CAPITAL STRUCTURE DETERMINANTS: EVIDENCE FROM SPANISH LISTED FIRMS

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Abstract

Using annual data that records leverage levels of 77 non-financial firms in Spain prior and during the financial crisis, we demonstrate that tangibility, size, volatility, profitability, non-debt tax shield, growth opportunities and industry effect are factors that determine the capital structure of a company. Our results show that leverage is positively and statistically significant with size, non-debt tax shield and industry-effect. Our findings illustrate that profitability; growth opportunity and volatility are negatively and statistically significant with the debt issues on the balance sheet of these public traded firms. We discuss the extent to which these results are consistent with empirical evidence illustrated by prior studies with reference to the 2008 financial crisis. Also, during the 2008 financial crisis the cost of financial distress is high, and as such when size is used as a proxy for the probability of bankruptcy a negatively relationship is inevitable. Lastly, majority of the listed firms were more attached by equity finance as a result of the reluctant behavior of the international investors and the falling Spanish economy.

Keywords: Leverage, Profitability, Non-Debt Tax Shield, Volatility, Growth Opportunity, Tangibility, Industry-Effect, Financial Crisis

1. INTRODUCTION

This paper documents the determinants of capital structure in Spanish listed firms and investigates whether the 2008 financial crisis plays a major role in firms' capital structure. Specifically, our study pretend to answer the following: Are the financial leverage decision in the Spanish listed firms consistent with those reported in prior studies examining other European countries? How relevance is the 2008 financial crisis influence the capital structure?

The father of the capital structure theory Modigliani and Miller believe that tax and other force have no effect on firm's capital structure. Since M&M, other empirical researchers such as Rajan and Zingales (1995) have been able to relate the firm capital structure with firm's value. Even though there exists several studies that relate to capital structure and very few studies have been able to provide empirical evidence descripting capital structure and its determinants.

Thus the existing empirical evidence is based on mainly data collected from SABI. Findings based on this data shows that the relation between profitability and leverage is negatively and statistically significant across all the models. The expected relation between growth opportunities and leverage is statistically and negative significant when leverage is measured in book value as oppose to a statistically and positively significant when leverage is expressed in market value. The relative low P/B ratio as a proxy of growth opportunities reveals, is due to the relatively low leverage measure in book value. Volatility as a proxy for the risk of a firm is negatively and statistically significant determinant.

For tangibility, the theoretical point of view, a positive relationship is expected between leverage and tangibility. However, based on the results of this study, the relationship is non-significant for the OLS regression and negatively significant. This can be partly explained by the 2008 financial crisis, which causes difficulties and lower the value of the assets in the case of firm bankruptcy. Even though such effect could not explain the relationship, but it is not very likely to cause a negative relationship, which is observed in the analysis.

This study provides empirical evidence about the capital structure of listed firms in Spain and it analyzes potential determinant of leverage. This paper is structure as follows: Chapter 2 accounts for the literature review, while Chapter 3 shows the potential determinants of capital structures. Chapter 4 provides empirical results whereas discussion and conclusion are summarized in chapter 5.

2. LITERATURE REVIEW

Myers' premise of firm's capital structure suggests that there is no optimal capital structure, that is, firm prefers internal equity financing to external financing because the total cost of obtaining new external financing are substantial and can be minimized by avoiding going to the financial markets more often than is absolutely necessary; and by going to the financial markets, specific attention is drawn to the firm and its financial performance. For example poorly performing firms do not want to draw public attention to themselves by having to

sell a very expensive stock which substantiates the lack of performance of the firms, (Myers, 1984). However, when times aren't good and the internal cash flow is not sufficient to finance capital expenditures, firm issue debt first, rather than issue equity. Therefore, there is no well-defined optimal capital structure, because the internal and external financing are two kind of equity.

On the other hand, the trade-off theory says that firms seek debt levels that balance the tax advantages of additional debt against the cost of possible financial distress. Thus, the marginal capital structure is achieved when the marginal present value of the tax shield on additional debt is equal to the present value of the cost of financial distress on additional debt. In the case of the signalling theory, the trade-off between benefits of signalling and costs of financial distress implies that a company choose a debt ratio as a signal about its type. Therefore with the signalling approach, capital structure becomes more of dynamic, ongoing, evolving decision. There is not a single optimal level of debt, because managers continually have access to information before it is available to outside investors. And depending on the nature of the information, managers may choose to issue debt or equity in amounts that will at one push the firm toward an optimal capital structure while another time may push the firm away from an optimal capital structure. Ross (1977) developed a model in which capital structure decision signals the firm's future prospects. Using two identical firms that investors see no different between and managers for both firms have information that has not been revealed to the financial market and one firm has substantially better prospect than the other. After applying the Ross' signalling model, their result show that increased in the firm's value is associated with increased debt issuance.

In the case of agency theory, the trade-off between the relation between owners and debt holders and relation between owners and managers stipulates that the optimal debt/equity ratio is achieved when the agency cost is minimized. In a sole proprietorship, where the agency cost is minimized, because management and the owner are the same person, the capital structure of the firm is optimal, as the entrepreneur maximises his or her wealth by balancing the combination of wages and the value of the firms' common stock. However, as firm grows, the entrepreneur may meet financing needs by raising external funds, either by sharing ownership with others or by incurring debt financing. The growth in firm calls for delegate of decision-making authority to a separate management. And as such may result in an agency cost. Finally, the trade-off between costs of financial distress and increase of efficiency in the case of free cash flow theory, which is designed mainly for firms with extra-high free cash flows suggests that the high debt ration disciplines managers to pay out cash instead of investing it below the cost of capital or wasting it in organisational inefficiencies.

