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CAPITAL STRUCTURE OF MEDIUM AND LARGE COMPANIES IN THE PORTUGUESE MANUFACTURING INDUSTRY: THE IMPACT OF THE FINANCIAL CRISIS

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Abstract

This study analyses the Capital Structure of Medium and Large companies in the Portuguese Manufacturing industry along the period 2007-2017.

This is a particularly interesting period since the Global Financial Crisis deeply affected offer and demand for credit and consequently the Capital Structure of Portuguese firms.

In our analysis, we address the following key questions: How do determinants of debt ratios perform along this period? What conclusions can we draw concerning the challenges that decision makers had to face during this period? What are the main differences in the explanatory variables when comparing the Pre-Crisis period (2007-2008) and the Crisis period (2009-2017), where the crisis had its full impact?

The research also tries to verify hypotheses elaborated for the explanatory variables according to the main Capital Structure theories – The Trade-Off theory and the Pecking Order theory.

The study considers three debt ratios: Total Debt ratio, Short-Term Debt ratio, Long-Term Debt ratio, and six explanatory variables: Size, Profitability, Growth, Asset Structure, Non-Debt Tax Shield and Liquidity.

The determinants show a relevant explanatory capacity. Size, Profitability, Asset Structure and Non-Debt Tax Shield are important in explaining the Long-Term Debt ratio while Size, Asset Structure and Liquidity are important to explain the Short-Term Debt ratio. Total Debt ratio is mostly explained by Profitability and Liquidity.

Size, Profitability and Liquidity show relevant explanatory differences for the two periods considered.

Although the results are more consistent with the arguments supporting the Pecking Order theory, we also found evidence that supports the arguments behind the Trade-Off theory.

Keywords: Capital Structure; Financial Crisis; Portuguese Manufacturing Industry; Panel Data

Resumo

O estudo analisa a Estrutura de Capital das Médias e Grandes empresas na indústria Transformadora Portuguesa no período 2007-2017.

Neste período, a Crise Financeira Global afetou profundamente a oferta e procura de crédito e consequentemente a Estrutura de Capital das empresas Portuguesas.

Abordamos as seguintes questões: Como é que as variáveis explicativas dos rácios de dívida se comportaram? Que conclusões podemos tirar relativamente aos desafios que os responsáveis tiveram que enfrentar? Quais são as principais diferenças entre as variáveis explicativas quando comparando o período Pré-crise (2007-2008) com o período Crise (2009-2017)?

A dissertação tenta também verificar as hipóteses elaboradas para as variáveis explicativas, de acordo com as principais teorias da Estrutura de Capital – a teoria de Trade-Off e de Pecking Order.

Este estudo considera três rácios de dívida: rácio de Dívida Total, rácio de Dívida de Curto-prazo, rácio de Dívida de Longo-prazo e seis variáveis explicativas: Dimensão, Rentabilidade, Crescimento, Tangibilidade, Custos Fiscalmente Dedutíveis Excluindo Dívida e Liquidez.

Os determinantes mostram uma capacidade explicativa relevante. Dimensão, Rentabilidade, Tangibilidade e Custos Fiscalmente Dedutíveis Excluindo Dívida são importantes a explicar o rácio de Dívida de Longo-prazo enquanto que Dimensão, Tangibilidade e Liquidez são importantes a explicar o rácio de Dívida de Curto-prazo. O rácio de Dívida Total é maioritariamente explicado pela Rentabilidade e Liquidez.

Dimensão, Rentabilidade e Liquidez apresentam diferenças relevantes para os dois períodos.

Apesar dos resultados serem mais consistentes com os argumentos que suportam a teoria Pecking Order, também encontramos evidência que suporta os argumentos por detrás da teoria de Trade-Off.

Palavras-chave: Estrutura de Capital; Crise Financeira; Indústria Transformadora Portuguesa; Dados em Painel

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Tomas, my friend, with whom I started this journey two years ago.

My friends, for knowing who I am. I hope that all of you achieve your goals and count on me to be there for you as you were for me.

For me, one of the most valuable things in life is time, and the way we use it will determine who we are. The most admirable Thank You for all of the energy given!

"You are the universe experiencing itself"

Alan Watts

List of Abbreviations

EU – European Union

GDP – Gross Domestic Product

GFCI – Gross Fixed Capital Investment

IMF – International Monetary Fund

INE – Instituto Nacional de Estatística

LTD – Long-term Debt ratio

M&M – Modigliani and Miller

NDTS – Non-Debt Tax Shield

ROA – Return on Assets

SPSS - Statistical Package for the Social Sciences

STD – Short-term Debt ratio

TD – Total Debt ratio

WACC – Weighted Average Cost of Capital

Contents

1 INTRODUCTION

"How do firms choose their capital structures?" (Myers, 1984)

Since Modigliani and Miller in 1958 formulated their famous theorem stating that under certain assumptions, the choice of debt mix is irrelevant in terms of company market value, financial theory has been searching for valuable explanatory theories to understand how companies and managers make decisions affecting capital structure levels.

Innumerous empirical studies have been developed in order to test the different theories and discuss the determinants of capital structure of firms. The subject has great importance for the Portuguese economy, once Portuguese firms are considered to have high levels of leverage, frequently associated in the credit markets with high risk of bankruptcy.

The subject gained increased relevance, with the impact of the Global Economic Crisis on the Portuguese economy and Portuguese firms capital structure. Several empirical studies have been devoted to this subject analysing the behaviour of capital structure, testing capital structure theories and determinants explanatory capacity. Analyses have been conducted according to sector of activity and firms' dimension, among others.

However, only now with 10 years passed since the beginning of the financial crisis, is possible to have a complete frame to analyse how the possible explanatory variables explain capital structure of Portuguese firms along this period.

Taking this in consideration, the present study tries to contribute to that analysis.

Our objectives are:

- Analyse the behaviour of capital structure of medium and large Portuguese firms in the manufacturing industry[1], which represents a rather homogenous cluster of companies, along the period from 2007 up to 2017;

[1] Defined according to NACE (Nomenclature Statistique des Activités Économiques dans la Communauté Européenne)

- Compare the explanatory capacity of capital structure determinants considering the whole period (2007-2017) a Pre-crisis period (2007-2008), where the Crisis effects where presumably not yet felt on the capital structure of companies, and a period where the Crisis had its full impact (2009-2017);

- Test the applicability of the capital structure theories to explain the capital structure of Portuguese firms along this period;

After this introduction, our study is structured in the following main chapters: a literature review providing an historical overview on the theories of capital structure taking in consideration the authors that contribute the most; an analysis of the impact of the global financial crisis on Portuguese credit markets and on Portuguese corporations; a presentation of the capital structure indicators and determinants that will be used in the empirical study; then, we explain the research methodology adopted presenting results for the descriptive statistics, a correlation analysis and finally, we perform an ordinary least squares (OLS) method taking in consideration our panel data to estimate the coefficients for each explanatory variable for our multiple linear regression for the whole period, the Pre-crisis period and the Crisis period and we discuss the results found; we end drawing conclusions on the behaviour of debt ratios, the explanatory capacity of the various determinants considered, and the accuracy of the main capital structure theories in explaining the behaviour of the capital structure of the Portuguese manufacturing industry companies along this period.

2 LITERATURE REVIEW

2.1 Capital Structure: Overview

"The study of Capital Structure attempts to explain the mix of securities and financing sources used by corporations to finance real investment" (Myers 2001: 81).

Does the choice of Debt and Equity have an influence on the market value of the firm? Does an optimal Capital Structure exist? If it does what are the factors that determine it? What other factors can influence management decisions on the mix of Equity and Debt to finance investments?

Three main theories have been developed to explain Capital Structure: The Trade-Off theory; The Pecking Order Theory; Agency costs.

The starting point for the Capital Structure analysis has been the theoretical model developed by Modigliani & Miller (1958) which proved the irrelevance of Financial Leverage for the value of the firm under certain assumptions. Subsequently, these assumptions and their impact on the relevance of Capital Structure have been widely discussed resulting in the previously referred theories. Taxes and financial distress costs are related to the Trade-Off theory; asymmetric information is behind the Pecking Order theory; the consideration of Agency costs that arise in the relationships between shareholders and managers and debtholders and managers, brings new light on the factors that influence decisions on capital structure. The theories complement each other as an explanatory model for Capital Structure and Management and Shareholders decisions on investment financing: "There is no universal theory of the debt-equity choice, and no reason to expect one" (Myers, 2001: 81).

These theories have been developed in the seventies (Trade-Off theory) and in the eighties (Pecking Order and Agency costs). Subsequently another field of research emerged, related with the explanatory capacity of variables at the firm level and country level as determinants of Capital Structure. Innumerous empirical studies have been conducted in order to test which determinants better explain the Capital Structure and draw conclusions on the adequacy of the main theories developed.

