Determinants of Capital Structure: Differences Between Northern and Southern Europe

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Biographical Note

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Abstract

The Capital Structure issue has been a matter of debate since Modigliani and Miller (1958). Theories and empirical studies regarding this topic abound, but there is still not a consensus on the determinants of the choice between equity and debt. The aim of this study is to contribute to this research area and to see whether there are differences, or not, on the determinants of capital structure between two groups of companies: companies from northern European countries and southern European countries. The recent financial and sovereign debt crisis divided Europe into two regions. One region composed by safe countries, in the north, and another represented by the countries under austerity measures, in the south. This would lead to higher difficulties in accessing debt funds by companies from south of Europe countries and to differences in the way those companies are financed.

The results showed that the significant variables in one country are not necessarily significant in others. Besides, it was found that there are differences in the determinants of capital structure between northern and southern European companies, mainly regarding firms' size and profitability, assets' tangibility and non-debt tax shield.

Key-words: *Capital Structure, Capital Structure Theories, Capital Structure Determinants, Sovereign Debt.*

JEL-Codes: *G32, H63*

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1. Introduction

The Capital Structure topic has been a matter of debate since the irrelevance theorem of Modigliani and Miller (1958). Theories and empirical studies regarding this theme abound. Kraus and Litzenberger (1973) proposed the Trade-off Theory, where a company's amount of debt results from balancing its costs and advantages. Myers and Majluf (1984) proposed the Pecking Order Theory that states that companies favor internal to external funds, and debt to equity. Later, Baker and Wurgler (2002) proposed the Market Timing Theory that suggested managers issue (repurchase) shares when the price of their shares (measured by the price to book value ratio) is high (low).

Empirically, researchers tried to determine which variables impact the companies' financing choices, and concluded that they can be the firms' characteristics (size, profitability, earnings volatility or asset tangibility) or the countries' institutions (culture, legal system or corruption level, for example). Nevertheless, there is still not a consensus regarding those determinants.

Usually, the studies apply to different samples of countries. Concerning Europe, some focused only in one country, like U.K. (Ozkan, 2001) or Spain (De Miguel and Pindado, 2001). Others are dedicated to a group of European countries (Antoniou et al., 2002 or Hall et al., 2004). But few studies compared groups of countries. For instance, Acedo-Ramíres and Ruiz-Cabestre (2014), distinguished market-oriented economies from bank-oriented, and Bancel and Mittoo (2004) found differences in the determinants of capital structure between Scandinavian and non-Scandinavian countries.

The recent financial crisis originated a sovereign debt crisis in Europe because governments, mainly in Portugal, Greece, Ireland, Spain and Cyprus, bailed out bankrupt banks, increasing their public debt, their bond yields (Kantar et al., 2014) and the yield spread (Dell'erba et al., 2013), which created difficulties in the repayment of debt, leading to austerity programs (Apergis and Cooray, 2014). For Moro (2014), Eurozone countries are completely separated into the "prosperous North (Germany, Austria, Netherlands and Finland) and those of the austerity-hit South (France, Italy, Spain, Greece and Portugal)[1]." (p. S23). Furthermore, many times, northern and southern Europe countries are compared regarding their cultural differences and the

[1] Lately in this work, the countries under study will be presented, as well as their classification (between northern and southern), which is quite different from that of Moro (2014).

opposite characteristics of their people: while northerners are seen as more honest, hard-workers and "cold" people, southerners are seen as less honest and lazier. These contrasting characteristics may lie on the basis of the crisis.

To the extent of our knowledge, no work explored the differences in the determinants of capital structure between the companies from countries in the north and in the south of Europe. This study will try to fill this gap. First, it studies whether southern companies use more or less debt than northern companies. On the one hand the formers can be more indebted (as southern countries tend to rely more than northern countries on debt as can be seen by their public debt levels) but, on the other hand, the cost of debt is higher is the southern countries, which according to the Trade-off Theory will led to less levered capital structures. Second, this study will analyze if there are differences in the determinants of capital structure between the groups of countries described above. Besides, this study will also help us to understand which capital structure determinants are more relevant in each group of countries. Finally, the link between public and private debt will be studied by testing whether the level of public debt is a significant explanatory variable to the firm's financing decisions.

The results showed that southern companies are smaller but have higher proportion of fixed assets, and have higher levels of debt than northern companies. Furthermore, it was found that firms' profitability, size, assets' tangibility and the non-debt tax shield are relevant in explaining the debt level.

It was also found that the companies, apart from being separated into northern and southern, can be distinguished considering the level of public debt of the country where they are stablished.

Finally, it was found that, in fact, there are differences in the determinants of firms' capital structure across the groups of countries considered.

The rest of this dissertation is divided in 5 sections. Section 2 corresponds to the literature review, where previous theories and studies are summarized. Later, in section 3 the methodological aspects of this work are described. Section 4 analyzes the results obtained. Finally, in section 5 the conclusions are summarized and suggestions for future research are presented.

2. Literature review

"I will start by asking, 'How do firms choose their capital structures? Again, the answer is, 'We don't know'.". Myers (1984) (p.575).

2.1. Introduction

The capital structure of a company corresponds to the combination of equity and debt that it uses to finance its activities. The importance of choosing an appropriate capital structure is that it allows companies to reduce their cost of financing and maximize their value.

This has been one of the most debated issues in Finance since the irrelevance theorem of Modigliani and Miller (1958), who argued that, under some assumptions, the capital structure is irrelevant for a firm's value. However, those assumptions do not prevail in the real world and so it is not indifferent for the firms' valuation the combination of equity and debt used.

Attempting to find an answer for the question of how companies choose their capital structures, theories for the capital structure have emerged. One of those theories is the Trade-off Theory, proposed by Kraus and Litzenberger (1973), Scott (1976), Kim (1978), Jensen and Meckling (1976) and Grinblatt and Titman (2002). Other theory proposed is the Pecking Order Theory, suggested by authors like Myers and Majluf (1984) and Myers (1984). Then, the Market Timing theory was defended by Baker and Wurgler (2002).

In this section we will present the Modigliani and Miller contributions, as well as the main capital structure theories. Besides, a review of the empirical studies regarding the determinants of capital structure will be made.

2.2. Modigliani and Miller Contributions

The capital structure topic has been a matter of debate since Modigliani and Miller (1958). As companies have different ways to finance their investments, the challenge is to identify the one that yields the lowest cost of capital and maximizes the firm value. According to the Proposition I of those authors, "the market value of a firm is independent of its capital structure" (p. 268) and is only related to its profitability, so the capital structure problem is not a problem, if it is assumed that the capital markets are perfect, have no frictions, investors have homogeneous expectations and there are no

arbitrage opportunities. However in a world with taxes and other market imperfections, it is proved that the capital structure is relevant to the cost of capital and to the firm's market value.

Later, in 1963, Modigliani and Miller presented a correction to their previous paper, since they found that the market value of a company is dependent on the expected after-tax return, on the tax rate and on the degree of leverage, which means that the capital structure is not irrelevant for the firm's value. Nevertheless, they emphasized that the fact that debt is related to a tax shield does not mean that companies should be only financed by debt. First, because there are other sources of financing, like the retained earnings, that can be cheaper. Second, because some lenders define limits to the amount they lend to a given company. Finally, the authors' data did not show that, even in a context with high tax rates, that are associated with higher tax advantages, the leverage increased.

Knowing that the way a company is financed is not indifferent for its valuation and that markets have frictions, theories for the capital structure have emerged.

2.3. Capital Structure Theories

2.3.1. Trade-off Theory

Kraus and Litzenberger (1973) extend the work of Modigliani and Miller (1963) and while including the impact of market imperfections, such as the existence of taxes and bankruptcy costs, developed what is called the Trade-off Theory (because there exists a trade-off between the present value of the tax shield originated by a marginal increase in debt and the present value of the marginal bankruptcy costs).

According to the theory, when choosing the amount of debt, a company considers that on the one hand, higher debt means greater tax rebate, but on the other hand, higher debt may lead to bankruptcy, which has huge costs such as the fact that firm's assets may be sold at a value below its economic value. The bankruptcy can also led to the reduction in sales (Titman, 1984), to the delays of production, the payment of fees to lawyers or accountants and the loss of tax credits. So, the existence of a tax advantage related to debt should be balanced with the bankruptcy cost disadvantages.

Since this theory balances the advantages and disadvantages of debt, it defends the existence of an optimal capital structure (the one that generates the lowest cost of

capital) that results from the best combination between debt and equity[2]. However, not all firms are in its optimal debt-to-equity ratio, since, as stated by Myers (1984), there are adjustment costs that arise from changing from one capital structure to another[3]. Morover, for Hovakimian et al. (2001) there are impediments that prevent firms to adjust towards their target ratio, which also changes over time.

In his contribution, Kim (1978) stated that the tax savings and the bankruptcy costs should only be balanced if the debt capacity of a firm, that is, "the maximum amount of debt that a firm with given investments can borrow in a perfect capital market" (p. 52), is higher than the optimal amount of debt that the firm should have. This leads to the conclusion that, even if a firm is able to increase its leverage it should not do so until reach the risk of bankruptcy. At the debt capacity, the increase in the debt level and in the debt payments leads to an increase in bankruptcy costs, and the present value of tax savings remains almost the same, which decreases the firm's value. So, there may be a given amount of debt payments (and, as a consequence, of debt) that leads to the maximum firm's value and "… the optimal capital structure [associated with the optimal amount of debt] involves less debt financing than the firm's debt capacity." (Kim, 1978, p.55).

Apart from balancing only the tax advantages and the bankruptcy costs, there are other authors that, regarding the Trade-off Theory, include also the agency costs. Those costs were pointed out at first by Jensen and Meckling (1976) and are associated with the separation between ownership and control (that lead to conflicts of interest between shareholders and managers) and with the conflicts between shareholders and debtholders.

According to Jensen (1986), debt (despite being related to bank costs) allows to reduce the conflicts of interest between shareholders and managers. In the case of high levels of Free Cash Flow (FCF) the agency costs are very high since the discretionary power of managers is large, however if a company has debt obligations (like the payment of the interests and the principal), managers cannot spend that resources indiscriminately, at

[2] Marsh (1982) proved that companies choose their capital structure as they have a target ratio in mind. Ozkan (2001), De Miguel and Pindado (2001) and Antoniou et al. (2002), also confirmed that firms adjust their target ratio.

[3] Acedo-Ramírez and Ruiz-Cabestre (2014) found that UK companies adjust to their target debt level more rapidly than other continental European countries, because the transaction costs faced by the English companies are lower.

the expense of shareholders and so the existence of debt implies more control and better management of companies. In the author words, "These control effects of debt are a potential determinant of capital structure." (p. 324).

