THE EFFECT OF TAXES ON THE DEBT POLICY OF SPANISH LISTED COMPANIES

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Abstract

This study explores the role of taxes on explaining the companies´ financing decisions. We test whether or not the corporate tax shields explanation of capital structure is applicable to firms listed on the Spanish stock exchange over the period 2007-2013. Taxes are found to be economically and statistically significant determinants of capital structure. Our results confirm that marginal tax rates affect the debt policies of Spanish firms. Furthermore, consistent with the theoretical expectations the relation between debt and taxation is stronger for highly profitable firms and for less levered firms.

1. Introduction

A large body of research has tested for the effects of corporate taxation. Although the results of empirical models vary significantly, the majority of this research agrees that, to some degree, taxes influence a broad range of corporate financial decisions such as financing policy, investment policy or corporate reorganisation and hedging[1]. The magnitude of those effects and their overall impact on the economy are still under debate. Notwithstanding, the most significant drawback a policy maker confronts in deciding whether and how to establish the tax treatment of corporate debt and equity financing is that the impact of taxation on corporate financial policy is not totally understood.

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 (Mooij, 2011). United States and European fiscal authorities have raised the possibility of diminishing the ability of companies to deduct interest payments from taxable income, and emphasizing equal treatment of equity and debt[2]. The reason is that the tax-favoured status of debt has reduced tax revenue collection and supposedly encouraged a "debt bias" of companies – using extra debt in response to tax incentives. In this sense, it is believed that by using too much debt financing, the probability of firms becoming financially distressed increases, and thereby exacerbating or perhaps even causing economic downturns. Mooij (2011) mentions that although existence of debt in the capital structure is not a cause of the financial crises but since excessive leverage makes firms more vulnerable to economic shocks, debt biasness might have contributed to the deepness of the crises.

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. Documenting that tax rates are correlated with corporate capital structure choices suggests that firms may increase value by choosing debt optimally. The trade-off theory of capital structure argues that

[1] A detailed review of the literature on the role of taxes in corporate finance is provided by Graham (2008).
[2] Examples are the Comprehensive Business Income Tax (CBIT) proposal by the U.S. Treasury and the proposals of the Mirrlees Review for the U.K. tax system.

firms determine their optimal debt ratio by comparing the present values of additional tax savings and of the additional expected cost of financial distress caused by marginal increase of debt.

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; each firm has seven years of consecutive data to ease the implementation of panel data methodology. We test the hypothesis that companies have a tax incentive to use debt financing versus equity financing because interest paid is tax-deductible while dividends paid to shareholders are not. Furthermore, we use Shevlin (1990) and Graham (1996a) expected marginal tax rate approach for the identification of tax effects on the debt policies of Spanish firms.

Despite its key relevance, relatively limited empirical studies have been done on the effects of marginal corporate tax on debt policy. In this sense, Graham (1996a) and the subsequent studies have corroborated 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) and Sinha and Bansal (2013) obtained analogous results for Japanese and Indian firms, respectively. In Spain, as far as we are concerned, no empirical study of the effects of simulated marginal tax rates on debt policy has previously been conducted.

This paper contributes to the current state of the art of the impact of corporate taxation on firm´s capital structure, expanding previous literature along different lines. Firstly, we provide further empirical evidence on the relationship between taxes and debt financing. Unlike other papers, our measure of leverage includes only financial debt and directly excludes other liabilities like 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

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

adopted in Spain on January 1st 2007, which allow our results to be comparable with others from economies that have also implemented the abovementioned international standards. Finally, we study a special period partially characterised by a severe economic and financial crisis that has dramatically affected Mediterranean countries like Spain.

Our findings show that the marginal tax rates significantly affect the debt policy of Spanish firms. The results confirm the importance of corporate taxes for company financing decisions considering the uniqueness of the Spanish tax provisions.

The remainder of the paper proceeds as follows. Next section analyses the theoretical framework of the study and presents the hypotheses to be tested. In section 3 we examine the empirical model specification and define the variables used; furthermore we explain the estimation of the marginal corporate tax rates of companies by the Monte Carlo method, following Shevlin (1990) and Graham (1996a). Section 4 presents the data for the study and the descriptive analysis regarding the tax variables. The econometric methodology and the results are discussed in Section 5. Several robustness tests are presented in Section 6 and the final section provides some concluding remarks.

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 income is taxed and debt interest is a deductible expense, firm value can be increased by using debt financing rather than funding entirely from equity. In this context the increase in firm´s value is due to the debt tax shield. The question of why traditionally debt financing has received a 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 deep economic reasoning pertaining to contemporary economic or business circumstances (Strebulaev and Whited, 2012).