2.2 Modigliani & Miller Model

The most famous model about capital structure was introduced in 1958 by Franco Modigliani and Merton Miller and it is called the Modigliani-Miller Theorem. This theory forms the basis for modern thinking on the subject. Modigliani-Miller states that, under certain assumptions, namely, perfect capital markets, no corporate income taxes, no transaction or bankruptcy costs, no arbitrage opportunities and homogeneous expectations, the choice of the securities mix is irrelevant in terms of company market value. Proposition I of the model states that "The market value of any firm is independent of its capital structure and is given by capitalizing its expected return at the rate appropriated to its class" (Modigliani & Miller, 1958: 268). The firm value depends on its underlying profitability and risk and does not change with the chosen mix of debt and equity to finance its assets.

This statement has implicit that the Weight Average Cost of Capital (from now on abbreviated as WACC) is constant and completely independent of the debt ratio:

$$WACC = r_A = r_D * \frac{D}{V} + r_E * \frac{E}{V} \quad \text{(i)}$$

Where:

- r_D= Yield on the firm's debt
- r_E= The expected rate of return demanded by equity investors
- D = Market value of Debt
- E = Market value of Equity
- V = Market value of Firm

Solving the equation for: $r_E = r_A + (r_A - r_D) * \frac{D}{E}$ (ii) meaning that the expected return on equity increases with the Debt to Equity ratio and leading to the formulation of the Proposition II of the model "The expected yield of a share of stock is equal to the appropriate capitalization rate for a pure equity stream in the class, plus a premium related to financial risk equal to the debt to equity ratio times the spread between r_A and r_D" (Modigliani & Miller, 1958: 271).

The Modigliani-Miller theorem faced some criticisms. One of them was the fact of the M&M only works in a world without taxes which is an unrealistic assumption.

However, it is possible to relax this assumption by including the presence of corporate taxes (Modigliani & Miller, 1963). In this scenario, the optimal debt-to-equity ratio would be 100% which is easy to understand if we keep in mind that the payment of interest on debt is not subject to the tax payment while the payment of dividends is.

2.3 Trade-Off Theory

When we consider income taxes there is a clear incentive to finance through issuance of debt since the interest expense is considered a cost and tax deductible increasing the after tax return to debtholders and stockholders. This tax shield has a value that increases the value of the firm.

The present value of the tax shield, using a perpetuity formula will be:

$$PV\ (Interest\ tax\ shield) = \frac{tf*r*D}{r} = tf * D \qquad \text{(iii)}$$

Where:

- r = Interest rate on Debt
- tf = The firm tax rate
- D = Market value of Debt
- PV = Present Value

However, the presence of costs of financial distress offset the tax advantages for high levels of debt.

Financial distress includes legal and the administrative costs of bankruptcy but also inefficiencies in operating a company with high debt levels in an uncertain world. Conflicts of interest between lenders and stockholders will arise affecting the firms investment and operating decisions (agency costs).

The static Trade-Off framework balances the gains on tax shields and the costs of financial distress until an optimal point that maximizes the value of the firm. Firms should balance the equity and debt amount to the point where the firm value is maximum, replacing debt for equity or equity for debt until an optimal point is reached (Figure 1.)

(Myers, 1984).

"The tradeoff theory of optimal Capital Structure has a strong commonsense appeal. It rationalizes moderate debt ratios and it is consistent with certain obvious facts, such as companies with relatively safe, tangible assets tend to borrow more than companies with risky, intangible assets." (Myers, 2001: 91).

Figure 1. Trade-off theory of capital structure (source: Myers, 1984)

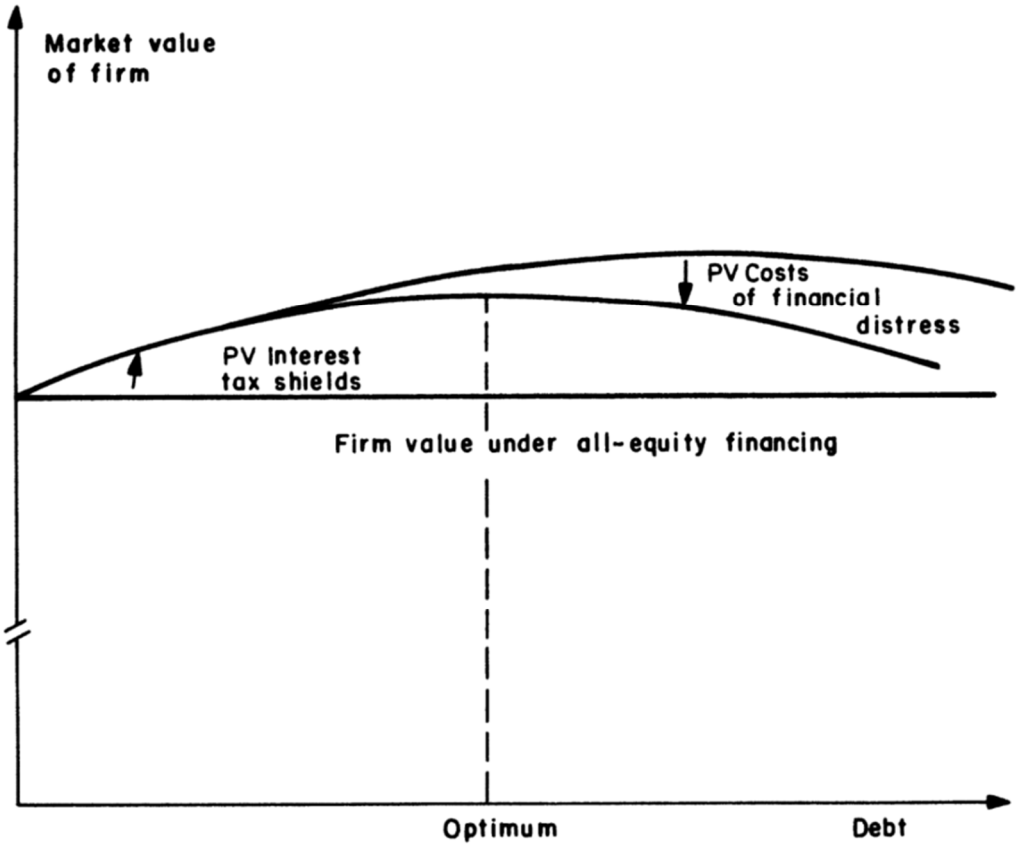


Figure 1. The static-tradeoff theory of capital structure.

Despite of being rarely mentioned, there are some adjustment costs that prevent an easy adjustment between equity and debt and that differ among companies. If these costs are high, the company is going to have a debt-to-equity ratio different from the desired one. Then, the adjustment costs are an important variable to have in consideration when measuring the reasons that makes companies differ from their preferred Capital Structure.

However the Trade-Off theory has difficulty in explaining the low debt ratios frequently observed in high profitable tax paying firms. This is a good argument for the Pecking Order theory.

2.4 Pecking Order Theory

Myers (1984) and Myers and Majluf (1984) developed a theory based on information differences: the Pecking Order theory.

In a world where investors do not know the true value of the existing assets or of a new investment opportunity presented to the firm, the announcement of a stock issue will bring down the stock price. According to Myers (2001) there is empirical evidence that the price drop at announcement is greater when the information asymmetry is large.

The rational for this market behaviour comes from the assumption that managers act on the interest of the existing shareholders and refuse to issue undervalued shares. The information that investors infer from the decision to issue drives down prices.

Given this evidence in stock market behaviour, managers looking for external finance for new projects will tend to prefer debt over equity. The announcement of a debt issue as normally much less impact on stock price (Myers 2001). The issue of new shares can only happen if the company is facing a high growth opportunity capable of offsetting the agency costs that might arise.

These reflections lead to the Pecking Order theory of Capital Structure (Myers, 1984):

a. Firms prefer internal to external finance. (Information asymmetries are assumed relevant only for external financing.)

b. Dividends are "sticky," so that dividend cuts are not used to finance capital expenditure, and so that changes in cash requirements are not soaked up in short-run dividend changes. In other words, changes in net cash show up as changes in external financing.

c. If external funds are required for capital investment, firms will issue the safest security first which means: debt before equity. If internally generated cash flow exceeds capital investment, the surplus is used to pay down debt rather than repurchasing and retiring equity. As the requirement for external financing increases, the firm will work down the pecking order, from safer to riskier debt, perhaps to convertible securities or preferred stock, and finally to equity as a last resort.

d. Each firm's debt ratio therefore reflects its cumulative requirement for external financing.

The pecking order theory explains why more profitable companies borrow less – they have more internal finance capability. It also explains the empirical evidence that most external financing comes from debt. (Myers, 2001)

We can conclude with Myers (2001: 93) that "The pecking order theory says that the key time-series variable is the firm's cumulative requirement for external financing—its cumulative "balance of payments" with outside investors. Each year's requirement equals internally generated cash flow less cash spent on capital investment and dividends. The Pecking Order also says that this financial deficit will be covered entirely by borrowing, at least at low or moderate debt ratios. If the deficit is negative, the surplus of internal funds is used to pay down debt.".