Concerning the agency costs between shareholders and debtholders, Grinblatt and Titman (2002) found that they distort the investment decisions. For example, sometimes, shareholders want to take risky projects, even if they have a negative present value. This decision may be good for them, but leads to an increase in the return required by debtholders, reducing the value of existing bonds. The authors also concluded that equityholders are more concerned about short-term returns and, consequently, give-up from investments associated with long-run returns, even if they are more profitable. Moreover, they argued that in the presence of debt, shareholders want to keep the company alive even if it values more if liquidated.

Given that lenders recognize those distortions, they will take actions in order that shareholders bear the costs of the distortions, for example by increasing the borrowing costs, by limiting the amount they lend, or by using covenants.

2.3.2. Pecking Order Theory

Another theory regarding capital structure proposed is the Pecking Order Theory (POT) (Myers and Majluf, 1984) that states that firms, facing an investment opportunity, prefer to use internal funds instead of external funds. So, this theory does not predict the existence of an optimal capital structure. Also, in the case external funds are required, firms favor debt against equity, since debt is safer than equity (Myers, 1984) and the loss in the firm's value using debt is lower. This occurs because there is asymmetric information between managers and investors (the former know more about the company and the latter recognize this). According to the authors, the issuance of debt tells the investors that the company is able to meet its debt obligations and has opportunities to grow. Conversely, the issuance of new shares is not welcomed by shareholders, since they interpret that as a signal that the company is overvalued and, as was proved, leads to a decrease in shares' price..

According to Myers (2001), the POT allows to distinguish profitable from non-profitable companies, because the former have higher internal funds and do not need to issue as much debt or equity as the latter. For him, "Each firm's debt ratio therefore reflects its cumulative requirement for external financing." (p. 93).

2.3.3. Market Timing Theory

Considering that the theories described above could not completely describe and explain the decisions made by managers regarding the sources of financing, several other theories were proposed recently. From those, the Market Timing Theory purposed by Baker and Wurgler (2002) defended that the "capital structure is the cumulative outcome of past attempts to time the equity market" (p. 1) and is not associated with the existence of an optimal capital structure. They concluded that market timing affects the capital structure in a persistent manner.

This strategy implies that managers track the evolution of its market-to-book (MtB) ratio, and it is proved that they issue equity when the market value is higher than its book value and past market values, and they repurchase shares when the market value is lower. This implies a negative relation between the market value and the level of debt. Managers justify this behavior stating that "if our stock price has recently risen, the price at which we can sell is 'high'"[4]. And one can add that if the stock price has dropped, they can buy it at a lower price. This way of acting allows to profit from differences in the cost of equity relative to the cost of other sources of financing.

This recent theory is hard to conciliate with the previous ones because, for example, the POT says that leverage increases to finance future investments, but these authors found that this is determined by past values of MtB. Regarding the Trade-off Theory, it states that "capital structure eventually adjusts to changes in the market-to-book ratio" (Baker and Wurgler, 2002, p. 25), but the same authors affirm that "variation in the market-to-book ratio has a decades-long impact on capital structure." (p.25).

2.4. Traditional Determinants of Capital Structure

"[T]he capital structure decision of a firm is not only the product of its own characteristics but also the result of environment and tradition in which it operates." (Antoniou et al., 2002, p. 19)

Researchers have been attempting to prove the impact of the theories described above on companies' capital structure and also to find the determinants of those financial structures, which can be related to firm-specific characteristics or can depend on the

[4] This statement results from a survey made by Graham, J. R. and C. R. Harvey (2001), "The theory and practice of corporate finance: evidence from the field", *Journal of Financial Economics*, 60**(**2-3**),** 187-243. (p. 216).

macroeconomic environment, country's institutions[5] or industry in which the firm operates.

According to Harris and Raviv (1991), in their summary of the existing literature, the firm characteristics usually mentioned to explain capital structures' decisions are the amount of fixed assets hold by companies, the non-debt tax shield, the investment opportunities, the firm's size, the volatility, the advertising and R&D expenditures, the probability of bankruptcy, the profitability and the uniqueness of the product[6]. The impact of each of these determinants may vary across studies, although there is some consensus regarding specific variables[7].

2.4.1. Companies' size

Regarding the size of the companies, Ferri and Jones (1979) found a positive relation between this variable and the leverage, which is justifiable by the fact that larger firms are more diversified and, because of that, are less risky, have higher credit ratings, lower interest rates and so are more likely to have larger amounts of debt. Consequently, according to the Trade-off theory, there is a positive relation between leverage and the size of a firm.

Besides, Michaelas et al. (1999) argued that smaller firms are less profitable, so enjoy less the tax shields originated by debt, and are more likely to go bankrupt. Given that, Michaelas et al (1999) and others[8] defended a positive impact of firm size on leverage. Conversely, Ozkan (2001) got a negative, although not significant, relation between size and leverage, which can be justified by the fact that larger firms have lower degrees of

[5] Rajan and Zingales (1995) studied the determinants of the capital structure in G7 countries to see if they are similar to the ones observed in US companies. The pertinence of their study is that, on the one hand, since those countries are similar, it is possible to expect that the financial structures are also similar. On the other hand, each country has specific institutions regarding accounting and bankruptcy rules, legal environments and the role of banks (some are bank-oriented countries and others are market-oriented) and securities markets, which would lead to differences in financing decisions. However, they concluded that differences that exist in capital structures across those countries "are not easily explained by institutional differences previously though important.".
Other authors like Antoniou et al. (2002) and Acedo-Ramírez and Ruiz-Cabestre (2014) also distinguished market-oriented countries from bank-oriented countries. Acedo-Ramírez and Ruiz-Cabestre (2014) found significant differences in terms of the determinants of capital structure across both groups of countries, mainly regarding the effective tax rate, the financial distress costs (measured by the value of intangible assets), the investment in net fixed assets, the cash flow, the firm size and the market return.

[6] Titman and Wessels (1988) connected the uniqueness of a firm's product with debt ratios, and found that they are negatively related, that is, the more specialized a company is, the less indebted it should be. Their findings support Titman (1984).

[7] In Appendix A it is possible to find a summary of the determinants of capital structure used in this study and their impact on the level of debt, according to the different theories.

[8] Chui et al. (2002), Antoniou et al. (2002), Frank and Goyal (2009) – who measured the size by the amount of book assets - Fan et al. (2012) and Acedo-Ramírez and Ruiz-Cabestre (2014).

asymmetric information and have no problem in issuing equity instead of debt[9]. So, the POT predicts a negative relation between leverage and firm's size. On their study, Hall et al. (2004) found evidence to support the positive and the negative relation: the positive occurs for long-term debt and the negative for short-term debt. Marsh (1982) also considered size an important explanatory variable for leverage.

2.4.2 Volatility

Concerning the volatility of firm's earnings, the existence of "non-trivial"[10] bankruptcy costs should lead to an opposite relation between the variability of earnings and the amount of debt, which is in accordance with the prediction of the Trade-off theory. The POT also predicts a negative relation between these two variables and the reasoning is that profitable firms with volatile earnings should reduce debt or invest in cash and securities to ensure that in the future they can raise debt if they need to. Nevertheless, Ferri and Jones (1979) did not found any evidence of a negative relation, as was found by Bradley et al. (1984) and Acedo-Ramírez and Ruiz-Cabestre (2014). On the other hand, Michaelas et al. (1999) found a positive relation between volatility and gearing, probably due to relatively lower costs of financial distress.

2.4.3 Fixed Assets

The impact of fixed assets on leverage, according to Ferri and Jones (1979), is negative because they can enlarge the variability of the firm's income, hindering the access to debt. This is supported by Hall et al. (2004), but just for the short-term debt. However, other authors like Michaelas et al. (1999) (and Hall et al. (2004) for the long-term) found that the higher the amount of fixed assets a firm has, the higher the level of debt that it will have on its capital structure, because the assets can be used as collateral in debt contracts and lenders will ask for a low risk premium. Besides, the existence of collaterals in a debt contract limits the use of the funds made by managers, reducing the agency costs. Because of that, the Trade-off theory predicts that leverage and tangibility are positively related (Zurigat, 2009). This positive effect is also supported by the POT, as the assets used as collateral will allow issuing debt at interesting rates. Rajan and Zingales (1995), Frank and Goyal (2009), Fan et al. (2012), and Acedo-Ramírez and Ruiz-Cabestre (2014) got the same results. Antoniou et al. (2002) found evidence that support both the negative and the positive effect of tangible assets on leverage,

[9] This justification was suggested by Rajan and Zingales (1995), who actually did not understand why they found a positive relation between size and debt in all countries, except in Germany.
[10] Bradley et al (1984), p. 858.

depending on the country. This variable is also considered relevant in explaining companies' leverage by Marsh (1982).

2.4.4. Non Debt Tax Shield and Tax Gains

Another determinant of capital structure can be the non-debt tax shield (NDTS). According to Ozkan (2001), if a company can have tax shields arising from a source different from debt interest, like tax deductions for depreciations (Deangelo and Masulis, 1980)[11], then, it has no advantage in issuing debt. So, the authors predicted, and proved, that there is a negative relation between non-debt tax shield and leverage. This negative relation is supported by the Trade-off theory, as it states that the advantage of increasing debt is related with the taxes that are saved due to the payment of interests. However, Bradley et al. (1984) and Michaelas et al. (1999) found a positive relation between these variables. According to Bradley et al (1984), this evidence is puzzling, but considering that the firms that have higher amounts of depreciations are the same firms that have higher values of tangible assets, they can easily access to bank loans and get friendly interest rates.

According to Antoniou et al. (2002), the relation between debt level and tax rate can be positive (because a higher tax rate is associated with higher tax gains from leverage, increasing debt, as predicted by the Trade-off theory), or negative (as a higher corporate tax decreases the internal funds, increases the cost of capital and decreases debt). Overall, those authors and Michaelas et al. (1999) found an insignificant relation between tax rate and leverage. But, for Fan et al. (2012) and Acedo-Ramírez and Ruiz-Cabestre (2014) the relation was positive and significant.

2.4.5. Profitability

Following the predictions of the POT, more profitable firms should have lower amounts of debt in their balance sheets because they will use their internal returns in first place. Due to that, a negative relation between profitability and leverage would be expected. Michaelas et al. (1999) and others[12] found a negative coefficient for profitability, which is consistent with the POT. In opposition, the Trade-off Theory says that, as profitable

[11] These authors argued that "the existence of corporate tax shield substitutes for debt such as accounting depreciation deductions and investment tax credits." (pp. 26-27).