The purpose of this section is to present the collected lessons of the literatures surveyed. These lessons are presented in three subsections. In the first, we discuss the summary of theoretical predictions with evidence of the model surveyed in examining the capital structure in Spain from 1990 – 2014. In the second, we briefly summarize the Industry Leverage Rankings while the determinants of Leverage are discussed in the third section. Much of the material in this section is synthesized in tables.

2.1. Summary of Theoretical Results

Here, we discuss studies carried in Spain regarding the relationship between leverage and exogenous factors that are not the result of decisions by agents in the model such as profitability, growth etc as well as those exogenous factors that are the result of decision of the agents in the model. Both the leverage and the other factors are jointly determined by some third, exogenous factor. In these cases the exogenous factors are more readily observable than the exogenous driving factor. Table 1 makes it clear that the literature provides a substantial number of implications especially before the crisis. However, among those studies examined, there was no empirical evidence testing the Spanish capital structure before and after the financial crisis especially covering the time period from 2001 to 2014 of all listed non-financial firms.

2.2. Firm and Industry Characteristics

While it is vital to understand overall capital structure, it is very important to examine capital structure for different types of firms and industry characteristics. For simplicity we group firms based on their dominant industry. We employ the digit IAE (Impuestos sobre Actividades Economicas) codes which identify non-financial companies into 10 difference groups: 0 for cattle raising, 1 for energy and water, 2 extraction, transformation of non-energetic minerals, 3 for metal transforming industries, 4 for other manufacturing industries, 5 for construction, 6 for restaurant and lodging trade, and 7 for transport and communication. Table 2 shows 13-years (2001-2014) capital structure for different industries in term of the average ratios of debt/book value of equity and debt/market value of equity for all listed firm before and during the financial crisis.

Table 1. Summary of Theoretical Results

The table shows for each theoretical result, the model type from the result was derived and the specific paper that obtain the result

Author	Period	Independent Variable	Dependent Variables	Results
Sanchez &Gracia (2007)	1999-2004 Non - financial Spanish firms	Tobin's Q Ratio Intangible assets Size, ROA, Sales, Debt period	Total debt, bank debt, issue share & debt term	Total debt is high for firm with higher level of intangibles assets. Banks debt and share issue are relatively the same for both firms with high and low intangible assets. The Tobin's Q ratio and intangible assets are positive correlated with total debts, bank debt and debt term.
Mazagotos et al (2009)	1999-2000 Family and non-family businesses in Castilla and León	Debt, self-financing, capital expansion, age, profitability, size, ROA, ROC, property concentration,	Non family y family business	Self-financing and age is not significant to both firm's capital structure while debts and capital expansion are influence the both firms' capital structure. Size and industry type statistically influence the capital structure of both firms
Naharro and Palacín (2005)	2001 Non-financial in Andalucia	Size rank from 1=small, 2= medium & 3=Large, Non-debt tax	Short-term debt	Using firms from Andalucia, conclude that size and sector influence firm short-term debts as well as it capital structure whereas for long term debt, there are relatively no differences.
Tato (1991)		Profitability, growth, Internal financing,, ROA	Short-term and long – term debt, Debt/Marke t value	Leverage is correlated with profitability, internal financing and growth
Vacas (1996)		Salary, employment, Dividend	leverage	Leverage is positively correlated with the real activities of the company
Haro et al (2013)	Investee companies	Venture capital, growth, business sector, geographic location and age	Short-term debt, long-term debt	Investee companies have a lower than average level of short-term debt. Also, short-term is positively correlated to age, business sector, geographic location, duration and growth opportunities
Blasco and Moya (2003)	1999 Tourism Sector	Efficiency,	Levarage	Leverage is positively correlated con efficiency of firms in the tourism sector
del Poza (2007)	2003-2005 Listed firm in European Union	Size, profitability, cost of debt, fixed assets,	Debt/marke t value and Debt/book value	Leverage is positive correlation to firm size, profitability, cost of debt and fixed assets for Euro Stoxx 50. Madrid stock exchange
Devesa and Esteban (2008)	2000-2003 Firms in the Hotel sector	Liquidity ratios, structure, size, growth, profitability	Debts	Leaders financial structure have some influence within the hotel sector. Growth is negative correlated with leverage
Ramire (2005)	1997-2001	Profitability, sectors, size, assets and growth, cost of debt	Short-term and long term debt ratios,	Leverage is positively correlated with profitability, size and assets. Size influence the level of debts assume by firms Growth is negative correlated with leverage

Source: own elaboration

Table 2. Capital Structure for Selected Industries in Spain from 2001-2014

The debt/equity ratios were computed from the SABI data based on firm that had a reasonable amount of equity and also data available for all 13 years. Debt is defined as the total of short-term credit debt (such as bank loan, commercial paper, and the current portion of long-term debt) and long-term debt

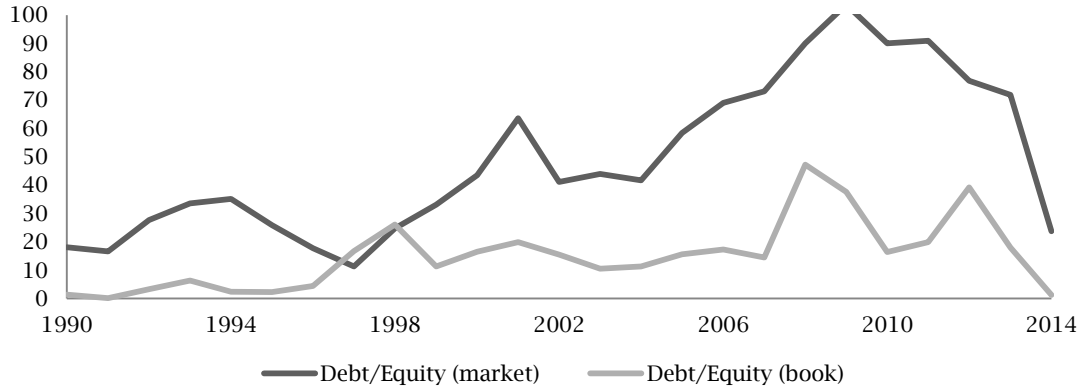
IAE Label(s)	IAE Code(s)	Number of Observations	Mean (Debt/Book Equity)	Mean (Debt/Market Equity)
Cattle raising	0	2	0,10	0,05
Energy and water	1	8	0,77	0,20
Extraction, transformation of non-energetic minerals	2	13	0,80	0,13
Metal transforming industries	3	6	0,41	0,23
Other manufacturing industries	4	14	0,19	0,05
Construction	5	8	0,99	0,35
Restaurant and lodging trade, etc...	6	20	0,12	0,07
Transport and communications	7	6	0,44	0,18