2.5 Agency Costs and Conflicts Among Shareholders, Debtholders & Managers.

The relationship between equity holders, debtholders and managers raises issues related to the separation between ownership and control in corporations, being a particular case of the more general situation of an "Agency" relationship and correspondent Agency costs.

According to Jensen and Meckling (1976) an Agency relationship is defined as: "a contract in which the principals (equity holders) engage another person (manager) to perform some services on their behalf which involves delegating some decision making authority to the Agent".

If both parties are utility maximizers, probably the Agent will not always act in the best interests of the principals. Agency costs arise as a consequence of the need to manage these conflicting objectives.

The principals will develop actions and strategies in order to monitor the actions of the agent. They can establish appropriate incentives and implement control procedures.

The agent will also expend resources (bonding costs) to assure the principals the transparency of his actions and his best effort to obtain the desired results.

According to Jensen and Meckling (1976), the Agency costs can be defined as the sum of:

- The monitoring expenditures by the principal;
- The bonding expenditures by the Agent;
- A residual loss of the welfare of the principal.

Jensen and Meckling (1976) developed a model to discuss the conditions for the equilibrium among the interests of the manager, equity and debt holders. An important conclusion is that the decision to finance through equity or debt is also determined by the Agency costs that the manager, shareholders and debtholders incur. As argued by the cited authors "as debt increase beyond some point, the marginal Agency costs of debt begin to dominate the marginal Agency costs of outside equity and the result of this is the generally observed phenomenon of the simultaneous use of both debt and outside equity".

The agency costs associated with debt consist of:

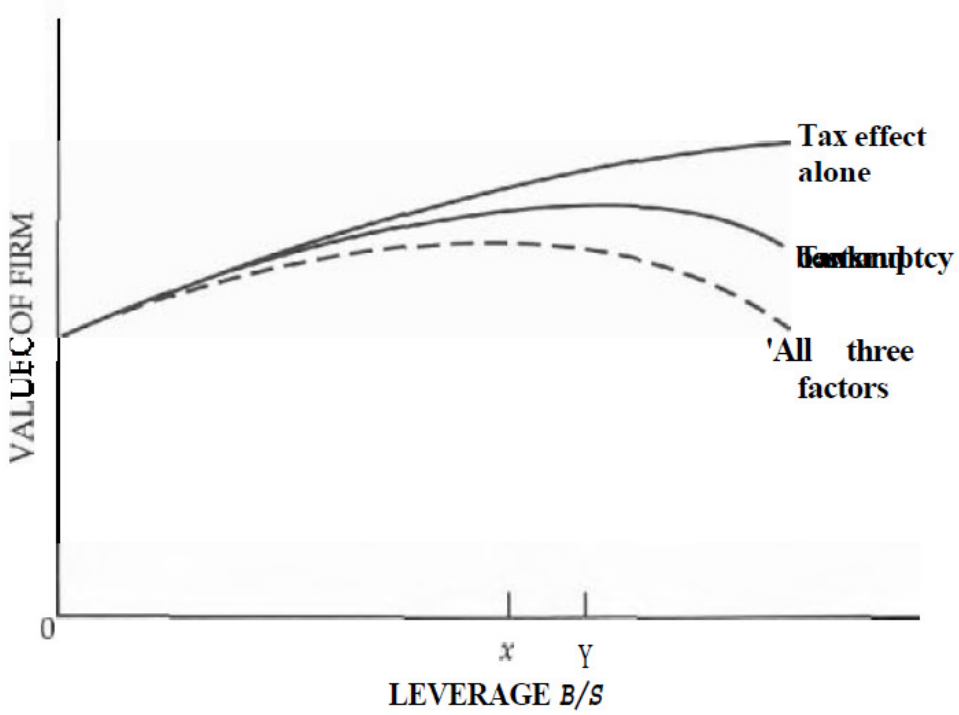
- The opportunity wealth loss caused by the impact of debt on the investment decisions of the firm;
- The monitoring and bonding expenditures by the debtholders and the owner manager;
- The bankruptcy and reorganization costs.

As Myers (2001) points out the potential conflicts arising between debt and equity investors "mean that the near threat of default can feedback into the firm's investment and operating decisions, for example, by deterring investments with a positive net present value or shifting the firm to riskier strategies.".

The important conclusion is that the costs associated with excessive debt overtake the strict bankruptcy and reorganization costs. This conclusion reinforces the rational for conservative debt ratios and is an important contribution to the Trade-Off theory.

Agency costs associated with excess debt will then have an impact on firm value. The situation can be illustrated in Figure 2. (Horne, 2002). This figure shows a third curve representing the value of the firm with the inclusion of Agency costs, where the optimal capital structure occurs for a lower debt ratio (without Agency costs, the point that maximizes the firm value is Y, now, taking in consideration the effect of the Agency costs, we perceive that the new optimal point that maximizes the firm value is X).

Figure 2. Agency Costs considered on the Trade-Off theory (source: Horne, 2002)



Jensen (1986) stresses the particularly importance of Agency costs when companies have high Free Cash-Flows, being this term defined as "cash-flow in excess of that required to fund all projects that have positive net present values when discounted at the relevant cost of capital". In these situations, the risk of managers to spend the available financial resources in less profitable projects or in organization inefficiencies substantial increases.

The replacement of equity for debt will reduce this risk for equity holders. Debt will impose limitations on managers actions. Jensen (1986) refers empirical evidence of stock market reactions which are positive for leverage increasing transactions and negative for leverage reducing transactions, which could be explained by the correspondent reduction

and increase of Agency costs.

Still, according to Jensen (1986), the trend for Leverage Buy-Outs (form now on abbreviated as LBO's) and Takeovers that occurred in the eighties could also be related to Agency costs associated with high Free Cash-Flow.

Desirable LBO's candidates are firms with stable and important Free Cash-Flows and are normally structured with high debt ratios, in which managers normally receive a significant percentage of the equity (15-20%). This reduces the possibility of inefficient allocation of capital by the managers and allows the alignment of the interests of shareholders and managers.

Free Cash-Flow can also be connected with takeovers since acquisitions are one way managers spend cash instead of paying it out to shareholders. For this reason the risk of investing in low profitable operations must be taken into account for acquirers with high Free Cash-Flows.

The important conclusion is that debt can induce a more efficient resource allocation in firms with high Free Cash-Flow.

3 THE GLOBAL FINANCIAL CRISIS AND THE SOVEREIGN DEBT CRISIS OF THE EURO AREA: IMPACT ON PORTUGUESE CORPORATIONS

The Global Financial Crisis 2007-2012 is generally considered the deepest financial crisis since the Great Depression. Having its origin in the subprime mortgages market in the United States, soon became a global financial crisis given the impact in the mortgage backed securities markets and derivatives markets where large financial institutions were heavily invested, causing a deep global recession in the period 2008-2012.

After Lehman Brothers filed for bankruptcy on the 15th of September 2008, the collapse of large financial institutions was avoided by the bailout of national governments but a deep international liquidity crisis emerged as a result of this financial institutions solvency crisis, affecting the normal operation of financial markets, including the interbank money market.

An important consequence of the Financial Crisis has been the Sovereign Debt Crisis in the Euro Area. The deep economic recession and the bailout of the financial system led European governments to increase public expenditure and public debt. Ultimately some European countries found it difficult or impossible to pay and/or refinance their Public Debt which in turn caused additional pressure on the solvency of European banks given the significative amounts of Euro area public debt they hold in their portfolios.

After Greece and Ireland, in May 2011 Portugal became the third Euro area country to have a rescue plan established by the European Union and the IMF. A rigorous austerity plan has been implemented.

The Crisis had a deep impact in the Portuguese economy. The public sector has been committed to meet demanding targets for the budget deficit through decrease in public expenditures and investment, and raising taxes. The economy faced a severe recession as data for annual GDP growth clearly expresses (Table 1), affecting individual incomes and the performance of companies. The deleverage of the high debt levels of individuals and companies became inevitable.

According to data from the “Central de Balanços” of the Bank of Portugal (Economic Bulletin May 2018) the leverage ratio (defined as Debt/ Debt + Equity) for

the whole companies incorporated in Portugal which was 70% in 2010 decreased 2,2% between 2010 and 2016. For the same period data from the statistical bulletin of the Bank of Portugal show a 15% decrease in debt of private corporations (1) This decrease has been particularly felt in micro (-21%) and small enterprises (-16%). Medium and large enterprises show a decrease of 11% [2] .In this period Portuguese firms had to face important bank credit restrictions as a consequence of the increased bankruptcy risk. On the other hand, it should be noted that given the economic downturn the demand for credit has also been substantially reduced. Table 1 has data for Fixed capital investment by non financial companies in this period showing a continuous decrease between 2008 and 2013 and recovery starting in 2014 up to 2017. Deleverage has been a natural consequence of the dynamics in the Offer and the Demand for Credit.