[12] Ozkan (2001), Chui et al (2002), Hall et al. (2004), Frank and Goyal (2009) and Fan et al. (2012). Antoniou et al. (2002) found a negative relation between profitability and leverage in France and in the UK, due to the fact that French firms are mainly privately held, distribute lower dividends and have more internal resources. Rajan and Zingales (1995) found a negative relation in all countries, except in Germany. Acedo-Ramírez and Ruiz-Cabestre (2014) found a negative relation.

companies have higher amounts of Free Cash Flow (FCF), in order to lower the agency costs and to commit managers to use the internal resources in a responsible manner, these companies should have higher levels of debt (Jensen, 1986, and Harris and Raviv, 1991).

2.4.6. Liquidity

Another determinant of capital structure might be firm's liquidity. The existence of agency costs and conflicts of interest between shareholders and debtholders may lead to a negative relation between this variable and the amount of debt (Ozkan, 2001). Besides, more liquid firms can use their own funds to finance their investments, decreasing the leverage, which is consistent with the POT. Ozkan (2001) confirmed this inverse relation and Antoniou et al. (2002) proved the negative relation in the UK, due to the fact that this is a market-oriented economy, which has no close relations with banks, being hard to get loans.

2.4.7. Growth Opportunities

Regarding the impact of the growth opportunities, which correspond to capital assets that are valuable for the company but that cannot be collateralized (because they are intangible) and are most of the times measured by the market-to-book ratio, the POT predicts a positive relation between this variable and leverage, because firms with more investment projects will need more external funds, and as debt is preferred against equity (Myers and Majluf, 1984), the leverage will increase. However, Ozkan (2001) and others[13], found a negative relation, arguing that the existence of risky debt on balance sheets may prevent firms from issuing more debt, passing up some investment opportunities.

Furthermore, according to the Market Timing Theory, when the stock price is high relative to earnings or book value, firms prefer to issue equity, since they can sell the new shares at higher prices, thus, reducing the amount of debt. So, this theory expects a negative relation between gearing and growth opportunities, as was proved by Rajan and Zingales (1995) and by Antoniou et al. (2002). The inverse relation is also supported by Frank and Goyal (2009) and Fan et al. (2012).

[13] Myers (1977) adds that the issuance of risky debt leads to suboptimal investment strategies, decreasing the firm's market value.

The Trade-off theory also predicts a negative relation between growth opportunities and the debt level because, as the intangible assets cannot be used as collateral, their value will decline rapidly in case of bankruptcy (Zurigat, 2009) and lenders will demand higher interest rates, increasing the cost of debt and decreasing the level of gearing.

Additionally, the existence of conflicts of interests between shareholders and bondholders, when a company has debt and investment opportunities, leads managers to take investment decisions that are not optimal. According to Billett et al. (2007), there are mechanisms like short-term debt (Myers, 1977) and covenants that reduce those conflicts. In the absence of these mechanisms, the solution for the companies to reduce the disputes is to decrease the debt, which implies that firms with more growth opportunities have lower leverage. But, Billett et al. (2007) predicted and concluded that the introduction of covenants on debt contracts leads to a positive relation between leverage and growth opportunities. This positive relation was found by Michaelas et al. (1999) and by Hall et al. (2004) for short-term debt in all countries and in the UK, Portugal and Italy, individually. Also, Titman and Wessels (1988), when considering the ratio of debt (long or short-term debt and convertible debt) to book value of equity, found a positive association between those ratios and growth opportunities. The rationale is that growth opportunities create value to the firm, increasing its debt capacity and, consequently, its ratio of debt to equity book value, because the equity book value does not increases. In other words, the value brought by growth opportunities is reflected in firm's market value, which facilitates the access to debt and increases the nominator of the debt to book value of equity ratio. Since the denominator remains the same, it is possible to find that positive relation.

2.4.8. Companies' Age

Some authors also discovered that firm's age can be an explanatory variable for leverage and that there is an inverse relation between them. The rationale, according to Petersen and Rajan (1994)[14], is that old firms collect retained earnings and young firms need to raise external funds. Michaelas et al. (1999) and Hall et al. (2004) proved this negative relationship.

[14] Petersen and Rajan (1994) defended that the older a firm is, the closer the relations with financial institutions would be, which would lead to lower costs of capital and higher availability of funds. Nevertheless, they found a negative relation between firm's debt ratios and age.

2.4.9. Advertising and R&D Expenditures

Another determinant also pointed in the literature is the advertising and R&D expenditures, which have a negative impact on debt level, as was found by Bradley et al. (1984) and Chui et al (2002).

2.4.10. Industry Effect

The industry where the firms operate also impacts the level of debt, which is reasonable since in the same industry companies tend to use the same assets, are affected by the same risks and have similar external funds' needs (Myers, 1984). Ferri and Jones (1979), Bradley et al. (1984), Michaelas et al. (1999) and Chui et al. (2002) concluded that the type of industry affects a firm's capital structure. For Frank and Goyal (2009) the median industry leverage has a positive and significant impact on firm leverage.

2.5. Countries' Related Determinants of Capital Structure

Several studies (Chui et al., 2002; Frank and Goyal, 2009 or Fan et al., 2012, for example) have tried to find if countries' institutions and characteristics also affect the level of gearing. This work aims to analyze how the sovereign debt affects the companies' financing decisions.

2.5.1. Countries' Institutions and Characteristics

Mcclure et al. (1999) and Hall et al. (2004), using data from different countries, showed that the determinants of capital structure affects differently the companies' capital structure according to the institutions and characteristics of each country.

Fan et al. (2012) showed that leverage is positively related to economic development, corruption level and to the existence of an explicit bankruptcy code. Other authors emphasized the role of national cultures on corporate capital structures. Chui et al. (2002) state that the "culture affects management´s perception of the cost and risk related to debt finance, and agency problems in each country" (p. 100). They found that the debt ratio is negatively related to the levels of conservatism and mastery of a country. Moreover, the macroeconomic conditions, like the inflation expectations, affect positively the gearing (Frank and Goyal, 2009). Bancel and Mittoo (2004) found that the differences in the quality of the legal system accounts for the cross-country differences on the determinants of capital structure. Those disparities are found between Scandinavian and non-Scandinavian countries. Regarding this, Fan et al. (2012) found a negative relation between common law systems and leverage, because these countries tend to use more equity than civil-law countries.

2.5.2. Countries' level of debt

Does the sovereign debt level influence the amount of debt that a company has? A company in a more indebted country may have higher tendency to increase its leverage, however it also faces higher interest rates.

The recent financial crisis originated a sovereign debt crisis in Europe because governments, mainly in Portugal, Greece, Ireland, Spain and Cyprus, bailed out bankrupt banks, increasing their public debt, to a percentage higher than 60% of the GDP. Their bond yields also rose (Kantar et al., 2014). According to Dell'Erba et al. (2013), there is a positive relation between the spreads and the level of debt in emerging and advanced economies, but is bigger in the formers. In the advanced economies the relation is stronger in the Eurozone countries (mainly in Greece, Portugal, Italy and Spain) then in Non-Eurozone countries. The authors also found that after the financial crisis the spreads strengthened their relation with debt levels in the euro area, but decreased outside.

The increments in the bond yields increased the difficulty faced by the government to repay its debt, since the costs of new issuances became much higher, leading to austerity programs that were similar across the intervened nations (Apergis and Cooray, 2014).

Furthermore, financial markets may be unwilling to lend money to banks and companies in countries under assistance programs, which are mainly located in the south of Europe. So, in the beginning of the assistance program it was expected that firms in this region would implement a deleveraging process and so should have lower amounts of debt by the end of the program. However, according to the IMF[15], from 2009 to 2013, the decrease in debt in Portuguese companies was lower than the average in the euro area. So, the actual impact of the sovereign debt in companies' leverage is not completely defined.

For Moro (2014), eurozone countries are completely separated into the "prosperous North" and "the austerity-hit South" (p. S23). This division also applies to the characteristics of their people: while "northerners are more likely to be thrifty, dour, cold, honest [and] hard-working", southerners "are spendthrift, warmer, more fun-

[15] Global Financial Stability Report released on 8 October 2014.

loving, lazier [and] less honest"[16]. Those differences may lie on the basis of the recent crisis.

Given this, it will be interesting to know if the determinants of capital structure of companies in the north are different from those of southern companies, and if the level of public debt is a significant explanatory variable of the firms' debt levels. As such, the goals of this work are: i) find if southern companies use more or less debt than northern ones; ii) analyze if there are differences in the determinants of capital structure between the two groups of countries; iii) define which determinants are more relevant in each group of countries.

[16] "Why is it grim up north?" – published on *The Economist* on 4th May 2010 (http://www.economist.com/blogs/charlemagne/2010/05/north_v_south).

3. Methodology and Sample

3.1. Model specification

In order to determine the factors that have a stronger influence in the capital structure decision of European firms and to see if those factors are the same in northern and in southern companies, a model[17] for each country will be estimated. Additionally, a model for all countries will be estimated. In this last case, a dummy variable (that equals 1 if the company belongs to the north) is introduced to see if the determinants differ across Europe.

The first model estimated for each country is the following:

$$D_i = \beta_1 + \beta_2\, Size_i + \beta_3\, Tangibility_i + \beta_4 Profitability_i + \beta_5 Effective\ tax\ rate_i + \beta_6 Growth\ opportunities_i + \beta_7 Non\ Debt\ Tax\ Shield_i + u_i \quad [1]$$

The dependent variable is the ratio between Total Debt and Total Assets, as was proposed by Ferri and Jones (1979). This variable is calculated using book values, to avoid the movements in financial markets.

The explanatory variables are those found in the previous studies as the main determinants of capital structure:

- Company's size is proxied by the natural logarithm of book value of total assets. Ferri and Jones (1979), Michaelas et al. (1999), Hall et al. (2004), Frank and Goyal (2009) and Fan et al. (2012) used the total assets to measure size. The use of the natural logarithm, according to Wooldridge (2002), allows to restrict the range of the variable, making the estimates less sensitive to extreme observations on the variables;
- Tangibility that corresponds to the ratio between fixed assets and total assets, following the approach of Michaelas et al. (1999), Hall et al. (2004) and Fan et al. (2012);

[17] The models were estimated using the software EViews.