The earlier empirical articles did not find convincing evidence that taxation affected the financial policy of firms (see for example, Bradley, Jarrell and Kim, 1984). These discouraging results lead Myers (1984) to state his well-known *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". In the meta-analysis by Feld et al. (2013), they suggest that very small or even negative tax estimates found in the studies do not correctly reflect debt response to taxes. It seems difficult to conduct an effective analysis of a direct relationship between marginal tax rate and debt policy, as most large corporations face the same statutory tax rate[4]. In most of the developed countries, the statutory tax laws do not demonstrate enough variation in corporate statutory tax rates over the years and across the firms. In the absence of variation in tax rates throughout time and across companies, we can only presume a similar debt policy for each company, which is not true, 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. Namely, 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 this 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 taxable income. Likewise, there are typically "carry forward" and "carry backward" of losses in the corporate tax system, which causes differences in the marginal tax rates. Due to this dynamic dimension of taxes, it is necessary to forecast future taxable income 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 tends to raise capital less by new debt issue. Due to the fact that both existing loss carried forward and investment tax credit are substitutes for new debt issue for tax savings, this result is consistent with the trade-off theory.

[4] 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.

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. Afterwards, using simulated taxable income series and applying U.S. corporate tax law, he estimated the (expected) marginal tax rates of individual firms. Using the previous 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. 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; De Jong, Rezaul and Thuy, 2008; De Socio and Nigro, 2012). The problem is that these substitutes of tax rates introduce a significant downward bias in estimates if potential endogeneity bias is not dealt with. In this sense, Feld et al. (2013) state that the simulated marginal tax rates suggested by Graham (1996a) have an advantage in avoiding a significant downward bias in estimation. Besides, Plesko (2003) concluded that in comparison to generally used average tax rate measures, proxies used for marginal tax rate (mainly those based on simulation methods) perform better in estimating current year tax rates.

Following all the rationale described previously, our first and main hypothesis is formulated as *"Due to higher marginal tax rates raise the value of tax savings, marginal tax rates should be positively related to firm´s debt policy"*.

DeAngelo and Masulis (1980) introduced the idea of tax shield substitution, which implies that debt interest competes with other allowable deductions as a tax shelter. Firms can substitute non-debt tax shields, like the depreciation deduction, for debt tax shields. Following this rationale, firms with large amounts of non-debt tax shields will have lower levels of debt than firms with small amounts 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. Nevertheless, Mackie-Mason (1990) criticizes DeAngelo and Masulis (1980) view 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 this profitability effect from the debt substitution

effect, 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, stand-alone, should be positively related to firm´s debt policy and non-debt tax shields, weighted by the probability of bankruptcy, should be negatively related to firm´s debt policy"*.

3. Model and variables

A. 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:

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

Each variable, both dependent and independent, has been discussed in detail below. Specifically, we examine and propose some proxies of debt, taxes and non-debt tax shields, since taxation and debt is the focus of our paper. The specific explanatory variables considered in any study significantly affect tax effects, because omitted variable biases are indeed quantitatively important (Feld et al., 2013).

B. Debt policy measures

A common issue in capital structure studies is identifying the appropriate measure of leverage. While studying the effects of the marginal tax rate on the firms´ debt policy, two approaches have been developed (Graham et al., 1998; Graham, 1999):

- On the one hand and according to the *incremental approach*, the debt ratio is not an efficient measure of leverage, as it may contain the cumulative effects of decisions taken in the past. Therefore, it is more effective to examine incremental financing decisions rather than simply widely used debt ratios to study the effects of the marginal tax rate on the debt policy of firms. This line of research can be justified by noting that important debt policy decisions in corporations may take a long time before implementation. Examples of studies that follow this approach are Graham (1996a, 1996b), Gropp (1997), Alworth and Arachi (2001), Kunieda et al. (2011) and Sinha and Bansal (2013).

- On the other hand, the *cumulative approach* proposes the use of debt level ratio as dependent variable. In this case, some type of adjustment is made on tax proxies in order not to obtain a spurious relationship with debt policy. As it will be discussed later on in Section 5, the potential endogeneity problem of the marginal tax rate is in some occasions avoided using before-financing tax proxies. Examples of studies that support this approach are Graham et al. (1998), Graham (2000), and Bartholdy and Mateus (2011).

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

Following the previous rationale, this research employs two measures of leverage by considering incremental debt level in the numerator and capital employed in the denominator, namely,

- 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 considering the lagged value of the denominator.

C. Tax variables

Testing the impact of taxes on company financing decisions is arduous and open to criticism. The main difficulty deals with the finding of an adequate proxy for the company-specific marginal tax rate as its "true" value is not observable. The computation of the marginal tax rate requires two sets of information: (i) the tax code treatment of net operating losses, and (ii) the managers´ expectations on future income flows. As in mostly 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 contrary to for example the U.S. tax system, Spanish firms cannot "carry back" current losses to receive a tax refund for taxes paid in recent years. Consequently, our estimation method is based on Shevlin (1990) and Graham (1996a, 1996b) estimation procedure, modified to reflect data availability and the differences between the corporate tax system in U.S. and Spain.

