	261,530,561.21	67.0%	87
2013	165,273,306.52	7,758,021.04	320,808,810.14	51.5%	85

In 2008, total financial debt (sum of short-term and long-term borrowings) amounts to €62 million. It reaches a maximum of €179 million in 2011 and then declines. The value of the equity, however, increases from 2008 to 2009, and then declines until 2011, at which point it starts to increase once more. The debt-equity ratio increases steadily from 2008 to 2011, when it shows a slight fall, being more pronounced in 2013. The steady increment in the debt-equity ratio until 2011 is driven by both a decrease in the numerator and an increase in the denominator, the latter higher than the former. Interest expenses reveal an upward trend throughout the whole sample period.

As far as the simulation approach is concerned, we simulate interest deduction benefit functions and use them to estimate the tax-reducing value of each incremental euro of interest expense. Tax benefits of debt are estimated by integrating the area under the tax benefit function, and we compute the capitalized tax benefits of debt as a percentage of firm´s market value. Table 2.4. shows the tax benefit of debt for the whole of our firm´s sample, both in gross value (excluding personal taxes) and in net value (including personal taxes).

TABLE 2.4.: THE AGGREGATE TAX BENEFIT OF DEBT

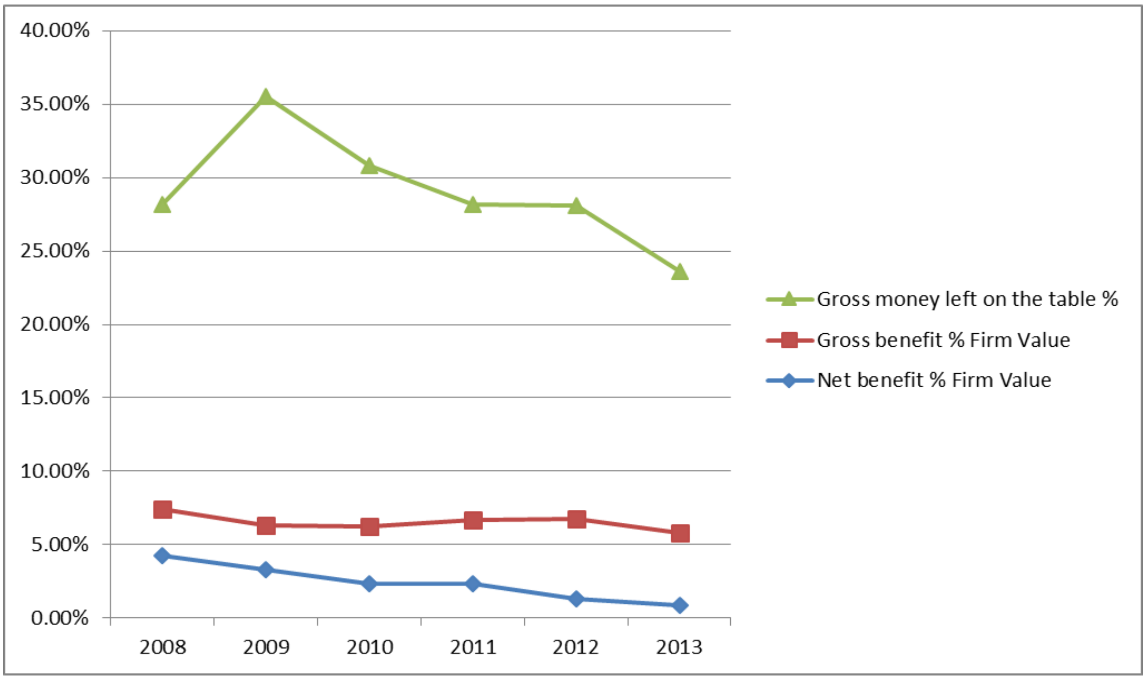
	GROSS TAX BENEFITS			NET TAX BENEFITS		
Years	Total €	Per Firm €	% of Firm Value Capitalized	Total €	Per Firm €	% of Firm Value Capitalized
2008	12,974,181,773	589,735,535	7.45	7,475,643,151	339,801,961	4.27
2009	33,673,455,900	410,651,901	6.29	17,544,511,082	213,957,452	3.27
2010	32,344,457,358	380,523,028	6.23	13,056,879,356	153,610,345	2.31
2011	30,452,850,336	354,102,911	6.67	11,569,591,429	134,530,133	2.33
2012	28,521,178,948	327,829,643	6.78	6,195,241,880	71,209,677	1.29
2013	26,037,330,523	306,321,536	5.83	5,133,123,132	60,389,684	0.90
Total	164,003,454,838	366,898,109	6.42	60,974,990,030	136,409,373	2.12

% of Firm Value Capitalized is the present value of future tax benefits, estimated under the assumption that the debt tax shield computed at the end of year t will be maintained over the following years. The interest rate on debt for each firm, calculated as the quotient between interest expenses and debt, is used as the discount rate. We evaluate firm value as the sum of market value of equity and book value of financial debt.

The total (Individual) tax benefit of debt is greatest in 2009 (2008) before gradually diminishing over time. Capitalized tax benefits are the present value of future tax benefits divided by the firm value. The capitalized gross value of interest deductions is about 6.4% of market value over the sample period; this compares to the traditional 11.4% (marginal tax rate times debt) of firm value, which assumes that full tax benefits are realized on every euro of interest deducted in each scenario. It reaches its highest value in 2008 at 7.5%, and then gradually reduces to 5.8% in 2013. Capitalized net tax benefits after the personal penalty follow a similar trend, but the equivalent figures are obviously smaller.

Firms with a kink larger than one can increase interest, and still receive the maximum marginal tax benefit until they reach their kink. If the incremental non-tax costs of debt are smaller than the incremental tax benefits, then a firm can increase its firm value by issuing more debt. In accordance with Graham (2000, 2008, 2013), for firms with a kink larger than one, we estimate the incremental gross tax benefits from additional debt up to their kink. The resulting number can be interpreted (if many firms are underlevered) as a rough measure of the value loss due to conservative corporate debt policy, or (if most firms are optimally levered) as a lower bound for the difficult-to-measure costs of debt that would occur if a company were to lever up to its kink (Graham, 2013). Figure 2.4. presents these incremental gross tax benefits, i.e. gross 'money left on the table', as a percentage of firm value along with the capitalized gross and net tax benefit of debt.

FIGURE 2.4.: DEBT TAX BENEFITS



For the entire sample period, the incremental gross tax benefits given up by firms are larger than the capitalized gross tax benefits secured. Specifically, the foregone incremental tax benefits represent 28.19% of firm value in 2008, before gradually declining to 23.64% in 2013. These results suggest that the gross money left on the table from conservative debt policy is substantial, though less so over time. The total tax benefits of debt can be computed by adding the incremental tax benefits from additional debt to the capitalized tax benefits from the current debt. As a result, the average firm gains 7.45% of firm value from its current debt level in 2008, and can add 28.19% by leveraging up to its kink. Therefore, in 2008 the total gross tax benefit is 35.64% of firm value. Conversely, in the remaining years, the total gross tax benefits are 41.80% (2009), 37.05% (2010), 34.84% (2011), 34.86% (2012) and 29.46% (2013).

The previous figures would suggest that, on average, firms appear to be underlevered, as the average unexploited tax benefits seem to be larger than the costs of debt that would be incurred if the firms were to lever up. Nevertheless, Almeida and Philippon (2007) show that the expected cost of default approximately equals the estimate of the money left on the table (net of personal taxes). This finding implies that firms on average may not be underlevered[29].

Regarding the regression approach, we begin by estimating the parameters of Equation [10], which is the forward regression with a deflated intercept[30]. The coefficients of these parameters are reported in Table 2.5.

TABLE 2.5.: ESTIMATION RESULTS OF EQUATION [10]

	β_0	β_1	β_2	Adj. R^2	N	Obs.
Mean	$3.73\ 10^7$	1.7662	1.3358	0.9120	87	447
t-statistic	13.18	2.76	8.71			

Fixed effects regression coefficients estimated from Equation [10] with the intercept and all the explanatory variables scaled by total assets. The *t*-statistic is the ratio of the coefficient to its standard error.

The results are consistent with the concern that debt is likely to be related to size; hence, the debt coefficient may be biased upward (Kemsley and Nissim, 2002). In conclusion, the estimated debt coefficient (i.e. 1.3358) is too large to be explained by tax factors.

The next step is to estimate Equation [14], the reverse approach, in order to avoid the drawbacks associated with the forward regression. Nevertheless, in equation [14] we considered ρ as a constant, which would lead us to expect a bias since it is important to control for firm profitability information when estimating the debt tax shelter, and

[29] As Graham (2013) points out, it is worth mentioning that the Almeida and Philippon (2007) estimate of the personal tax costs is based on crude estimates. Therefore, if this personal tax penalty happens to be overstated, it is possible that the "underleverage" puzzle might not have been fully resolved by Almeida and Philippon (2007).

[30] As an alternative procedure, we have also checked for cross-sectional and serial correlation, and heteroscedasticity in the fixed effects model of Equation [10], without deflating the intercept and the explanatory variables, using the Breusch and Pagan (1980) LM test, Wooldridge (2002) test and the Modified Wald test (Baum, 2001), respectively. The estimated coefficients of the panel data model are almost qualitatively and quantitatively the same as the ones reported in Table 5 (results are available upon request to the authors).

profitability is associated with different capitalization rates (Jiang, 2004). The estimation results are displayed in Table 2.6.

TABLE 2.6.: ESTIMATION RESULTS OF EQUATION [14]

	β_0	β_1	β_2	Debt Tax Shield	R^2	N	Obs.
Mean	-1,134,251	0.0147	-0.0153	1.0408	0.7467	87	447
t-statistic	-3.98	3.36	-1.15				

Fixed effects regression coefficients estimated from Equation [14] with the intercept and all the explanatory variables scaled by total assets. The *t*-statistic is the ratio of the coefficient to its standard error.

As discussed in subsection 2.3.2., the estimate for the debt tax shield is calculated as the quotient between $-\beta_2$ and β_1, that is, 0.0153/0.0147, which equals 1.0408. Again, the estimated debt tax shield coefficient is quite large due to a bias effect. The reason might be to considering ρ as a constant in Equations [10] and [14], and therefore without including any specific control for it; furthermore, there might be a measurement error in the empirical proxy for E(FOI).

Our last regression estimation in the regression approach deals with equation [15]. We estimate it by non-linear least squares, but this time, instead of considering ρ as a constant, we express the capitalization rate as a linear function of several observable instruments associated with risk and growth. The estimation results of equation [15] are presented in Table 2.7.

TABLE 2.7.: ESTIMATION RESULTS OF EQUATION [15]

	β_0	β_1	β_2	β_3	β_4	Debt Tax Shield	γ_2	γ_3	γ_4
Mean	0.5820	0.7450	0.0014	-0.0488	0.0065	0.3423	-4,019,516	-284,888	455,783
t-statistic	4.57	7.57	1.05	-6.66	2.07	2.67	-7.27	-1.15	2.63

Non-linear panel data regression coefficients estimated from equation [15].

The net debt tax shield in terms of firm value can be computed as the mean leverage ratio (39.81%) multiplied by the estimated coefficient of the debt tax shield in Table 2.7. (0.3423), which equals 13.62%. Nevertheless, this result should be interpreted cautiously, because compared to the result obtained with the simulation approach, this high figure implies near zero non-tax costs from debt, costs of bankruptcy and/or personal taxes.

2.5.2. Debt conservatism and firm-by-firm comparison

The extent to which a firm's debt financing is considered conservative may be assessed by reference to the firm's tax benefit function and kink. A large kink implies that the firm is using debt conservatively, as it can raise more debt without any decline in the tax benefit of incremental interests. Table 2.8. reports the distribution of kinks and standardized kinks.

TABLE 2.8.: THE DISTRIBUTION OF KINKS AND STANDARDIZED KINKS

Kink	Standardized Kink	Obs.	Percentile (%)
0.0	0.00	86	19.2
0.2	0.08	55	12.3
0.4	0.19	42	9.4
0.6	0.18	12	2.7
0.8	0.25	13	2.9
1.0	0.19	19	4.3
1.2	0.21	7	1.6
1.6	0.19	9	2.0
2.0	0.57	14	3.1
3.0	1.78	12	2.7
4.0	0.93	6	1.3
6.0	1.56	86	19.2
7.0	0.31	4	0.9
8.0	1.98	82	18.3
Total		447	100.0

The standardized kink is the actual interest at the kink divided by the standard deviation of income.

From Table 2.8. we can observe that 49.1% of all kinks are larger than one, and 42.4% of kinks are larger than two. Therefore, approximately half of sample firms can raise additional debt and still enjoy the maximum marginal tax benefit. The maximum kink value of 8.0, corresponds with the maximum standardized kink value of 1.98. This suggests that firms with a large kink will remain in the flat part of their tax benefit function, even after a negative shock to their income, and still be able to access the full benefits of debt. At the other extreme, almost one-fifth of our sample observations have tax benefits that are negative and start to decline at the first increment of interest expense (i.e., kink equal to zero).

TABLE 2.9.: TIME EVOLUTION OF KINK AND ZEROBEN

Years	Kink	ZeroBen	Obs.
2008	3.11	8.00	22
2009	2.94	8.00	82
2010	3.06	7.99	85
2011	3.03	7.94	86
2012	3.07	7.86	87
2013	3.27	7.76	85
Total	3.08	7.91	447

ZeroBen steadily declines from 8.00 in 2008 to 7.76 in 2013, while kink increases from 3.11 to 3.27 for the same time horizon.

For further analysis, we identify four different groups of firms.

- Group A: high-profitability firms, defined as those firms whose positive ROA (i.e. return on assets, equal to earnings before interest and taxes divided by total assets) is above the median ROA of the sample of firms.

- Group B: low-profitability firms, defined as those firms whose positive ROA is below the median ROA of the sample of firms.

- Group C: high-leveraged firms, defined as those firms whose leverage ratio is above the median leverage ratio of the sample of firms.

- Group D: low-leveraged firms, defined as those firms whose leverage ratio is below the median leverage ratio of the sample of firms.

Table 2.10. compares the tax benefits of debt by firms' profitability. Profitable groups are formed by partitioning the sample into four equal-size groups by ROA ranking in year t.

TABLE 2.10.: COMPARISON OF THE TAX BENEFIT OF DEBT BY FIRMS' PROFITABILITY

Group of Firms	ROA	Kink	N
A	Lower 25%	2.36	85
	Second 25%	2,52	84
B	Third 25%	2.87	86
	Upper 25%	3.88	80

Profitability is based on ROA ratio criterion.

In Table 2.10., we observe that kink increases with profitability. High-profitability firms could increase interest expense by a greater amount than low-profitability firms, without reducing their marginal tax benefit.

As far as the level of indebtedness is concerned, Table 2.11. reports the comparison between groups of firms C and D.

TABLE 2.11.: COMPARISON OF THE TAX BENEFIT OF DEBT BY FIRMS' CHARACTERISTICS

Group of Firms	Characteristic	2008	2009	2010	2011	2012	2013
	Gross Benefit of Debt Tax Shield (%)	11.57	10.12	9.75	10.29	10.32	8.85
	Net Benefit of Debt Tax Shield (%)	6.78	5.33	3.57	3.56	1.69	1.04
C	Kink	2.20	2.95	2.74	2.43	2.50	2.41
	$MTR^{100\%}$ (%)	21.71	19.84	17.24	16.45	15.43	15.17
	Leverage (%)	54.43	51.01	56.57	63.17	67.11	60.81
	EBIT (€ million)	4,209	15,083	10,592	15,176	4,325	4,862
	Gross Benefit of Debt Tax Shield (%)	3.33	2.46	2.79	3.06	3.31	2.88
	Net Benefit of Debt Tax Shield (%)	1.75	1.22	1.08	1.09	0.90	0.75
D	Kink	4.02	2.92	3.37	3.63	3.64	4.10
	$MTR^{100\%}$ (%)	19.48	19.63	18.23	17.39	17.51	16.90
	Leverage (%)	17.50	13.11	15.76	18.52	19.18	17.03
	EBIT (€ million)	4,227	4,586	5,266	4,966	9,731	8,138

Both gross and net benefits of the debt tax shield are computed in terms of firms' market value. Leverage is the quotient between total book debt and firms' market value.

As shown in Table 2.11., firms with a higher leverage ratio have a lower kink, and vice versa. Moreover, high-leveraged firms have both a higher gross and a higher net benefit of the debt tax shield (as a percentage of firm value).

2.6. Robustness of results

In order to verify the robustness of our previous empirical evidence, we perform several different tests.