- Profitability is proxied by the ratio between earnings before interests and taxes (EBIT) and the total assets. This ratio was used by Chui et al. (2002). The use of EBIT, instead of other measures of earnings, is justified by the fact that it allows to compare companies with different capital structures;
- Effective tax rate that corresponds to the ratio between the taxes paid and the earnings before taxes, as was proposed by Acedo-Ramírez and Ruiz-Cabestre (2014);
- Growth opportunities are proxied by the market-to-book ratio (MtB), following the suggestion of Rajan and Zingales (1995), Frank and Goyal (2009) and Fan et al. (2012).
- Non debt tax shield are calculated dividing the depreciation expenses by the total assets. This approach was used by Michaelas et al. (1999) and Ozkan (2001);
- Level of public debt[18] that corresponds to the government gross nominal consolidated debt, as a percentage of the country gross domestic product (GDP).

Year fixed effects are included in the regressions through the use of year dummy variables.

Additionally, in order to see if the level of indebtedness varies from the north to the south, the following is estimated:

$$D_i = \beta_1 + \beta_2\, Size_i + \beta_3\, Tangibility_i + \beta_4 Profitability_i + \beta_5 Effective\ tax\ rate_i + \beta_6 Growth_i + \beta_7 Non\ Debt\ Tax\ Shield_i + \beta_8\, Level\ of\ public\ debt\ (\%GDP)_i + \beta_9 N_i + u_i \quad [2]$$

Where the new variable, (N_i), takes the value 1 (one) if the company belongs to the north of Europe and 0 (zero) otherwise.

Finally, to complement the analysis, in addition to the additive dummy variable (N_i), this dummy will be introduced in the multiplicative way, with the purpose of seeing if the differences in the determinants of capital structure between the northern and the southern companies are statistically significant:

[18] This variable will appear in the next model.

$$
\begin{aligned}
D_i = \ & \beta_1 + \beta_2\, Size_i + \beta_3\, Tangibility_i + \beta_4 Profitability_i + \beta_5 Effective\ tax\ rate_i \\
& + \beta_6 Growth\ opportunities_i + \beta_7 No\ n\ Debt\ Tax\ Shield_i \\
& + \beta_8\, Level\ of\ public\ debt\ (\%GDP)_i \\
& + \beta_9 N_i + \beta_{10} N_i \times Size_i + \beta_{11} N_i \times Tangibility_i + \beta_{12} N_i \\
& \times Profitability_i + \beta_{13} N_i \times Effective\ tax\ rate_i + \beta_{14} N_i \\
& \times Growth\ opportunities_i + \beta_{15} N_i \times Non\ Debt\ Tax\ Shield_i + \beta_{16} N_i \\
& \times Level\ of\ public\ debt\ (\%GDP)_i + u_i
\end{aligned}
$$

[3]

Dummy variables that control for year fixed effects are also included.

3.2. Sample and data

The sample of this study is composed by 236 non-financial companies listed in the main stock indexes of 12 European countries (Germany, Austria, Belgium, Finland, France, Netherlands, Cyprus, Spain, Greece, Ireland, Portugal and Italy). Financial companies are excluded from the sample because they have to comply with minimum capital requirements that affect their capital structure, which means that it does not depends on the discretion of the managers. Germany, Austria, Belgium, Finland, Netherlands and France[19] will be considered as northern countries, and Cyprus, Spain, Greece, Ireland, Portugal and Italy as southern countries.

The data was collected from Datastream between 2010 and 2013, in an annual basis, and corresponds to the non-financial companies for which accounting data necessary to calculate the dependent variable (the ratio between total debt and total assets) and the explanatory variables (the companies' size, the assets' tangibility, the profitability, the effective tax rate, the growth opportunities and the non-debt tax shields) was available. Additionally, information related to public debt as a percentage of GDP for each country was gathered from the same data base.

[19] The classification of France as a northern or a southern country is not clear-cut. As was said in the introduction, Moro (2014) considers that France belongs to "the austerity-hit South". However, Apergis and Cooray (2014) argued that, contrary to what happened in Greece, Ireland, Portugal, Spain and Cyprus, France was not affected by financial assistance programs and to austerity measures (that were implemented because the sovereign debt in those countries was extremely high). Besides, other authors like Engler et al. (2014) also consider France as a northern country, as well as Austria, Belgium, Finland, Germany and Netherlands. For those authors, the southern Europe is composed by Greece, Ireland, Italy, Portugal and Spain.

4. Analysis of the results

4.1. Descriptive analysis of the sample

Table 1 shows the average ratio between total debt and total assets (in percentage) for the group of northern and southern companies, as well as other descriptive statistics regarding this ratio.

Table 1: Descriptive statistics for the ratio Total debt/Total assets

Year	North					South					Total sample				
	Mean (%)	Median (%)	Max (%)	Min (%)	Std. Dev	Mean (%)	Median (%)	Max (%)	Min (%)	Std. Dev	Mean (%)	Median (%)	Max (%)	Min (%)	Std. Dev
2010	24.7	23.1	78.4	0.0	0.02	32.2	31.1	73.9	0.12	0.18	28.1	26.0	78.4	0.12	0.16
2011	24.8	23.1	83.8	0.0	0.02	35.2	32.5	279.3	0.07	0.29	29.6	26.7	279.3	0.07	0.23
2012	25.0	23.5	94.7	0.0	0.02	35.4	33.2	216.2	0.01	0.25	29.8	27.3	216.2	0.01	0.20
2013	25.4	24.4	116.5	0.0	0.02	33.5	32.0	166.8	0.04	0.21	29.2	27.4	167.0	0.04	0.19

As it is possible to see, southern companies have higher debt ratios than northern companies.

In what concerns the evolution of the debt ratio through the years, it increased in northern companies during the whole period of analysis. In southern companies the debt ratio increased from 2010 to 2012, but decreased in the last year of the study. This may be a consequence of the austerity measures that were implemented in some of the countries and a result of additional difficulties to access credit. However, as argued before, the actual impact of the sovereign debt in companies leverage is not completely defined, as the decrease on debt would be expected to happen earlier.

Table 2 shows the average level of public debt as percentage of GDP (% GDP) for the same group of countries and other descriptive statistics for this ratio.

As was expected, the level of public debt is higher in the south of Europe. Besides, there was an increment in the level of public debt through the years in the north and in the south of Europe, and, consequently, in the overal sample. The result in the south of Europe is contrary to what was expected by the assistance programs implemented in Greece, Portugal, Ireland, Cyprus, Spain or Italy.

Table 2: Descriptive statistics for the level of public debt (%GDP)

Year	North					South					Total sample				
	Mean (%)	Median (%)	Max (%)	Min (%)	Std. Dev	Mean (%)	Median (%)	Max (%)	Min (%)	Std. Dev	Mean (%)	Median (%)	Max (%)	Min (%)	Std. Dev
2010	75.2	82.5	96.6	48.8	221.1	96.8	94.0	148.3	61.3	30.5	85.3	82.7	148.3	48.8	25.9
2011	76.4	80.0	99.2	49.3	231.5	107.2	108.2	170.3	70.5	32.7	90.7	86.2	170.3	49.3	29.3
2012	79.6	81.0	101.1	53.6	210.5	116.0	124.1	157.2	86	24.2	96.5	90.6	157.2	53.6	26.7
2013	80.8	78.4	101.5	57.0	197.1	125.8	129.0	175.1	93.9	25.0	101.8	93.9	175.1	57	30.1

Finally, Table 3 presents the discriptive statistics of this study main variables.

Table 3: Descriptive statistics of the variables[20]

Descriptive statistics/ Variables	North					South					Total sample				
	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation
Total debt/ Total assets	0.2498	0.2338	1.1654	0.0025	0.1393	0.3409	0.3284	2.7931	0	0.2375	0.2918	0.2699	2.7931	0	0.1961
Size	16.4297	16.4183	19.5798	13.2272	1.4079	15.1377	15.2692	18.9236	9.5818	1.8028	15.8334	15.8284	19.5798	9.5818	1.7262
Tan	0.2620	0.2552	0.8341	0	0.1604	0.3517	0.3413	0.9340	0	0.2288	0.3033	0.2796	0.9340	0	0.1999
Profit	0.0739	0.0709	0.3653	-0.1003	0.0539	0.0711	0.0637	0.7345	-0.2102	0.0761	0.0726	0.0673	0.7345	-0.2102	0.0651
Effective tax rate	18.42%	25.27%	1136%	-3267%	1.6076	11.89%	24.51%	890.41%	-2807%	1.7397	15.42%	24.95%	1136%	-3267%	1.6689
Growth opportunities	1.9528	1.7	14.73	-12.08	1.5867	3.4409	1.21	608.9	0	29.7740	2.6299	1.53	608.9	-12.08	20.1171
NDTS	0.0422	0.0391	0.1467	0	0.0221	0.042	0.0367	0.1893	0	0.0287	0.0421	0.0379	0.1893	0	0.0254

Table 3 allows to conclude that northern companies have, on average, lower levels of debt (as stated before), are larger than southern companies and have lower percentage of fixed assets. Besides, they are more profitable.

The Table 3 also shows the presence of extreme values, mainly in the variables effective tax rate and growth opportunities[21].

Regarding the non-debt tax shield, there are not relevant conclusions to take: its mean, median, minimum and maximum values are similar in both groups of countries.

[20] In appendix B are presented the descriptive statistics for each country individually.

[21] Given these extreme values it was decided to winsorize all variables (except the size, as it corresponds to the natural logarithm of total assets). The chosen percentile was 99. However, the models estimated for each country do not include the variables winsorized, because for the countries with smaller samples it was not possible to follow this approach.

4.2 Estimation results

4.2.1 Estimation results for each country

The results of the estimation of model [1] are presented in Table 4.

Regarding *northern countries/companies*, the capital structure determinants that appear more often as significant in explaining the debt ratio are the growth opportunities and the non-debt tax shields. The impact of the growth opportunities means that the managers of these companies track the evolution of the market-to-book ratio to choose their source of funds. Besides, the negative impact of growth opportunities on debt level may also be justified by the evidence that northern companies have lower percentage of fixed assets – as growth opportunities are related to the existence of intangible assets that cannot be used as collateral in debt contracts, lenders will demand higher interest rates, leading to a decrease in the level of gearing (Zurigat, 2009). Netherlands is the only northern country where the impact of the growth opportunities on debt is positive, which is against the expectations. Moreover, the relation between the non-debt tax shields and debt level is positive in all of the northern countries, which is also against the expectations. According to Bradley et al. (1984) this happens because the firms that have higher amounts of depreciations are the same firms that have higher values of tangible assets and they can easily access to bank loans and get friendly interest rates. In fact, the impact of tangibility on debt is always positive (except on Germany).