Table 1. Gross Fixed Capital Investment by non-financial companies and GDP Annual Growth Rate

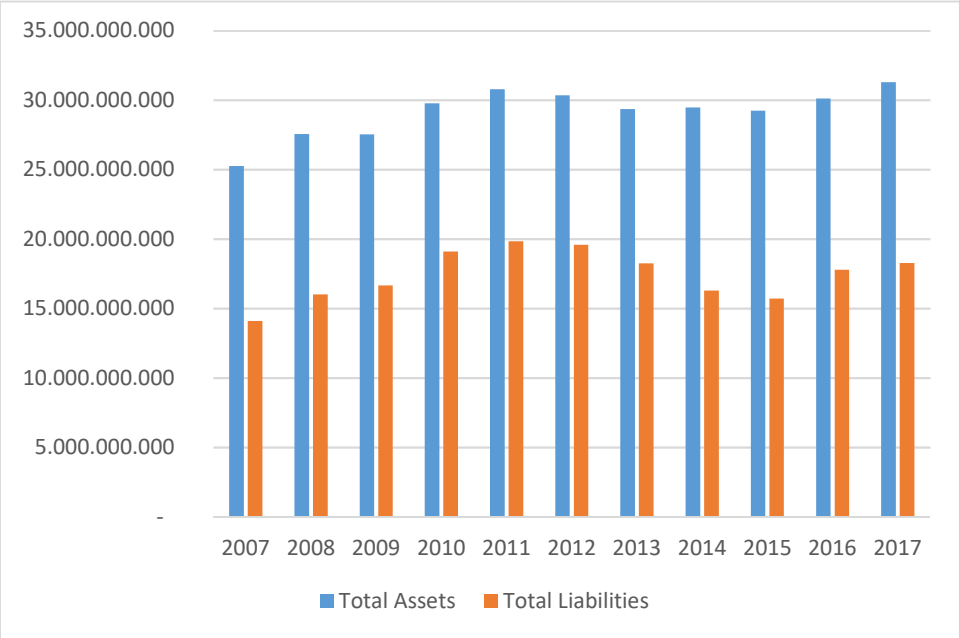
Economic Indicators / Years	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gross Fixed Capital Investment	22.230	23.110	20.405	18.457	18.040	15.687	15.189	16.760	18.312	19.377	21.437
GDP Annual Growth Rate	2,5%	0,2%	-3,0%	1,9%	-1,8%	-4,0%	-1,1%	0,9%	1,8%	1,9%	2,8%

Source: INE, values for GFCI expressed in Millions €

The aggregated values for the 435 firms that compose our sample (the sample is defined in chapter 5.2 – Sample Characterization) of medium and large sized companies in the Portuguese manufacturing sector (Figure 3) show a reduction in total liabilities of -7,4% between 2010 to 2016. The decrease has been particularly important in the years 2014 and 2015, where the minimum value for the period was reached. We can conclude that there was a clear lag between the beginning of the economic crisis and the reduction of aggregated debt for medium and large companies in the Portuguese manufacturing sector. Probably it was necessary to wait for higher net incomes in order to have a considerable reduction in the amounts of debt.

[2] Considers loans, securitized debt and commercial credit. It should be noted that the bankruptcy of many companies, particularly in the construction and building sector explains part of this decrease.

Figure 3. Total Assets and Total Liabilities for the sample of 435 companies



However, when we consider the average of total debt ratios of the 435 firms, we perceive that the deleveraged process gradually occurs from 2007 until 2017, although with a special incidence in the years 2012-2015 (see Table 2, pag.25). This is a good indicator to evaluate the impact of the financial crisis on the capital structure of the medium and large sized firms in the Portuguese manufacturing industry.

4 CAPITAL STRUCTURE RATIOS & DETERMINANTS

In this section, we will discuss the indicators that characterize the company's capital structure and the determinants that may explain it.

4.1 Capital Structure Ratios

The debt ratios will translate the degree of leverage that a company has.

In order to have a deep interpretation about the company's capital structure, not only an overall debt ratio - Total Debt ratio (for now on, abbreviated as TD) - should be considered, since important changes may occur in the different debt maturities(current debt and in the non-current/long-term debt) that are not reflected in the TD. As Hall (2000) showed, TD masks opposite effects of variations is STD and LTD.

So, we consider along with the Total Debt ratio, the Short-Term Debt ratio (for now on, abbreviated as STD), which will take in consideration the current liabilities and the Long-Term Debt ratio (for now on, abbreviated as LTD) which will take in consideration the non-current liabilities, following the works by Michaelas (1999), Vieira and Novo (2010), Proença (2012), Lemos (2017); Lisboa (2017).

TD, STD and LTD will be defined as follows:

$$TD = \frac{Total\ Liabilities}{Total\ Assets} \times 100 \quad \text{(iv)}$$

$$STD = \frac{Current\ Liabilities}{Total\ Assets} \times 100 \quad \text{(v)}$$

$$LTD = \frac{Non\ Current\ Liabilities}{Total\ Assets} \times 100 \quad \text{(vi)}$$

4.2 Explanatory Variables

Based on the explanatory theories of capital structure reviewed in chapter 2, several empirical studies tried to identify the main factors that influence capital structure. Since this is a continuous research project, the factors considered in the various empirical studies differ.

In our study, we consider the firms-specific factors that have been widely assumed in the following studies: Proença (2012); Muijs (2015); Lemos (2017) and whose rationale is discussed in section 4.3 of this chapter.

4.2.1 Size

Firm's size is defined as the natural logarithm of Total Assets, formulated as follows:

$$Size = Ln\ of\ Total\ Assets \tag{vii}$$

Size can be measured as the natural logarithm of annual turnover or the natural logarithm of total assets. We adopt the natural logarithm of total assets (Vieira and Novo, 2010; Proença, 2012; Alves and Francisco, 2013; Muijs, 2015)

4.2.2 Profitability

Return on assets has been the indicator widely used for profitability. In our study it is formulated as:

$$Return\ on\ Assets = \frac{Net\ Income}{Total\ Assets} \times 100 \tag{viii}$$

4.2.3 Growth

Growth rate of total assets and sales growth rate have been used in empirical research as indicator for growth. In our study, we followed Hall (2000) and Proença (2012), using the percentage increase of sales formulated as:

$$Growth = \frac{Sales(t) - Sales(t-1)}{Sales(t-1)} \times 100 \quad \text{(ix)}$$

4.2.4 Asset Structure

The firm's asset structure has been formulated as follows:

$$Asset\ Strucuture = \frac{Tangible\ Assets}{Total\ Assets} \times 100 \quad \text{(x)}$$

This formulation can be found in various recent empirical studies (e.g. Michaelas, 1999; Hall, 2000; Vieira e Novo, 2010; Proença, 2012; Lemos, 2017)

4.2.5 Non – Debt Tax Shield

Depreciations has been the indicator used for non-debt tax shield, formulated as follows:

$$Non - Debt\ Tax\ Shield = \frac{Depreciations}{Total\ Assets} \times 100 \quad \text{(xi)}$$

This proxy has been used in several empirical studies (e.g. Titman and Wessels, 1988; Michaelas, 1999; Proença, 2012; Lisboa, 2017; Lemos, 2017)

4.2.6 Liquidity

The amount of current liabilities covered by current assets has been the indicator used for liquidity, formulated as follows:

$$Liquidity = \frac{Currrent\ Assets}{Current\ Liabilities} \times 100 \quad \text{(xii)}$$

4.3 Hypotheses

4.3.1 Size:

Capital structure theories point to an influence of firm size on capital structure.

Large companies have a diversified business strategy enabling them to have more stable earnings, which leads to less cost of financial distress since these companies will be less susceptible to bankruptcy (Myers and Majluf, 1984)

Large companies have access to better credit solutions once debtholders perceive these companies as being less risky.

According to the Trade-Off theory, these effects will lead to a positive relation between size and debt.

This relation should be more evident for long-term debt given the higher transaction costs associated. Transaction costs of issuing short-term debt are considered to be lower. Titman and Wessels (1988) found a negative relationship between size and short-term debt.

According to Fama and French (2002), firm size can be used as proxy for volatility since bigger firms are associated with less volatility in earnings. To lower the chance of issuing new risky securities or foregoing profitable investments, firms with more volatile

net cash-flows are likely to have less leverage. This means that following the Pecking Order model, a positive relation between size and debt could also be found.

However, Rajan and Zingales (1995) predicted, following the assumptions of Pecking Order theory, a negative relationship between size and debt by arguing that a larger firm size due to the lower information asymmetry has a higher capacity to finance through equity, and therefore lowering their debt ratio.

In our study, we will test the following hypotheses considering total debt, short and long-term debt:

H1a: Positive relation between firm size and total debt

H1b: Positive relation between firm size and long-term debt

H1c: Negative relation between firm size and short-term debt

4.3.2 Profitability:

According to the Pecking Order theory, firms will prefer in a first instance to finance themselves through internal funds (Myers, 1984). As so, a more profitable firm will find important internal resources to finance their growth and investments meaning that they will tend to have less leverage. As so, according with this theory, a negative relationship should be found between profitability and leverage. Several empirical studies support this view.