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 of managers´ expectations, and is based on the assumption that pre-tax income follows a random walk with drift[5]. 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

[5] 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 suture taxable income.

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. Specifically, we use taxable income series calculated from the actual financial data for individual firms of 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.

Following Shevlin (1990) and Graham (1996a, 1996b), taxable income is calculated using the following formula:

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

Where EBT is earnings before taxes. Net tax deferred assets is the difference between deferred tax assets and deferred tax liabilities coming from the balance sheet. 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 net operating loss or tax credit carry-forwards that exist at the reporting date. Its value is computed by considering financial reporting standards for book income and tax rules for taxable income. For instance, deferred tax assets can be created due to the tax authority recognizing revenues and/or expenses at different times than that of the accounting standards. In Spain, "tax effect accounting" including the concept of net tax deferred assets, was first introduced in fiscal year 2007. Statutory tax rate is 32.5% for fiscal year 2007 and 30% for fiscal years 2008-2013.

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 Spanish corporate tax system. In Spain, carry-forward of loss is allowed for losses during the preceding 15 years, and there is no possibility of carry-backward of loss.

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[6].

After adding one euro to the taxable income values used above, we recalculate the annual corporate tax bills. Note that we consider one euro increase in taxable income for every year rather than one euro increase in taxable income only for the initial period of the simulation time horizon as in Shevlin (1990) and Graham (1996a). As intentional debt policy is lumpy instead of smoothly incremental, it is reasonable to assume that intentional debt policy is decided based on a permanent increase rather than only a one-year increase in taxable income. Next, we compute again the present value of the new corporate tax bills:

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

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.

In fifth place, 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[7]. This simulation process is carried out for all companies in the sample.

As it will be discussed in Section 5, apart from the previous MTR computations, we also calculate another series of (expected) marginal corporate tax rates based on an alternative measure of income which is earnings before interest and taxes. Therefore we have two series of marginal tax rates: the after-interest MTR, which we simply denote by MTR, and the pre-interest MTR, which we called MTREBIT.

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

[7] 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.

Expecting each manager to make decisions based on MTR is a very unrealistic assumption (Graham 1996a). Actually, MTR does not provide an exhaustive measure of the incentive to issue debt provided by the tax system. Thus based upon the availability of data, several other tax-related variables have been included in the model to check and separate their autonomous effect, if any. These are:

- ETR: taxes paid on profits divided by pre-tax income, excluding extraordinary and discontinued items.
- ETRb: taxes accrued on profits divided by pre-tax income, excluding extraordinary and discontinued items.
- NDTS: first difference in book depreciation[8] divided by the sum of book total debt plus market equity value.
- NDTS*RISK: NDTS multiplied by a bankruptcy probability index[9].

Most tax and capital structure research uses data drawn from financial statements, not 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.

D. 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.

[8] Though not only depreciation but also investment tax credit have often been included in NDTS in previous studies in the U.S. (see for example Bradley et al., 1984), we include only depreciation, as investment tax credit is less important in Spanish corporate tax system than in U.S. corporate tax system.
[9] See the next subsection relating control variables for a description of this bankruptcy probability index.

- Probability of bankruptcy (RISK): we use a bankruptcy probability index based on accounting ratios which is a variant of Altman (1968) Z-Score. Following Mackie-Mason (1990) and Graham (1996a) 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. 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.
- Tangibility (TANG): we use the percentage of tangible assets over total assets. If a higher tangibility ratio implies a lower probability of bankruptcy, the trade-off predicts that firms with higher tangibility ratios will tend to have lower debt ratios. Furthermore, the view emphasizing the agency cost of debt also supports that expectation, as tangible assets can easily be used as collateral for debt.
- Size (SIZE): we use the natural logarithm of total assets. Because the bankruptcy probability of larger firms is lower due to their greater diversification of business, the trade-off theory predicts that larger firms will have higher debt ratios.

Table A1 in the Appendix provides a summary of the definitions of the dependent and explanatory variables.

4. Data and descriptive analysis

The data used in this paper come from three sources. The 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, i.e. 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 7-year period spanning 2007 and 2013. 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[10]. Furthermore, International Financial Reporting Standards (IFRSs) were implemented on January 1st 2008 in Spain. The IFRSs adoption allow to compare our results from the capital structure of Spanish listed companies with those from other markets that have also adopted IFRSs.

As it 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. We also excluded companies with negative equity, i.e. near bankruptcy firms. Overall, we have a balanced data panel containing 88 companies with a total of 616 observations.

In order to reduce the effect of outliers, all variables are winsorised at 0.5% in each tail of the distribution. Table 1 presents summary statistics of the dependent and explanatory variables.