Regarding *southern countries/companies*, the capital structure determinants that appear more often as significant in explaining the level of leverage are the firms' size and the effective tax rate. When significant, the variable size impacts positively on debt in all countries, except in Ireland, meaning that larger Irish companies have lower amounts of debt on their capital structure. Besides, when significant, the variable effective tax rate is always positively related to leverage, except in Portugal. This opposite relation may be due to the fact that higher taxes decrease the internal funds, increase the cost of capital and, consequently, decrease the amount of debt.

Table 4: Estimation results for each country

Country/ Variables	Expected sign	Netherlands/ AEX	Austria/ ATX	Belgium/ BEL	France/ CAC	Germany/ DAX	Finland/ OMX	Cyprus/ CySE	Greece/ ATHEX	Spain/ IBEX	Ireland/ ISEQ	Italy/ MIB	Portugal/ PSI
		0.0061	0.0136	0.0116	0.0103	0.0441***	-0.0021	0.1789***	0.0284**	0.0359	-0.1853*	0.0264*	-0.0293
Size	+	(0.7250)	(0.5554)	(0.7248)	(0.5502)	(0.0080)	(0.8633)	(0.0003)	(0.0423)	(0.1189)	(0.0947)	(0.0769)	(0.3096)
		0.1682	0.1996**	0.0968	0.0782	-0.0465	0.1311*	0.1586	-0.1633	0.1606	0.8876*	0.0947	-0.2381**
Tan	+	(0.2610)	(0.0319)	(0.7562)	(0.5002)	(0.7579)	(0.0803)	(0.2475)	(0.1967)	(0.1318)	(0.0924)	(0.4457)	(0.0254)
		-0.4804	-0.6007	-0.7137	-0.0219	0.1764	-0.1325	0.0451	-0.6842***	-0.2579	-0.0407	-0.8915*	0.1715
Profit	-	(0.1609)	(0.1889)	(0.3874)	(0.9431)	(0.4674)	(0.3653)	(0.9012)	(0.0031)	(0.5058)	(0.9673)	(0.0524)	(0.8241)
Effective tax		-0.0916***	-0.0243	0.0100	0.0005	0.1221**	-0.0043	0.0155*	0.0046**	-0.0332	0.0378	-0.0019	-0.0415***
rate	+	(0.0000)	(0.4757)	(0.7566)	(0.7403)	(0.0356)	(0.2166)	(0.0575)	(0.0396)	(0.4081)	(0.6138)	(0.2748)	(0.0002)
Growth		0.0443**	-0.0100	-0.0189	-0.0472**	-0.0425**	-0.0227***	0.1598	0.0174	0.0002**	-0.0226	0.0057	-0.0371***
opportunities	-	(0.0120)	(0.4958)	(0.2729)	(0.0186)	(0.0106)	(0.0008)	(0.1372)	(0.5044)	(0.0172)	(0.4639)	(0.6117)	(0.0012)
		3.6066***	2.1344***	2.8572	0.1922	1.0904	1.9877***	-1.9389	2.2756***	-1.1744	-9.6497	-0.3472	3.2538***
NDTS	-	(0.0016)	(0.0000)	(0.2580)	(0.7846)	(0.1840)	(0.0038)	(0.2003)	(0.0000)	(0.2501)	(0.1136)	(0.4405)	(0.0000)
		-0.1048	-0.0229	0.0647	0.1107	-0.4884	0.2136	-1.9924***	-0.0784	-0.1889	2.9744*	-0.0700	0.9259**
c		(0.7213)	(0.9473)	(0.9027)	(0.7088)	(0.1115)	(0.2845)	(0.0002)	(0.7450)	(0.6359)	(0.0661)	(0.7702)	(0.0291)
Year Fixed Effects		Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
N		72	48	52	140	100	86	37	61	100	57	92	56
adjusted R^2		0.3397	0.2494	0.0921	0.1695	0.3744	0.4798	0.4222	0.4565	0.1512	0.3079	0.2145	0.3975
		10.0173***	10.9923***	0.8223	2.0019**	3.8991***	17.0171***	6.9657***	26.1026***	6.4769***	40.1902***	3.6243***	19.3789***
F-statistic		(0.0000)	(0.0000)	(0.5991)	(0.0439)	(0.0003)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0007)	(0.0000)

This table indicates the estimated coefficients for each regressor. Between () is presented the p-value. *** - the variable is significant at 1%; ** - the variable is significant at 5%; * - the variable is significant at 10%. N corresponds to the number of observations included in each estimation.

4.2.2 Estimation results for the whole sample with an additive dummy

In order to analyze if the level of indebtedness varies from the north to the south, the results of the model [2] are presented in Table 5.

According to appendix C none of the explanatory variables are extremely correlated, except the Level of public debt (% GDP) and the geographic dummy (dummy variable that takes the value 1 if the company belongs to a northern country and 0 if the company belongs to a southern country), which makes sense since it indicates that northern countries have lower levels of public debt. This correlation was expected and so the model [2] was estimated first using alternatively each variable and then including both variables.

Looking at the models where the variables level of public debt (%GDP) and the geographical dummy are used alternatively, it is possible to see that the variables companies' profitability and non-debt tax shields are significant in both models. Besides, when included, the alternative variables are also significant. The differences lie on the variables tangibility and size, as the former is significant in the first model and the latter is significant in the second.

Table 5 also shows that when the two variables are used simultaneously, the results are very similar to the results of the model that includes the geographical dummy, as the significant explanatory variables are the same and the level of public debt (%GDP) becomes not significant. Moreover, the impact of this variable on firms' debt level changes and becomes negative, which is a consequence of the multicollinearity that exists between the dummy variable and the level of public debt.

It is also worth noting that the results presented in Table 5 show the model with the level of sovereign debt has a lower adjusted R^2 than the model with the geographical dummy, and so the next models estimated will include this last dummy variable instead of the public debt variable.

As such, focusing on the results of the second model of Table 5, there is a positive relation between the companies' size and the debt level, meaning that larger companies have higher amounts of gearing on their capital structure. This is in accordance with the Trade-off Theory and with the results of Fan et al. (2012) and Acedo-Ramírez and Ruíz Cabestre (2014), who found a positive and significant relation between firms' size and debt level, both in Continental Europe and in UK. Moreover, profitability and debt are

negatively related, as predicted by the POT. Fan et al. (2012) and Hall et al. (2004) also found a negative relation between profitability and debt, and between profitability and short-term debt, respectively.

The non-debt tax shield impacts positively on the debt level, which is against the prediction of the Trade-off Theory, and confirms the statement of Bradley et al. (1984).

Finally, the dummy variable indicates that northern companies have lower amounts of debt on their financial structure, even after controlling for the main capital structure determinants.

Table 5: Estimation results of the model with additive dummy[22]

Country/ Variables	Expected sign	All countries (excluding Dnorth)	All countries (excluding Level of Public debt - %GDP)	All countries (all variables)
Size	+	0.0056 (0.4174)	0.0137* (0.0631)	0.0140* (0.0591)
Tan	+	0.1149** (0.0167)	0.0772 (0.1194)	0.0794 (0.1033)
Profit	-	-0.5679*** (0.0000)	-0.5027*** (0.0002)	-0.4850*** (0.0004)
Effective tax rate	+	0.0008 (0.9436)	0.0019 (0.8620)	0.0025 (0.8196)
Growth opportunities	-	-0.0028 (0.5166)	-0.0044 (0.3125)	-0.0050 (0.2625)
NDTS	-	0.8935* (0.0650)	0.9743* (0.0592)	0.9801* (0.0606)
Level of Public debt (%GDP)	+	0.0006** (0.0191)	----	-0.0004 (0.3671)
Dnorth		----	-0.0929*** (0.0000)	-0.1050*** (0.0003)
c		0.1188 (0.3175)	0.1031 (0.3855)	0.1331 (0.2735)
Year Fixed Effects		Included	Included	Included
N		901	901	901
adjusted R^2		0.1171	0.1726	0.1740
F-statistic		5.4720*** (0.0000)	8.1580*** (0.0000)	7.5886*** (0.0000)

This table indicates the estimated coefficients for each regressor. Between () is presented the p-value. *** - the variable is significant at 1%; ** - the variable is significant at 5%; * - the variable is significant at 10%. N corresponds to the number of observations included in each estimation.

[22] Some experiments were made where some explanatory variables (namely the firm's size, the tangibility and the non-debt tax shields) were excluded, in order to know if the results hold using different regressors. It was possible to conclude that the significant explanatory variables are the same and the adjustment of the model (measure by the adjusted R^2) is similar. See appendix D.

4.2.3 Estimation results for the whole sample with an additive and multiplicative dummy

Finally, model [3], that uses an interactive/multiplicative effect between the dummy N_i and the other exogenous variables, was estimated and the results are presented in Table 6[23]. The coefficients of those interactive variables indicate the differences in the respective regressor in northern companies with respect to the southern ones.

According to the results presented in Table 6 it is possible to conclude that the significant explanatory variables are the firms' size, the profitability and the interaction between the geographic dummy variable and the non-debt tax shields. Specifically, there is a positive relation between size and debt level in southern companies (in northern ones, the effect is still positive, but weaker), which is in accordance to the predictions of the Trade-off Theory.

Besides, profitability and leverage are negatively related, as predicted by the POT, both in southern and in northern firms. Regarding the effect of the non-debt tax shields on debt level, it is significant and positive in northern countries.

Aiming to know if there is a structural break in the model, that is, if there are differences in the regression coefficients of the two groups of countries, a Chow-test was preformed, using the variables of model [3]. The hypotheses under analysis are:

$$H0: \beta_i^{north} = \beta_i^{south}, \qquad \forall\, i = 1, \dots, 14$$

$$H1: \exists i : \ \beta_i^{north} \neq \beta_i^{south}, \qquad i = 1, \dots, 14$$

The results obtained led to the rejection of H0. As such, one can infer that there are differences in the coefficients estimated for northern and southern companies.

Given the fact that the significant explanatory variables vary from the north to the south, and considering the results of the Chow-test, one of the goals of this dissertation was reached: analyze if there are differences in the determinants of capital structure between the groups of countries considered.

[23] Some adjustments were made to model [3] to take into account the exclusion of the variable level of public debt (%GDP).