Contrasting with the Pecking Order model, the Trade-Off theory supports the concept that a more profitable firm should have a higher degree of leverage. This relationship is sustained by the fact that higher profitable companies will have higher income taxes. As so, they will have an incentive to use debt finance, once it will allow them to reduce their fiscal burden (Fama and French, 2002; DeAngelo and Masulis, 1980).

In our study, we will test the following hypotheses considering total debt, short and long-term debt:

H2a: Negative relation between firm profitability and total debt

H2b: Negative relation between firm profitability and long-term debt

H2c: Negative relation between firm profitability and short-term debt

4.3.3 Growth:

In a first approach to the Pecking Order theory, there is a positive relation between investment and leverage. This relationship is supported by the fact that companies with high growth levels where investment exceeds retained earnings will need to issue debt.

However, in a more complex view of the model (Myers, 1984), where firms balance current and expected future financing costs, firms with large perspective investments will try to maintain low risk debt capacity to avoid losing future investment opportunities or the need to issue risky debt securities or equity. In this view, firms with larger investment perspectives will have less current leverage (Fama and French, 2002).

Considering the Trade-Off model, as growth can be related with lower bankruptcy costs and favourable conditions, a positive relationship could be present between growth and leverage (Ross, 1977).

In our study, we will test the following hypotheses considering total debt, short and long-term debt:

H3a: Positive relation between firm growth and total debt

H3b: Positive relation between firm growth and long-term debt

H3c: Positive relation between firm growth and short-term debt

4.3.4 Asset Structure:

According to Rajan and Zingales (1995), tangible assets are easy to collateralize. As so, creditors will give better finance conditions if the company uses this assets has collateral for the leverage.

Following the Trade-Off model, we should find a positive relationship between tangible assets and leverage given the improved credit risk and better accessibility to debt.

Myers (1984) refers to a relationship between company's assets and costs of financial distress. Specialized and intangible assets or growth opportunities are more likely to lose value in financial distress. Firms holding valuable intangible assets or growth opportunities tend to borrow less than firms with holding mostly tangible assets.

Recent research on capital structure suggests a positive relationship between tangible assets and long-term debt being the relationship between short-term debt and asset structure more controversial, once the short-term debt can be replaced by long-term debt because a higher Tangibles can induce a replacement of short-term debt by long-term debt Vieira and Novo (2010) and Proença (2012) found a negative relationship between tangible assets and STD.

In our study, we will test the following hypotheses considering total debt, short and long-term debt:

H4a: Positive relation between firm asset structure and total debt

H4b: Positive relation between firm asset structure and long-term debt

H4c: Negative relation between firm asset structure and short-term debt

4.3.5 Non-Debt Tax Shield:

Modigliani and Miller (1963) in their paper, stress the importance of taxes on the decision for the optimal capital structure, given the tax benefits associated to debt.

However, as DeAngelo and Masulis (1980) reflected, the incentive to use debt in order to reduce taxes, will be influenced by the existence of other tax deductible items as R&D and depreciations. As so, the larger the non-debt tax shield, the lower the incentive to issue debt translating a negative relationship.

In our study, we will test the following hypotheses considering total debt, short and long-term debt:

H5a: Negative relation between firm non-debt tax shield and total debt

H5b: Negative relation between firm non-debt tax shield and long-term debt

H5c: Negative relation between firm non-debt tax shield and short-term debt

4.3.6 Liquidity:

Liquidity is the capacity of the company to meet their short-term financial needs with the company current assets.

Following the Pecking Order theory, firms with a higher liquidity ratio should finance their needs with internal funds lowering this way their debt ratios. As so, a negative relation with leverage is expected to be found.

According to Ozkan (2001) the research evidence suggests that liquidity has negative impacts in debt ratios as expected through the theory stated above.

However, high liquidity ratios can be perceived by creditors as a lower default risk, according to the Trade-Off theory, a higher liquidity ratio could be related with higher debt ratios, namely with long-term debt.

In our study, we will test the following hypotheses considering total debt, short and long-term debt:

H5a: Negative relation between firm liquidity and total debt

H5b: Positive relation between firm liquidity and long-term debt

H5c: Negative relation between firm liquidity and short-term debt

5 METHODOLOGY & EMPIRICAL RESULTS

In this section, we will analyse the impact of the capital structure determinants in order to test the hypotheses elaborated.

Firstly, we will analyse the descriptive statistics of the whole sample in order to have a better understanding of its characteristics and dimensions.

Then, in a second phase, along with the analysis of the whole sample, we will consider two periods, defined as: *Pre-Crisis: 2007-2008*; *Crisis: 2009-2017.* Although the subprime crisis started in the near end of 2007, we consider that the effects on the Portuguese economy only have been felt after 2008. We should have in mind that the European sovereign debt crisis only showed up from 2009 onwards. This idea is supported by the data collected related with economic and financial system behaviour in Portugal along this period (Chapter 3).

A bivariate analysis, using the Pearson correlation coefficient, will be computed to have a framework of how is the relationship behaviour between the determinants with each debt ratio in the different defined periods.

Finally, an Ordinary Least Squares method is performed with our panel data to have an estimate of the unknown parameters of our multiple linear regression to confirm if the determinants set are good predictors of the considered debt ratios. We also intend with to understand the magnitude and significance level of each variable when predicting the debt ratios.

5.1 Methodology

In this study, we are interested in analysing the capital structure behaviour of the big and medium sized firm's of the Portuguese Manufacturing industry during the period from 2007-2017.

According with firm's size EU category, the following conditions were applied:

a) Portuguese active firms in the Manufacturing Industry along the period;

b) Having a minimum of 50 employees;

c) Having a minimum 10.000.000€ of sales or 10.000.000€ of total assets

Through *Sabi software database*, the above conditions criteria for medium and big size companies were applied for the whole sample years, obtaining the result of 457 companies meeting the criteria. However, we found in this group of companies that some of them had inconsistent values (outliers) for some ratios, and as so, there were 22 companies excluded from our sample. A homogeneous sample was what we were looking for, in order to obtain the most accurate results, ending with a sample size of 435 companies.

5.2 Sample Characterization

5.2.1 Descriptive Statistics of Debt ratios

For the considered period, is clear that deleverage of Portuguese manufacturing industry occurred, as we can see in Figure 4 accomplished with the data of Table 2.

The average value of the total debt ratio decreased in a systematic way, from 57,4% in 2007 to around 50,7% in 2017, reaching a minimum value of 50,3% in 2016.

Figure 4. Debt ratios average values

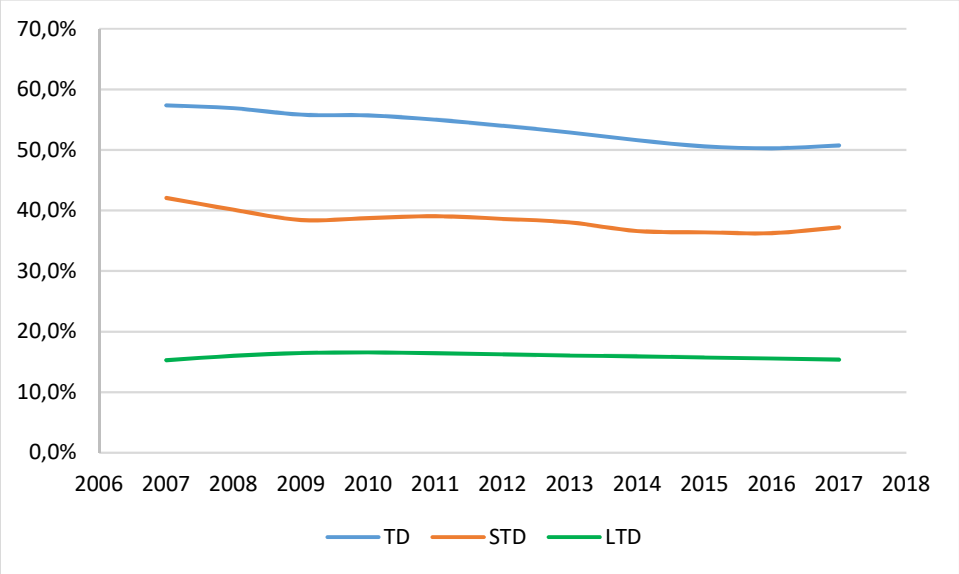


Table 2. Debt ratios average values

Debt Ratio / Years	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
TD	57,4%	56,9%	55,8%	55,7%	55,0%	54,0%	52,9%	51,6%	50,6%	50,3%	50,7%
STD	42,1%	40,1%	38,4%	38,7%	39,1%	38,6%	38,0%	36,6%	36,4%	36,3%	37,2%
LTD	15,3%	16,0%	16,5%	16,6%	16,4%	16,3%	16,1%	15,9%	15,7%	15,6%	15,4%

Concerning the debt structure, the data collected show that the variation on TD is mostly explained by a decrease in the average value of short-term debt from 42,1% in 2007 until 37,2% in 2017, reaching a minimum value of 36,3% in 2016. On the other hand, the average value of long-term debt remained stable even showing a slight upward trend from 2007 to 2010 and a slight negative one from 2010 onwards, with a maximum value of 16,6% and a minimum of 15,3%.