Source: Information was consulted from Sabi database and authors own elaboration base on the IAE (Impuestos sobre Actividades Economicas)

Examining Table 2 shows that the debt/book value of equity and debt/market value of equity figures are not the same, and also, there are substantial differences in the use of debt among the industry examined (whether measured in the book value or market value terms). For examples, firms in restaurant and lodging trade, cattle raising, and other light manufacturing industries use substantially less debt in their capital structures than do firms in the construction, extraction, and metal transforming industries. However, looking at the ratio of the total debt to book value equity and market value for the Spanish non-financial listed firms before and during the crisis does not provide a perfect view of the capital structure employed by firms in different industries. Figure 1 shows the two ratios (debt/book value of equity and debt/market value of equity) employ in this study to capture the capital structure for Spanish listed firm before and during the financial crisis. Up to about 1996 the two ratios were about the same; after 2000 we see that the ratio of debt to the market value equity was great than the debt to book value of equity. Financial crisis on the late 2000s had a major impact on the debt /market value equity of most Spanish listed firms. This is true because, from Figure 1 we can clearly see how the debt /market value equity significantly increase from 2007 to 2011 and falling from 2012.

However as we approach to 2014, we find that both the ratios falls drastically. We can argue that one of the consequences of the disruption of the capital and lending markets caused by the financial crisis was to significantly increase the amount of debt in firm capital structures. In Figure 1, even though the debt/market value of equity increases greatly during the crisis, the debt/book value of equity was found similarly, but smaller financial crisis effects.

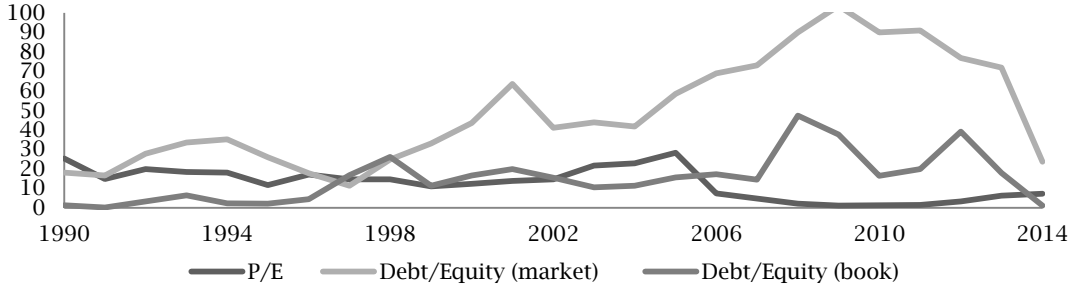
Figure 1. Ratio of total debt to market value equity and book value equity for non-financial listed firms from 1990 to 2014 in Spain



Source: own elaboration

The divergence between the ratio of debt/book value of equity and the ratio of debt/market value of equity during the financial crisis can be seen in the fall in relative stock prices. One way to gauge the level of relative stock prices is to look at average price/earnings (P/E) ratios during the crisis. Using Sabi data base, the P/S ratios, debt/market value ratio, and the debt/book value equity is shown in Figure 2. The price/ earnings ratio was relatively stable from 1990-2005, even though the debt/market value ratio rises and falls.

Figure 2. Ratio of total price to earnings and total debt to market value equity and book value equity for Spanish non-financial listed firms from 1990 to 2014



Source: own elaboration

However, from 2006-2013 the price/earnings ratio was relatively low due to the sharp rise in the debt/market value of equity. Taking in account the decrease in relative stock price, as reflected in lower P/E ratios during 2008-2013 time period, we see that an important reason for the sharp increase in the ratio of debt/market value of equity (relative to debt/book value of equity) was due to lower relative stock prices during the financial crisis.

Furthermore, several studies carried out in Spain shed light on the specific characteristics of firms and industries that determine leverage ratios such as Vacas, (1996), Mazagotos et al, (2009), Naharro and Palacín (2005), Haro et al (2013), Sanchez &Gracia (2009) and del Posa, (2007), del Prado et al (1992). These studies generally agreed that leverage increases with total assets, non-debt tax shields, firm size, growth opportunities, and industrial sectors, and decreases with intangible assets, liquidity ratio, and research and development expenditure, profitability. It is safe to conclude that a firm`s capital structure is affected by many factors in Table 3. And, depending on the nature of the firm, industry, the economy, and competition, firms may at various points in time add to reduce the amount of debt in their capital structure. Thus, available theory and empirical evidence support the notion that capital structure is a dynamic, ongoing, evolving decision. Even though this studies have provided detail of the determinants of capital structure for Spanish firms for the selected time periods, it should be noted that none of these studies have examine the capital structure of Listed firms in Spain before and during the Financial crisis. Thus, a re-examination of the determinants of the capital structure is very vital.