First, we use an alternative proxy for E(FOI) in Equations [10], [14] and [15]. This new proxy is computed as EBIT times one minus marginal corporate tax rate plus depreciation, averaged over the subsequent five years. The estimation results of our first robustness test are shown in Tables 2.12., 2.13. and 2.14., respectively.

TABLE 2.12.: ESTIMATION RESULTS OF EQUATION [10] WITH A NEW PROXY FOR E(FOI)

	β_0	β_1	β_2	Adj. R^2	N	Obs.
Mean	$3.62\ 10^7$	1.9878	1.3048	0.9107	87	447
t-statistic	12.58	1.61	8.60			

Fixed effects regression coefficients estimated from Equation [10] with the intercept and all the explanatory variables scaled by total assets. The *t*-statistic is the ratio of the coefficient to its standard error.

TABLE 2.13.: ESTIMATION RESULTS OF EQUATION [14] WITH A NEW PROXY FOR E(FOI)

	β_0	β_1	β_2	Debt Tax Shield	R^2	N	Obs.
Mean	-148.550	0.0056	0.0120	-2.1429	0.9195	87	447
t-statistic	-0.80	1.78	1.46				

Fixed effects regression coefficients estimated from Equation [14] with the intercept and all the explanatory variables scaled by total assets. The *t*-statistic is the ratio of the coefficient to its standard error.

TABLE 2.14.: ESTIMATION RESULTS OF EQUATION [15] WITH A NEW PROXY FOR E(FOI)

	β_0	β_1	β_2	β_3	β_4	Debt Tax Shield	γ_2	γ_3	γ_4
Mean	0.5860	0.8404	-0.0014	-0.0552	0.0120	0.2715	-3.684.373	431.098	113.635
t-statistic	4.65	8.14	-0.95	-7.49	3.56	1.89	-6.81	1.59	0.62

Non-linear panel data regression coefficients estimated from Equation [15].

As can be observed from Tables 2.12., 2.13. and 2.14., the computation of E(FOI) with a new proxy does not qualitatively change the results nor the conclusions obtained in subsection 2.5.1.

Second, a number of studies have attempted to analyse the tax implications of financing decisions on the firm's value by considering the interest expense instead of the debt level as explanatory variable (see Fama and French 1998; Kemsley and Nissim, 2002; Jayaraman, 2006; Sinha and Bansal, 2014, among others). Therefore, our second robustness test entails including the interest expense variable in the regression analysis. In line with previous research, we formulate the following empirical specification:

$$\frac{VALUE_{it}}{Total\ Assets_{it}} = \beta_0 + \beta_1 \cdot \frac{INT_{it}}{Total\ Assets_{it}} + \beta_2 \cdot \frac{OI_{it}}{Total\ Assets_{it}} + \beta_3 \cdot \frac{DIV_{it}}{Total\ Assets_{it}} + \beta_4 \cdot \frac{CAPEX_{it}}{Total\ Assets_{it}} + \beta_5 \cdot SIZE + \eta_i + \varepsilon_{it} \quad [16]$$

Where VALUE is the difference between market and book value of the firm, INT is the interest expense and constitutes the pivotal value (i.e., its coefficient leads to the estimated value for the debt tax shield), OI is earnings before interest and taxes multiplied by one minus the marginal corporate tax rate, DIV is the amount of dividends paid, CAPEX is capital expenditures, and SIZE is the natural logarithm of sales[31]; η_i absorbs firm–specific effects, and ε_{it} is the disturbance term.

Estimating Equation [16] requires testing for the potential endogeneity of the contemporaneous interest variable. The implementation of the Hausman (1978) test of endogeneity reveals the absence of endogeneity for the interest regressor[32].

Table 2.15. shows the estimated coefficients of Equation [16].

TABLE 2.15.: ESTIMATION RESULTS OF EQUATION [16]

Explanatory Variables	Dependent Variable: VALUE
INT	7.705* (1.93)
OI	-0.757 (-1.44)
DIV	4.384*** (3.28)
CAPEX	-0.189 (-0.34)
SIZE	0.016 (0.32)
Observations	432
R-Squared Within	0.1472
Wald test (F-statistic)	5.82 (0.000)
Hausman test (χ^2)	88.90 (0.000)

Fixed–effect regression coefficients estimated from Equation [16] with *t*-statistic in brackets. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels. Wald's test statistic refers to the null hypothesis that all coefficients of the explanatory variables are equal to zero. Hausman's test refers to the null hypothesis of both fixed effects and random effects being equivalent.

[31] Fama and French (1998) argue that poor controls for future profitability could distort the relation between firm value and debt. In order to address this concern, we include capital expenditures to better control for the firm's future profitability, and firm size to take into account other firm-level factors.
[32] χ^2=0.81 (0.999) accepting the null of absence of endogeneity. We instrument the interest variable with its one-period lagged value.

The interpretation of the estimated coefficient associated with the interest variable (i.e. β_1) is the following. Recall that the value of a leveraged firm is the sum of the value of the unleveraged firm and the present value of the debt tax shield. We can compute the present value of the debt tax shield as the quotient between the marginal tax rate and the capitalization rate (i.e. cost of debt) times the interest expense. Therefore, the estimated marginal tax rate may be calculated as $\hat{t}_c = \hat{\beta}_1 \cdot r_d$. Specifically, 7.705 multiplied by the median interest rate (3.14%) equals 24.19%, which represents the debt tax shield in terms of debt value. If we now multiply 24.19% by the mean leverage ratio (39.81%), we obtain the debt tax shield in terms of firm value (9.63%).

As an additional test to verify the effect of including interest expense instead of debt level, we re-estimate Equation [15] with interest expense as a replacement for debt where applicable. Table 2.16. reports these new estimation results.

TABLE 2.16.: ESTIMATION RESULTS OF EQUATION [15] WITH INTEREST EXPENSE

	β_0	β_1	β_2	β_3	β_4	Debt Tax Shield	γ_2	γ_3	γ_4
Mean	0.5703	0.7083	0.0017	-0.0473	0.0062	4.1998	-3,917,979	-262,558	454,296
t-statistic	4.75	7.54	1.29	-7.05	1.99	2.51	-7.81	-1.06	2.62

Non-linear panel data regression coefficients estimated from Equation [15].

Multiplying the median interest rate (3.14%) by 4.1998 gives the debt tax shield in terms of debt value (13.19%). The debt tax shield in terms of firm value results from multiplying 13.19% by the mean leverage ratio (39.81%), which amounts to 5.25%.

In addition to the re-estimation of Equation [15], we also carry out another estimation of this Equation but including the same alternative proxy for E(FOI) variable as was used for Tables 2.12., 2.13. and 2.14. The new coefficient estimates are shown in Table 2.17.

TABLE 2.17.: ESTIMATION RESULTS OF EQUATION [15] WITH A NEW PROXY FOR E(FOI) AND WITH INTEREST EXPENSE

	β_0	β_1	β_2	β_3	β_4	Debt Tax Shield	γ_2	γ_3	γ_4
Mean	0.5958	0.8001	-0.0012	-0.0549	0.0118	3.5760	-3.672.214	447.100	108.059
t-statistic	4.95	8.03	-0.83	-8.16	3.60	2.03	-7.45	1.67	0.59

Non-linear panel data regression coefficients estimated from Equation [15].

As can be observed from Table 2.17., the new values of the debt tax shield in terms of debt value (11.23%) and the corresponding figures in terms of firm value (4.47%) are in the same vein as those obtained in Table 2.15.

Finally, as Kemsley and Nissim (2002) state, all else being equal, the value of the debt tax shield should increase in firm-specific corporate tax rates. In order to take advantage of firms' differing corporate tax rates, we use the pre-financing marginal tax rates explained in subsection 2.2.1., to split our observations according to the sample median marginal tax rate. Thus, we create two dummy variables[33]: $DMTR_1$, which equals one if the marginal tax rate is below the median marginal tax rate (i.e. low-tax observations), and $DMTR_2$, which equals one if the marginal tax rate is above the median marginal tax rate (i.e. high-tax observations). The mean (median) marginal tax rate is 24.38% (24.63%) and 10.62% (11.46%) for high-tax and low-tax observations, respectively. Moreover, we interact these dummy variables with the intercept, the capitalization rate, and debt. The resulting regression equation is as follows:

$$\begin{aligned} E(FOI)_{it} = {} & \left[\sum_{i=1}^{2} \beta_{0i} \cdot DMTR_{it} + \beta_1 \cdot \beta_U + \beta_2 \cdot \frac{V_{Lit} - \sum_{i=1}^{2} \beta_{5i} \cdot DMTR_{it} \cdot D_{it}}{NOA_{it}} + \beta_3 \cdot \ln\left(NOA\right)_{it} + \beta_4 \cdot \ln\left(OL\right)_{it} \right] \cdot \\ & \cdot \left(V_{Lit} - \sum_{i=1}^{2} \beta_{5i} \cdot DMTR_{it} \cdot D_{it} \right) + \sum_{i=1}^{8} \gamma_{1i} \cdot DMTR_{it} + \sum_{i=1}^{8} \gamma_{2i} \cdot Dummy\_Industry_i + \\ & + \gamma_3 \cdot \frac{V_{Lit} - \sum_{i=1}^{2} \beta_{5i} \cdot DMTR_{it} \cdot D_{it}}{NOA_{it}} + \gamma_4 \cdot \ln\left(NOA\right)_{it} + \gamma_5 \cdot \ln\left(OL\right)_{it} + \varepsilon_{it} \end{aligned} \qquad [17]$$

[33] The use of dummy variables helps counteract the effect of any measurement error in the firm level marginal tax rates.

The estimation results of the last robustness test are shown in Table 2.18.

TABLE 2.18.: ESTIMATION RESULTS OF EQUATION [17]

	β_{01}	β_{02}	β_1	β_2	β_3	β_4	β_{51}	β_{52}	γ_3	γ_4	γ_5
Mean	0.8705	0.8349	0.4078	0.0019	-0.0515	0.0011	0.3060	2.7254	-4,151,547	-1,297,652	801,121
t-statistic	5.29	5.14	2.96	1.59	-5.75	0.33	1.90	3.77	-6.20	-3.46	4.74

Non-linear panel data regression coefficients estimated from Equation [17].

As reported in Table 2.18., the results are qualitative as expected, with the value of the net debt tax shield increasing with firm-specific corporate tax rate.

2.7. Concluding remarks

Following Modigliani and Miller (1963), the empirical capital structure literature has examined the hypothesis that the corporate tax benefit of debt increases firm value. Previous studies on debt tax shields have evaluated the determinants of debt usage or the basic relationship between marginal tax rates and firms' debt policy. This study, however, directly estimates the tax benefits of debt under different approaches. To the best of our knowledge, it is the first empirical analysis to assess the tax benefit of debt and its contribution to firm value within a Spanish context, and one of the few in the European economies. Therefore, our paper is related to prior research that estimates the tax benefits of debt summarized by Graham (2013) and Hanlon and Heitzman (2010).

Our research structure relies upon Graham (2000) and Kemsley and Nissim (2002) frameworks. The results obtained prove that the tax benefits of debt for Spanish listed firms are significant. Under the simulation approach, the mean capitalized gross (net) tax benefit of current interests is estimated to be 6.4% (2.1%) of firm value. For the entire sample period, the mean incremental tax benefit is found to be 28.9% of firm value. Conversely, the regression approach leads to a 13.6% (34.2%) debt tax shield in terms of firm (debt) value. The previous figures contrast with those of the traditional tax shield value, which amounts to 11.4% (that is, marginal tax rate multiplied by debt).

Since econometric issues cloud interpretation (Graham, 2013), our results especially those coming from the regression approach, should be interpreted with caution. For instance, there might be measurement errors in the variables, risk and growth are very difficult to be controlled for using proxies for the discount rate, and the same applies to profitability for the unlevered firm value. As a conclusion, more research in this field is needed.

We run a number of robustness tests in order to verify our empirical results. We show that our conclusions are robust to using alternative variables proxies such as the measurement of the expected future operating income or the use of interest expense instead of debt level. Furthermore, as expected, the value of the debt tax shield increases with firm-specific marginal corporate tax rates.

The results of this study should provide insight into the effect of government regulations, especially with respect to the tax code, on the capital structure of firms. Moreover, managers should be aware of the relative importance of the value of debt tax benefits.

Finally, it is worth mentioning two caveats in light of our empirical results, caveats which might inform our future research. On the one hand, the fiscal tax advantage of debt does not necessarily mean that debt financing dominates equity financing in firms' capital structures; a more in-depth analysis of the different tax treatments of retained equity, external equity and debt financing is needed. On the other hand, the non-tax consequences of leverage may offset all tax savings in equilibrium.

2.8. References

- Almeida, H. and Philippon, T., 2007, "The risk-adjusted cost of financial distress", *The Journal of Finance*, 62 (6), 2557-2586.

- Baum, C. F., 2001, "Residual diagnostics for cross-section time series regression models", *The Stata Journal*, 1 (1), 101-104.

- Blouin, J., Core, J. E. and Guay, W., 2010, "Have the tax benefits of debt been overestimated?", *Journal of Financial Economics*, 98, 195-213.

- Caskey, J., Hughes, J. and Liu, J., 2012, "Leverage, excess leverage, and future returns", *Review of Accounting Studies*, 17 (2), 443-471.

- Clemente-Almendros, J. A. and Sogorb-Mira, F., 2015, "The effect of taxes on the debt policy of Spanish listed companies", *Unpublished Working paper*, University CEU Cardenal Herrera.

- Cooper, I. A. and Nyborg, K. G., 2006, "The value of tax shields is equal to the present value of tax shields", *Journal of Financial Economics*, 81, 215-225.

- Cooper, I. A. and Nyborg, K. G., 2007, "Valuing the debt tax shield", *Journal of Applied Corporate Finance*, 19 (2), 50-59.

- Doidge, D. and Dyck, A., 2015, "Taxes and corporate policies: Evidence from a quasi natural experiment", *The Journal of Finance*, 70 (1), 45-89.

- Easton, P. D. and Sommers, G. A., 2003, "Scale and the scale effect in market-based accounting research", *Journal of Business Finance & Accounting*, 30 (1-2), 25–56.

- Engel, E., Erickson, M. and Maydew, E., 1999, "Debt equity hybrid securities", *Journal of Accounting Research*, 37, 249–273.

- Fama, E. F., 2011, "My life in finance", *Annual Review of Financial Economics*, 3 (1), 1-15.

- Fama, E. F. and French, K. R., 1992, "The cross-section of expected stock returns", *The Journal of Finance*, 47 (2), 427-465.

- Fama, E. F. and French, K. R., 1998, "Taxes, financing decisions, and firm value", *The Journal of Finance*, 53 (3), 819-843.

- Gordon, R. and Mackie-Mason, J., 1990, "Effects of the Tax Reform Act 1986 on corporate financial policy and organizational form" in J. Slemrod (Ed), Do taxes matter? The impact of the Tax Reform Act of 1986, MIT Press, Cambridge, MA.

- Graham, J. R., 1999, "Do personal taxes affect corporate financing decisions?", *Journal of Public Economics*, 73 (2), 147-185.

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

- Graham, J. R., 2001, "Estimating the tax benefits of debt", *Journal of Applied Corporate Finance,* 14 (1), 42-54.
- Graham, J. R., 2003, "Taxes and corporate finance: A review", *Review of Financial Studies,* 16, 1075-1129.
- Graham, J. R., 2008, "Taxes and corporate finance" in B. E. Eckbo (Ed), Handbook of Corporate Finance. Empirical Corporate Finance, North-Holland Elsevier, Volume 2, Chapter 11, 59-133.
- Graham, J. R., 2013, "Do taxes affect corporate decisions? A Review" in G. M. Constantinides, M. Harris and R. M. Stulz (Eds), Handbook of the Economics of Finance, North-Holland Elsevier, Volume 2, Part A, Chapter 3, 123-210.
- Graham, J. R., Lemmon, M. L. and Schallheim, J. S., 1998, "Debt, leases, taxes, and the endogeneity of corporate tax status", *The Journal of Finance,* 53 (1), 131-162.
- Green, R. C. and Hollifield, B., 2003, "The personal-tax advantages of equity", *Journal of Financial Economics*, 67 (2), 175-216.
- Hanlon, M. and Heitzman, S., 2010, "A review of tax research", *Journal of Accounting and Economics,* 50, 127-178.
- Hausman, J., 1978, "Specification tests in econometrics", *Econometrica,* 46 (6), 1251-1271.
- Hoaglin, D., 2003, "John W. Tukey and data analysis", *Statistical Science,* 18 (3), 311-318.
- Jiang, Y., 2004, "Taxes, debt, and firm value: new evidence", *Unpublished Ph. D. Dissertation Thesis,* Graduate School of Yale University.
- Jayaraman, S., 2006, "Firm value and the tax benefit of debt", *Unpublished Working paper*, University of North Carolina.
- Kaplan, S., 1989, "Management buyouts: evidence on taxes as a source of value", *The Journal of Finance*, 44 (3), 611-632.
- Kemsley, D. and Nissim, D., 2002, "Valuation of the debt tax shield", *The Journal of Finance*, 57 (5), 2045-2073.
- Ko, J. K. and Yoon, S., 2011, "Tax benefits of debt and debt financing in Korea", *Asia-Pacific Journal of Financial Studies*, 40, 824-855.
- Korteweg, A., 2010, "The net benefits to leverage", *The Journal of Finance,* 65, 2137-2170.
- Masulis, R. W., 1983, "The impact of capital structure change on firm value: some estimates", *The Journal of Finance*, 38, 107-126.
- McGuire, S. T., Neuman, S. S., Olson, A. J. and Omer, T. C., 2014, "Valuation and pricing of tax loss carryforwards", Available at SSRN: http://dx.doi.org/10.2139/ssrn.2347635.