Table 6: Estimation results of the model with additive and multiplicative dummy variables[24]

Country/ Variable	Expected sign	All countries
Size	+	0.0205* (0.0696)
Tan	+	0.0194 (0.7678)
Profit	-	-0.6688*** (0.0009)
Effective tax rate	+	0.0065 (0.6831)
Growth opportunities	-	-0.0018 (0.7178)
NDTS	-	0.1130 (0.8694)
Dnorth		-0.0384 (0.8587)
Dnorth x Size		-0.0120 (0.3652)
Dnorth x Tan		0.1316 (0.1429)
Dnorth x Profit		0.3179 (0.2169)
Dnorth x Effective tax rate		-0.0078 (0.7354)
Dnorth x Growth opportunities		-0.0003 (0.9732)
Dnorth x NDTS		1.7431* (0.0637)
c		0.0616 (0.7324)
Year Fixed Effects		Included
N		901
Adjusted R^2		0.1999
F-Statistic		7.2338*** (0.0000)
Chow-test		15.8244*** (0.0000)

This table indicates the estimated coefficients for each regressor. Between () is presented the p-value. *** - the variable is significant at 1%; ** - the variable is significant at 5%; * - the variable is significant at 10%. N corresponds to the number of observations included in each estimation.

[24] Again, some experiments were made where some explanatory variables (namely the firm's size, the tangibility and the non-debt tax shields) were excluded, in order to know if the results hold using different regressors. It was possible to conclude that the significant explanatory variables do not change too much and the adjustment of the models (measure by the adjusted R^2) are similar. Nevertheless, it is worth mentioning that the additive dummy variable is significant in the model without the variable size and is negatively related to gearing, indicating that, ceteris paribus, northern companies have lower amounts of debt in their capital structures, as already found. See appendix E.

4.3 Additional tests

Although there is a correlation between the level of public debt (%GDP) and the country's location (North/South), the correlation is not perfect and so there are observations from southern countries with low level of public debt and observations from northern countries with high levels of public debt. As shown in table 7 there are 167 observations from southern countries (N_i = 0) with a level of public debt lower than 100% of GDP and 26 observations from northern countries (N_i = 1) with a level of public debt higher than 100% of GDP.

Table 7: Number of observations under the dichotomy north/south and level of public debt (%GDP)

		Level of public debt (%GDP)				
		[0, 50[	**[50, 100[**	**[100, 150[**	**[150, 200]**	**Total**
Dnorth	**0**	0	167	225	48	440
	1	44	434	26	0	504
	Total	44	601	251	48	944

Taking into account that evidence, we decided to separate our sample according to the level of public debt (%GDP) and according to the location of the country.

$$Dn > 100_i = \begin{cases} 1, & if\ the\ company\ belongs\ to\ the\ north\ of\ Europe\ and \\ & the\ Level\ of\ public\ debt\ (\%GDP)\ is\ higher\ than\ 100\% \\ 0, & otherwise \end{cases}$$

$$Ds < 100_i = \begin{cases} 1, & if\ the\ company\ belongs\ to\ the\ south\ of\ Europe\ and \\ & the\ Level\ of\ public\ debt\ (\%GDP)\ is\ lower\ than\ 100\% \\ 0, & otherwise \end{cases}$$

$$Ds > 100_i = \begin{cases} 1, & if\ the\ company\ belongs\ to\ the\ south\ of\ Europe\ and \\ & the\ Level\ of\ public\ debt\ (\%GDP)\ is\ higher\ than\ 100\% \\ 0, & otherwise \end{cases}$$

In this case, the base category corresponds to an observation that belongs to the north of Europe and the Level of public debt (%GDP) is lower than 100%.

First, these variables were included in the additive way, and the model [4] was estimated:

$$D_i = \beta_1 + \beta_2 Size_i + \beta_3 Tangibility_i + \beta_4 Profitability_i + \beta_5 Effective\ tax\ rate_i + \beta_6 Growth\ opportunities_i + \beta_7 Non\ Debt\ Tax\ Shield_i + \beta_8 Dn > 100_i + \beta_9 Ds < 100_i + \beta_{10} Ds > 100_i + u_i$$

[4]

Additionally, the interaction between the dummies and the other explanatory variables was taken into account, and the model [5] was estimated.

$$\begin{aligned} D_i = {} & \beta_1 + \beta_2 Size_i + \beta_3 Tangibility_i + \beta_4 Profitability_i + \beta_5 Effective\ tax\ rate_i \\ & + \beta_6 Growth\ opportunities_i + \beta_7 Non\ Debt\ Tax\ Shield_i \\ & + \beta_8 Dn > 100_i + \beta_9 Ds < 100_i + \beta_{10} Ds > 100_i + \beta_{11} Dn > 100_i \\ & \times Size_i + \beta_{12} Dn > 100_i \times Tangibility_i + \beta_{13} Dn > 100_i \\ & \times Profitability_i + \beta_{14} Dn > 100_i \times Effective\ tax\ rate_i \\ & + \beta_{15} Dn > 100_i \times Growth\ opportunities_i + \beta_{16} Dn > 100_i \\ & \times Non\ Debt\ Tax\ Shield_i + \beta_{17} Ds < 100_i \times Size_i + \beta_{18} Ds < 100_i \\ & \times Tangibility_i + \beta_{19} Ds < 100_i \times Profitability_i + \beta_{20} Ds < 100_i \\ & \times Effective\ tax\ rate_i + \beta_{21} Ds < 100_i \times Growth\ opportunities_i \\ & + \beta_{22} Ds < 100_i \times Non\ Debt\ Tax\ Shield_i + \beta_{23} Ds > 100_i \times Size_i \\ & + \beta_{24} Ds > 100_i \times Tangibility_i + \beta_{25} Ds > 100_i \times Profitability_i \\ & + \beta_{26} Ds > 100_i \times Effective\ tax\ rate_i + \beta_{27} Ds > 100_i \\ & \times Growth\ opportunities_i + \beta_{28} Ds > 100_i \times Non\ Debt\ Tax\ Shield_i \\ & + u_i \end{aligned}$$

[5]

The results obtained are presented in Table 8[25].

The analysis of the simple model suggest that there is a positive relation between firm size and debt level, which is in accordance to the Trade-off Theory. Moreover, profitability impacts negativelly on the level of gearing, as predicted by the POT. Besides, the relation between the non-debt tax sheilds and debt is positive, which

[25] Again, some experiments were made where some explanatory variables (namely the firm's size, the tangibility and the non-debt tax shields) were excluded, in order to know if the results hold using different regressors. It was possible to conclude that the significant explanatory variables do not change too much and the adjustment of the models (measure by the adjusted R^2) are similar. Nevertheless, it is worth mentioning that in the multiplicative model, the additive dummies for the south are significant only when size is excluded and they are positively related to debt, reinforcing the conclusion that southern companies have more debt on their capital structure than northern ones. See appendix F.

supports the results of Bradley et al. (1984). The model also reinforce previous findings that companies from southern countries, independently of the country debt level, have higher amounts of debt in their capital structures than a company from a northern country.

The results of the multiplicative model are richer and suggest that tangibility impacts positively on leverage in northern companies that belong to countries with levels of public debt lower than 100% of GDP, meaning that in those countries, the existence of fixed assets that can be used as collateral is relevant in debt contracts. In opposition, in southern companies that belong to countries where the sovereign debt is higher than 100% of GDP, the relation between tangibility and debt level is negative.

Regarding profitability, and as predicted by the POT, in the companies from a northern country with low level of public debt (the base category) there is a negative relation between profitability and the level of gearing.

Moreover, in the base category, there is a positive relation between the existence non-debt tax shield and the debt ratio. Knowing that these non-debt tax shields are associated with depreciations, which are related to the existence of fixed assets, the impact of tangibility on debt in this category is justified. Nevertheless, this relation becomes negative in companies belonging to southern countries where the level of sovereign debt is lower than 100% of GDP.

Finaly, the coefficient associated to the variable size is only significant in the group of companies from southern countries associated with levels of public debt lower than 100% of GDP. For these companies the size has a positive impact on debt level.

Again, the Chow-test led to the rejection of H0, meaning that there are differences in the coefficients of the determinants of capital structure between the four categories of companies considered. This supports the previous results.

Table 8: Estimation results of the additional tests

Country/ Variables	Expected sign	All countries (additive dummies)	All countries (additive and multiplicative dummies)
Size	+	0.0139* (0.0585)	0.0096 (0.1432)
Tan	+	0.0766 (0.1191)	0.1653*** (0.0035)
Profit	-	-0.5010*** (0.0003)	-0.3868** (0.0202)
Effective tax rate	+	0.0023 (0.8404)	-0.0024 (0.8796)
Growth opportunities	-	-0.0044 (0.3176)	0.0025 (0.8030)
NDTS	-	0.9545* (0.0612)	1.7613*** (0.0004)
Dn>100		0.0365 (0.4827)	-0.0911 (0.8450)
Ds<100		0.1008*** (0.0014)	-0.2020 (0.3094)
Ds>100		0.0915*** (0.0000)	0.3163 (0.2896)
c		0.0062 (0.9604)	-0.0010 (0.9927)
Dn>100 x Size			0.0175 (0.5498)
Dn>100 x Tan			-0.2599 (0.4279)
Dn>100 x Profit			1.6943 (0.2707)
Dn>100 x Effective tax rate			0.0081 (0.9338)
Dn>100 x Growth opportunities			-0.1249 (0.1155)
Dn>100 x NDTS			-0.1977 (0.9131)
Ds<100 x Size			0.0282** (0.0235)
Ds<100 x Tan			-0.0423 (0.6924)
Ds<100 x Profit			-0.1864 (0.5983)
Ds<100 x Effective tax rate			-0.0086 (0.7757)
Ds<100 x Growth opportunities			-0.0002 (0.9830)
Ds<100 x NDTS			-2.7482*** (0.0070)
Ds>100 x Size			-0.0059 (0.7473)
Ds>100 x Tan			-0.2041** (0.0369)
Ds>100 x Profit			-0.3514 (0.2382)
Ds>100 x Effective tax rate			0.0167 (0.4787)
Ds>100 x Growth opportunities			-0.0099 (0.4891)
Ds>100 x NDTS			-0.8046 (0.3678)
Year Fixed Effects		Included	Included
N		901	901
Adjusted R^2		0.1724	0.2298
F-Statistic		7.0200*** (0.0000)	5.1812*** (0.0000)
Chow-test		----	7.7863*** (0.0000)

This table indicates the estimated coefficients for each regressor. Between () is presented the p-value. *** - the variable is significant at 1%; ** - the variable is significant at 5%; * - the variable is significant at 10%. N corresponds to the number of observations included in each estimation.