3. METHODOLOGY

3.1. Sample Selection

We sample all firms in *SABI data base* (Sistema de Análisis de Balances Ibericos) with sufficient data available from 2001 to 2014 so as to enable us calculate the *SABI*-based variables for every firm-year. Our sample firms were limited to listed and active firms in the Madrid Stock Exchange from 2001 to 2014. Initially, the total sample of listed firms (including financial and non-financial firms) found in the SABI database was 3,137. We eliminate listed firms in regulated industries using the IAE (Impuesto sobre Actividades Económicas) codes and characteristics for banks and financial institutions (IAE codes between 8000 and 9000). Finally, our selected process yields 1,064 firm-years observation for the Spanish listed firms from 2001 to 2014 (see Table 2).

3.2. Choice of variables to be tested

The dependent variables: Two measures of long-term debt ratio are proposed: 2Book leverage (BL) which measures level of debt as the ratio of long-term debt (LTD) over the sum of book long-term debt and book equity (BL = LTD/(LTD+Book equity))

Second measure uses a market value (ML) of the debt ratio by substituting book value by market equity (ML = LTD/(LTD + market equity)).

The Independent variables: Basedon the data availability and the light shed by several studies that determine leverage ratios, seven determinants of capital structure are analyzed in this study: profitability, growth opportunities, non-debt tax shield, tangibility, volatility, size and industrial sector as illustrated in Table 4.

3.2.1. Profitability

Following the theoretical framework between profitability and leverage, it can be said that the theory inconsistent. Because, the pecking-order theory demonstrated that firms prefer internal financing to external funding. More profitable firms have lower need of the external financing and as such reduce the leverage ratio. However, the trade-off-theory shows that more profitable firms should have higher leverage because they have more income to shield from taxes. The free cash flow theory suggests that more profitable companies should use more debt in order to disciple managers, to induce them to pay out cash instead of spending money in inefficient project. Most empirical studies observe a positive relationship between leverage and profitability when using the Spanish sample firms from 1997-2001. For example, Mazagotos et al (2009), Tato, (1991), Del Poza (2007), Devesa and Esteban (2008), and Ramire, (2005). In this study, profitability is proxied by return on assets

(defined as earnings before interest and taxes divided by total assets).

Table 3. Some Potential determinants of Financials Leverage

Characteristic	Naharro & Palacín	Mzagotos et al	Ortega del Poza	Ramíre	Haros et al	Sanchez & Meca	Blasco & Mova	Devesa & Esteban	Tato
Volatility									
Bankruptcy									
Industrial sector		+	-	+	+			+	
Fixed assets			-			-			
Non-debts tax	+						-		
Growth opportunities		+		-	-			-	+
Size	+	-	+	+	+	+		+	
Intangibles						+			
Profitability		-	+	+				+	+
R&D expenditures				-					-
Age	+				-				
Debt period			-			+			

Source: The above studies used sample of non-financial firm covering 1997-2004, and potential determinants of financial leverage. For details for this studies please see the reference section. It should be noted that we did not find any new study with relevant to financial crisis and covering the time period from 1990-2014.

3.2.2. Non-Debt Tax Shield

According to DeAngelo and Masulis (1980), depreciation deductions or investment tax credits due to changes in the corporate tax code or due to changes in inflation which reduce the real value of tax shields will increase the amount of debt that firms employ under the Ceteris paribus assumption. They conclude that the relationship between leverage and non-debt tax shield should be negative because, non-debt taxes are substitute for debt related tax shield. For instance, cross-sectional analysis has proven that companies with lower investment related tax shields will employ greater debt in their capital structures. In Spain, few empirical studies confirm the theoretical prediction, for example, Naharro and Palacín, (2005) suggest that the notion of non-debt tax shield depends on the size of the firms and thus offsets the tax shield benefits of leverage for small firms and that there is no relationship for big firms. Thus, it is important to re-examine the non-debt tax determinant for capital structure. Non-debt tax shield is proxied using depreciation divided by total assets.

3.2.3. Size

In Spain, the theoretical point of view about the effect of size on leverage is ambiguous. The firms with larger size are considered to be more diversified and fail less often, so size may be an inverse proxy for the probability of bankruptcy. If so, then size is positive correlated with leverage. However, size may also be a proxy for the information outside investors have, which should increase their preference for equity relative to debt (Raja and Zingales, 1995). Empirical studies carried out in Spain such asHaro et al, (2013) Naharro and Palacín, (2005), Pison (2014), Del Prado et al (1992), Del Poza (2007), Devesa and Esteban (2008),Osińska (2012),Ramíre (2005) and Mazagotos et al (2009) show that size and leverage are positive correlated. To proxy for size of a company, the natural logarithm of sales is used in this study (as it is the most studies of similar character). Also, using the alternative natural logarithm of total assets as the proxy for size would not change the qualitative results of the empirical analysis.

3.2.4. Growth Opportunities

More equity financing are the best option for firms with high future growth opportunities because a less leverage firms is more likely to maximize profitable investment opportunities (Myers, 1977), this is because, using equity financing instead of debt financing retained the flow of wealth from the stockholder to debt holders. Therefore, the relationship between growth opportunities and leverage is predicted as negative. Some empirical studies carried out in Spain such as Tato, (1991) and Haro et al, (2013) confirm the theoretical prediction of growth opportunities and leverage positively correlated. However, Devesa and Esteban (2008) and Ramíre (2005), report a negative relationship between growth opportunities and leverage. One reason for the negative relationship between growth opportunities and leverage is the use of market-to-book value as proxy for growth opportunities. Rajan and Zingales (1995) conclude that firms with high market-to-book ratios have higher costs of financial distress, which is why the relationship is negative. In this study, the market-to-book value (P/B) is used as a proxy for growth opportunities.

3.2.5. Tangibility

Theoretically, firms with higher tangibility provide lower risk profile to its creditor and increase the value of the assets in the case of

bankruptcy. This implies that the more tangible the firm's assets, the greater its ability to issue secured debts, thus, a positive relationship can be predict between tangibility and leverage. In Spain, empirical studies do not provide us with clear information either. Some authors find a positive relationship between intangible assets and leverage, for example, Ramíré (2005) and Meca and Sanchez, (2007). Thus, much is need to be done about the firms' tangibility and leverage. To proxy for tangibility of a company in this study, we use tangible assets divided by total assets.