TABLE 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
	ETR	0.0754	0	0.1386	0	1.0819	3.2717	20.1522
	ETRb	0.0982	0.0811	0.7474	-4.4166	4.2640	-0.3678	21.3978
	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	20.1760	20.0691	1.8188	15.8881	25.2056	0.4041	2.9405

*Table A1 in the Appendix provides definitions of all the variables.

[10] Like in many other countries, data based on financial statements do not reflect tax accounting conventions and the actual tax incentives faced by companies.

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 2007 fiscal year and 30.00% for 2008 fiscal year onwards). This gap is caused by asymmetrical tax treatment of profits and losses and by the loss carry-forward provision in 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 of the marginal tax rates of all firms.

The probability of bankruptcy measure, RISK, averages about 4.33 for all firm-year observations, but there is a wide dispersion on this figure (standard deviation of 40.82). The average size of the companies included in the sample is approximately 579 million euros in terms of book value of assets.

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 A2 in the Appendix. As it is shown, the low values of VIF suggest the inexistence of collinearity among the variables considered.

Table 2 reports average statistics on the two alternative measures of the marginal tax rate of the sample of firms.

TABLE 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 following Shevlin (1990) and Graham (1996a), and MTREBIT is the marginal tax rate estimated with earnings before interest and taxes following Graham et al. (1998).

Table 3 reports average statistics on the two alternative measures of the effective tax rate of the sample of firms.

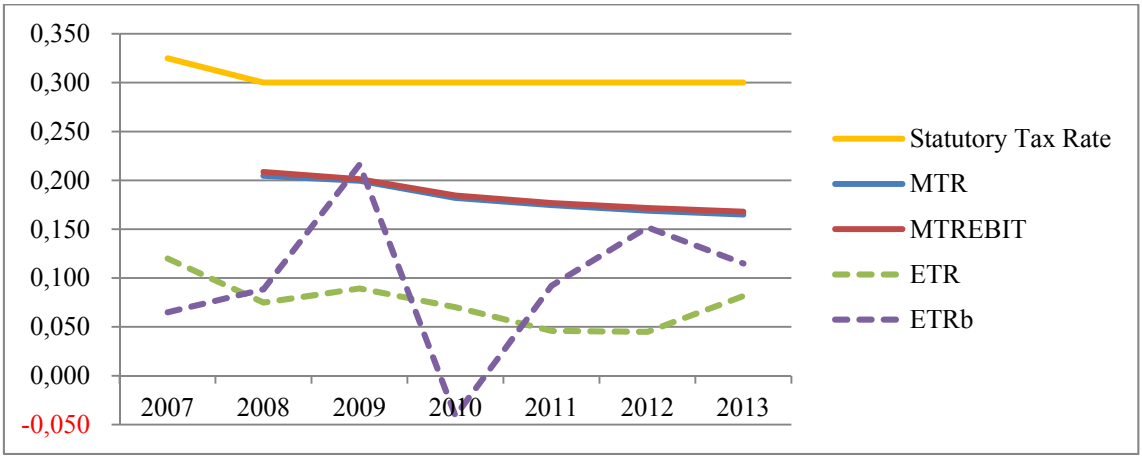
TABLE 3: TIME EVOLUTION OF ETR AND ETRb

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

Figure 1 shows the time evolution of the statutory tax rate, MTR, MTREBIT, ETR and ETRb.

FIGURE 1: TIME EVOLUTION OF MTR, MTREBIT, ETR, ETRb AND STATUTORY TAX RATE



During the period 2007-2013 statutory tax rates remained mostly stable. Conversely, since 2008 an increasing number of companies with losses (i.e. pre-tax book income

and EBIT<0) occurs. Simultaneously, the number of companies with MTR and MTREBIT lower than 10% increases. Overall, there is a downward trend in both MTR and MTREBIT.

Figures 2 and 3 show the distribution of simulated marginal tax rates (MTRs) for the firms in the sample 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 through time. In any given year, none of the firms have MTRs equal to the top statutory tax rate, about 10 percent have MTRs below the 5%, and 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% percent of the firms in the sample experienced losses (i.e. pre-tax book income<0) in 2010 and 2013, respectively.