- Miller, M. H., 1977, "Debt and taxes", *The Journal of Finance*, 32, 261-275.
- Miller, M. H. and Modigliani, F., 1966, "Some estimates of the cost of capital to the electric utility industry, 1954-57", *American Economic Review*, 56, 333-391.
- Modigliani, F. and Miller, M. H., 1958, "The cost of capital, corporation finance, and the theory of investment", *American Economic Review*, 48, 261-297.
- Modigliani, F. and Miller, M. H., 1963, "Corporate income taxes and the cost of capital: A correction", *American Economic Review*, 53, 433-443.
- Penman, S. H., 1996, "The articulation of price-earnings ratios and market-to-book ratios and the evaluation of growth", *Journal of Accounting Research*, 34 (2), 235-259.
- Roychowdhury, S., 2006, "Earnings management through real activities manipulation", *Journal of Accounting and Economics*, 42, 335-370.
- Sarkar, S., 2014, "Valuation of tax loss carryforwards", *Review of Quantitative Finance and Accounting*, 2014, 43 (4), 803-828.
- Sinha, P. and Bansal, V., 2014, "Interrelationship between taxes, capital structure decisions and value of the firm: A panel data study on Indian manufacturing firms", MPRA Paper No 58310, University Library of Munich, Germany.
- Van Binsbergen, J., Graham, J. and Yang, J., 2010, "The cost of debt", *The Journal of Finance* 65, 2089-2136.
- Wooldridge, J. M., 2002, Econometric Analysis of Cross Section and Panel Data, MIT Press, Cambridge, MA.

2.9. Appendix

TABLE A-2.1.: DEFINITION OF VARIABLES

Variables	Definition
$MTR^{0\%}$	Marginal tax rate estimated following the Graham *et al.* (1998) approach, and assuming the firm has no interest deductions
$MTR^{100\%}$	Marginal tax rate estimated following the Graham *et al.* (1998) approach, and using the firm's actual interest deductions
Kink	Point at which the tax benefit function starts to slope downwards
ZeroBen	Point at which the tax benefit function equals zero
V_L	Market value of the firm calculated as market value of equity plus book value of debt
OI	Operating income calculated as earnings before interest and taxes multiplied by one minus the marginal corporate tax rate
NOA	Net operating assets calculated as total assets minus operating liabilities
OL	Operating liabilities (i.e. all non-debt liabilities)
β_U	Unlevered beta
D	Total financial debt

CHAPTER 3: DEBT CONSERVATISM AND CORPORATE TAXES IN SPANISH LISTED COMPANIES

3.1. Introduction

Graham’s (2000) results along with other research (see Graham, 2013, for a detailed review of the literature) support the notion that highly profitable, low-default probability, and high marginal tax rate firms are no more likely to use debt than other types of firms, suggesting that debt tax benefits might be of secondary importance. Although there is evidence that debt tax benefits add to firm value, additional research is needed to explain the apparently conservative debt policy of many firms. According to Graham (2013), such analysis might investigate whether non-debt tax shields substitute for interest deductions, and help to solve the “conservative leverage puzzle”.

The main goal of this paper is to re-examine the under-leverage result obtained by Graham (2000) in light of costs of debt and non-debt tax shelters available to companies. To assess a firm’s leverage, an accurate measurement of the marginal benefits as well as the marginal costs of debt is needed. Prominent among the benefits are the interest tax deductions from debt obligations, while financial distress costs are one of the more important counterweights to such benefits. Consequently, we estimate the financial distress costs of incremental debt, and set them against the potential tax benefits of additional leverage. Specifically, we measure the expected costs of increased leverage following the mapping between firm leverage and expected distress costs developed by Molina (2005).

On the other hand, DeAngelo and Masulis (1980) was one of the first papers to point to the importance of non-debt tax substitutes with respect to capital structure. Examples of such non-debt tax shields include depreciation, investment tax credits, or loss carryforwards. Specifically, our study examines a proxy for these tax shields called tax spread – the difference between tax expense and taxes actually paid – and relates it to Graham’s (2000) kink variable to see if this measure can explain the under-leverage result. Accordingly, we aim to analyse whether the tax benefits of debt might be of secondary importance, while tax benefits in general might still be of primary importance due to non-debt tax shelters. For instance, Graham, Lang and Shackelford (2004) examined one non-debt tax shield, namely the exercise of executive/employee stock options, and found these tax shelters can explain some, but not all, of the kink. Likewise, Shivdasani and Stefanescu (2010) found that pension assets and liabilities also act as tax shields, and pension contributions are about a third of those from interest payments.

In order to further explore the possibility that causal recipes for our outcomes may influence the kink, we follow Woodside (2010). Each of our variables in the original data are calibrated using the computer software subroutine in the fuzzy set / Qualitative Comparative Analysis (fsQCA) software program (Woodside 2013). The procedure is analogous to performing a z-scale transformation of original data (Ragin 2008). Following the fsQCA method, we elaborate a "truth table" and estimate the relevant solutions for the kink using the control variables (Complex, Parsimonious and Intermediate solutions). Next, we set a table with Consistency and Coverage as fit measures (Ragin 2005, Schneider and Grofman 2006). After applying this fsQCA approach, we take advantage of the substantial benefit from studying the case finding; thanks to fsQCA, we are able to generalize beyond the individual case but still identify individual cases in specific models relevant to our research (Woodside 2013).

Our results indicate that Spanish listed companies might not be acting sub-optimally despite their apparently conservative debt policy. When financial costs of debt are taken into account, a large portion of the potential debt tax savings are offset. Furthermore, firms use debt conservatively when they face low financing restrictions, net operating loss carryforwards, non-negative equity, high growth opportunities, a high percentage of current assets and a high portion of tangible assets. The conservative approach to debt policy is reinforced by the availability of non-debt tax shields. For instance, through permanent deferrals, accounting discretion, and opaque tax shelters, firms that appear under-levered may be simply overstating book income relative to taxable income.

The remainder of the paper is organized as follows. In the next Section, we discuss the theoretical background and formulate our hypotheses, while Section 3.3. explains the empirical research strategy. Section 3.4. presents the data for the study and the descriptive analysis regarding the key variables. The empirical results are discussed in Section 3.5., and the final Section provides some concluding remarks.

3.2. Theoretical foundation and hypotheses development

The trade-off theory of capital structure states that firms should pursue a given debt policy until the marginal benefit of doing so equals the marginal cost. The main advantage of debt financing is the tax deductibility of the interest payments.

Conversely, of the factors that reduce the tax benefit of debt, bankruptcy costs and financial distress are of particular note. The debt tax benefit coupled with the costs of default creates an optimal leverage ratio where the value of the firm is maximized.

The "conservative (or low) leverage puzzle" refers to the stylized fact that on average firms have low leverage ratios relative to what would be expected from capital structure theory. For example, Graham (2000) finds that firms are substantially under-levered from the viewpoint of debt tax benefits, and firms that follow a conservative debt policy are more likely to be stable and profitable. Molina (2005) and Almeida and Philippon (2007) argue that, because Graham's (2000) estimates of distress costs are too small, he overestimates the extent to which firms are underleveraged. Blouin, Core and Guay (2010) find evidence suggesting that under-levered firms have difficult-to-measure non-debt tax shields that are not captured in researchers' estimates of taxable income. More recently, and closely related to the debt conservatism stylized fact, Strebulaev and Yang (2013) have studied what has been called the "zero-leverage puzzle", which refers to the zero-debt or almost zero-debt policy of a substantial number of large public non-financial US firms.

Based on Graham (2000), firms' debt policy can be classified as either aggressive or conservative depending on the extent to which debt is used to minimize tax payments. Underleveraged (or conservative) firms forgo significant tax savings that would have been available if they had increased their debt levels to their kink. The kink can be measured as a ratio where the numerator is the maximum interest that can be deducted for tax purposes before expected marginal benefits begin to decline[34], and the denominator is actual interest incurred (Caskey, Hughes and Liu, 2012). For example, a firm with a kink of 2.0 is expected to be able to double its current interest expense and continue to benefit from interest tax shields at the firm's marginal tax rate. Using the kink as a measure of aggressiveness or conservativeness of the firm's debt policy, we could categorize its possible values in two groups:

[34] Another way to look at this numerator is to consider the amount of interest required in order to make earnings after interest and before taxes equal to zero.

- Kink<1: which indicates that earnings before interest and taxes are less than the actual financing expenses paid, and earnings after interest and before taxes are thus negative. This represents an aggressive debt policy.

- Kink>1: in this case, the opposite is true, and earnings after interest and before taxes are positive. Firms' debt policy is considered to be conservative.

The larger the kink, the greater the proportion by which interest tax deductions can increase without losing incremental value, and consequently the more conservative the debt policy. In conclusion, the kink and debt conservatism are positively related while the kink and debt levels are negatively related. Moreover, the kink and the marginal tax rate have a positive relationship.

In Clemente-Almendros and Sogorb-Mira (2015) we determined the tax benefit functions for a sample of Spanish listed companies and computed their kink values. Overall, 42% of the sample firms have kinks larger than two. For illustrative purposes, we now refer to a number of example firms and report their kink values in Table 3.1.

TABLE 3.1.: KINK AND MONEY LEFT ON THE TABLE FOR SEVERAL SAMPLE FIRMS

Company		2009	2010	2011	2012	2013
Abengoa, S.A. (ABG)	*KINK*	0.2	0.2	0.2	0.2	0.2
	Money Left on the Table	---	---	---	---	---
Industria de Diseño Textil, S.A. (ITX)	*KINK*	8.0	8.0	8.0	8.0	8.0
	Money Left on the Table	4.9%	5.8%	5.0%	3.8%	2.0%
Papeles y Cartones de Europa, S.A. (PAC)	*KINK*	3.0	3.0	2.0	3.0	3.0
	Money Left on the Table	31.0%	31.0%	17.0%	36.0%	28.0%
Telefónica, S.A. (TEF)	*KINK*	0.8	0.8	0.2	0.2	0.8
	Money Left on the Table	---	---	---	---	---
Tubacex, S.A. (TUB)	*KINK*	2.0	2.0	2.0	2.0	2.0
	Money Left on the Table	3.0%	3.7%	4.7%	4.7%	5.7%
Viscofán, S.A. (VIS)	*KINK*	0.2	0.2	6.0	6.0	6.0
	Money Left on the Table	---	---	1.5%	1.3%	1.2%

Kink measures the amount by which a firm could increase its current interest expense without losing any tax benefits associated with debt financing. Money left on the table is the additional tax benefit that could be obtained if firms with a kink greater than one levered up to the kink in their interest benefit functions.

From Table 3.1., we can deduce that ABG and TEF debt policies were relatively aggressive over the 2009-2013 period. Conversely, ITX, PAC, TUB and VIS used debt more conservatively, thus obtaining less tax benefits from interest deductions than they would otherwise have generated with a more expansive leverage strategy. Table 3.1. also reports the "money left on the table", which is the additional tax benefit (expressed as a percentage of the firm value) that could be achieved if firms with a kink greater than one levered up to the kink in their interest benefit functions (e.g. if a firm with a kink of 2.0 doubled its interest deductions). If the incremental non-tax costs of debt are smaller than the incremental tax benefits, then a firm can increase its firm value by issuing more debt. The data suggest that a conservative debt policy leads to a substantial amount of money left on the table, and this could constitute a significant portion of a firm's value[35]. Alternatively, if firms are optimally levered, the money left on the table could be interpreted as a lower bound for the difficult-to-measure costs of debt that could be incurred if a company were to lever up to its kink (Graham, 2013).

Notwithstanding, the trade-off theory of capital structure states that firms use debt conservatively when their non-tax costs of debt are high (Graham, 2001). In other words, firms with large kinks do not pursue debt aggressively because the cost of doing so is high. The optimal amount of debt varies according to the firm, and each firm should issue debt only for as long as the benefits continue to outweigh the costs.

Based on the abovementioned discussion, our first hypothesis is: *"Companies use debt conservatively when their costs of debt are high"* (Hypothesis 1).

Companies may prefer alternative tax shields to debt for different reasons. Firstly, they are less costly; while debt requires costly interest payments, numerous non-debt tax shields do not require any additional outlays for the firm. Secondly, they do not restrict the firm through debt covenants, which are likely to generate high transaction costs. Thirdly, non-debt tax shields frequently exploit provisions in the accounting rules that allow the firm to reduce taxes without affecting the income statement, thus favouring accounting earnings management[36]. Finally, some alternative debt tax shields have a

[35] Clemente-Almendros and Sogorb-Mira (2015) report that the foregone incremental debt tax benefits represent 28.19% of firm value in 2008, declining to 23.64% in 2013. The average firm-year money left on the table is 14.27%.

[36] For example, under certain circumstances, IFRS require foreign subsidiaries to consolidate under the parent company, but the earnings coming from the subsidiaries are not recognized as taxable income until

relatively larger return per euro invested, especially with the proliferation of thin capitalization rules.

Although Graham's kink measure is based on the proper application of the tax code and simulated future earnings from public financial statements, the measure is not designed to account for all non-debt tax shields available to companies that are not publicly reported. A possible proxy for these tax shields is the difference between tax expense and taxes actually paid, because tax shelters can create a spread between the publicly reported book income tax and the income tax privately reported to the fiscal authorities. This tax spread measure attempts to capture tax shields or shelters that have been overlooked in the capital structure literature, such as the effects of accelerated depreciation deductions (i.e. timing differences), pension contribution deductions and stock option deductions (i.e. permanent differences), etc. Specifically, we compute the tax spread as the difference between provisions for taxes on the company's income statement and taxes actually paid as detailed in the annual report.

$$\text{TAX\_SPREAD} = \text{Total Tax Expense} - \text{Taxes Paid} \qquad [1]$$

According to the previous rationale, we formulate our second hypothesis: *"Companies use debt conservatively when they have non-debt tax shields at their disposal"* (Hypothesis 2).

3.3. Empirical strategy

In order to test Hypothesis 1, we follow two different empirical strategies. Firstly, we focus on financial distress costs in order to determine whether these costs could offset the potential debt tax savings. We estimate the financial distress costs of incremental debt by concentrating on default probabilities, applying the approach of Molina (2005).

they are actually transferred to the parent company. Consequently, companies may permanently defer income tax through reinvestment abroad.

Specifically, we formulate the following regression model that attempts to explain the determinants of companies' ratings and hence default probabilities:

$$\begin{aligned} RAT_{it} &= \beta_0 + \beta_1 \cdot LEV_{it-1} + \beta_2 \cdot UBETA_{it-1} + \beta_3 \cdot RISK_{it-1} + \beta_4 \cdot PROF_{it-1} + \\ &\beta_5 \cdot TOBIN\acute{}S\ Q_{it-1} + \beta_6 \cdot SIZE_{it-1} + \beta_7 \cdot TANG_{it-1} + \varepsilon_{it} \end{aligned} \quad [2]$$

Where *RAT* denotes the company's rating with the highest score of 8 assigned to the AA rating, and the lowest, 1, to the C rating; *LEV* is the firm's leverage; *UBETA* is the unlevered beta; *RISK* is a financial distress proxy*; PROF* is a profitability variable; *TOBIN'S Q* is the market-to-book ratio; *SIZE* is measured as the natural logarithm of total assets; and *TANG* is a tangibility variable. We control for the potential endogeneity of the explanatory variables by using their lagged values in the regression analysis. Table A-3.1. in the Appendix provides a summary of the definitions of all the variables.