3.2.6. Volatility

According to the findings of Hsia (1981), the systematic risk of equity decreases when the variance of the firm's value increases. This implies that leverage is positively correlated to business risk. However, volatility can be view as negative correlated with leverage if we relate volatility of profitability as a proxy for the risk of a firm. Empirically, there was no evidence from prior studies carry in Spain predicting the relationship between leverage and volatility. In this study, standard deviation of return on assets is used as a proxy for volatility.

3.2.7. Industry Classification

Harris and Raviv (1991) find that food, electronics and drugs industries are statistically significant with low leverage while industry such as airlines, cement, paper, textile, mill products are statistically significant with leverage. Other empirical studies such as Kester (1986), Bradley et al. (1984), Long-Malitz, (1985) have argued that there is a statistically significant relationship between industry classification and leverage. To estimate the effect of industry classification on leverage, firms are classified into groups according to the IAE (Impuesto sobre Actividades Económicas) codes and characteristics employed in *SABI data base* (Sistema de Análisis de Balances Ibericos) covering the time period from 2001 to 2014: 0 - Cattle raising, 1 – Energy and Water, 2 – Extraction, transformation of non-energetic minerals, 3 – Metal transforming industries, 4 – Other manufacturing industries, 5 – Construction industry, 6 – Restaurant and lodging trade, 7 – Transport and Communications. Therefore seven dummy variables are used in the empirical analysis to estimate the effect of industry classification on leverage – *cal_rai*, *con_indus*, *ene_wat*, *extr_tra*, *met_tra*, *other_i*, *rest_load*. Table 5 shows summary statistics of the determinants of capital structure.

Table 4. Determinants of Capital Structure

bl	book value of debt ratio	BL = LTD/LTD+Book equity
ml	market value of debt ratio	ML = LTD/LTD+Market equity
roa	Profitability	EBIT/Total Assets
vol	Volatility	SD (ROA)
tang	Tangibility	Tangible Assets/Total Assets
gro	Growth opportunities	Price/Book value ratio
nts	Non-debt tax shields	Depreciation/Total Assets
size	Size	ln Sales
cal_rai	Industry dummy	= 1 if the firm belong to Cattle raising industry, and 0 otherwise
Con_ind	Industry dummy	= 1 if the firm belong to Construction, and 0 otherwise
extr_tra	Industry dummy	= 1 if the firm belong to Extraction, transformation of non-energetic minerals industry, and 0 otherwise
met_tra	Industry dummy	= 1 if the firm belong to Metal transforming industry, and 0 otherwise
others_i	Industry dummy	= 1 if the firm belong to other manufacturing industry, and 0 otherwise
ene_wat	Industry dummy	= 1 if the firm belong to energy and water industry, and 0 otherwise
rest_lod	Industry dummy	= 1 if the firm belong to Restaurant and lodging trade industry, and 0 otherwise
tra_com	Industry dummy	= 1 if the firm belong to Transport and Communications industry, and 0 otherwise

Source: Based on prior studies illustrated in section 3.3

3.3. Statistical Description

As Table 6 reports, in general, the dependent variables for leverage *bl* and *ml* are correlated with all the explanatory variables except for non-debt tax shield and tangibility. Concerning the book value of debt ratio used for leverage *(bl)*, higher Pearson coefficients are correlated with profitability *(roa)*, growth opportunity *(gro)* and non-debt tax shield *(nts)*. Meanwhile, the market value of debt ratio used as an instrument for leverage *(ml)* have positive and significant correlation with volatility *(vol)* and size *(size)*.

Table 5. Summary Statistics: Mean, Maximum (Max.), Minimum (Min.) & Standard deviation (Std. Dev.)

	Nº	Mean	Max.	Min.	Std. Dev.
bl	1064	-0,01	1,11	-2,30	0,19
ml	1064	-0,02	0,69	-2,05	0,14
roa	1064	1,67	315,71	-547,53	33,54
vol	1064	0,28	7,99	0,00	0,45
tang	1064	3,26	191,60	0,00	12,38
gro	1064	3,21	162,07	-18,13	9,19
nts	1064	0,02	0,18	0,00	0,02
size	1064	9,57	15,95	-0,04	4,32
bkrutcy	1064	7,77	885,95	0,00	46,48

Source: Leverage (bl& ml) is the dependent variable while profitability (roa), growth opportunity (gro), non-debt tax shield (nts), volatility (vol) and size (size) are the independent variables. These variables are calculated as the 13-year (2001-2014) sum of annual data extracted from the SABI data base as described in Data analysis section above.

Table 6. Pearson Correlation Coefficients

	Bl	ml	roa	gro	vol	tang	nts	size
bl	1							
ml	-0,549**	1						
	0,000							
roa	0,084**	-0,044	1					
	0,006	***0,150***						
gro	0,148**	-0,241**	0,032	1				
	0,000	***0,000***	*0,303*					
vol	-0,221**	0,139**	0,003	-0,063*	1			
	0,000	***0,000***	*0,935*	*0,040*				
tang	0,011	0,044	0,030	-0,010	-0,020	1		
	0,708	***0,155***	*0,328*	*0,740*	*0,515*			
nts	0,025	-0,037	-0,030	0,080**	-0,010	0,012	1	
	0,422	***0,234***	*0,330*	*0,009*	*0,738*	*0,700*		
size	-0,141**	0,176**	0,097**	-0,036	0,033	-0,033	0,270**	1
	0,000	***0,000***	*0,002*	*0,242*	*0,282*	*0,283*	*0,000*	

*Remarks: numerals in italics stand for the level of significant at the ** = 1% & * = 5% level.*
Source: Leverage (bl& ml) is the dependent variable while profitability (roa), growth opportunity (gro), non-debt tax shield (nts), volatility (vol) and size (size) are the independent variables. These variables are calculated as the 13-year (2001-2014) sum of annual data extracted from the SABI data base as described in Data analysis section above

4. EMPIRICAL RESULT

The econometric formulation proposed in this study examines the determinants of capital structure in accordance with the theoretical and empirical studies discuss above. Our goal is to identify the main factors explaining the observed variation in the debt level of listed Spanish non-financial firms before and during the 2008 financial crisis in order to recognize which variable best impact the capital structure of these companies. We propose in this work to test the following models: Maximum likehood estimation, Marginal effect and the Elasticity.