FIGURE 2: MTR DISTRIBUTION

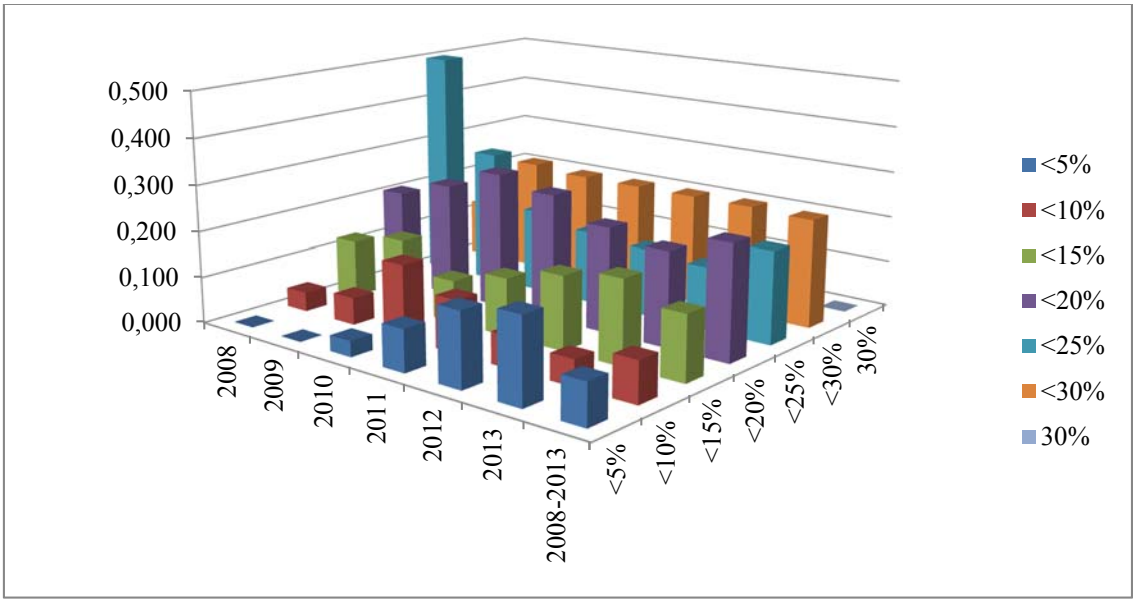
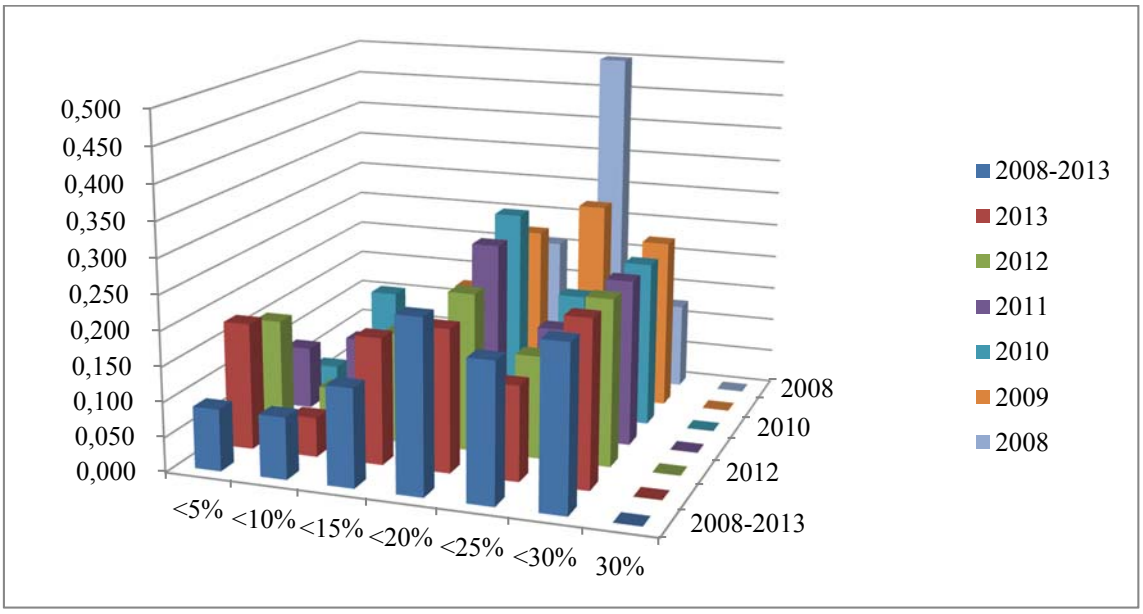


FIGURE 3: MTR DISTRIBUTION



Figures 4 and 5 show the distribution of simulated marginal tax rates, calculated using earnings before interest and taxes as the base for taxable income (MTREBITs) for the firms in the sample from 2007 to 2013 and an aggregation across all years in the sample. The data indicate that there is substantial variation in the marginal tax rate across firms and through time. In any given year, about 2 percent of the firms have MTREBITs equal to the top statutory tax rate, about 10 percent have MTREBITs below the 5%, and 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 4: MTREBIT DISTRIBUTION