We have used all available companies' ratings from Standard and Poor's, and for the non-rated cases we have computed ratings using Standard & Poor's criteria (Standard & Poor's Rating Services, 2011 and 2014). For the latter, we have specifically computed several key ratios such as EBIT interest coverage, EBITDA interest coverage, operating cash flows / total debt, total debt / EBITDA, and have assigned them their corresponding rating according to the annual median values of the abovementioned ratios provided by Standard and Poor's.

Financial distress has both direct and indirect costs; whether such costs are sufficiently relevant to capital structure decisions has been widely debated (Warner, 1977, Altman, 1984, Opler and Titman, 1994, Altman and Hotchkiss, 2006). In a sample of highly leveraged firms, Andrade and Kaplan (1998) estimate losses in value caused by financial distress in the order of 10% to 23% of pre-distress firm value. Based on the abovementioned study and others, Branch (2002) suggests that the total bankruptcy-related costs to firm and claimholders ranges between 13% and 21 %. We measure the expected costs of increased leverage following the mapping between company leverage and expected distress costs developed by Molina (2005). This mapping is carried out, firstly, by associating leverage ratios to credit ratings, and secondly, by joining credit ratings with expected distress costs. As a result, we multiply the total distress costs obtained in the empirical literature by the conditional probability of distress to compute the expected distress costs.

Subsequently, and as a second empirical strategy, we regress the debt conservatism measure, i.e. Graham's (2000) kink variable, on several explanatory variables that measure the different costs of debt.

$$\begin{aligned} KINK_{it} &= \beta_0 + \beta_1 \cdot RISK_{it} + \beta_2 \cdot VEARN\_RISK_{it} + \beta_3 \cdot UBETA_{it} + \beta_4 \cdot KZ_{it} + \\ &+ \beta_5 \cdot NOL_{it} + \beta_6 \cdot NE_{it} + \beta_7 \cdot TOBIN\acute{}S\ Q_{it} + \beta_8 \cdot NODIV_{it} + \beta_9 \cdot PROF_{it} + \\ &+ \beta_{10} \cdot CR_{it} + \beta_{11} \cdot CASHR_{it} + \beta_{12} \cdot SIZE_{it} + \beta_{13} \cdot TANG_{it} + \varepsilon_{it} \end{aligned} \quad [3]$$

Where *KINK* denotes the company's kink, *RISK* is a financial distress proxy, *VEARN_RISK* interacts the preceding variable with a measure of the variation in earnings, *UBETA* is the unlevered beta, *KZ* proxies for financing restrictions, *NOL* measures the existence of net operating carryforwards, *NE* indicates whether the firm has negative equity, *TOBIN'S Q* is the market-to-book ratio, *NODIV* measures the non-dividend status of the firm, *PROF* is a profitability variable, *CR* is the current ratio, *CASHR* is the cash ratio, *SIZE* is measured as the natural logarithm of total assets, and *TANG* is a tangibility variable.

Firms use less debt when their expected costs of financial distress are high. We use different measures to proxy the costs of distress. First, we use a bankruptcy probability index based on accounting ratios (*RISK*), which is a variant of Altman (1968) *Z-Score*; in line with Mackie-Mason (1990) and Graham (1996) we calculate this variable as total assets divided by the sum of 3.3 times EBIT, 1.0 times sales, 1.4 times retained earnings and 1.2 times working capital. Second, we compute the variable *VEARN_RISK* as the product of two terms: (i) the standard deviation of the first difference in the firm's historical EBITDA divided by total assets and (ii) the *RISK* variable. Third, we consider the unlevered beta (*UBETA*). Fourth, we take into account financing restrictions with the Kaplan and Zingales (1997) index (*KZ*) and compute it as in Duchin, Ozbas and Sensoy (2010): the sum of -1.002 times EBITDA scaled by total assets, 0.283 times

Tobin's Q, 3.319 times total debt divided by total assets, -39.368 times dividends scaled by total assets and -1.315 times cash divided by total assets. Lastly, we also include two dummy variables to identify firms close to or in financial distress: *NOL*, which equals one if the firm has net operating loss carryforwards and zero otherwise; and *NE* which is equal to one if the firm has negative equity and zero otherwise.

Myers (1977) argues that shareholders may forego profitable investment opportunities if project benefits go to the firm's bondholders. This perverse strategy leads firms to use less debt, a problem which becomes more pronounced as the proportion of the firm's value comprised of growth options increases. As a result, growth firms should use less debt. We measure growth investment opportunities with Tobin's q (*TOBIN'S Q*), computed as the market-to-book total assets ratio.

The existence of informational asymmetries between corporate managers (insiders) and investors (outsiders) may influence the company's financing choice. The so-called pecking order theory of capital structure predicts in this context of asymmetric information a hierarchical order in the financing policy of a company. At the top are the financial sources least affected by the costs of information: first, internal funds, followed by debt, and as a last resort, external equity (Myers and Majluf, 1984). In line with Graham (2000), we create a dummy variable (*NODIV*) which is equal to one if a firm does not pay dividends and hence may be subject to large informational asymmetries, and zero otherwise.

Cash flows and liquidity can also affect the cost of borrowing. Consequently, we proxy the profitability variable (*PROF*) as the quotient between earnings before interest, taxes, depreciation and amortization, and total assets. On the other hand, liquidity is measured with the current ratio (*CR*) and the cash ratio (*CASHR*).

Large firms often face lower informational costs when borrowing, and they may also have low *ex-ante* financial distress costs. We proxy *SIZE* by the log of total assets.
Lastly, a firm with valuable asset collateral can often borrow on relatively favourable terms and thus face low borrowing costs. We measure tangibility (*TANG*) as the percentage of tangible assets over total assets.

Table 3.2. shows the expected signs of the explanatory variables on the companies' kink and leverage.

TABLE 3.2.: EXPECTED SIGNS OF EXPLANATORY VARIABLES

Variables	Kink	Leverage
RISK	+	-
VEARN_RISK	+	-
UBETA	+	-
KZ	+	-
NOL	+	-
NE	+	-
TOBIN'S Q	+	-
NODIV	+	-
PROF	+ / -	- / +
CR	+ / -	- / +
CASHR	+ / -	- / +
SIZE	-	+
TANG	-	+

Table A-3.1. in the Appendix provides definitions of all the variables.

In order to test Hypothesis 2, we add four new variables, *TAX_SPREAD*, *NDT_NOL*, *LEV* and *MTR* to the regression model in Equation [3]. *TAX_SPREAD* is calculated following Equation [1] which attempts to capture the widest possible variety of debt tax shields. *NDT_NOL* is a dummy variable that is equal to one if the difference between net deferred taxes and net operating losses is positive, and zero otherwise, focusing on the net fiscal credits that differ from NOL carryforwards. *LEV* measures the leverage ratio as the quotient between total debt and total assets, and *MTR* is the marginal tax rate estimated with earnings before interest and taxes as per Graham, Lemmon and Shallheim (1998).

Table A-3.1. in the Appendix provides a summary of the definitions of all the variables.

In addition to the kink regression approach, we also follow a fuzzy approach. The main difference between regression methods and fsQCA is that the latter allows for an assessment of complex causality (i.e., different combinations that give the same outcome). Therefore, we will be able to identify the companies' different approaches to the use of financial debt, an area where classical regression methods sometimes have limitations. Subsequently, and by identifying different recipes, we can provide evidence-based recommendations to help improve managerial decisions. Using fsQCA, our contribution expands the current theoretical framework because the fsQCA allows researchers to supply more comprehensive answers to traditional questions such as 'What makes a company act conservatively regarding the use of debt?' or 'Why are some companies more conservative than others?'

3.4. Data and descriptive statistics

The data used in this paper come from four sources. Sistema de Análisis de Balances Ibéricos (SABI), a database managed by Bureau Van Dijk and Informa D&B, S.A., and the Spanish Securities and Exchange Commission (CNMV) provide the accounting information from annual accounts, while financial market information comes from the quotation bulletins of the Spanish Stock Exchange and the Bloomberg database.

Our sample comprises 88 Spanish listed companies with information for the seven-year period spanning 2007 to 2013. As is standard in the empirical literature, financial institutions, utilities and governmental enterprises are omitted because these types of companies are intrinsically different in terms of their operations and financial accounting information. Moreover, we focus on this time period because the necessary data for estimating tax related variables have only been available in Spain since fiscal year 2007[37]. Furthermore, International Financial Reporting Standards (IFRSs) were implemented in Spain on January 1st 2008. The adoption of these IFRSs allows a comparison of our empirical results from the debt policy of Spanish listed companies with those from other markets that have also adopted IFRSs. Finally, in order to mitigate the effect of outliers, all the variables are winsorized at 0.5% in each tail of the distribution.

Summary statistics for the variables used in the empirical specifications of Equations [2] and [3] are shown in Table 3.3.

[37] As in many other countries, data based on financial statements do not reflect tax accounting conventions and companies' actual tax incentives. In addition, Plesko (2003) suggests that the relation between financial and tax reporting may be very weak.

TABLE 3.3.: DESCRIPTIVE STATISTICS

Variables	Obs.	Mean	Median	St. Dev.	Min.	Max.	Skewness	Kurtosis
RAT	603	4.5257	4.0000	2.5026	1.0000	8.0000	0.0033	1.5982
LEV	616	0.3556	0.3328	0.2293	0.0000	0.9201	0.3556	2.2746
UBETA	444	0.4812	0.4204	0.3381	-0.0775	1.4211	0.5749	2.7926
RISK	607	4.3280	1.2984	40.8161	-110.4586	428.6164	8.3677	86.4585
PROF	616	0.0551	0.0472	0.0980	-0.4259	0.4714	0.1009	10.1035
TOBIN'S Q	527	1.6096	1.2607	1.2974	0.2986	8.8846	3.3323	16.3729
SIZE	616	20.1760	20.0691	1.8188	15.8881	25.2056	0.4041	2.9405
TANG	616	0.1086	0.0341	0.1632	0.0000	0.8453	2.1855	8.1530
KINK	447	3.0765	1.0000	3.2264	0.0000	8.0000	0.4654	1.4587
VEARN_RISK	436	0.1016	0.0339	2.2735	-18.6953	36.8642	8.1378	174.7655
KZ	518	0.5784	0.9067	2.0737	-8.9668	18.7417	-0.4878	18.9289
NOL	550	0.3909	0.0000	0.4883	0.0000	1.0000	0.4471	1.1999
NE	616	0.0048	0.0000	0.0696	0.0000	1.0000	14.2245	203.3382
NODIV	616	0.4350	0.0000	0.4961	0.0000	1.0000	0.2619	1.0686
CR	616	2.2695	1.1104	5.5087	0.0694	52.5633	7.4750	63.9294
CASHR	606	0.0406	0.0116	0.0708	0.0000	0.4271	2.9692	12.8313
TAX_SPREAD	613	0.0017	0.0000	0.0161	-0.0444	0.1107	2.9352	19.9949
NDT_NOL	548	0.5729	1.0000	0.4950	0.0000	1.0000	-0.2951	1.0871
MTR	461	0.1818	0.1909	0.0798	0.0002	0.3000	-0.5247	2.4316

Table A-3.1. in the Appendix provides definitions of all the variables.

The mean kink is greater than one, with a value of approximately 3.08, which means that on average our sample companies could have tripled their interest deductions before their marginal tax benefits began to decline. On the other hand, the average of the estimated marginal tax rates of all firms is 18.18%, which is much lower than the statutory tax rate (32.50% for fiscal year 2007 and 30.00% for fiscal year 2008 onwards). This gap is caused by asymmetrical tax treatment of profits and losses and by the loss carryforward provision in the Spanish corporate tax system. The standard deviation of the marginal tax rates is 7.98%, implying that there is moderate variation in the marginal tax rates of all firms.

The average size of the companies included in the sample is approximately €579 million in terms of book value of assets, and the profitability of our sample shows an average value of 5.51%.The probability of bankruptcy measure averages about 4.33 for all firm-year observations, but values are widely dispersed (standard deviation of 40.82). The mean difference between total tax expense and the tax paid is almost €1 million.

We calculated the correlation matrix and we also performed a multicollinearity test using the Variance Inflation Factor (VIF). Results are reported in Table A-3.2. in the Appendix, and the low VIF values suggest that there is no collinearity among the variables considered.

As discussed above, the kink indicates the extent to which a firm can increase its current leverage before the marginal expected tax benefit of debt financing begins to decrease, and therefore provides a measure of the relative level of conservatism of the firm's capital structure. An interesting comparison emerges between firms that follow very conservative debt policies and those with relatively more aggressive capital structures. In this regard, for each year from 2007 to 2013, we classify firms as belonging to the high kink group if their kink value is in the top quartile (most conservative) of all firms in that year; conversely, we assign firms to the low kink group if their kink value is in the bottom three quartiles. Table 3.4. presents a comparative analysis between medians and means of the kink and some key variables for both high and low kink groups.

TABLE 3.4.: RELATION BETWEEN KINK VALUES AND EXPLANATORY VARIABLES

Variable	Median		Median difference test	Mean		Mean difference test
	Low *KINK* (Obs. = 141)	High *KINK* (Obs. = 172)		Low *KINK* (Obs. = 141)	High *KINK* (Obs. = 172)	
RAT	4.0000	5.0000	0.2415	4.2695	4.6140	0.2453
LEV	0.4211	0.2708	0.0000***	0.4411	0.3074	0.0000***
UBETA	0.3353	0.4739	0.0018***	0.3940	0.5113	0.0018***
RISK	1.5860	0.9928	0.0006***	4.4029	1.6663	0.4199
PROF	0.0360	0.0523	0.1352	0.0428	0.0675	0.0310**
TOBIN'S Q	1.2486	1.2937	0.1062	1.3233	1.9501	0.0001***
SIZE	20.6367	20.0127	0.0144**	20.5363	20.1151	0.0436**
TANG	0.0266	0.0322	0.8144	0.0961	0.1085	0.5027
KINK	0.0000	6.5000	0.0000***	0.0780	6.9767	0.0000***
VEARN_RISK	0.0295	0.0303	0.9878	0.1651	0.0406	0.3070
KZ	1.2913	0.6892	0.0000***	1.1089	-0.0766	0.0000***
NOL	0.0000	0.0000	0.0539*	0.4255	0.3197	0.0537*
NE	0.0000	0.0000	0.8879	0.0070	0.0058	0.8881
NODIV	0.0000	0.0000	0.7545	0.4184	0.4360	0.7550
CR	1.0223	1.1471	0.0043***	1.2214	1.6179	0.0050***
CASHR	0.0329	0.0094	0.0000***	0.0525	0.0376	0.0716*
TAX_SPREAD	0.0001	0.0000	0.2245	0.0014	0.0026	0.5292
NDT_NOL	1.0000	1.0000	0.9377	0.5886	0.5930	0.9379
MTR	0.1706	0.2007	0.1051	0.1698	0.1758	0.5423

The low *KINK* is the group of firms with the most conservative debt policies, while the high *KINK* is the group of firms that more aggressively use debt financing. P-values for the differences reported are calculated either on a basis of a signed rank test (Wilcoxon) for medians and a t test for means. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels. Table A-3.1. in the Appendix provides definitions of all the variables.

As reported in Table 3.4., median (mean) values for kink are 0.0 (0.1) for the low kink group and 6.5 (7.0) for the high kink group. Comparing the two groups of firms we find that, as expected, the high kink firms have relatively less debt; specifically, the median (mean) leverage ratio is 42% (44%) for the low kink firms, and 27% (31%) for high kink firms. Likewise, the firms with the most conservative debt policies are more profitable, have higher economic risk, are smaller, exhibit fewer financing restrictions, have lower net operating loss carryforwards, and display a higher working capital compared to their low kink counterparts.

In sum, high kink firms appear to be very conservatively financed, suggesting that these firms apparently forego significant benefits associated with debt financing. If the trade-off theory of capital structure provides a suitable explanation of how firms choose their capital structures, then high kink firms should also be those firms with the largest potential costs associated with the use of debt financing.

Figure 3.1. depicts total tax expense, taxes paid and tax spread for the 2007-2013 period. It indicates a positive trend in the tax spread across the whole series, with the exception of 2012 and 2013. The figure also shows that there are times when the corporate taxes paid actually exceed the book income tax expense; in these years, taxable income is zero or negative.

FIGURE 3.1.: TIME SERIES OF TOTAL TAX EXPENSE, TAXES PAID AND TAX SPREAD

Source: Own elaboration.

3.5. Empirical results

3.5.1. Cost of default and debt tax benefit

Following Kaplan and Urwitz (1979) and Molina (2005) we use an ordered probit model for the estimation of the rating Equation [2]. This estimation procedure allows us to consider the ordinal characteristic of a rating-dependent variable.