5. Conclusions, Limitations and Future Research

5.1 Conclusions

The main goal of this research was to find if there are differences in the determinants of firms' capital structure between the north and the south of Europe, as northern countries are more prosperous and have lower amounts of sovereign debt, while southern countries have higher amounts of sovereign debt (which did not decreased, even under assistance programs)

The main conclusions of this study are related with the evidence that firms from southern Europe have higher levels of debt in their capital structures than the firms from northern Europe, even after controlling for the factors that can justify different levels of indebtedness. Besides, when all countries/companies were joined, the results showed that there are differences in the determinants of firms' capital structures between northern and southern companies. Specifically, the debt level in southern companies is mainly determined by their size (Fan et al. (2012) and Acedo-Ramírez and Ruíz-Cabestre (2014) also found a positive and significant relation between firms' size and debt level, both in Continental Europe and in UK) and profitability (Fan et al. (2012) and Hall et al. (2004) also found a negative relation between profitability and short-term debt), while the existence of non-debt tax shields determines the level of debt of northern companies (allowing to infer that the results of Bradley et al.,1984, are better supported in this group of nations). So, according to these results, the capital structure of southern companies is mainly determined by factors related to the companies (size and profitability), while the capital structure of northern companies is mainly determined by macroeconomic factors, like the existence of tax shields that come from a source different from debt.

Furthermore, when the companies are separated not only in terms of location but also regarding the level of public debt of the country where they are stablished, the conclusion that southern companies have higher amounts of debt was reinforced. Besides, southern companies' debt level continues to be determined by firms' size but also by the existence of non-debt tax shields (if the public debt is lower than 100% of GDP). Assets' tangibility plays a determinant role if the company belongs to the south and to a country with higher levels of public debt. Regarding northern companies with levels of public debt lower than 100% of GDP, their capital structure is determined by

assets' tangibility (meaning that in those firms, the existence of fixed assets that can be used as collateral is relevant in debt contracts), profitability and the existence of non-debt tax shield.

Apart from the main conclusions, it can also be noted that the differences between northern and southern companies do not lie only on the debt levels. In fact, northern companies are larger than southern companies, are more profitable and have lower percentage of fixed assets.

It is interesting to note that the results obtained with this study support the findings of previous works, either when countries are considered individually, or when the overall sample is used.

5.2 Limitations and Future Research

One of the limitations of this research is the use of book leverage and the exclusion of market leverage. The decision to work with book values has to do with the fact that financial markets fluctuate too much. But, according to McClure et al (1999), "financial theory clearly supports the use of market values for management decisions." (pp. 148 and 149).

Apart from that, the dynamic model was not used, as the time period of the sample is relatively short and there was no interest in knowing how quickly companies adjust to their target debt ratio.

Finally, this work can be extended by including more European countries, and not only some of the Eurozone. There is also the possibility to include more years in the sample in order to estimate a dynamic model for companies' capital structure.

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Appendix

A – The determinants of capital structure and their impact on the level of debt, according to the different theories

Theory/ Determinant	Trade-off Theory	Pecking Order Theory	Market-timing Theory	Expected sign
Size	+	-		+
Tangibility	+	+		+
Profitability	+	-		-
Effective Tax Rate	+			+
Growth Opportunities	-	+	-	-
NDTS	-			-
Level of Public Debt (%GDP)				+

B – Descriptive statistics for each country

Descriptive statistics/ Variables	Netherlands/AEX					Austria/ATX					Belgium/BEL					France/CAC					Germany/DAX					Finland/OMX				
	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation
Total debt/ Total assets	0.2332	0.2118	0.6737	0.0025	0.1553	0.2959	0.3245	0.5772	0.0133	0.1364	0.2938	0.2613	1.1654	0.0076	0.2302	0.2233	0.2169	0.4528	0.0025	0.1062	0.2588	0.2435	0.5703	0.0175	0.1183	0.2453	0.2566	0.4799	0.0069	0.1119
Size	16.2607	15.9353	19.4142	14.0003	1.2561	15.0918	14.9844	17.2621	13.2272	1.1130	15.9857	15.6103	19.1722	14.4419	1.3058	17.2378	17.2155	19.3527	14.6257	1.0151	17.3074	17.1687	19.5798	15.3599	1.0922	15.2848	15.0955	17.4406	13.5183	1.0176
Tan	0.2591	0.2529	0.5796	0	0.1661	0.4052	0.3653	0.8341	0.0972	0.1806	0.3073	0.3047	0.5581	0.0573	0.1319	0.2118	0.1663	0.5335	0.0302	0.1432	0.2549	0.2656	0.54	0.0653	0.1202	0.2477	0.2477	0.6739	0.0233	0.1764
Profit	0.0716	0.0764	0.2329	-0.0697	0.0565	0.0692	0.0711	0.1722	-0.0535	0.0436	0.0837	0.0776	0.2444	-0.0449	0.0545	0.0637	0.0601	0.1676	-0.0596	0.041	0.0783	0.0783	0.2149	-0.0377	0.0429	0.0837	0.0729	0.3653	-0.1003	0.0787
Effective tax rate	20.08%	21.25%	326.83%	-201.87%	0.6035	18.73%	24.19%	57.48%	-153.97%	0.2907	17.81%	24.86%	186.97%	-452.63%	0.7285	2.903%	27.67%	253.65%	-3266.7%	2.8109	24.88%	25.94%	135.56%	-64.29%	0.1907	34.61%	23.96%	1136%	-43.31%	1.197
Growth opportunities	2.3021	1.8	7.73	0	1.5769	2.0329	1.64	5.61	0.37	1.2313	1.4458	1.145	14.73	-12.08	3.1181	1.7115	1.56	4.33	0.3	0.8389	2.0609	1.985	4.94	0.45	1.009	2.1736	1.675	10.66	0	1.7907
NDTS	0.0426	0.0408	0.1132	0	0.0209	0.0516	0.0475	0.1467	0.0157	0.0289	0.0508	0.0474	0.1343	0.0207	0.0274	0.0364	0.0339	0.1314	0.0069	0.0185	0.0442	0.0393	0.1051	0.0187	0.0191	0.0384	0.0372	0.111	0.011	0.0206
Descriptive statistics/ Variables	Cyprus/CySE					Greece/ATHEX					Spain/IBEX					Ireland/ISEQ					Italy/MIB					Portugal/PSI				
	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation	Mean	Median	Max	Min	Standard deviation
Total debt/ Total assets	0.3056	0.3214	0.6811	0	0.1814	0.2947	0.3095	0.5713	0.0012	0.1448	0.3664	0.3721	0.6874	0.0001	0.1899	0.3287	0.2361	2.7931	0	0.4734	0.3204	0.3319	0.6004	0.0023	0.1471	0.4155	0.4202	0.7578	0.007	0.1872
Size	12.2763	12.2558	13.5893	10.7676	0.7310	14.6084	14.3625	16.6276	12.8257	1.0168	16.2406	16.357	18.6365	13.3326	1.3868	14.1225	14.2693	16.8646	9.5818	1.6027	15.9837	15.9285	18.9236	11.8373	1.6091	15.2087	15.1774	17.5599	12.9429	1.1555
Tan	0.4539	0.4340	0.8308	0.0415	0.2406	0.4462	0.4623	0.8484	0.0309	0.2342	0.3267	0.2882	0.934	0.0113	0.2567	0.3128	0.2624	0.7152	0	0.1652	0.2923	0.2404	0.7242	0.0067	0.2059	0.3746	0.3869	0.8041	0.0001	0.2083
Profit	0.0143	0.0133	0.0915	-0.0799	0.0413	0.0904	0.0552	0.7345	-0.0301	0.1179	0.0685	0.0647	0.4503	-0.1104	0.0729	0.0989	0.0818	0.3475	0	0.0715	0.0753	0.0704	0.2966	-0.2102	0.0668	0.0572	0.0574	0.1133	-0.0474	0.0308
Effective tax rate	-24.07%	5.31%	71.69%	-648.22%	1.2052	16.39%	24.99%	745.72%	-1346.1%	2.0377	18.11%	23.77%	270.62%	-250.47%	0.4613	22.83%	15.27%	890.41%	-321.7%	1.2379	8.47%	35.35%	352.38%	-2806.8%	2.8369	14.87%	24.93%	59.34%	-405.87%	0.5802
Growth opportunitie	0.2739	0.23	0.82	0.07	0.1967	1.0841	0.84	5.72	0	0.9271	8.5446	1.73	608.9	0	59.5631	2.5152	1.695	18.04	0	3.1705	2.3931	1.92	14.84	0.4	2.3802	1.8438	1.185	8.63	0.31	1.8285
NDTS	0.0241	0.022	0.0533	0	0.0151	0.0386	0.0315	0.1235	0.0053	0.0289	0.0449	0.0382	0.1472	0.0027	0.0313	0.0379	0.0328	0.0811	0.0114	0.0184	0.0494	0.0399	0.1893	0.0098	0.0333	0.0434	0.0404	0.1371	0.0125	0.0248

C - Correlation matrix

Correlations	Total debt/ Total assets	Size	Tan	Profit	Effective tax rate	Growth opportunities	NDTS	Level of public debt (%GDP)	Dnorth
Total debt/ Total assets	1	0.0795	0.2197	-0.2449	-0.0155	-0.1405	0.1551	0.1208	-0.2546
Size		1	-0.0359	-0.1402	0.0334	-0.1362	0.0600	-0.1594	0.3708
Tan			1	-0.1375	-0.0366	-0.1409	0.1964	0.1827	-0.2385
Profit				1	0.1184	0.4079	0.0264	0.0236	0.0241
Effective tax rate					1	0.0591	0.0719	0.0308	0.0297
Growth opportunities						1	0.1394	-0.0424	-0.0225
NDTS							1	0.0207	0.0213
Level of public debt (%GDP)								1	-0.5769
Dnorth									1

D – Estimation results of the model with additive dummy and its experiments

Country/ Variables	Expected sign	All countries (excluding Dnorth)	All countries (excluding Level of Public debt - %GDP)	All countries (all variables)	All countries (excluding Size)	All countries (excluding Tan)	All countries (excluding NDTS)
Size	+	0.0056 (0.4174)	0.0137* (0.0631)	0.0140* (0.0591)	----	0.0138* (0.0579)	0.0148** (0.0444)
Tan	+	0.1149** (0.0167)	0.0772 (0.1194)	0.0794 (0.1033)	0.0788 (0.1174)	----	0.1081** (0.0184)
Profit	-	-0.5679*** (0.0000)	-0.5027*** (0.0002)	-0.4850*** (0.0004)	-0.5486*** (0.0001)	-0.5214*** (0.0001)	-0.5038*** (0.0002)
Effective tax rate	+	0.0008 (0.9436)	0.0019 (0.8620)	0.0025 (0.8196)	0.0035 (0.7522)	0.0012 (0.9148)	0.0067 (0.5443)
Growth opportunities	-	-0.0028 (0.5166)	-0.0044 (0.3125)	-0.0050 (0.2625)	-0.0055 (0.1815)	-0.0055 (0.2075)	-0.0024 (0.6000)
NDTS	-	0.8935* (0.0650)	0.9743* (0.0592)	0.9801* (0.0606)	1.0343** (0.0455)	1.1154** (0.0282)	----
Level of Public debt (%GDP)	+	0.0006** (0.0191)	----	-0.0004 (0.3671)	----	----	----
Dnorth		----	-0.0929*** (0.0000)	-0.1050*** (0.0003)	-0.0752*** (0.0001)	-0.1005*** (0.0000)	-0.0899*** (0.0000)
c		0.1188 (0.3175)	0.1031 (0.3855)	0.1331 (0.2735)	0.3125*** (0.0000)	0.1275 (0.2610)	0.1085 (0.3626)
Year Fixed Effects		Included	Included	Included	Included	Included	Included
N		901	901	901	901	901	902
adjusted R^2		0.1171	0.1726	0.1740	0.1556	0.1657	0.1535
F-statistic		5.4720*** (0.0000)	8.1580*** (0.0000)	7.5886*** (0.0000)	8.2059*** (0.0000)	7.3559*** (0.0000)	8.0851*** (0.0000)

This table indicates the estimated coefficients for each regressor. Between () is presented the p-value. *** - the variable is significant at 1%; ** - the variable is significant at 5%; * - the variable is significant at 10%. N corresponds to the number of observations included in each estimation.