In Table 3 we have the descriptive statistics of the debt ratios for the period of 2007-2017. For 50% of the values are equal or below 36,5%. Finally, for LTD, the mean is 15,4% with a standard deviation of 14,7% and 50% of the values are equal or below 11,7%.

TD, the mean is 53,7% with a standard deviation of 19,6% and 50% of the values are equal or below 55,9%. For STD, the mean is 38,3% with a standard deviation of 17,7% and

Table 3. Descriptive Statistics for Debt Ratios for the whole sample

Debt Ratio/ Statistical data	Count	Mean	Median	Std. Deviation	Minimum	Maximum	Percentile	
							25	75
Total Debt Ratio	4.785	53,7%	55,9%	19,6%	3,0%	99,1%	39,6%	69,1%
Short Term Debt Ratio	4.785	38,3%	36,5%	17,7%	2,5%	99,1%	24,4%	50,5%
Long Term Debt Ratio	4.785	15,4%	11,7%	14,7%	0,0%	75,1%	2,8%	23,7%

5.2.2 Descriptive Statistics of Determinants

Some of the independent variables show important variations along the period. For instance ROA – Return on Assets has significative lower average values for the years 2008 up to 2013 (Table 4), reflecting the economic difficulties felt in the Crisis peak years, showing a recovery in the following years up to 2017.

In what concerns the variable Growth (Table 4), reflecting the deep economic instability, we have high dispersion average values along the period. Average Growth has been negative for the years of 2009 and 2014, having a peak values in 2007, 2010 and 2015.

Also the variable Liquidity shows lower average values for the years of 2010 up to 2013 and a significant improvement thereafter (Table 4).

The descriptive statistics values for the whole sample are expressed in table 5.

Table 4. Determinants average values

Determinants / Years	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Assets (LN)	17,2	17,2	17,2	17,3	17,3	17,3	17,3	17,3	17,3	17,4	17,4
ROA	4,7%	3,3%	3,3%	4,0%	3,1%	2,7%	3,3%	4,8%	5,3%	5,3%	5,4%
Growth	9,9%	8,8%	-8,6%	12,3%	6,8%	0,1%	7,7%	-2,9%	9,4%	1,5%	7,6%
Asset Structure	29,5%	29,9%	29,9%	28,9%	28,6%	29,1%	29,0%	29,0%	28,8%	29,4%	29,4%
NDTS	5,2%	5,2%	5,1%	4,6%	4,5%	4,4%	4,2%	4,2%	4,2%	4,2%	4,1%
Liquidity	177,3%	197,7%	207,9%	193,4%	192,7%	192,6%	199,7%	204,0%	212,9%	215,6%	210,3%

Table 5. Descriptive Statistics for Determinants for the whole sample

Determinant/ Statistical data	Count	Mean	Median	Std. Deviation	Minimum	Maximum	Percentile	
							25	75
Total Assets (LN)	4.785	17,3	17,1	0,9	14,9	22,6	16,6	17,8
Return On Assets (ROA)	4.785	4,1%	2,9%	7,2%	-81,6%	55,1%	0,5%	7,2%
Growth	4.785	4,8%	2,9%	37,9%	-82,6%	2221,9%	-6,0%	12,4%
Asset Structure	4.785	29,2%	26,7%	16,6%	0,3%	94,2%	16,7%	39,3%
Non-Debt Tax Shield	4.785	4,5%	3,9%	3,0%	0,0%	46,4%	2,4%	5,9%
Liquidity	4.785	200,4%	152,9%	179,5%	3,6%	3005,1%	109,8%	226,4%

5.3 Correlation

A correlation test will determine how is the statistic relationship between each determinant and the debt ratios in each period. So in table 6. we present the results obtained by running the Pearson correlation coefficients using *SPSS statistical software*.

Through the obtained coefficients, we conclude that moderate correlation has been found for Liquidity with TD and STD and for Profitability (ROA) with TD.

The other linear correlations are considered weak.

In the end, we can conclude that we did not find any strong correlations between each of the determinants and the dependent variables.

The Table 6 indicates the significance level for the correlation coefficients. Non significance statistical correlation has been found for Non-Debt Tax Shield when concerning the LTD. Growth has no statistical significance with STD and LTD for the Pre-Crisis period, however, when looking for the whole sample period, it gains statistical significance with STD. We also found that for the Pre-crisis period, Liquidity has no statistical significance in the LTD and Size has no statistical significance in TD.

The remaining relationships are at least statistically significant at a 5% level.

Table 6. Pearson Correlation Coefficients for the different periods

	Whole Period			Pre - Crisis			Crisis		
Bivariate Pearson Correlation	Total Debt Ratio	Short Term Debt Ratio	Long Term Debt Ratio	Total Debt Ratio	Short Term Debt Ratio	Long Term Debt Ratio	Total Debt Ratio	Short Term Debt Ratio	Long Term Debt Ratio
Size (log assets)	.067**	-.099**	.207**	-0,017	-.191**	.201**	.091**	-.073**	.210**
Return On Assets (ROA)	-.341**	-.136**	-.290**	-.481**	-.233**	-.321**	-.315**	-.117**	-.284**
Growth	.061**	.063**	0,005	.083*	0,035	0,061	.061**	.105**	-.045**
Asset Structure	.121**	-.095**	.275**	.138**	-.082*	.265**	.117**	-.099**	.277**
Non-Debt Tax Shield	-.044**	-.057**	0,010	-.084*	-.091**	0,002	-.046**	-.059**	0,009
Liquidity	-.571**	-.549**	-.098**	-.527**	-.574**	0,017	-.579**	-.545**	-.120**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

5.4 Multiple Linear Regression: Model and Discussion of Results

The estimation coefficients obtained with the regression model, allow us to observe the relationship between debt ratios and each determinant considered and discuss the hypothesis established.

We ran the whole sample values using *SPSS statistical software,* and we obtained the results summarized for the different periods in Table 7, 8 and 9. The multiple linear regression is formulated for the different debt ratios as follows:

$$Debt\ ratio_{it} = \beta_0 + \beta_1.Size_{it} + \beta_2.Profitability_{it} + \beta_3.Growth_{it} + \beta_4.Asset\ Structure_{it} + \beta_5.NDTS_{it} + \beta_6.Liquidity_{it} + \mu_{it} \quad \text{(xiii)}$$

Table 7. OLS method for the whole sample for the period 2007-2017

	Total Debt Ratio				Short-Term Debt Ratio				Long-Term Debt Ratio			
	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
(Constant)	52,246		12,748	0,000	102,037		26,921	0,000	-49,791		-13,999	0,000
Size (log assets)	1,038	0,050	4,454	0,000	-2,534	-0,135	-11,750	0,000	3,572	0,229	17,654	0,000
Return On Assets (ROA)	-0,716	-0,263	-22,947	0,000	-0,167	-0,068	-5,797	0,000	-0,549	-0,267	-20,264	0,000
Growth	0,030	0,059	5,236	0,000	0,025	0,054	4,685	0,000	0,005	0,013	1,041	0,298
Asset Structure	0,017	0,014	1,059	0,290	-0,263	-0,247	-18,269	0,000	0,280	0,315	20,689	0,000
Non-Debt Tax Shield	-0,570	-0,087	-6,778	0,000	0,047	0,008	0,599	0,549	-0,617	-0,125	-8,449	0,000
Liquidity	-0,058	-0,530	-45,713	0,000	-0,059	-0,600	-50,574	0,000	0,001	0,016	1,222	0,222
Count				4.785				4.785				4.785
F Statistic				541,499				484,268				209,967
Sig.				.000b				.000b				.000b
Adjusted R Square				0,404				0,377				0,208
R Square				0,405				0,378				0,209

Table 8. OLS method for the Pre-crisis period 2007-2008

	Total Debt Ratio				Short-Term Debt Ratio				Long-Term Debt Ratio			
	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
(Constant)	77,598		8,704	0,000	129,697		15,316	0,000	-52,100		-6,153	0,000
Size (log assets)	-0,190	-0,010	-0,373	0,709	-3,823	-0,205	-7,907	0,000	3,633	0,226	7,515	0,000
Return On Assets (ROA)	-1,103	-0,376	-14,233	0,000	-0,355	-0,128	-4,822	0,000	-0,748	-0,313	-10,163	0,000
Growth	0,018	0,075	2,929	0,003	0,009	0,039	1,505	0,133	0,009	0,047	1,579	0,115
Asset Structure	0,070	0,060	1,952	0,051	-0,245	-0,224	-7,200	0,000	0,315	0,334	9,257	0,000
Non-Debt Tax Shield	-0,925	-0,156	-5,169	0,000	-0,252	-0,045	-1,481	0,139	-0,673	-0,139	-3,961	0,000
Liquidity	-0,055	-0,444	-16,749	0,000	-0,069	-0,597	-22,363	0,000	0,015	0,147	4,732	0,000
Count				870				870				870
F Statistic				114,270				110,935				45,268
Sig.				.000b				.000b				.000b
Adjusted R Square				0,439				0,432				0,234
R Square				0,443				0,435				0,239