Table 3.5. reports the results of the estimation of the parameters in Equation [2]; it also shows the regression of ratings on leverage in isolation. We find that leverage (whether together with the other explanatory variables or on its own), unlevered beta and risk are

all significantly negatively associated with ratings. Conversely, profitability, the market-to-book ratio, size and tangibility are positively related to ratings.

TABLE 3.5.: ESTIMATION RESULTS OF EQUATION [2]

Explanatory Variables		
LEV	-2.3144*** (0.6606)	-1.8643*** (0.5685)
UBETA	-0.7791** (0.3783)	
RISK	-0.0030* (0.0016)	
PROF	3.3969** (1.6312)	
TOBIN'S Q	1.0101*** (0.2250)	
SIZE	0.2610*** (0.0774)	
TANG	1.9667** (0.8832)	
Cut (AA)	7.9720	1.0497
Cut (A)	7.2291	0.3028
Cut (BBB)	6.4640	-0.3301
Cut (BB)	6.0332	-0.6279
Cut (B)	5.2915	-1.4134
Cut (CCC)	4.7429	-1.8121
Cut (CC)	4.5177	-2.2571
Observations	354	516
Log likelihood	-559.49	-881.38
Likelihood ratio test	51.23 (0.000)	283.76 (0.000)
Wald test (F-statistic)	73.04 (0.000)	10.75 (0.001)

Panel data ordered probit regression coefficients estimated from Equation [2] with robust standard errors in parentheses. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels. The likelihood ratio test compares the pooled estimator with the panel estimator with the null hypothesis that there are no panel-level effects[38]. Wald test statistic refers to the null hypothesis that all coefficients of the explanatory variables are equal to zero. Table A-3.1. in the Appendix provides definitions of all the variables.

The middle panel of Table 3.5. provides the cut-points from the ordered probit model to assign a rating to each predicted value. Following Molina (2005) we evaluate the degree to which companies' ratings, default probabilities and expected default costs, all change when firms increase their leverage. We focus on the minimum leverage increase needed for a downgrade in the firm's rating. Table 3.6. shows the effects of additional leverage for each kink level.

[38] The likelihood ratio test supports the rejection of the null hypothesis that there are no panel effects. Accordingly, a panel data estimation is performed as in this case it is more appropriate.

TABLE 3.6.: DEBT TAX BENEFITS VERSUS FINANCIAL DISTRESS COSTS

KINK	LEV_{before}	LEV_{after}	RAT_{before}	RAT_{after}	Δ P. Default (%)	Default Cost (%)	Default Cost (%)	Tax Gain (%)
1.2	0.20	0.22	B	CCC	22.26	2.89	4.67	5.53
1.6	0.29	0.41	CCC	CC	33.30	4.33	6.99	9.92
2.0	0.30	0.45	B	CCC	22.26	2.89	4.67	7.30
3.0	0.54	0.76	CCC	CC	33.30	4.33	6.99	2.87
4.0	0.33	0.35	BB	B	9.60	1.25	2.02	0.17
6.0	0.30	0.37	BB	B	9.60	1.25	2.02	0.67

LEV_{before} is the current leverage, while LEV_{after} is the leverage after increasing interest to the minimum kink to be downgraded. RAT_{before} is the companies' rating for the current leverage, while RAT_{after} is the companies' rating for the leverage after increasing interest to the minimum kink to be downgraded. Δ P. Default is the change in expected default probabilities caused by the change in ratings provided by Standard and Poor's (Standard and Poor's Rating Services, 2015). The default cost columns are the result of multiplying the increase in default probabilities by Branch's (2002) estimation of total bankruptcy-related costs to firm and claimholders (13% - 21%). Tax gain refers to the proportional tax gain generated by the leverage increase from LEV_{before} to LEV_{after}, assuming linearity in our estimated tax gains. Table A-3.1. in the Appendix provides definitions of all the variables.

In order to carry out the analysis, we assume that factors other than leverage remain at their mean values. Hence, companies with a kink of 2.0 have 0.2969, 0.5405, 0.3844, 0.0491, 1.1831, 19.0732 and 0.2093 as their mean leverage, unlevered beta, risk, profitability, market-to-book ratio, size and tangibility, respectively. The default probability for each rating is a 10-year average cumulative default rate reported by Standard and Poor's for European companies and which included our period of study (Standard and Poor's Rating Services, 2015). For example, a representative firm with a kink of 2.0 has a B grade for its current leverage. If this firm increases its leverage by 1.51 times, its rating is expected to be downgraded to CCC, raising the default probabilities by 22.26%. On the other hand, for firms with kinks of 4.0 or 6.0 the impact of an increase in their leverage by 1.04 or 1.23 times, respectively, leads to the same rise in their default probabilities (i.e. 9.60%) as their ratings fall from BB to B. If we assume that our sample firms will experience a decline in firm value from defaults in line with the values reported in Branch (2002), then the default costs of the firms with, for example, a kink of 2.0 will range from 2.89% (13% x 22.26% = 2.89%) to 4.67% (21% x 22.26% = 4.67%) of firm value[39].

The tax gain column in Table 3.6. shows the expected tax gains from additional leverage. Using data from Clemente-Almendros and Sogorb-Mira (2015), we determine

[39] As Blouin *et al.* (2010) note, a drawback of this analysis is that default costs may vary for other reasons besides firm leverage. Notwithstanding, our aim is to produce findings comparable to prior research within this area.

that the potential loss in tax benefits due to underleverage (i.e. money left on the table) for Spanish listed companies is 14.27%. Assuming that the previous tax benefit estimation is linear, the tax benefit generated by the leverage increase for a firm with a kink of 2.0 is 7.30%. In this case, the anticipated tax gains are larger than the expected default costs; the minimum and maximum net improvements in a firm's value from additional leverage are 2.63% and 4.41%, respectively. The potential tax benefit is completely offset by the increase in financial distress costs when we use higher kinks: For example, for a representative firm with a kink of 4.0 (6.0), the net decline in firm value from additional leverage ranges between 1.85% and 1.08% (1.35% and 0.58%).

Table A-3.3. in the Appendix includes the same analysis, comparing the default costs and tax gains obtained by firms when they increase their leverage, but for each economic sector. Lastly, Tables A-3.4., A-3.5., A-3.6. and A-3.7. in the Appendix show some specific individual cases of the firms included in Table 3.1. with kinks higher than one.

3.5.2. Debt conservativeness and costs of debt

Firms are heterogeneous in debt usage. In this subsection, we assess the relationship between kinks and different firm characteristics. The minimum value of the kink is zero as it cannot have a negative value. Accordingly, we use a multivariate tobit model for the estimation of the kink from Equation [3]. Table 3.7. summarizes the results of this estimation with the kink as the dependent variable.

TABLE 3.7.: ESTIMATION RESULTS OF EQUATION [3]

Explanatory Variables		With Sector Dummies
RISK	-0.0078 (0.0051)	-0.0077 (0.0051)
VEARN_RISK	0.1297* (0.0670)	0.1256* (0.0669)
UBETA	-0.0203 (0.6232)	0.1328 (0.6218)
KZ	-0.1998* (0.1069)	-0.2001* (0.1064)
NOL	0.7996** (0.3388)	0.8057** (0.3381)
NE	-2.2130* (1.2255)	-2.1117* (1.2284)
TOBIN'S Q	0.6014*** (0.1761)	0.6374*** (0.1744)
NODIV	0.3673 (0.3244)	0.3761 (0.3230)
PROF	-2.1998 (1.5044)	-2.1465 (1.5029)
CR	0.2207** (0.1053)	0.2157** (0.1049)
CASHR	-0.7765 (1.9383)	-0.6174 (1.9339)
SIZE	0.0194 (0.2025)	0.0895 (0.2149)
TANG	3.2524** (1.2869)	2.7444** (1.3046)
TAX_SPREAD	10.6977* (6.3128)	10.5579* (6.3112)
NDT_NOL	0.5265* (0.2920)	0.5516* (0.2919)
LEV	2.7302** (1.0746)	2.8530** (1.0701)
MTR	-8.3150* (4.4326)	-7.5887* (4.4239)
Observations	415	415
Log likelihood	-766.80	-762.50
Sigma_u	3.7000*** (0.3555)	3.4840*** (0.3381)
Sigma_e	1.4458*** (0.0641)	1.4469*** (0.0642)
Likelihood ratio test	387.18 (0.000)	362.44 (0.000)

Panel data tobit regression coefficients estimated from Equation [3] with robust standard errors in parentheses. Table A-3.1. in the Appendix provides definitions of all the variables. Superscript asterisks indicate statistical significance at 0.01(***), 0.05(**) and 0.10(*) levels. Sigma_u and Sigma_e are the overall and panel-level variance components, respectively. The likelihood ratio test compares the pooled estimator with the panel estimator with the null hypothesis that there are no panel-level effects[40].

The regression results in Table 3.7. indicate that firms use debt conservatively when they face high expected costs of distress, low financing restrictions, net operating loss carryforwards, non-negative equity, high growth opportunities, a high percentage of current assets and a high portion of tangible assets. Moreover, a significant positive relation between the tax spread and the kink is found, which implies that firms also tend to be more conservative in debt financing when they have non-debt tax shields at their disposal.

[40] The likelihood ratio test supports the rejection of the null hypothesis that there are no panel effects. Accordingly, a panel data estimation is performed as in this case it is more appropriate.

3.5.2. Fuzzy approach

The fsQCA framework is different from traditional quantitative approaches. Instead of formulating hypotheses and testing them, the goal of this research approach is to determine which combinations of different variables enable the analysis of the outcome. Our research uses the program version by Ragin and Sean (2014), and the calibration relies on a direct method (Ragin, 2007). We utilize the direct method, which makes use of three qualitative anchors to structure calibration: the thresholds for full membership, full non-membership, and the cross-over point. Our selected thresholds are based on the study of the evolution of our variables, in each year and over the whole 2007-2013 period, as well as understanding the meaning of the data. For instance, for our dependent variable, the thresholds are 6, 1.6 and 1, for the threshold of full membership, the cross-over point and full non-membership, respectively.

The model applied is:

KINK = f (RISKc, TOBIN’S Qc, NODIVc, PROFc, CRc, SIZEc, TANGc, TAX_SPREADc, LEVc, MTRc)

Where all the variables have been previously defined and are summarized in Table A-3.1. in the Appendix.

These variables represent the scores of the calibrated rates of both dependent and control variables. We analysed the variables using a table of necessary conditions and a “truth table”[41]. We then ran our fsQCA model for each year of our study period individually, and for all the years together. Table 3.8. summarizes the recipe for the latter[42].

[41] Not reported but available upon request to the authors.
[42] Individual results for each year are not reported but are available upon request to the authors.

TABLE 3.8.: FUZZY ANALYSIS

Years 2008-2013 Model KINKc = f (RISKc, TOBIN'S Qc, NODIVc, PROFc, CRc, SIZEc, TANGc, TAX_SPREADc, LEVc, MTRc) **Complex Solution**				
Frequency cut-off: 1.0000	**Consistency cut-off:** 0.7704	**Solution coverage:** 0.0749	**Solution consistency:** 0.7906	
			Raw Coverage	**Consistency**
NODIVc*~RISKc*~TOBIN'S Qc*~PROF*~CRc*TANGc*~LEVc*~MTRc*TAX_SPREADc			0.0611	0.8018
NODIVc*~RISKc*~TOBIN'S Qc*~PROFc*~CRc*~SIZEc*TANGc*~MTRc*TAX_SPREADc			0.0694	0.7795
Cases with greater than 0.50 membership in term NODIVc*~RISKc*~TOBIN'S Qc*~PROFc*~CRc*TANGc*~LEVc*~MTRc*TAX_SPREADc: SOLARIA ENERGIA Y MEDIO AMBIENTE. SA (0.85,0.95), SA HULLERA VASCO LEONESA (0.74,0.95), SOTOGRANDE SA (0.67,0.50), ERCROS. SA (0.59,0.99), SOTOGRANDE SA (0.57,0.50), ERCROS. SA (0.56,0.99)				
Cases with greater than 0.50 membership in term NODIVc*~RISKc*~TOBIN'S Qc*~PROFc*~CRc*~SIZEc*TANGc*~MTRc*TAX_SPREADc: SOTOGRANDE SA (0.88,0.50), SOLARIA ENERGIA Y MEDIO AMBIENTE. SA (0.87,0.95), SOLARIA ENERGIA Y MEDIO A MBIENTE. SA (0.87,0.98), SA HULLERA VASCO LEONESA (0.74,0.95), SOTOGRANDE SA (0.67,0.50)				

Table A-3.1. in the Appendix provides definitions of all the variables.

The recipes reported in Table 3.8., as well as the ones resulting from the individual analysis, extend the tobit regression model conclusions, providing a wider context in which to better understand the influence of different variables on the studied outcome: the kink. More specifically, the analysis shows that fsQCA enhances our previous results from the tobit regression approach, which in turn demonstrates the relationship between the kink and our tax variable of interest, namely *TAX_SPREAD*.

3.6. Concluding remarks

A generalized view in corporate finance is that firms are less leveraged than they should be, at least according to the large potential tax benefits that they could attain by leveraging up their capital structure. The present research belongs to the cohort of empirical studies that have recently analysed conservatism in corporate debt policy.

Our results show that Spanish listed firms are not acting sub-optimally with respect to the tax advantage of debt financing, providing evidence that expected default costs could offset the majority of the potential tax savings and that tax sheltering is economically important. Therefore, using three different empirical approaches, we demonstrate that, on the one hand, expected default costs and, on the other hand, tax shields counterbalance interest deductions. Our results thus show that firms with large kinks do not pursue debt aggressively because the cost of doing so is high, and consequently shed light on the so-called "conservative leverage puzzle".

We contribute to the literature by explaining the observed leverage levels of Spanish listed companies, without explicitly calculating an optimal level of leverage. Moreover, our analysis includes a different and straightforward measure for non-debt tax shields, which is able to capture the effects of different tax shields. To the best of our knowledge, this is the first empirical analysis of the assessment of debt conservatism within a Spanish context.

Our study is no exception when it comes to limitations. For instance, our measure of the cost of debt focuses on default events and, therefore, excludes other costs of debt, such as agency costs. As Van Binsbergen, Graham and Yang (2010) found, the cost of being over-levered is asymmetrically higher than the cost of being under-levered, and the expected default costs constitute only half of the total *ex-ante* costs of debt. This may suggest that our cost estimates could be underestimated, and by extension, that we may not have entirely explained the debt policy's conservativeness of Spanish listed companies. Additionally, and as Strebulaev and Yang (2013) point out, to explain the "conservative leverage puzzle" it is necessary to explain why some firms tend not to have any debt at all instead of why firms on average have lower outstanding debt than expected. This new empirical strategy facilitates the identification of the economic mechanisms that lead firms to become low-levered, and extends the line of research that originated with Graham (2000) regarding the apparent non-optimizing policy on debt tax benefits.

The implications of our findings for company managers are significant. It is essential that they reassess their company debt policy. Accordingly, each company should explicitly calculate the benefits that could be attained by increasing leverage. If the costs of using more leverage are lower than the benefits, then the firm should consider increasing its indebtedness.

3.7. References

- Altman, E., 1968, "Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy", *The Journal of Finance*, 23, 589-609.

- Altman, E., 1984, "A further empirical investigation of the bankruptcy cost question", *The Journal of Finance*, 39, 1067-1089.

- Altman, E. and Hotchkiss, E., 2006, *"Corporate financial distress and bankruptcy: predict and avoid bankruptcy, analyze and invest in distressed debt" Third Edition*, John Wiley & Sons, Inc.

- Andrade, G. and Kaplan, S. N., 1998, "How costly is financial (not economic) distress? Evidence from highly leveraged transactions that became distressed", *The Journal of Finance*, 53, 1443-1493.

- Blouin, J., Core, J. E. and Guay, W., 2010, "Have the tax benefits of debt been overestimated?", *Journal of Financial Economics*, 98, 195-213.

- Branch, B., 2002, "The costs of bankruptcy: A review", *International Review of Financial Analysis*, 11, 39-57.

- Caskey, J., Hughes, J. and Liu, J., 2012, "Leverage, excess leverage, and future returns", *Review of Accounting Studies*, 17 (2), 443-471.

- Clemente-Almendros, J. A. and Sogorb-Mira, F., 2015, "How much do the tax benefits of debt add to firm value? Evidence from Spanish listed firms", *Unpublished Working paper,* University CEU Cardenal Herrera.