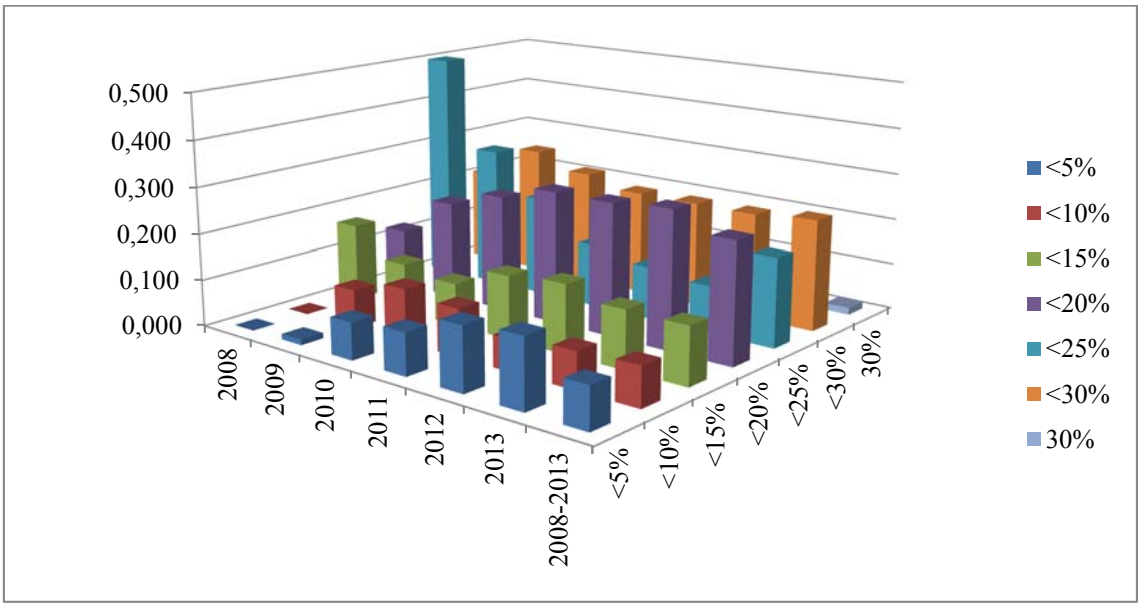
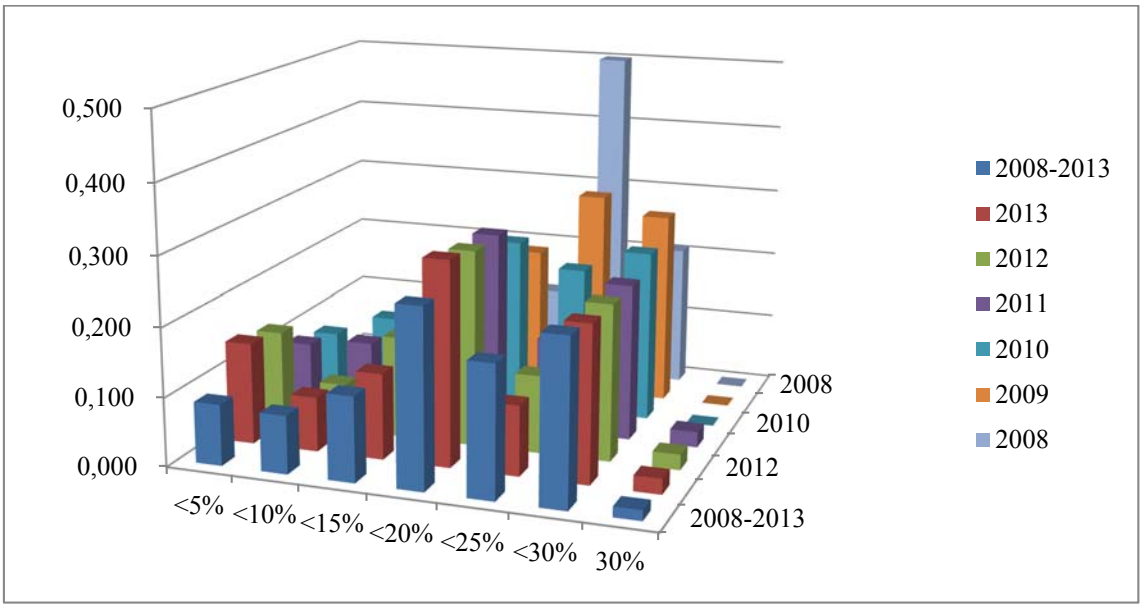


FIGURE 5: MTREBIT DISTRIBUTION



5. Econometric methodology and empirical results

A relevant difficulty in testing the impact of taxes on companies financing decisions stems from the fact that any measure of marginal tax rates based on actual balance sheet data is not exogenous. The reason is due to its 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 induce 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. In order to cope with this endogeneity problem, two solutions have been implemented in the empirical literature (Graham et al., 1998). The first one resembles a traditional way to instrument an endogenous regressor in econometrics, that is, to use 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 deals with the use of 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.