Table 9. OLS method for the Crisis period 2009-2017

	Total Debt Ratio				Short-Term Debt Ratio				Long-Term Debt Ratio			
	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
(Constant)	44,879		9,839	0,000	94,540		22,499	0,000	-49,662		-12,703	0,000
Size (log assets)	1,410	0,067	5,437	0,000	-2,171	-0,116	-9,086	0,000	3,581	0,231	16,108	0,000
Return On Assets (ROA)	-0,662	0,281	19,216	0,000	-0,151	-0,063	-4,814	0,000	-0,511	-0,257	-17,534	0,000
Growth	0,064	0,066	5,329	0,000	0,076	0,087	6,802	0,000	-0,011	-0,016	-1,094	0,274
Asset Structure	0,011	0,009	0,619	0,536	-0,264	-0,249	-16,687	0,000	0,274	0,313	18,658	0,000
Non-Debt Tax Shield	-0,560	-0,084	-5,907	0,000	0,076	0,013	0,870	0,384	-0,636	-0,128	-7,827	0,000
Liquidity	-0,057	-0,541	-42,187	0,000	-0,057	-0,596	-45,286	0,000	-0,001	-0,008	-0,545	0,586
Count				3.915				3.915				3.915
F Statistic				445,787				389,357				171,842
Sig.				.000b				.000b				.000b
Adjusted R Square				0,405				0,373				0,208
R Square				0,406				0,374				0,209

With the intention of verifying if the observed variations in the coefficients of the explanatory variables, within the periods, was statistically significant, we added to the formula xiii a dummy variable, getting the equation formulated in (xiv). The dummy variable was named as "Crisis" and it assumes the value of "0" for the Pre-crisis period and "1" for the Crisis period.

It was added to the multiple linear regression for the different debt ratios. The new formulation comes as:

$$\begin{aligned} Debt\ ratio_{it} = {} & \beta_0 + \beta_1.Size_{it} + \beta_2.Profitability_{it} + \beta_3.Growth_{it} \\ & + \beta_{4.}.Asset\ Structure_{it} + \beta_5.NDTS_{it} + \beta_6.Liquidity_{it} \\ & + \beta_{7}.Crisis_t + \beta_8.Crisis.Size_{it} + \beta_9.Crisis.Profitability_{it} \\ & + \beta_{10}.Crisis.Growth_{it} + \beta_{11}.Crisis.Asset\ Strucutre_{it} \\ & + \beta_{12}.Crisis.NDTS_{it} + \beta_{13}.Crisis.Liquidity_{it} + \mu_{it} \end{aligned} \quad \text{(xiv)}$$

According with Gujarati (2004), we apply the F test as follows in equation (xv) test was performed before analysing the model with the dummy variable. This test allows us to interpret if there was a statistical significant structural change in the considered model between the Pre-crisis and the Crisis period.

$$F = \frac{(R^2_{UR} - R^2_R)/m}{(1-R^2_{UR})/(n-k)} \sim F\ (m,\ n\text{-}k) \qquad \text{(xv)}$$

Where:

- R^2= Determination Coefficient
- UR= Unrestricted
- R = Restricted
- n = Number of Observations
- m = Number of Linear Restrictions
- k = Number of Parameters in the Unrestricted Regression

We performed the F test and the results for the three debt ratios were that the observed F statistic (TD=14,029; STD=12,271; LTD=5,209) was higher than the critical value with 95% of confidence (equal to all ratios=2,02), meaning that the null hypothesis ($H0: \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = \beta_{13} = 0$) is rejected, meaning, we have a statistical significant structural change within the two periods.

In the next section, we will discuss the found result in the table 7, 8, 9 and 10.

Table 10. OLS method for the whole sample for the period 2007-2017 with "Crisis" variable (Dummy variable; Crisis=0, 2007-2008; Crisis=1, 2009-2017)

	Total Debt Ratio				Short-Term Debt Ratio				Long-Term Debt Ratio			
	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
(Constant)	77,598		8,281	0,000	129,697		14,946	0,000	-52,100		-6,369	0,000
Size (log assets)	-0,190	-0,009	-0,355	0,722	-3,823	-0,204	-7,716	0,000	3,633	0,233	7,778	0,000
Return On Assets (ROA)	-1,103	-0,405	-13,540	0,000	-0,355	-0,144	-4,706	0,000	-0,748	-0,365	-10,519	0,000
Growth	0,018	0,035	2,786	0,005	0,009	0,019	1,468	0,142	0,009	0,024	1,634	0,102
Asset Structure	0,070	0,059	1,857	0,063	-0,245	-0,229	-7,026	0,000	0,315	0,354	9,581	0,000
Non-Debt Tax Shield	-0,925	-0,142	-4,917	0,000	-0,252	-0,043	-1,446	0,148	-0,673	-0,137	-4,100	0,000
Liquidity	-0,055	-0,502	-15,934	0,000	-0,069	-0,703	-21,824	0,000	0,015	0,179	4,898	0,000
Crisis	-32,719	-0,645	-3,146	0,002	-35,157	-0,766	-3,650	0,000	2,438	0,064	0,268	0,788
Crisis.Size	1,600	0,551	2,697	0,007	1,652	0,628	3,006	0,003	-0,051	-0,023	-0,099	0,921
Crisis.ROA	0,441	0,154	5,003	0,000	0,204	0,079	2,501	0,012	0,237	0,110	3,078	0,002
Crisis.Growth	0,046	0,043	3,374	0,001	0,067	0,069	5,283	0,000	-0,021	-0,026	-1,739	0,082
Crisis.Asset_Structure	-0,059	-0,057	-1,436	0,151	-0,019	-0,020	-0,490	0,624	-0,041	-0,052	-1,126	0,260
Crisis.NDTS	0,365	0,059	1,735	0,083	0,328	0,058	1,684	0,092	0,037	0,008	0,201	0,840
Crisis.Liquidity	-0,003	-0,026	-0,762	0,446	0,012	0,130	3,660	0,000	-0,015	-0,192	-4,756	0,000
Count				4.785				4.785				4.785
F Statistic				262,065				233,656				100,639
Sig.				0				0				0
Adjusted R Square				0,415				0,387				0,213
R Square				0,417				0,389				0,215

5.5 Discussion of Results

In this section we will discuss the obtained results taking in consideration each explanatory variable. Tables 7,8 and 9 will be used to take conclusions and to test the hypotheses described in Chapter 4.3. In general we consider the minimum 95% of confidence for our results to be statistical significant.

Table 10 will allows us, once we already proved that there was statistical significant differences between the Pre-Crisis and the Crisis period, with the F test performed in section 5.5, to say with statistical support if there was a significant variance between the two periods for each of the considered determinants.

From the signal of the coefficient β_7, taken from table 10, we can conclude the behaviour of debt ratios in the Crisis period, in other words, its possible to prove with statistical significance if we observe a deleverage effect in the Crisis period. In what concerns the TD, we observe with statistical significance that effectively there was a deleverage in the Crisis period (stand. β_7: TD =-0,64; P-value =0,00). To observe the behaviour of the different debt maturity ratios, we will also take conclusions for these ratios. We conclude there was deleverage in STD (stand. β_7: STD =-0,77, P-value =0,00). However, when analysing the results for LTD (stand. β_7: LTD =+0,06, P-value =0,79) we found that there is not a statistical significant difference between the Pre-crisis and the Crisis period, meaning there was not a relevant difference in terms of LTD between the two mentioned periods. Although, we still may find meaningful differences in what concerns the relationship behaviour between the explanatory variables and the LTD between these periods.

Table 11 sums up the expected results when we formulated the hypotheses according with the theory and the results that we got in our empirical test for the whole period.

Table 11. Expected relationship vs. Obtained relationship between the debt ratios and the explanatory variable/determinants for the period 2007-2017

Variable	Expected Sign (Hypotheses)			Obtained Sign (Econometric regression)		
	TD	STD	LTD	TD	STD	LTD
Size	+	-	+	+	-	+
Profitability	-	-	-	-	-	-
Growth	+	+	+	+	+	NS
Asset Structure	+	-	+	NS	-	+
Non-Debt Tax Shield	-	-	-	-	NS	-
Liquidity	-	-	+	-	-	NS

NS = No Significant Statistical Level

Table 12 sums up the results found when comparing the Pre-crisis and the Crisis period for each of the considered determinants.