- DeAngelo, H. and Masulis, R. W., 1980, "Optimal capital structure under corporate and personal taxation", *Journal of Financial Economics*, 8 (1), 3-29.

- Duchin, R., Ozbas, O. and Sensoy, B. A., 2010, "Costly external finance, corporate investment, and the subprime mortgage credit crisis", *Journal of Financial Economics*, 97, 418-435.

- Graham, J. R., 1996, "Debt and the marginal tax rate", *Journal of Financial Economics*, 41, 41-73.

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

- Graham, J. R., 2001, "Estimating the tax benefits of debt", *Journal of Applied Corporate Finance*, 14 (1), 42-54.

- Graham, J. R., 2013, "Do taxes affect corporate decisions? A Review" in G. M. Constantinides, M. Harris and R. M. Stulz (Eds), *Handbook of the Economics of Finance*, North-Holland Elsevier, Volume 2, Part A, Chapter 3, 123-210.

- Graham, J. R., Lang, M. H. and Shackleford, D. A., 2004, "Employee stock options, corporate taxes, and debt policy", *The Journal of Finance*, 59 (4), 1585-1618.

- Graham, J. R., Lemmon, M. L. and Schallheim, J. S., 1998, "Debt, leases, taxes, and the endogeneity of corporate tax status", *The Journal of Finance,* 53 (1), 131-162.
- Kaplan, S. N. and Zingales, L., 1997, "Do investment-cash flow sensitivities provide useful measures of financing constraints?", *Quarterly Journal of Economics,* 112, 169-215.
- Kaplan, R. S. and Urwitz, G., 1979, "Statistical models of bond ratings: A methodological enquiry", *Journal of Business,* 52 (2), 231-261.
- Mackie-Mason, J. K., 1990, "Do taxes affect corporate financing decisions?", *The Journal of Finance,* 45 (5), 1471-1493.
- Molina, C. A., 2005, "Are firms underleveraged? An examination of the effect of leverage on default probabilities", *The Journal of Finance,* 60 (3), 1427-1459.
- Myers, S. C., 1977, "Determinants of corporate borrowing", *Journal of Financial Economics,* 3, 799-819.
- Myers, S. C. and Majluf, N. S., 1984, "Corporate financing and investment decisions when firms have information that investors do not have", *Journal of Financial Economics,* 13, 187-221.
- Opler, T. and Titman, S., 1994, "Financial distress and corporate performance", *The Journal of Finance*, 49, 1015-1040.
- Plesko, G. A., 2003, "An evaluation of alternative measures of corporate tax rates", *Journal of Accounting and Economics*, 35, 201-226.
- Ragin, C., 2005, "From fuzzy sets to crisp truth tables", *Compass Working Paper,* WP 2004-28.
- Ragin, C., 2007, "Fuzzy sets: calibration versus measurement" in D. Collier, H. Brady and J. Box (Eds.), *The Oxford Handbook of Political Methodology*, Oxford University Press.
- Ragin, C., 2008, *"Redesigning social inquiry: fuzzy sets and beyond"*, Chicago University Press.
- Ragin, C. and Sean, D., 2014, Fs/QCA [Computer Software], Version 2.5. Irvine, CA: University of California.
- Schneider, C. Q. and Grofman, B., 2006, "It might look like a regression equation … but it's not! An intuitive approach to the presentation of QCA and fs/QCA results", *Compass Working Paper*, WP 2006-39.
- Shivdasani, A. and Stefanescu, I., 2010, "How do pensions affect capital structure decisions?", *Review of Financial Studies,* 23 (3), 1287-1323.
- Standard & Poor's Rating Services, 2011, *"CreditStats: 2010 Industrial comparative ratio analysis, long-term debt--Europe, Middle East, Africa"*, McGraw Hill Financial.

- Standard & Poor's Rating Services, 2014, *"CreditStats: 2013 Industrial comparative ratio analysis, long-term debt--Europe, Middle East, Africa"*, McGraw Hill Financial.
- Standard & Poor's Rating Services, 2015, *"Default, transition, and recovery: 2014 annual European corporate default study and rating transitions"*, McGraw Hill Financial.
- Strebulaev, I. A. and Yang, B., 2013, "The mystery of zero-leverage firms", *Journal of Financial Economics*, 109, 1-23.
- Van Binsbergen, J. H., Graham, J. R. and Yang, J., 2010, "The cost of debt", *The Journal of Finance*, 65, 2089-2136.
- Warner, J., 1977, "Bankruptcy costs: some evidence", *The Journal of Finance,* 32, 337-347.
- Woodside, A., 2010, *"Case study research: theory, methods and practice",* Emerald Group Publishing Limited.
- Woodside, A., 2013, "Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory", *Journal of Business Research*, 66, 463-472.

3.8. Appendix

TABLE A-3.1.: DEFINITION OF VARIABLES

Variables	Definition
RAT	Company's rating with the highest score, 8, assigned to the AA rating, and the lowest, 1, to the C rating of Standard and Poor's.
LEV	Ratio of total debt to total assets
UBETA	Unlevered beta
RISK	1 / [(3.3*EBIT/Total Assets) + (1.0*Sales/Total Assets) + (1.4*Retained Earnings/Total Assets) + (1.2*Working Capital/Total Assets)]
PROF	Earnings before interest, taxes, depreciation and amortization divided by total assets
TOBIN'S Q	Market-to-book ratio of total assets
SIZE	Natural logarithm of total assets
TANG	Tangible assets divided by total assets
KINK	Maximum interest that could be tax deducted before expected marginal tax benefits begin to decline, divided by actual interest paid
VEARN_RISK	Standard deviation of the first difference in EBITDA divided by total assets, and multiplied by the variable *RISK*
KZ	(-1.002*EBITDA/Total Assets) + (0.283*Tobin's Q) + (3.319*Total Debt/Total Assets) + (-39.368*Dividends/Total Assets) + (-1.315*Cash/Total Assets)
NOL	Dummy variable equal to one if the firm has net operating loss carryforwards, and zero otherwise
NE	Dummy variable equal to one if the firm has negative equity, and zero otherwise
NODIV	Dummy variable equal to one if cash dividends are not paid, and zero otherwise
CR	Short-term assets divided by short-term liabilities
CASHR	Cash divided by total assets
TAX_SPREAD	Difference between total taxes and taxes actually paid, divided by total assets
NDT_NOL	Dummy variable equal to one if the firm has a positive difference between net deferred taxes and net operating losses, and zero otherwise
MTR	Marginal tax rate estimated with earnings before interest and taxes following Graham *et al.* (1998) approach

TABLE A-3.2.: CORRELATION MATRIX AND VARIANCE INFLATION FACTORS

	KINK	*LEV*	*UBETA*	*RISK*	*PROF*	*TOBIN'S Q*	*SIZE*	*TANG*	*VEARN_RISK*	*KZ*	*NOL*	*NE*	*NODIV*	*CR*	*CASHR*	*TAX_SPREAD*	*NDT_NOL*	*MTR*
LEV	-0.2529																	
UBETA	0.1065	-0.2985																
RISK	-0.0178	-0.0165	0.0406															
PROF	0.1306	-0.1687	0.0516	-0.0300														
TOBIN'S Q	0.2546	-0.1335	0.1080	-0.0289	0.4775													
SIZE	-0.1213	0.3852	0.1477	-0.0046	0.0624	0.0287												
TANG	0.0521	-0.1318	-0.1383	-0.0420	0.1485	-0.1536	-0.2042											
VEARN_RISK	0.0089	-0.0200	0.0734	0.8339	0.0053	0.0029	0.0003	-0.0078										
KZ	-0.2664	0.5502	-0.1558	0.0104	-0.6131	-0.4986	-0.0744	-0.0482	-0.0035									
NOL	-0.1282	0.1827	0.1520	-0.0422	-0.3799	-0.2218	-0.0398	-0.1417	-0.0720	0.3112								
NE	-0.0054	0.1525	-0.0611	-0.0082	-0.2613	0.1038	-0.1023	-0.0418	-0.0051	0.3012	0.0419							
NODIV	-0.0408	0.1050	-0.0857	-0.0157	-0.3738	-0.2492	-0.3042	-0.0367	-0.0639	0.4827	0.4048	0.0797						
CR	0.1187	-0.2855	0.0096	-0.0191	0.0300	0.0039	-0.1888	-0.0391	-0.0108	-0.1035	-0.1076	-0.0262	-0.0661					
CASHR	-0.0701	-0.0708	0.0077	-0.0235	0.0726	0.0834	-0.0013	-0.0096	0.0010	-0.1376	-0.0483	-0.0230	-0.0810	0.0684				
TAX_SPREAD	0.0149	0.0865	-0.0483	-0.0115	-0.1612	-0.0179	-0.0678	-0.0391	-0.0483	0.1952	0.0010	0.2365	0.1042	0.0198	0.0151			
NDT_NOL	0.0129	0.1730	0.0908	-0.0286	-0.0121	-0.0578	0.1658	-0.2961	-0.0200	0.0755	0.1194	0.0141	0.0659	-0.0634	-0.0670	-0.1097		
MTR	0.0624	0.1730	0.2901	0.0424	-0.0128	0.0527	0.0790	-0.0929	0.0454	0.0390	0.1859	-0.0942	0.0838	0.0616	0.0026	0.0041	0.1084	
VIF		**2.56**	**1.44**	**3.35**	**2.58**	**2.04**	**1.54**	**1.25**	**3.39**	**3.64**	**1.54**	**1.62**	**1.74**	**1.24**	**1.06**	**1.44**	**1.21**	**1.23**

Table A-3.1. provides definitions of all the variables.

TABLE A-3.3.: DEBT TAX BENEFITS VERSUS FINANCIAL DISTRESS COSTS BY ECONOMIC SECTORS

	KINK	LEV_{before}	LEV_{after}	RAT_{before}	RAT_{after}	Δ P. Default (%)	Default Cost (%)	Default Cost (%)	Tax Gain (%)	Money Left on the Table (%)
Sector 1	6.0	0.11	0.37	B	CCC	22.26	2.89	4.67	7.12	14.43
Sector 2	3.3	0.35	0.58	B	CCC	22.26	2.89	4.67	4.97	17.70
Sector 3	3.1	0.31	0.63	B	CCC	22.26	2.89	4.67	5.18	10.77
Sector 4	3.3	0.42	0.51	BB	B	9.60	1.25	2.02	1.99	24.32
Sector 5	3.7	0.32	0.44	BBB	BB	6.54	0.85	1.37	1.81	12.40
Sector 6	1.6	0.40	0.45	BB	B	9.60	1.25	2.02	0.48	2.16
Sector 7	6.0	0.10	0.24	BBB	BB	6.54	0.85	1.37	1.91	7.11
Sector 8	1.0	0.45	0.49	BB	B	9.60	1.25	2.02	-1.57	0.36

Sector 1 includes agriculture, mining and quarrying, Sector 2 is manufacturing, Sector 3 includes electricity, gas and water, Sector 4 is construction, Sector 5 includes wholesale and retail trade, transportation and accommodation, Sector 6 includes information and communication, Sector 7 is real state activities, and Sector 8 includes professional, scientific and support service activities. LEV_{before} is the current leverage, while LEV_{after} is the leverage after increasing interest to the kink. RAT_{before} is the companies' rating for the current leverage, while RAT_{after} is the companies' rating for the leverage after increasing interest to the kink. Δ P. Default is the change in expected default probabilities caused by the change in ratings provided by Standard and Poor's (Standard and Poor's Rating Services, 2015). The default cost columns are a result of multiplying the increase in default probabilities by Branch's (2002) estimation of total bankruptcy-related costs to firm and claimholders (13% - 21%). Tax gain refers to the proportional tax gain generated by the leverage increase from LEV_{before} to $LEV_{after,}$ assuming linearity in our estimated tax gains. Money left on the table is the additional tax benefit that could be obtained if firms with a kink greater than one levered up to the kink in their interest benefit functions. Table A-3.1. provides definitions of all the variables.

TABLE A-3.4.: DEBT TAX BENEFITS VERSUS FINANCIAL DISTRESS COSTS FOR INDUSTRIA DE DISEÑO TEXTIL, S.A.

	KINK	LEV_{before}	LEV_{after}	RAT_{before}	RAT_{after}	Δ P. Default (%)	Default Cost (%)	Default Cost (%)	Tax Gain (%)	Money Left on the Table (%)
2010	8.0	0.21	2.65	AA	A	0.24	0.03	0.05	9.36	5.79
2011	8.0	0.20	3.15	AA	A	0.24	0.03	0.05	10.24	4.95
2012	8.0	0.22	3.22	AA	A	0.24	0.03	0.05	7.40	3.75
2013	8.0	0.11	3.25	AA	A	0.24	0.03	0.05	8.07	2.01
Total	8.0	0.21	2.69	AA	A	0.24	0.03	0.05	7.40	4.28

LEV_{before} is the current leverage, while LEV_{after} is the leverage after increasing interest to the kink. RAT_{before} is the companies' rating for the current leverage, while RAT_{after} is the companies' rating for the leverage after increasing interest to the kink. Δ P. Default is the change in expected default probabilities caused by the change in ratings provided by Standard and Poor's (Standard and Poor's Rating Services, 2015). The default cost columns are the result of multiplying the increase in default probabilities by Branch's (2002) estimation of total bankruptcy-related costs to firm and claimholders (13% - 21%). Tax gain refers to the proportional tax gain generated by the leverage increase from LEV_{before} to $LEV_{after,}$ assuming linearity in our estimated tax gains. Money left on the table is the additional tax benefit that could be obtained if firms with a kink greater than one levered up to the kink in their interest benefit functions. Table A-3.1. provides definitions of all the variables.

TABLE A-3.5.: DEBT TAX BENEFITS VERSUS FINANCIAL DISTRESS COSTS FOR PAPELES Y CARTONES DE EUROPA, S.A.

	KINK	LEV_{before}	LEV_{after}	RAT_{before}	RAT_{after}	Δ P. Default (%)	Default Cost (%)	Default Cost (%)	Tax Gain (%)	Money Left on the Table (%)
2009	3.0	0.64	0.88	CCC	CC	33.30	4.33	6.99	5.57	30.71
2010	3.0	0.61	0.69	B	CCC	22.26	2.89	4.67	2.03	31.06
2011	2.0	0.58	0.70	B	CCC	22.26	2.89	4.67	3.48	16.61
2012	3.0	0.58	0.67	B	CCC	22.26	2.89	4.67	3.00	35.99
2013	3.0	0.55	0.70	B	CCC	22.26	2.89	4.67	3.92	27.54
Total	2.8	0.57	0.67	B	CCC	22.26	2.89	4.67	2.63	29.16

LEV_{before} is the current leverage, while LEV_{after} is the leverage after increasing interest to the kink. RAT_{before} is the company rating for the current leverage, while RAT_{after} is the companies' rating for the leverage after increasing interest to the kink. Δ P. Default is the change in expected default probabilities caused by the change in ratings provided by Standard and Poor's (Standard and Poor's Rating Services, 2015). The default cost columns are the result of multiplying the increase in default probabilities by Branch's (2002) estimation of total bankruptcy-related costs to firm and claimholders (13% - 21%). Tax gain refers to the proportional tax gain generated by the leverage increase from LEV_{before} to $LEV_{after,}$ assuming linearity in our estimated tax gains. Money left on the table is the additional tax benefit that could be obtained if firms with a kink greater than one levered up to the kink in their interest benefit functions. Table A-3.1. provides definitions of all the variables.

TABLE A-3.6.: DEBT TAX BENEFITS VERSUS FINANCIAL DISTRESS COSTS FOR TUBACEX, S.A.

	KINK	LEV_{before}	LEV_{after}	RAT_{before}	RAT_{after}	Δ P. Default (%)	Default Cost (%)	Default Cost (%)	Tax Gain (%)	Money Left on the Table (%)
2009	2.0	0.21	0.47	B	CCC	22.26	2.89	4.67	3.11	2.61
2010	2.0	0.29	0.42	B	CCC	22.26	2.89	4.67	1.70	3.67
2011	2.0	0.28	0.48	CCC	CC	33.30	4.33	6.99	3.36	4.65
2012	2.0	0.29	0.36	B	CCC	22.26	2.89	4.67	1.12	4.73
2013	2.0	0.31	0.39	B	CCC	22.26	2.89	4.67	1.54	5.69
Total	2.2	0.24	0.40	B	CCC	22.26	2.89	4.67	2.49	4.61

LEV_{before} is the current leverage, while LEV_{after} is the leverage after increasing interest to the kink. RAT_{before} is the companies' rating for the current leverage, while RAT_{after} is the companies' rating for the leverage after increasing interest to the kink. Δ P. Default is the change in expected default probabilities caused by the change in ratings provided by Standard and Poor's (Standard and Poor's Rating Services, 2015). The default cost columns are the result of multiplying the increase in default probabilities by Branch's (2002) estimation of total bankruptcy-related costs to firm and claimholders (13% - 21%). Tax gain refers to the proportional tax gain generated by the leverage increase from LEV_{before} to $LEV_{after,}$ assuming linearity in our estimated tax gains. Money left on the table is the additional tax benefit that could be obtained if firms with a kink greater than one levered up to the kink in their interest benefit functions. Table A-3.1. provides definitions of all the variables.