Following the argue in Wooldridge (2002, page 661), which state that dependent variable that is restricted to the unit interval (0, 1), a linear model for E(y/x) cannot be a good description of the effects of respective regressors on the dependent variable. This is because for the estimated coefficients there would be feasible values of explanatory variables such that predicted dependent variables are outside the unit interval. Thus, the most common alternative to the above model is the log-odds transformation as a linear function. The log-odd transformation as a linear function can be express as follow:

$$E(\log[y/(1-y)] \mid x) = x\beta \qquad (1)$$

The motivation for using log[y/(1-y)] as a dependent variable in linear model is that log[y/(1-y)] ranges over all real values as y ranges between 0 and 1. This approach leads to estimation of β by OLS. However, the log-odd

transformation has two drawbacks: [1] if y takes on the boundary values 0 and 1, an adjustment has to be made before computing the log-odd transformation. [2] Even if y is strictly inside the unit interval, without further assumptions, we cannot recovered E(y/x). Thus to avoid this problem, according to Wooldridge (2002, page 662) and Papke and Wooldridge, (1996), we can modeled E(y/x) as a logistic function as

$$E\left(\frac{y}{x}\right) = \frac{\exp(x\beta)}{1+\exp(x\beta)} \quad (2)$$

This model ensures that as $x\beta \rightarrow \infty$ the effect of any x_j on E(y/x) diminishes and that the predicted values for y are in (0,1). The interpretation of estimated results is very similar as in the case of logit model for binary data. Wooldridge argue that one approach to estimate β is non-linear least squares. However, the assumption that implies relative efficiency of NLS – namely, $Var(y/x) = \sigma^2$ is unlikely to hold for fractional y.

4.1. Maximum Likelihood Estimation

Papke and Wooldridge (1996) propose an estimation of β using maximum likelihood estimation, where the log likelihood for observation *i*when E(y/x) is modeled as a logistic function is:

$$l_i = -y_i \log[G(x_i\beta)] + (1- y_i)\log[1- G(x_i\beta)] \quad (3)$$

$$\text{and} \quad G(x_i\beta) = \frac{\exp(x\beta)}{1+\exp(x\beta)}$$

4.1.2. Regression results

Table 7 shows an empirical analysis of seven potential determinants of capital structure, such profitability, growth opportunities, volatility, tangibility, non-debt tax shield, size and industry effect. According to the coefficient of determination (adjusted R^2), the explanatory power of the model is higher when leverage is expressed in term of market value than when it is measured in term of book value. The explanatory power of the models presented in this study is relatively high in comparison to empirical evidence of similar character. Specifically, there is no consistent theoretical prediction of the important of profitability on leverage. However, when using the MLE, our studies report a statistically significant and negative relationship between profitability and leverage. The expected relation between growth opportunities and leverage is statistically and negative significant when leverage is measured in book value as oppose to a statistically and positively significant relationship when leverage is expressed in market value.

Comparing the OLS and the MLS, the expected relation between volatility and leverage is not clear. Even though there is no clear empirical result because of the low statistically significant of volatility, this study report that volatility as a proxy for the risk of a firm is negatively correlation with leverage. Meanwhile, a positive relationship is revealed between leverage and tangibility across the OSL and MLE.

The theoretical prediction of the relationship between size and leverage is predicted as statistically and positively significant at the level of 1% while, non-debt tax shield is statistically and positively significant in the entire model. The sign of beta and statistical significant reveal the sign of the relationship between dependent variable and the respective regressors and the statistical significance of the relationship. However, since there are some characteristic of non-linear, the size of the effects cannot be seen from the OLS and MLE directly. Concerning the dummy variable, they are used in order to control for the industry-specific effects (especially for the differences in the level of debts employed by difference industries).

4.2. Marginal Effect

Since the interpretation of the economic meaning of the parameter values in a quasi-log likelihood model is not very obvious, we apply the first-derivative of model [2] to estimate the Marginal effect as:

Marginal effect (ME)

$$\frac{\partial E(y|x)}{\partial x_k} = \frac{\exp(x\beta)}{[1+\exp(x\beta)]^2}\beta_k \quad (4)$$

We compare the marginal effect of our model with that of the OLS estimates from the linear regression of y on x. The respective marginal effect for the dummy variables is calculated as the difference between dependent variable for $x_j = 1$ and $x_j = 0$. Lastly, Wooldridge (2002) proposed that elasticity is an attractive alternative to report the hypothetical observation with mean characteristics. This is because, it is vital for researcher to choose the levels of Y and x at which to report this elasticity; it is traditional to calculate the elasticity at the mean. Thus, the elasticity becomes:

Elasticity (E)

$$\frac{\partial E(y|x)}{\partial x_k}\frac{x_k}{E(y|x)} = \frac{1}{1+\exp(x\beta)}\beta_k x_k \quad (5)$$