As our dependent variable is based on an incremental basis, following Graham (1996a), we use the changes in possible determinants as explanatory variables, except for the variables MTR, NDTS*RISK and RISK. Therefore, our model equation [1] now resembles the following:

$$\Delta LEV_{it} = \beta_0 + \beta_1 \cdot MTREBIT_{it-1} + \beta_2 \cdot NDTS_{it} + \beta_3 \cdot NDTS_{it} * RISK + \beta_4 \cdot RISK_{it} + \\ + \beta_5 \cdot \Delta TANG_{it} + \beta_6 \cdot \Delta SIZE_{it} + \eta_i + \eta_t + \varepsilon_{it}$$

The existing evidence on the relation between taxes and capital structure is predominantly cross-sectional. Fan, Titman and Twite (2012) document that, in the cross-section, taxes are significant determinants of capital structure in developed economies. However, they find no evidence that taxes matter once firm-fixed effects are controlled for. Considering the panel nature of our data, we will exploit the most of its information and we will run regressions with panel data econometrics.

Table 4 shows the estimation results of our model for both leverage measures LEV_1 and LEV_2.

TABLE 4: ESTIMATION RESULTS OF THE CAPITAL STRUCTURE MODEL

Explanatory Variables	LEV_1	LEV_2
MTREBIT	1.4955** (0.758)	0.6866 (0.772)
NDTS	0.5634 (1.914)	0.8754 (1.839)
NDTS*RISK	-0.4019*** (0.082)	-0.1184 (0.092)
RISK	-0.0005* (0.000)	-0.0007** (0.000)
TANG	0.2352* (0.126)	0.2450** (0.120)
SIZE	0.3796*** (0.112)	0.2538*** (0.065)
Observations	456	456
R-Squared Within	0.2001	0.1154
Wald test (F-statistic)	15.09 (0.000)	9.71 (0.000)
Hausman test (χ^2)	18.86 (0.004)	8.14 (0.008)

Fixed–effect regression coefficients estimated from Equation [1] with robust standard errors 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.

In the case of the regression for LEV_1 all of the parameter estimates have the expected signs, and are statistically significant, except NDTS. 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.

When LEV_2 is used as dependent variable, the most important difference from the previous results is that MTREBIT becomes not statistically significant.

6. Robustness of results

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

According to De Socio and Nigro (2012), the positive relationship between taxation and leverage is greater for more profitable firms because they can obtain greater benefits from the debt tax shield. Likewise, Sinha and Bansal (2013) suggest that the relationship between taxes and debt may differ in profitable and loss making companies. For instance, if a company suffers losses it would presumably try to decrease its debt in order to minimize fixed charges of capital. Nevertheless, there is some probability that this company has a positive marginal tax rate due to the presence of potential future expected profits. Since for such a company cost of financial distress and not marginal tax rates may be the crucial factor in capital structure decisions, there may be an important difference between the debt-tax relations of the two types of companies, i.e. profitable and loss making companies. Following Sinha and Bansal (2013), we suggest including a dummy variable called taxable income (TI) which takes a value of 1 if there are profits before taxes and 0 otherwise. Table 5 presents the results of this new estimation:

TABLE 5: ESTIMATION RESULTS OF THE CAPITAL STRUCTURE MODEL CONSIDERING TAXABLE INCOME

Explanatory Variables	LEV_1	LEV_2
MTREBIT	1.3494* (0.718)	0.5763 (0.880)
NDTS	0.2583 (1.881)	0.6117 (1.836)
NDTS*RISK	-0.4008*** (0.083)	-0.1174 (0.093)
RISK	-0.0005* (0.000)	-0.0007** (0.000)

TANG	0.2561** (0.127)	0.2625** (0.124)
SIZE	0.3792*** (0.112)	0.2534*** (0.064)
TI	0.0311 (0.040)	0.0257 (0.048)
Observations	455	455
R-Squared Within	0.2023	0.1172
Wald test (F-statistic)	10.44 (0.000)	8.49 (0.000)
Hausman test (χ^2)	16.86 (0.018)	10.50 (0.062)

Fixed–effect regression coefficients estimated from Equation [1] with robust standard errors 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.

We implicitly assume that the magnitudes of the marginal effects of the marginal tax rates on the firms´ debt policy are the same for all firms. However, it is possible for instance, that firms with more CFOs having better knowledge of modern corporate finance theory may have a stronger response of debt policy to 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. The idea is that larger firms are considered to have more CFOs with greater knowledge of modern corporate finance in Spain.

7. Concluding remarks

This paper provides empirical evidence on assessing 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.

The research follows 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 and in this case, that tax shield cannot be used immediately and will offset future positive taxable income. Furthermore, we control for the endogeneity problem due to the reverse causality between debt and taxes.

Our results indicate that there is a positive relationship between the firm-specific marginal tax rates and the leverage ratio increase of Spanish firms. This finding is consistent with previous results by the empirical studies of the debt policies of U.S. firms (Graham, 1996a), Italian firms (Alworth and Arachi, 2001), Japanese firms (Kunieda et al., 2011) and Indian firms (Sinha and Bansal, 2013).