TABLE A-3.7.: DEBT TAX BENEFITS VERSUS FINANCIAL DISTRESS COSTS FOR VISCOFÁN, S.A.

	KINK	LEV_{before}	LEV_{after}	RAT_{before}	RAT_{after}	Δ P. Default (%)	Default Cost (%)	Default Cost (%)	Tax Gain (%)	Money Left on the Table (%)
2010	0.2	0.18	0.48	AA	A	0.24	0.03	0.05	0.00	0.00
2011	6.0	0.12	0.53	AA	A	0.24	0.03	0.05	1.02	1.49
2012	6.0	0.17	1.06	AA	A	0.24	0.03	0.05	1.38	1.31
2013	6.0	0.17	0.86	AA	A	0.24	0.03	0.05	0.95	1.21
Total	3.7	0.17	0.45	AA	A	0.24	0.03	0.05	0.52	0.80

LEV_{before} is the current leverage, while LEV_{after} is the leverage after increasing interest to the kink. RAT_{before} is the companies' rating for the current leverage, while RAT_{after} is the companies' rating for the leverage after increasing interest to the kink. Δ P. Default is the change in expected default probabilities caused by the change in ratings provided by Standard and Poor's (Standard and Poor's Rating Services, 2015). The default cost columns are the result of multiplying the increase in default probabilities by Branch's (2002) estimation of total bankruptcy-related costs to firm and claimholders (13% - 21%). Tax gain refers to the proportional tax gain generated by the leverage increase from LEV_{before} to $LEV_{after,}$ assuming linearity in our estimated tax gains. Money left on the table is the additional tax benefit that could be obtained if firms with a kink greater than one levered up to the kink in their interest benefit functions. Table A-3.1. provides definitions of all the variables.

CONCLUSIONS

The main goal of this thesis is to contribute to a better understanding of firms' capital structure determinants, and more specifically, the influence of taxes on corporate debt policy. In order to explain firms' financing decisions, we first analyse whether taxes are a determining factor in corporate borrowing, and therefore, in firms' capital structure. In this way, we contribute to the capital structure literature using the marginal tax rate and the specific interest-deduction benefit function for Spanish companies. We also calculate the value of the debt tax shield, i.e., the value of the tax savings due to the deduction of financial expenses from taxable income. And finally, we explain the apparently conservative debt policy of many firms.

Our empirical research aims to shed light on the sometimes confusing and conflicting findings of related previous research. For this purpose, we use different methodologies and tests to overcome different issues considered as the potential cause of this ambiguity, such as econometric issues, non-tax explanations or the use of an incorrect proxy to gauge a specific company tax status.

We focus on a sample of Spanish listed firms for the period 2007-2013, which provides us with a data panel. We use accounting and financial market information, as well as information regarding the companies' rating. We start in 2007 since it was the year that the IFRS's principles for temporary differences were incorporated into the Spanish General Accounting Plan.

The results obtained in the first essay show that taxes are economically and statistically significant determinants of capital structure, demonstrating that taxes are not a second-order effect in firms' indebtedness decisions. Our conclusions provide evidence in favour of the positive relationship between taxes and leverage. In order to overcome potential problems that may cloud the opposite interpretation, as in previous empirical research, we compute company-specific marginal tax rates that account for the dynamic behaviour of corporate taxes and for the specific company's activity. Moreover, we also control for the endogeneity problem in two different ways. In addition, we also examine the role of non-debt tax shields. Our results indicate that non-debt tax shields affect leverage decisions, acting as substitutes for the debt tax shield. Finally, using different methodologies, we show that the Spanish corporate tax reform of 2012 did not affect firms' capital structure status, at least as far as our research period is concerned.

In the second essay, we assess the debt tax benefits. Our evidence supports the idea that taxes influence corporate decision-making and that debt makes a reasonable contribution to firm value. Again, and in order to cope with potential econometric issues that may result in puzzling interpretations, we not only use the econometric advantages of panel data methodology, but we also estimate the specific tax benefit function of debt for our sample firms. To strengthen our conclusions, we also take into account the effect of personal taxes. Furthermore, we show that as debt increases, there is a point at which the tax benefit curve starts to slope downwards, while the value of the debt tax shield increases with the firm-specific marginal corporate tax rate. Finally, we present evidence regarding the fact that some companies may be considered underleveraged since they are not apparently taking full advantage of the tax benefit of debt.

In the last essay, we conduct additional empirical research to explain the apparently conservative debt policy of many firms despite the fact that the tax benefits of debt add to firm value. Our results show that the tax benefits of debt may be offset by the expected default costs and the tax sheltering activity. Consequently, we help to shed light on the "conservative leverage puzzle", providing evidence as to why some firms do not use debt more aggressively.

We contribute to the empirical literature of capital structure in several ways. Firstly, to the best of our knowledge, this is the first research paper to calculate both the specific marginal tax rate and the specific tax benefit functions and the value of the debt tax shield for Spanish firms. Secondly, we prove that the company-specific marginal tax rate is a better proxy than others usually used in the capital structure context, such as the effective tax rate, in order to measure the effect of taxes on debt policies. Thirdly, we explain the apparent debt conservatism of Spanish listed firms.

The present thesis has several implications. For policy makers, we highlight the importance of taxes in deciding corporate financing, and therefore, the possible effect of the asymmetric fiscal treatment of interest on capital structure decisions. Our results may thus encourage fiscal authorities to reconsider the effect of corporate tax reform on capital structure decisions, especially taking into account the importance of bank debt for Spanish companies, together with the relative lack of alternatives for refinancing. Regarding managers, owners and entrepreneurs, they should be conscious of the importance of the value of debt tax benefits due to their contribution to firm value. At the same time, they should also consider other factors, such as default costs, and particularly, non-debt tax factors, in order to make capital structure decisions that optimize the value of the invested resources and therefore the value of the company. Our conclusions may help managers to reconsider their company's current and future company policy.

Our study certainly has its limitations. In Spain, information regarding deferred tax assets and liabilities was not separately identified in financial statements until 2007, and as a consequence, our period of study is relatively short. Additionally, we do not consider agency costs and this may mean that our estimated costs are underestimated.

We expect our conclusions to open new lines of future research. One particular interesting goal would be to extend our research to unlisted companies to check whether the same conclusions are obtained, as well as Small and Medium-sized Enterprises (SMEs). Additionally, estimating the default costs in the context of Spanish firms would be a worthwhile objective. Finally it could be particularly enlightening to examine the magnitude of adverse economic consequences when firms base decisions on an incorrect tax rate, since they might exhibit behavioural biases when incorporating taxes into their decision-making processes.

ANNEX: SUMMARY IN SPANISH

5.1. Motivación y Objetivos

¿Qué factores influyen en la estructura de capital de las empresas? Y más concretamente, ¿afectan los impuestos a las decisiones corporativas de financiación? Las respuestas a estas preguntas aún no se han resuelto de manera concluyente.

Los factores que afectan a la toma de decisiones sobre la política de estructura de capital pueden ser agrupadas en tres categorías: impuestos, costes de contratación y costes de información.

Los impuestos juegan un importante papel en la estructura de capital porque el pago de intereses se puede deducir de los beneficios de las empresas; añadiendo deuda a la estructura de capital de las empresas, disminuye entonces su carga fiscal incrementando, de esta manera, su flujo de caja después de impuestos. Por tanto, tener deuda corporativa puede ofrecer una ventaja fiscal. En relación a los costes de contratación, cualquiera que sea el beneficio fiscal de un endeudamiento mayor, el mismo debe de considerar a su vez el mayor coste esperado de tener dificultades financieras (gastos directos e indirectos en relación al proceso de quiebra, tales como la pérdida que resulta de los recortes en las inversiones esperadas cuando la empresa tiene problemas financieros). Según este punto de vista, la estructura de capital óptima es aquella en la que se espera que la próxima unidad monetaria de deuda proporcione un beneficio fiscal adicional que compense el resultante incremento en los costes esperados de tener dificultades financieras. Finalmente, y en relación a los costes de información, los ejecutivos en las empresas a menudo tienen mejor información sobre el valor de las mismas que los inversores externos. El reconocimiento de esta diferencia en la información entre gestores e inversores ha conducido a la formulación de tres teorías sobre las decisiones financieras: sincronización del mercado (*market timing*), señalización (*signaling*) y orden jerárquico (*pecking order*).

La presente tesis se centra en la influencia de los impuestos en la deuda corporativa y en el valor del escudo fiscal corporativo.

Lo que hace el debate sobre la estructura de capital especialmente intrigante es que las teorías existentes conducen a diferentes y, algunas veces, contradictorias conclusiones. En particular, hay una gran cantidad de estudios empíricos acerca de si existe o no una estructura óptima de capital empresarial, que tratan de identificar los factores que pueden determinarla. Los resultados son ambiguos y este hecho es desconcertante. Hay muchas explicaciones posibles para esta ambigüedad: cuestiones econométricas, la inclusión u omisión de un cierto tipo de información en forma de variables de control o de variables ficticias, formulación incorrecta del modelo, cálculos incorrectos, etcétera. Más específicamente, una gran cantidad de investigaciones han encontrado evidencia consistente acerca de que los beneficios fiscales tienen una relación positiva con el apalancamiento financiero y añaden valor a la empresa. Sin embargo, algunas de estas evidencias son ambiguas porque explicaciones diferentes a las fiscales o problemas econométricos sesgan las interpretaciones. Si los beneficios fiscales de la deuda, de hecho, añaden valor a la empresa, una importante pregunta sin respuesta es por qué las empresas no utilizan más deuda, sobre todo las empresas más grandes y rentables. ¿Están fallando estas empresas en lograr la optimización de su estructura de capital o existen costes y otros factores que no han sido incluidos en los modelos de manera adecuada?

Los impuestos y los sistemas fiscales han adquirido gran importancia en la actualidad. Esencialmente, hay dos factores que explican esta relevancia. El primer factor es cómo se financian las empresas españolas. El problema particular de la economía española no es tanto el tamaño de la deuda financiera como el hecho de que es casi exclusivamente deuda procedente de financiación bancaria. Las pequeñas y medianas empresas (PYMEs) dominan el panorama de los negocios en España, y su deuda empresarial es típicamente deuda bancaria. Esto, junto con el actual estado delicado de muchas instituciones financieras y la falta de alternativas eficaces para refinanciar deudas, está condenando a muchas empresas, ya sea a la desaparición o al estancamiento en su crecimiento. Una de las causas que influyen en la prevalencia de la financiación a través de préstamos bancarios, en lugar de fórmulas de capital, es la falta de neutralidad fiscal en el tratamiento de los intereses. La deducibilidad fiscal de los intereses corporativos pagados sobre los fondos prestados recibidos es decisiva. La limitación de estas deducciones introducidas recientemente por la legislación fiscal española, persigue este trato discriminatorio. Algunos países están considerando la posibilidad de contemplar los dividendos como una forma de intereses que retribuyen la financiación vía capital, para que puedan también ser un concepto fiscal deducible por las empresas. El segundo factor se refiere a la necesidad de nuevos estudios que arrojen luz sobre la relación entre la regulación y las decisiones financieras, y por lo tanto, el impacto de las políticas fiscales[43]. Y esto es así, porque un proceso de convergencia fiscal está actualmente en curso dentro de la zona euro y la regulación ha demostrado ser un factor crítico en la preferencia de las empresas, ya sea para la financiación vía deuda o la financiación vía capital (reformas europeas en los mercados financieros, la política norteamericana de expansión cuantitativa).

En resumen, según la teoría, debería haber una relación positiva entre los impuestos y la deuda de las empresas. Sin embargo, la evidencia empírica de esta relación positiva no es concluyente.

Nuestro trabajo se centra en la relación entre los impuestos y la teoría de la estructura de capital, y aborda algunos de los principales enfoques de la investigación empírica sobre estructura de capital.

Nuestra investigación proporciona evidencia de una relación positiva entre los impuestos y la deuda financiera corporativa, demostrando que los impuestos no son un factor de segundo orden en las decisiones de apalancamiento, y son importantes para el valor de la empresa. Una cuestión importante a considerar es que el uso de una *proxy* incorrecta para estimar el estatus fiscal específico de una empresa, podría explicar por qué muchos trabajos de investigación financiera no muestran que los factores fiscales desempeñan un papel importante en las decisiones empresariales. Hasta donde somos conscientes, este es el primer intento en España para calcular tanto el tipo fiscal marginal estimado y su influencia sobre la deuda financiera, así como el valor del escudo fiscal corporativo para las empresas españolas.

El tipo fiscal marginal se puede definir como el valor presente de los actuales y esperados futuros impuestos pagados sobre una unidad adicional de ingresos obtenidos hoy. Este concepto juega un papel importante en las finanzas corporativas, debido al hecho de que tiene en cuenta el comportamiento dinámico de los impuestos en las empresas, tales como las pérdidas operativas netas que se pueden llevar hacia adelante para compensar futuros beneficios netos. Además, está relacionado con la tasa de impuestos atribuible a la actividad de una empresa específica, de manera que, utilizar el

[43] Bris, A., 2012, "Las cuestiones pendientes en finanzas corporativas", *Revista de Bolsas y Mercados Españoles*, 193, 44-47.

tipo impositivo marginal específico simulado en la investigación empírica sobre la estructura de capital, ofrece la ventaja de contemplar las reglas del régimen fiscal aplicable, de una manera que otras *proxies* fiscales estáticas no pueden. Sin embargo, el hecho de que esta *proxy* implica bastantes cálculos complejos, puede explicar por qué casi nunca se calcula de forma explícita. Además, el tipo impositivo marginal nos ayuda a construir las funciones de beneficio de las deducciones de intereses de cualquier empresa en un año, con el fin de estimar los beneficios fiscales brutos y netos, expresados como porcentaje del valor de la empresa, y luego medir la pérdida de valor debido a una política de deuda corporativa conservadora. Esto último implica que los beneficios fiscales de la deuda parecen, en gran medida, estar sin explotar. En nuestros diferentes ensayos, hemos calculado el tipo impositivo marginal simulado como *proxy*.

Estudiamos los efectos de la fiscalidad de las empresas, tanto en la toma de decisiones sobre estructura de capital como en el valor de la empresa, en tres ensayos, cada uno con un objetivo específico. Nuestros resultados también proporcionan información sobre este tema en el contexto de la Unión Europea, y especialmente en España. Una cuestión clave es que calculamos el tipo impositivo marginal específico simulado y la función concreta de beneficio de las deducciones de intereses para todas las empresas en nuestra muestra.

5.2. Estructura de la Tesis

En nuestro primer ensayo intentamos mostrar el impacto de la fiscalidad empresarial en la estructura de capital de las empresas en España. Nuestra contribución a la literatura existente es calcular el tipo impositivo marginal simulado para las empresas españolas y utilizarlo para mostrar cómo los impuestos afectan a la política de deuda corporativa, en un determinado período caracterizado por una crisis económica y financiera. Estas tres cuestiones conducen a las siguientes hipótesis:

- *Hipótesis 1. “Dado que mayores tipos impositivos marginales incrementan el valor de los escudos fiscales, dichos tipos deberían estar positivamente relacionados con la política de endeudamiento de las empresas”.*
- *Hipótesis 2. “Los escudos fiscales no provenientes de la deuda, de manera independiente, deberían estar positivamente relacionados con la política de*

endeudamiento de las empresas, mientras que los escudos fiscales no provenientes de la deuda promediados por la probabilidad de quiebra, deberían estar negativamente relacionados con la política de endeudamiento de las empresas”.

- *Hipótesis 3. “Las empresas afectadas por el límite a la deducibilidad de los gastos financieros, reducen su ratio de endeudamiento después de la reforma fiscal más que aquellas compañías que no se ven afectadas por la misma”.*

Una diferencia clave es que nos centramos sólo en la deuda financiera, excluyendo aquellos pasivos que no dependen del efecto del impuesto de sociedades.