E – Estimation results of the model with additive and multiplicative dummy variables and its experiments

Country/ Variable	Expected sign	All countries	All countries (excluding Size)	All countries (excluding Tan)	All countries (excluding NDTS)
Size	+	0.0205* (0.0696)	----	0.0205* (0.0695)	0.0210* (0.0626)
Tan	+	0.0194 (0.7678)	0.0237 (0.7300)	----	0.0252 (0.6865)
Profit	-	-0.6688*** (0.0009)	-0.7113*** (0.0006)	-0.6778*** (0.0007)	-0.6584*** (0.0009)
Effective tax rate	+	0.0065 (0.6831)	0.0082 (0.5843)	0.0062 (0.6939)	0.0104 (0.5146)
Growth opportunities	-	-0.0018 (0.7178)	-0.0031 (0.4934)	-0.0020 (0.6946)	-0.0017 (0.7289)
NDTS	-	0.1130 (0.8694)	0.3048 (0.6687)	0.1382 (0.8378)	----
Dnorth		-0.0384 (0.8587)	-0.1989*** (0.0002)	-0.0107 (0.9597)	0.0436 (0.8434)
Dnorth x Size		-0.0120 (0.3652)	----	-0.0121 (0.3618)	-0.0137 (0.3108)
Dnorth x Tan		0.1316 (0.1429)	0.1273 (0.1640)	----	0.2126** (0.0147)
Dnorth x Profit		0.3179 (0.2169)	0.3254 (0.2110)	0.3623 (0.1638)	0.2642 (0.3161)
Dnorth x Effective tax rate		-0.0078 (0.7354)	-0.0085 (0.7071)	-0.0087 (0.7137)	-0.0092 (0.6682)
Dnorth x Growth opportunities		-0.0003 (0.9732)	-0.0006 (0.9569)	-0.0058 (0.5908)	0.0014 (0.9063)
Dnorth x NDTS		1.7431* (0.0637)	1.5281 (0.1106)	2.0641** (0.0247)	----
c		0.0616 (0.7324)	0.3679*** (0.0000)	0.0684 (0.6935)	0.0529 (0.7688)
Year Fixed Effects		Included	Included	Included	Included
N		901	901	901	902
Adjusted R^2		0.1999	0.1755	0.1912	0.1699
F-Statistic		7.2338*** (0.0000)	7.0336*** (0.0000)	7.2811*** (0.0000)	7.1666*** (0.0000)
Chow-test		15.8244*** (0.0000)	13.5460*** (0.0000)	20.7617*** (0.0000)	15.0059*** (0.0000)

This table indicates the estimated coefficients for each regressor. Between () is presented the p-value. *** - the variable is significant at 1%; ** - the variable is significant at 5%; * - the variable is significant at 10%. N corresponds to the number of observations included in each estimation.

F – Estimation results of the additional tests and its experiments

				Additive			Multiplicative		
Country/ Variables	**Expected sign**	**All countries (additive dummies)**	**All countries (additive and multiplicative dummies)**	**All countries (Excluding Size)**	**All countries (Excluding Tan)**	**All countries (Excluding NDTS)**	**All countries (Excluding Size)**	**All countries (Excluding Tan)**	**All countries (Excluding NDTS)**
Size	+	0.0139* (0.0585)	0.0096 (0.1432)	----	0.0139* (0.0537)	0.0150** (0.0403)	----	0.0097 (0.1381)	0.0089 (0.2025)
Tan	+	0.0766 (0.1191)	0.1653*** (0.0035)	0.0785 (0.1162)	----	0.1064** (0.0187)	0.1655*** (0.0030)	----	0.2459*** (0.0000)
Profit	-	-0.5010*** (0.0003)	-0.3868** (0.0202)	-0.5448*** (0.0001)	-0.5202*** (0.0002)	-0.5031*** (0.0002)	-0.4153** (0.0106)	-0.3483** (0.0487)	-0.4385** (0.0159)
Effective tax rate	+	0.0023 (0.8404)	-0.0024 (0.8796)	0.0039 (0.7258)	0.0015 (0.8942)	0.0069 (0.5300)	-0.0018 (0.9143)	-0.0037 (0.8266)	-0.0000 (0.9998)
Growth opportunities	-	-0.0044 (0.3176)	0.0025 (0.8030)	-0.0055 (0.1779)	-0.0054 (0.2123)	-0.0023 (0.6084)	0.0002 (0.9807)	-0.0038 (0.7243)	0.0051 (0.6584)
NDTS	-	0.9545* (0.0612)	1.7613*** (0.0004)	1.0196** (0.0470)	1.0932** (0.0292)	----	1.7369*** (0.0006)	2.1626*** (0.0000)	----
Dn>100		0.0365 (0.4827)	-0.0911 (0.8450)	0.0281 (0.5946)	0.0387 (0.4540)	0.0475 (0.3887)	0.1866 (0.1043)	-0.1637 (0.7552)	-0.1257 (0.7648)
Ds<100		0.1008*** (0.0014)	-0.2020 (0.3094)	0.0839*** (0.0075)	0.1081*** (0.0003)	0.0989*** (0.0011)	0.2030*** (0.0017)	-0.1985 (0.2996)	-0.2749 (0.1683)
Ds>100		0.0915*** (0.0000)	0.3163 (0.2896)	0.0723*** (0.0001)	0.0994*** (0.0000)	0.0891*** (0.0000)	0.2043*** (0.0005)	0.2711 (0.3584)	0.2270 (0.4483)
c		0.0062 (0.9604)	-0.0010 (0.9927)	0.2357*** (0.0000)	0.0225 (0.8519)	0.0132 (0.9159)	0.1616*** (0.0000)	0.0360 (0.7529)	0.0611 (0.6075)
Dn>100 x Size			0.0175 (0.5498)				----	0.0182 (0.5629)	0.0204 (0.4392)
Dn>100 x Tan			-0.2599 (0.4279)				-0.2794 (0.4170)	----	-0.2426 (0.2617)
Dn>100 x Profit			1.6943 (0.2707)				1.3452 (0.3936)	1.6598 (0.2791)	1.9729 (0.2560)
Dn>100 x Effective tax rate			0.0081 (0.9338)				0.0117 (0.9010)	0.0051 (0.9562)	-0.0145 (0.8586)
Dn>100 x Growth opportunities			-0.1249 (0.1155)				-0.1115 (0.1681)	-0.1174 (0.1271)	-0.1409 (0.1432)
Dn>100 x NDTS			-0.1977 (0.9131)				-0.1238 (0.9459)	-0.7189 (0.6412)	----
Ds<100 x Size			0.0282** (0.0235)				----	0.0279** (0.0200)	0.0283** (0.0230)
Ds<100 x Tan			-0.0423 (0.6924)				-0.0473 (0.6872)	----	-0.1545 (0.1403)
Ds<100 x Profit			-0.1864 (0.5983)				-0.1216 (0.7362)	-0.2414 (0.4989)	-0.1967 (0.5970)
Ds<100 x Effective tax rate			-0.0086 (0.7757)				0.0040 (0.9113)	-0.0191 (0.4916)	-0.0195 (0.5245)
Ds<100 x Growth opportunities			-0.0002 (0.9830)				0.0021 (0.8514)	0.0050 (0.6581)	-0.0052 (0.6618)
Ds<100 x NDTS			-2.7482*** (0.0070)				-2.6239** (0.0256)	-2.8563*** (0.0075)	----
Ds>100 x Size			-0.0059 (0.7473)				----	-0.0064 (0.7329)	-0.0015 (0.9345)
Ds>100 x Tan			-0.2041** (0.0369)				-0.2017** (0.0439)	----	-0.2746*** (0.0037)
Ds>100 x Profit			-0.3514 (0.2382)				-0.3245 (0.2888)	-0.3581 (0.2425)	-0.3147 (0.3002)
Ds>100 x Effective tax rate			0.0167 (0.4787)				0.0162 (0.4996)	0.0171 (0.4820)	0.0221 (0.3332)
Ds>100 x Growth opportunities			-0.0099 (0.4891)				-0.0085 (0.5330)	-0.0037 (0.8006)	-0.0097 (0.5258)
Ds>100 x NDTS			-0.8046 (0.3678)				-0.7314 (0.4161)	-1.2151 (0.1637)	----
Year Fixed Effects		Included	Included	Included	Included	Included	Included	Included	Included
N		901	901	901	901	902	901	901	902
Adjusted R^2		0.1724	0.2298	0.1551	0.1657	0.1543	0.1911	0.2155	0.1947
F-Statistic		7.0200*** (0.0000)	5.1812*** (0.0000)	6.9323*** (0.0000)	6.4872*** (0.0000)	6.9091*** (0.0000)	4.9805*** (0.0000)	5.4903*** (0.0000)	5.4009*** (0.0000)
Chow-test		----	7.7863*** (0.0000)	----	----	----	6.2164*** (0.0000)	9.3296*** (0.0000)	7.3393*** (0.0000)

This table indicates the estimated coefficients for each regressor. Between () is presented the p-value. *** - the variable is significant at 1%; ** - the variable is significant at 5%; * - the variable is significant at 10%. N corresponds to the number of observations included in each estimation.