Our study is not an exception when it comes to limitations. Access to tax related data is a complex issue in most of developed countries. In Spain, taxable income of corporations and therefore deferred tax assets and liabilities has been explicitly included in financial statements from fiscal year 2007 onwards. Consequently, our time horizon of study is relatively short. We expect the results may improve and a better and more precise value of marginal tax rates may be available while enlarging the historic information of tax related data.

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 rate that is higher or lower than that on returns from common stocks. Therefore, it would be interesting, as a future line of research, to analyse whether not only corporate taxes but also personal taxes affect corporate financing decisions in Spain. Another remarkable issue to be considered is the fact that using data of listed as opposed to unlisted firms can lead to very different findings, because 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 which affect capital structure are internal to a company, and only tax is one of the factors which may be exogenously determined and used to control company´s actions to some extent. From

the point of view 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 firms. Thus, it would be desirable to have corporate tax reform in the direction toward equal tax treatment of debt and equity in Spain.

References

- 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.
- 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.
- 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.
- Cloyd, C. B., Limberg, S. T. and Robinson, J. R., 1997, "The impact of federal taxes on the debt-equity structure of closely-held corporations", *National Tax Journal*, 50 (2), 261-277.
- 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.
- De Socio, A. and Nigro, V., 2012, "Does corporate taxation affect cross-country firm leverage?", Working Paper, No 889, Bank of Italy.
- DeAngelo, H. and Masulis, R., 1980, "Optimal capital structure under corporate and personal taxation", *Journal of Financial Economics*, 8 (1), 3-29.
- Fan, J. P. H., Titman, S. and Twite, G., 2012, "An international comparison of capital structure and debt maturity choices", *Journal of Financial and Quantitative Analysis*, 47, 23-56.
- 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., 1999, "Do personal taxes affect corporate financing decisions?", *Journal of Public Economics*, 73, 147-185.
- 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 B. E. Eckbo (Ed), Handbook of Corporate Finance. Empirical Corporate Finance, North-Holland Elsevier, Volume 2, Chapter 11, 59-133.
- Graham, J. R. and Mills, L., 2006, "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", Working Paper, No 46, International Monetary Fund.
- Haugen, R. A. and Senbet, L. W., 1986, "Corporate finance and taxes: a review", *Financial Management*, 15 (3), 5-21.
- Kunieda, S., Takahata, J. and Yada, H., 2011, "Japanese firms' debt policy and tax policy", Discussion Paper Series Nº 2011-11, Hitotsubashi University, Tokyo.
- 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. de, 2011, "The tax elasticity of corporate debt: a synthesis of size and variations", Working Paper, WP/11/95, International Monetary Fund.
- Myers, S. C., 1984, "The capital structure puzzle", *The Journal of Finance*, 39, 575-592.
- Plesko, G. A., 2003, "An evaluation of alternative measures of corporate tax rates", *Journal of Accounting and Economics*, 35, 201-226.
- 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.

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

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

- 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.

APPENDIX

TABLE A1
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 considering the lagged value of the denominator
MTR	Marginal tax rate estimated following Shevlin (1990) and Graham (1996a) approach
MTREBIT	Marginal tax rate estimated with earnings before interest and taxes following Graham et al. (1998) approach
ETR	Taxes paid on profits divided by pre-tax book income, excluding extraordinary and discontinued items
ETRb	Taxes accrued on profits divided by pre-tax book income, excluding extraordinary and discontinued items
NDTS	First difference in book depreciation divided by the sum of book total debt plus 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

TABLE A2
CORRELATION MATRIX AND VARIANCE INFLATION FACTORS

	LEV_1	LEV_2	MTR	MTREBIT	NDTS	RISK	TANG	SIZE
LEV_1	1.0000							
LEV_2	0.7689 (0.0000)	1.0000						
MTR	0.0797 (0.0874)	0.0262 (0.5744)	1.0000					
MTREBIT	0.0510 (0.2749)	0.0002 (0.9964)	0.7472 (0.0000)	1.0000				
NDTS	0.1068 (0.0141)	0.1297 (0.0028)	0.0352 (0.4509)	0.0044 (0.9253)	1.0000			
RISK	-0.0044 (0.9198)	-0.0573 (0.1905)	0.0372 (0.4281)	0.0424 (0.3665)	-0.0252 (0.5658)	1.0000		
TANG	0.0735 (0.0916)	0.0155 (0.7218)	-0.0291 (0.5331)	-0.0929 (0.0463)	0.1807 (0.0000)	-0.0420 (0.3015)	1.0000	
SIZE	0.0339 (0.4374)	0.0130 (0.7655)	-0.0549 (0.2395)	0.0790 (0.0903)	0.0111 (0.7996)	-0.0046 (0.9093)	-0.2042 (0.0000)	1.0000
VIF			**2.33**	**2.36**	**1.04**	**1.00**	**1.08**	**1.07**

Significance levels in brackets. Table A1 provides definitions of all the variables.