La deducción de los gastos financieros de la base imponible produce un ahorro fiscal, conocido como los beneficios fiscales de la deuda. Las consecuencias de estos beneficios fiscales sobre el valor de la empresa es un tema de debate y controversia; las valoraciones obtenidas a través de la evidencia empírica de este beneficio fiscal varían considerablemente, y en algunos casos son incluso negativas. Utilizando diferentes metodologías, nuestro segundo ensayo contribuye a la literatura mediante el cálculo del valor de este ahorro fiscal, también llamado escudo fiscal, y que muestra hasta qué punto el valor de la empresa aumenta, con y sin considerar los impuestos personales, ya que estos últimos pueden compensar el beneficio fiscal de la deuda.

Por último, a pesar de que nuestra evidencia apoya el hecho de que los beneficios fiscales de la deuda añaden valor a la empresa, en nuestro tercer ensayo llevamos a cabo una investigación adicional para explicar la política de deuda aparentemente conservadora de muchas empresas. Primero, estimamos los costes marginales de impago para contrastarlos con los beneficios marginales de la deuda. A continuación, investigamos si los escudos fiscales no provenientes de la deuda sustituyen a la deducción de los gastos financieros. Utilizamos diferentes *proxies* con el fin de capturar los efectos de esos factores de escudo fiscal no provenientes de la deuda, y los relacionamos con la variable “*kink*”, que es la *proxy* que usamos para medir si las empresas están utilizando los beneficios fiscales de la deuda financiera. Así, formulamos las siguientes hipótesis:

- *Hipótesis 1. “Las empresas son conservadoras en el uso de la deuda cuando sus costes de la deuda son altos”.*

- *Hipótesis 2. "Las empresas usan deuda de manera conservadora cuando tienen a su disposición escudos fiscales no provenientes de la deuda"*.

5.3. Ámbito Temporal y Geográfico

Nuestro análisis empírico se centra en una muestra de empresas cotizadas españolas para el período 2007-2013. Hemos obtenido datos del Sistema de Análisis de Balances Ibéricos (SABI), una base de datos gestionada por Bureau Van Dijk e Informa D & B, S.A., y la Comisión Nacional de Mercados y Valores (CNMV). Ambas fuentes nos proporcionan la información contable de las cuentas anuales. La información financiera de mercado proviene de los boletines del mercado de valores de la Bolsa española y Bloomberg, mientras que la información en relación con la calificación crediticia de las empresas ha sido obtenida de Standard & Poor's. El año de inicio de 2007 no fue elegido al azar. La incorporación de las Normas Internacionales de Información Financiera (NIIF) a las normas contables españolas en el Nuevo Plan General Contable del 2007 (NPGC), considera las diferencias temporarias que incluyen no sólo las diferencias temporales (incluidas por el viejo PGC de 1990) entre la base imponible y el resultado contable antes de impuestos, que se derivan de diferentes criterios temporales utilizados para determinar estos dos resultados, pero también otras consideraciones. De acuerdo con este razonamiento, las cifras provenientes del NPGC del 2007 y las del PGC de 1990 no son directamente comparables. Esto es fundamental en el cálculo del tipo impositivo marginal. Utilizamos las empresas que cotizan en bolsa, porque necesitamos información sobre los datos de mercado para calcular las variables dependientes y explicativas. Otra razón es que la información detallada a efectos fiscales se recoge sólo en la memoria anual, y este estado contable no está disponible en la base de datos SABI; de hecho, es accesible en los registros de la CNMV, pero sólo para las empresas cotizadas. En concreto, la memoria anual ofrece una explicación y conciliación numérica del importe del impuesto que resulte de multiplicar el total de ingresos y gastos reconocidos, en oposición al resultado del ejercicio, por los tipos impositivos aplicables.

5.4. Metodología

Esta tesis incluye tres ensayos que son estudios empíricos, cada uno centrado en un aspecto diferente del efecto de los impuestos sobre la decisión de estructura de capital empresarial. En los párrafos siguientes, se describe la metodología utilizada en cada ensayo.

En nuestro primer ensayo, primero calculamos el tipo impositivo marginal simulado, examinando el comportamiento dinámico de los impuestos en el contexto específico de la legislación fiscal española. Para nuestra estimación inicial, se utiliza un panel de datos estáticos con efectos fijos. Una dificultad importante a resolver cuando se analiza la influencia de los impuestos sobre las decisiones de estructura de capital, es el problema de endogeneidad de la situación fiscal, lo que puede producir una correlación espuria entre el nivel de la deuda financiera y, en nuestro caso, el tipo impositivo marginal. Seguimos dos enfoques principales con el fin de resolver este problema en nuestro contexto. Utilizamos el tipo impositivo marginal simulado pero antes de las decisiones de financiación, y también utilizamos la tasa fiscal marginal simulada basada en ingresos antes de impuestos, pero retardada un período. Además, ponemos a prueba la solidez de nuestra principal evidencia empírica, teniendo en cuenta el efecto del nivel de apalancamiento, el actual tipo impositivo máximo y el tamaño. Para comprobar si la reforma fiscal española de 2012 afectó a la elección entre capital y deuda financiera, se utiliza el método de diferencias en diferencias y dos procedimientos de macheado, el denominado *Kernel propensity score* y el enfoque *nearest neighbour matching*.

Como ya se ha indicado anteriormente, las preguntas que pretendemos responder en el segundo ensayo son las siguientes: ¿Cuánto aumenta el valor de la empresa?, y, ¿cuánto valen los escudos fiscales? Para responder a ambas preguntas, generalmente se utilizan tres enfoques principales: los estudios de eventos, las regresiones en sección cruzada / de panel y las simulaciones. Estos enfoques producen una amplia gama de estimaciones, algunas de las cuales son propensas a problemas de identificación. Nosotros sólo nos centramos en los dos últimos enfoques. En el método de regresión, utilizamos dos modelos de datos de panel, lineales y no lineales. En el enfoque de simulación, calculamos las funciones de beneficio de la deducción de intereses para todas las empresas de la muestra en cada año, y mediante la integración del área bajo esta función, los beneficios fiscales capitalizados de la deuda se calculan como un porcentaje del valor de mercado de una empresa, para cada emparejamiento de empresa y año. Además, se analiza el efecto de los impuestos personales sobre el valor del escudo fiscal. Con el fin de comprobar la robustez de nuestros principales resultados, se utiliza una *proxy* alternativa tanto para los ingresos como para la deuda. A pesar de que los resultados de ambos enfoques son cualitativamente similares, los del método de regresión deben tomarse con cautela, debido a cuestiones econométricas.

Como parte de nuestra investigación empírica sobre la política de endeudamiento aparentemente conservadora de algunas empresas de nuestra muestra, nuestra metodología principal en el tercer ensayo es un modelo ordenado Probit de datos de panel, donde la variable dependiente es la calificación crediticia de las empresas. Describiendo y trazando la relación entre el endeudamiento de la empresa y los costes de impago, estimamos los valores predichos de la calificación crediticia y a continuación las probabilidades de impago con el fin de calcular el coste financiero de impago derivado de un incremento en la deuda. En segundo lugar, utilizamos un modelo censurado Tobit de datos de panel. En este caso, se utiliza la variable "*kink*" como variable dependiente, con el fin de medir cómo de conservadora es una empresa con respecto al uso de la deuda financiera. Utilizamos diferentes *proxies* para capturar los efectos de factores distintos del escudo fiscal de la deuda en el apalancamiento financiero, los cuales permiten que una empresa específica pueda reducir su pago de impuestos. Para explorar más a fondo la posibilidad de que distintas combinaciones (recetas) de nuestras variables de control puedan influir en el "*kink*", seguimos el análisis cualitativo de comparación *fuzzy-set*. Todas las variables están calibradas usando un subprograma específico en el programa de software fsQCA, *fuzzy set Qualitative Comparative Analysis*. Utilizamos la metodología fsQCA para elaborar la "tabla de la verdad" y estimar las recetas pertinentes para nuestras variables dependientes. Después de aplicar el enfoque fsQCA, somos capaces de identificar los casos individuales en los modelos específicos relevantes para nuestra investigación.

5.5. Principales Resultados

Nuestros resultados indican que las decisiones de estructura de capital están positivamente afectadas por los impuestos, mientras que los escudos fiscales no provenientes de la deuda y la probabilidad de quiebra se relacionan negativamente. Por otra parte, la reforma fiscal española 2012 no afectó el nivel de deuda financiera.

Bajo el enfoque de simulación y utilizando los tipos impositivos marginales simulados, calculamos las funciones de beneficio de las deducciones de intereses para las empresas individualmente. Tal como esperábamos, también mostramos cómo los beneficios fiscales marginales de la deuda disminuyen a medida que se añade más deuda. Además, se argumenta que algunas empresas pueden ser consideradas como infra-endeudadas si adoptan un menor nivel de deuda financiera que el que les permitiría aprovechar al máximo el ahorro en impuestos.

A través de la comparación entre los beneficios marginales y los costes financieros de impago, valoramos el efecto neto del endeudamiento en las empresas, y posteriormente intentamos explicar la aparente situación de infrautilización de la deuda. Una relación positiva entre los escudos fiscales no provenientes de la deuda y nuestro "*kink*" ayudaría a explicar por qué algunas empresas parecen no utilizar ventaja de los beneficios fiscales de la deuda. Demostramos que la aparente infrautilización de los beneficios fiscales de la deuda no es tal, lo que demuestra que los costes financieros de impago y los escudos fiscales no provenientes de la deuda son importantes y afectan a la toma de decisión de la estructura de capital. Además, se demuestra que no hay una combinación única de factores que explica la conclusión anterior.

5.6. Conclusiones y Discusión

El objetivo principal de esta tesis es contribuir a una mejor comprensión de los determinantes de la estructura de capital de las empresas, y más específicamente, la influencia de los impuestos sobre la política de deuda corporativa. Con el fin de explicar las decisiones de financiación en las empresas, es conveniente analizar si los impuestos son un factor determinante en el endeudamiento de las mismas, y por lo tanto, en su estructura de capital. De esta manera, contribuimos a la literatura sobre estructura de capital utilizando el tipo fiscal marginal y la función específica de beneficio de las deducciones de intereses para las empresas españolas. También calculamos el valor del escudo fiscal de la deuda, es decir, el valor de los ahorros en impuestos debido a la deducción de los gastos financieros de la base imponible. Y, por último, se explica la aparente política de endeudamiento conservadora de muchas empresas.

Nuestra investigación empírica tiene como objetivo arrojar luz sobre los resultados a veces confusos y contradictorios de la investigación previa relacionada. Para este fin, utilizamos diferentes metodologías y pruebas para superar diferentes factores considerados como la causa potencial de esta ambigüedad, tales como los problemas econométricos, las explicaciones no fiscales o el uso de una *proxy* incorrecta para evaluar un status específico fiscal de una empresa.

Nos centramos en una muestra de empresas cotizadas españolas para el periodo 2007-2013, lo que nos proporciona un panel de datos. Utilizamos información contable y de los mercados financieros, así como información sobre la calificación crediticia de las empresas. Comenzamos en el año 2007, ya que fue el año en que los principios NIIF para las diferencias temporarias fueron incorporados en el Plan General de Contabilidad español.

Los resultados obtenidos en el primer ensayo muestran que los impuestos son, económica y estadísticamente, determinantes importantes de la estructura de capital, lo que demuestra que los impuestos no son un factor de segundo orden en las decisiones de endeudamiento de las empresas. Nuestras conclusiones proporcionan evidencia a favor de la relación positiva entre los impuestos y el apalancamiento empresarial. Con el fin de superar los potenciales problemas que pueden enturbiar la interpretación opuesta, como en investigaciones empíricas anteriores, calculamos el tipo fiscal marginal específico de las empresas, que tiene en cuenta el comportamiento dinámico de los impuestos corporativos y la actividad concreta de cada empresa. Por otra parte, también controlamos el problema de la endogeneidad de dos maneras diferentes. Además, examinamos el papel de los escudos fiscales no provenientes de la deuda. Nuestros resultados indican que los escudos fiscales no provenientes de la deuda afectan las decisiones de apalancamiento, ejerciendo el papel de sustitutos del escudo fiscal de la deuda. Por último, a través de diferentes metodologías, mostramos que la reforma española del impuesto de sociedades de 2012 no afectó a la estructura de capital de las empresas, por lo menos en lo que a nuestro período de la investigación se refiere.

En el segundo ensayo, valoramos los beneficios fiscales de la deuda. Nuestra evidencia apoya la idea de que los impuestos influyen en la toma de decisiones corporativas y que la deuda hace una contribución razonable al valor de la empresa. Una vez más, y con el fin de hacer frente a posibles problemas econométricos que pueden dar lugar a interpretaciones espurias, no sólo utilizamos las ventajas econométricas de la metodología de datos de panel, sino que incluso estimamos la función de beneficio fiscal específica de la deuda para las empresas de nuestra muestra. Para fortalecer nuestras conclusiones, también tenemos en cuenta el efecto de los impuestos personales. Además, se muestra que a medida que aumenta la deuda, hay un punto en el que la curva de beneficio fiscal comienza a inclinarse hacia abajo, mientras que el valor del escudo fiscal de la deuda aumenta con el tipo fiscal marginal específico de la empresa. Por último, presentamos evidencia sobre el hecho de que algunas empresas pueden ser consideradas conservadoras en el uso de la deuda ya que no están, al parecer, aprovechando al máximo los beneficios fiscales de la misma.

En el último ensayo, llevamos a cabo una investigación empírica adicional para explicar la política de deuda aparentemente conservadora de muchas empresas, a pesar de que los beneficios fiscales de la deuda añaden valor a la empresa. Nuestros resultados muestran que los beneficios fiscales de la deuda pueden ser compensados por los costes esperados de incumplimiento de pago y la actividad de minimizar los impuestos. En consecuencia, ayudamos a arrojar luz sobre el "rompecabezas de endeudamiento conservador", proporcionando pruebas de por qué algunas empresas no utilizan la deuda de manera más agresiva.

Contribuimos a la literatura empírica de la estructura de capital de varias maneras. En primer lugar, hasta donde somos conscientes, este es el primer trabajo de investigación donde se calcula tanto el tipo fiscal marginal y la función de beneficio fiscal específicos de cada empresa, así como el valor del escudo fiscal de la deuda de las empresas españolas. En segundo lugar, demostramos que el tipo fiscal marginal específico de la empresa es una *proxy* mejor que otras que se utilizan generalmente en el contexto de la estructura de capital, tales como la tasa efectiva de impuestos, con el fin de medir el efecto de los impuestos sobre las políticas de deuda. En tercer lugar, explicamos el aparente conservadurismo de la deuda de las empresas cotizadas españolas.

La presente tesis tiene varias implicaciones. Para los legisladores políticos, destacamos la importancia de los impuestos en la decisión de financiación de las empresas, y por lo tanto, el posible efecto del tratamiento fiscal asimétrico de los intereses sobre las decisiones de estructura de capital. Nuestros resultados pueden así animar a las autoridades fiscales a reconsiderar el efecto de la reforma del impuesto de sociedades en las decisiones de estructura de capital, sobre todo teniendo en cuenta la importancia de la deuda bancaria para las empresas españolas, junto con la relativa falta de alternativas de refinanciación. En cuanto a los gerentes, propietarios y empresarios, deben ser conscientes de la importancia del valor de los beneficios fiscales de la deuda debido a su contribución al valor de la empresa. Al mismo tiempo, también deben considerar otros factores, como los costes de impago, y en particular, los factores fiscales no provenientes de la deuda, con el fin de tomar las decisiones de estructura de capital que optimicen el valor de los recursos invertidos y, por lo tanto, el valor de la empresa. Nuestras conclusiones pueden ayudar a los gerentes a reconsiderar la política actual y futura de la empresa.

Nuestro estudio, ciertamente, tiene sus limitaciones. En España, la información sobre los activos y pasivos por impuestos diferidos no fue identificada separadamente en los estados financieros hasta el año 2007, y como consecuencia, nuestro período de estudio es relativamente corto. Además, no tenemos en cuenta los costes de agencia y esto puede significar que nuestros costes calculados estén subestimados.

Esperamos que nuestras conclusiones abran nuevas líneas de investigación futura. Uno de los objetivos particularmente interesante, sería la de extender nuestra investigación a las empresas no cotizadas para comprobar si se obtienen las mismas conclusiones, así como a las PYMEs. Además, la estimación de los costes de impago en el contexto de las empresas españolas sería un objetivo que merece la pena por sí mismo. Por último, podría ser particularmente instructivo examinar la magnitud de las consecuencias económicas adversas cuando las empresas basan sus decisiones en una tasa fiscal incorrecta, ya que podrían exhibir sesgos de comportamiento al incorporar los impuestos en sus procesos de toma de decisiones.