Table 7. Maximum likelihood estimation

	OLS						LOGIT					
	BL			ML			BL			ML		
	Coeff.	Std error	Wald test	Coeff.	Std error	Wald test	Coeff.	Std error	Wald test	Coeff.	Std error	Wald test
Constant	0,818*	0,036	-22,596	0,476	0,036	-13,262	3,946*	0,252	-29,849	1,057	0,239	-0,054
roa	-1,002*	0,001	-3,277	-0,001*	0,004	-2,021	-1,008*	0,003	-6,434	-0,995	0,003	-2,533
gro	0,007**	0,002	-4,129	-0,011**	0,002	-7,477	-1,076**	0,017	-17,478	0,914**	0,014	-43,51
vol	-0,224**	0,031	-7,22	0,129*	0,031	-4,205	-0,114*	0,542	-41,466	-5,403*	0,369	-20,904
tang	0,001	0,000	-0,025	0,002	0,001	-1,791	1,001	0,006	-0,034	1,01	0,007	-2,247
nts	-1,197***	1,874	-1,874	-1,484**	0,634	-2,358	-167,416	3,389	-2,282	7,628**	3,282	-5,401
size	0,017*	0,003	-5,003	0,021*	0,003	-6,231	0,866*	0,026	-30,961	1,178*	0,023	-6,231
cal_rai							2,035**	0,286	-6,173	0,239*	0,359	-15,922
con_ind							3,308**	0,431	-7,697	0,278**	0,433	-8,737
extr_tra							3,470**	0,400	-9,652	0,539***	0,374	-2,737
met_tra							3,410*	0,363	-11,401	0,290	0,348	-12,691
other_i							2,061**	0,0372	-3,772	0,275*	0,380	-11,579
rest_lod							1,076	0,002	2,341	0,213*	0,004	2,981
tra_com							3,107*	0,351	-10,439	0,484**	0,282	-6,591
R^2	10,4			10,9			19,7			21,4		
Wald test	16,082			19,276			86,565			88,756		

Table 7 shows maximum likelihood estimation, leverage (bl& ml) is the dependent variable while profitability (roa), growth opportunity (gro), non-debt tax shield (nts), volatility (vol) and size (size) are the independent variables. These variables are calculated as the 13-year (2001-2014) sum of annual data extracted from the SABI data base as described in Data analysis section above

Table 8 shows an empirical analysis of seven potential determinants of capital structure, such profitability, growth opportunities, volatility, tangibility, non-debt tax shield, size and industry effect. According to the coefficient of determination (adjusted R^2), the explanatory power of the model is higher when leverage is expressed in term of market value than when it is measured in term of book value. The explanatory power of the models presented in this study is relatively high in comparison to empirical evidence of similar character.

Different results are obtained when leverage is expressed in term of market value and book value. As expected, the findings of our study show that the relation between profitability and leverage is negatively and statistically significant across all the models. In respective of the use of book value or market value in expressing the leverage variable, the negative correlation between leverage and profitability is consistent with pecking-order hypothesis rather than with static trade-off models. Empirically, the expected relation between growth opportunities and leverage is statistically and negative significant when leverage is measured in book value as oppose to a statistically and positively significant when leverage is expressed in market value. The relative low P/B ratio as a proxy of growth opportunities reveals is due to the relatively low leverage measure in book value. This result confirms theoretical prediction that firms with higher future growth opportunities use more equity financing (Myers 1984).

Volatility as a proxy for the risk of a firm, is negatively and statistically significant determinant. Even though there is no clear empirical result to support our findings. For tangibility, the theoretical point of view, a positive relationship is expected between leverage and tangibility. However, based on the results of this study, the relationship is non-significant for the OLS regression and negatively significant. This can be partly explained by the 2008 financial crisis, which causes difficulties and lowers the value of the assets in the case of firm bankruptcy. Even though such effect could not explain the relationship, but it is not very likely to cause a negative relationship, which is observed in the analysis.

The theoretical prediction of the relationship between size and leverage is predicted as statistically and positively significant at the level of 1%. This result supports the view of size as an inverse proxy for the probability of bankruptcy. Meanwhile for non-debt tax shield is statistically and positively significant in the entire model. This confirms the theoretical prediction and shows non-debt tax shield as substitutes to debt related tax shield. Concerning the dummy variable, they are used in order to control for the industry-specific effects (especially for the differences in the level of debts employed by difference industries).

Table 8. Marginal and Elasticity effect

	Marginal effect				**Elasticityeffect**			
	BL		ML		BL		ML	
	Coeff.	Std error	Coeff.	Std error	Coeff.	Std error	Coeff.	Std error
Constant	0,509*	0,251	0,229	0,274	0,505*	0,250	0,235	0,276
roa	-0,01*	0,004	-0,097	0,003	-0,01*	0,003	-0,095	0,003
gro	-0,15**	0,014	0,017*	0,014	-,146**	0,016	0,017*	0,014
vol	-0,423*	0,502	-0,341*	0,367	-0,427*	0,502	-2,342*	0,367
tang	0,021*	0,005	-0,01*	0,008	0,021*	0,006	-0,01*	0,007
nts	-1,000	2,389	1,409**	3,190	-1,007	2,389	1,465**	3,192
size	0,029	0,027	0,029*	0,023	0,028	0,026	0,032*	0,023
cal_rai	0,093**	0,283	0,127*	0,359	0,093**	0,283	0,127*	0,359
con_ind	-0,093**	0,429	0,014**	0,41	-,093**	0,429	0,014**	0,41
extr_tra	0,059**	0,401	0,029**	0,264	0,059**	0,401	0,029**	0,264
met_tra	-0,012*	0,363	0,021*	0,028	-0,012*	0,361	0,02*	0,028
other_i	2,061**	0,036	0,275*	0,380	2,061**	0,0372	0,275*	0,380
rest_lod	2,061**	0,369	0,107*	0,289	2,061**	0,378	0,107*	0,294
tra_com	0,235*	0,371	0,246**	0,285	0,235*	0,381	0,246**	0,282
R^2	19,73		21,42		19,7		21,4	
Wald test	86,565		89,051		86,565		88,756	

Table 8 shows marginal and elasticity effect where leverage (bl& ml) is the dependent variable while profitability (roa), growth opportunity (gro), non-debt tax shield (nts), volatility (vol) and size (size) are the independent variables. These variables are calculated as the 13-year (2001-2014) sum of annual data extracted from the SABI data base as described in Data analysis section above

5. DISCUSSION WITH REFERENCE TO THE 2008 FINANCIAL CRISIS IN SPAIN

5.1. Profitability

Intuitively, the negative and statistically significant relationship between profitability *(roa)* and leverage in Spanish non-financial firms seems to agree with Pecking order model. It could be that other factors such as the 2008 financial crisis, avoidable underinvestment and new projects being mispriced place a significant role for the negative relationship. During the 2008 financial crisis, even though the banks were compiled by the influence of the Spanish government-directed credit policy, the negative book values associated with the banks impose some difficulties. Also, during the crisis, majority of the listed firms were more attached by equity finance as a result of the reluctant behavior of the international investors and the falling

Spanish economy. It should be noted that the lack of adequate investment protection and poor corporate governance employ during the 2008 financial crisis cause most managers of these firms to prefer equity financing rather debt financing. Lastly, some firms prefer the equity financing to debt because of the Spanish government centralize role in controlling major stakeholder of firms and the owner of banks as well as the beneficiary of tax. Our result is consistent with the argument present (Szyszka2012).

5.2. Size

According to the Trade-off model, firms in the industrial economic sectors that employed heavy capital equipment are characterized of higher debt capacity and are able to be more highly geared than those firms in the industrial sector that employed less industrial equipment. Marsh (1982) argued that small firms choice short-term debt whereas large firms prefer long-term debt. Using data from developed countries with Germany as an exception listed firms, Wald (1999) proved that there exist a positive correlation between firm`s size and debt. Large firms have the possibilities of spreading their risk through diversification measured. Also,during the 2008 financial crisis the cost of financial distress is high, and as such when size is used as a proxy for the probability of bankruptcy a negatively relationship is inevitable.

Kester (1986) and Titman and Wessel (1988) suggest that during financial distress, firms restrict their financial information with the outsiders. During the financial crisis, poorly performing firms do not want to draw attention to themselves by having to sell a very expensive stock or bond issue which substantiates the lack of performance or weakness of the firm as a result, such information with be restricted from the public. However, in the Spanish case, the relationship between firm size and leverage is negatively and statistically significant for all our model. The negative relationship is consistent with Myers and Majluf (1984) of informational asymmetries and the fact that high level of bankruptcy characterized with most firms during crisis as well as poor debtholder protection. However, Jensen (1986) and Williamson (1988) argued that most large firms will prefer issue long-term debt just to control their managers' behavior due to more dilute ownership.

5.3. Growth Opportunities

Theoretically, a negative relationship between growth opportunities and leverage in Spain is found. According Jensen (1986), firms have a tendency to expropriate wealth from debtholders. That is, firms with greater opportunities, which are a form of intangible assets, tend to borrow less than firms holding more tangible assets. Thus, the trade-off model does apply to the Spanish non-financial firms. One reason for the negative relationship is due to the presence of the 2008 financial crisis that render mostfirms in search for growth opportunities with intangible assets such as R&D, advertising and goodwill.

5.4. Tangibility

Empirical evidence have been documented that there exist a positive relationship between tangibility and leverage. Among these studies, the positive relationship is due to that fact that tangible assets are easy to collateralize for the debt to reduce lender`s rick. Jensen and Meckling (1976) suggest that issuing debt secured by tangible assets reduces agency cost and that assets tangibility are important criterion in banks` credit policy. In sum, during financial crisis, debtholders term to depend more on assets tangibility with is consistent with trade-off model and the pecking-order theory (Table 9)

Table 9. Level of Significant

	Level of Significant	**Variables**	**OLS**	**Logit**
			sign	
1%	Significant relationship	*Roa*	-	-
		Size	+	+
		extr_tra	+	+
		tra_com	+	+
5%	Less significant relationship	*Gros*	-	-
		Vol	-	-
		cal_rai	+	+
		con_ind	+	+
		extr_tra	+	+
		met_tra	+	+
		other_i		+
		rest_lod	+	+
10%	Slightly significant relationship	*nts*	+	+
≥10%		*tang*		

Table 9 shows the level of significant where leverage (bl& ml) is the dependent variable while profitability (roa), growth opportunity (gro), non-debt tax shield (nts), volatility (vol) and size (size) are the independent variables. These variables are calculated as the 13-year (2001-2014) sum of annual data extracted from the SABI data base as described in Data analysis section above.

6. CONCLUSION

The 2008 financial crisis coupled with other forces had play a major role in determining the capital structure of listed Spanish firms. This is because during crisis, financial markets greatly reduce their security issuance and lending by financial institution becomes more and more complicated. Using financial information from 77 firms from 2001 to 2014,our results show that the relation between profitability and leverage is negatively and statistically significant across all the models. The expected relation between growth opportunities and leverage is statistically and negative significant when leverage is measured in book value as oppose to a statistically and positively significant when leverage is expressed in market value.

The relative low P/B ratio as a proxy of growth opportunities reveals is due to the relatively low leverage measure in book value. Volatility as a proxy for the risk of a firm is negatively and statistically significant determinant. For tangibility, the theoretical point of view, a positive relationship is expected between leverage and tangibility. However, based on the results of this study, the relationship is non-significant for the OLS regression and negatively significant. This can be partly explained by the 2008 financial crisis, which causes difficulties and lower the value of the assets in the case of firm bankruptcy. Even though such effect could not explain the relationship, but it is not very likely to cause a negative relationship, which is observed in the analysis.

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