Table 12. Results for Pre-crisis vs. Crisis period

Variable	Relationship in the Pre-crisis period (Table 8)			Relationship in the Crisis period (Table 9)			Statistical significant changes between the two periods (Table 10)		
	TD	STD	LTD	TD	STD	LTD	TD	STD	LTD
Size	NS	-	+	+	-	+	S	S	NS
Profitability	-	-	-	-	-	-	S	S	S
Growth	+	NS	NS	+	+	NS	S	S	NS
Asset Structure	NS	-	+	NS	-	+	NS	NS	NS
Non-Debt Tax Shield	-	NS	-	-	NS	-	NS	NS	NS
Liquidity	-	-	+	-	-	NS	NS	S	S

S = Significant Statistical Level

NS = No Significant Statistical Level

5.5.1 Size

DATA 2007-2017

In what concerns firm size, when estimating the standardized β coefficients, we found a meaningful positive relationship with LTD (table 7: stand.β =+0,229; P-value =0) and a weaker and negative relationship with STD (table 7: stand.β =-0,135; P-value =0) validating the Hypotheses H1b and H1c. In terms of TD, we found a much lower explanatory level (table 7: stand.β =+0,05; P-value =0) that can be explained by the opposite behaviour in what concerns the relationship between LTD and STD, which results in only marginal effects in TD, despite validating the Hypothesis H1a.

The results for LTD and STD are in line with the findings of several empirical studies, namely Titman and Wessels (1988), Vieira and Novo (2010), Proença (2012) and Muijs (2015).

An important finding is that it seems to be clear that bigger firms have an easier access to long-term debt. We can also infer that firms show a preference for long-term rather than short-term debt. Smaller firms having a more difficult access to long-term debt, are compelled to use short-term debt.

Another insight that we can draw from the estimation is that size has not a strong explanatory capacity in determining TD. According to the Trade-Off theory, given the characteristics of bigger firms – more stable earnings leading to less cost of financial distress – we would expect that size would have a stronger explanatory level when determining TD.

However, what seems to happen is that bigger firms, having the capacity to issue long-term, will have a different debt structure, but not necessarily higher TD.

Pre-crisis vs. Crisis period

Analysing the results for the two time periods, the TD, the unstandardized β coefficient for the Pre-crisis period (table 10: unstand.β=-0,19, P-value =0,72) and for the Crisis (table 10: unstand.β =+1,41, P-value =0,01). These results show that despite Size does not have statistical significance in explaining TD in the Pre-crisis period, we found there is statistical differences within the two periods. In the Crisis period it gains a meaningful statistical significance, having a positive relationship in explaining TD: table 8 – pre-crisis (TD: unstand.β =-0,19, P-value =0,71) and 9 - crisis (TD: stand.β =+1,41, P-value =0,00) . We can conclude that, in the Crisis period, there is a positive relationship between Size and TD.

In the Crisis period, for the unstandardized β coefficient for STD (table 10: unstand.β =-2,17, P-value =0,00) and for the Pre-crisis period (table 10: unstand.β =-3,82, P-value =0,00), we notice that the difference between the two periods was statistically significant, being the impact of Size on explaining STD higher in the Pre-crisis period. We also complement by analysing table 8 – pre-crisis (STD: unstand.β =-3,82, P-value =0,00) and 9 - crisis (STD: unstand.β =-2,17, P-value =0,00) which show us that the

explanatory variable is significant and negatively related in both periods.

In terms of LTD, for the unstandardized β coefficient, in the Crisis period (table 10: unstand.β =+3,58, P-value =0,92), we found that there was not a statistical significant change in Size explaining LTD when relating to the Pre-crisis period (table 10: unstand.β =+3,63, P-value =0,00), this is, the crisis effect did not change the relationship between Size and LTD. Although that, we found by analysing table 8 – pre-crisis, results (LTD: unstand.β =+3,58, P-value =0,00) and 9 - crisis (LTD: unstand.β =+3,63, P-value =0,00) which show us that the explanatory variable is significant in both periods, despite not having significant differences from one period to another.

We conclude for the Crisis period, Size became significant positively related with TD and less negatively related with STD. Concerning LTD, Size is positively related without major differences for the Pre-crisis period. One possible explanation for the relationship between Size and STD in the Crisis period is that short-term financing needs have been relatively higher in the Crisis years even for bigger firms.

5.5.2 Profitability

DATA 2007-2017

The considered ratio, ROA, has a negative relationship for all analysed periods when predicting the debt ratios. This finding is consistent with our Hypotheses H2a, H2b and H2c, clearly supporting the Pecking Order theory, which states that a more profitable firm will find important internal resources to meet its financial needs and will tend to have less leverage.

These results are consistent with most of the empirical studies developed (Vieira and Novo, 2010; Proença, 2012; Muijs, 2015; Lemos, 2017; Lisboa, 2017)

The coefficients are far more important explaining TD (table 7: stand.β = -0,263, P-value =0,00) and LTD (table 7: stand.β = -0,267, P-value =0,00) rather than STD (table 7: stand.β = -0,068, P-value =0,00). One possible explanation is that the retained profits are being used to finance internally capital needs related with investment while STD is better explained by the firm operative dynamics.

Pre-crisis vs. Crisis period

Table 10 shows the results for the two time periods.

For TD, in the Pre-crisis period, the unstand.β=-1,10 and the P-value =0,00 and for the Crisis period unstand.β =-0,66, P-value =0,00. These results are complement by analysing table 8 – pre-crisis (TD: unstand.β =-1,10, P-value =0,00) and 9 - crisis (TD: unstand.β =-0,66, P-value =0,00) which show us that the explanatory variable is significant and negatively related in both periods.

For STD, in the Pre-crisis period, the unstand.β =-0,36, P-value =0,00 and for the Crisis period unstand.β =-0,15, P-value =0,01. These results are complemented by analysing table 8 – pre-crisis (STD: unstand.β =-0,36, P-value =0,00) and 9 - crisis (STD: unstand.β =-0,15, P-value =0,00) which show us that the explanatory variable is significant and negatively related in both periods.

For LTD, in the Pre-crisis period, the unstand.β =-0,75, P-value =0,00 and for the Crisis period unstand.β =-0,51, P-value =0,00. These results are complemented by analysing table 8 – pre-crisis (LTD: unstand.β =-0,75, P-value =0,00) and 9 - crisis (LTD: unstand.β =-0,51, P-value =0,00) which show us that the explanatory variable is significant and negatively related in both periods.

It is relevant to notice that the difference between the two periods was statistically significant, being the impact of Profitability on explaining TD, LTD and STD negatively higher in the Pre-crisis period.

We conclude that, in the Crisis period, firms Profitability does have less negative impact in the TD, STD and LTD when compared with the Pre-crisis period.

These results are certainly related with the increasing financing needs that firms faced along the Crisis period.

5.5.3 Growth

DATA 2007-2017

The independent variable sales growth shows a positive meaningful relationship with TD (table 7: stand.β = +0,06, P-value =0,00) and STD (table 7: stand.β = +0,05, P-value =0,00) confirming the Hypothesis H3a and H3c.

Concerning LTD, our results shows that Growth has no statistical significant relationship with LTD for the total period 2007-2017 (table 7: stand.β = +0,01, P-value =0,30) neither for the Pre-crisis years (table 8: stand.β = +0,01, P-value =0,12) neither for the Crisis period (table 9: stand.β = -0,01, P-value =0,27). Along with this conclusion, we can clarify that the determinant has no statistical impact and as so, we have to refuse the H3b, in other words, we could not prove that there is a positive relation between firm growth and long-term debt.

These inconclusive results for LTD have also been found in the studies of Vieira and Novo (2010), Muijs (2015), Lisboa (2017). The positive results for STD have also been found in the studies by Muijs (2015), Lisboa (2017).

Pre-crisis vs. Crisis period

When comparing the two time periods, the unstandardized β coefficient for TD for the Pre-crisis period is: unstand.β=+0,01, P-value =0,01 (table 10) and for the Crisis period: unstand.β =+0,06, P-value =0,00 (table 10). These results show that Growth has statistical significant differences in explaining TD when comparing both periods. We also complement by analysing table 8 – pre-crisis (TD: unstand.β =+0,01, P-value =0,00) and 9 - crisis (STD: unstand.β =+0,06, P-value =0,00) which show us that the explanatory variable is significant and positively related in both periods. We conclude that, in the Crisis period, firms Growth will have more impact in the TD when compared with the Pre-crisis period.

In the Pre-crisis period, the coefficient for STD is unstand.β =+0,01, P-value =0,14 (table 10) and for the Crisis period is unstand.β =+0,08, P-value =0,00 (table 10). We notice that the difference between the two periods was statistically significant, being the impact of Growth on explaining STD positive in the Crisis period (it was not statistical

significant in the Pre-crisis period). We also complement by analysing table 8 – pre-crisis (STD: unstand.β =+0,01, P-value =0,13) and 9 - crisis (STD: unstand.β =+0,08, P-value =0,00) which show us that the explanatory variable is significant and positive related only in the Crisis period.

In terms of LTD, in the Pre-crisis period unstand.β =+0,01, P-value =0,10 (table 10), we found that there was not a statistical significant change in Growth explaining LTD when comparing the Pre-crisis and the Crisis period (table 10: unstand.β =-0,01, P-value =0,08), this is, the crisis effect did not change the relationship between Growth and LTD. Moreover has we have seen before, Growth is not statistical significant relating with LTD for any of the considered periods.

The conclusion seems to be that sales growth is related with increased needs of short-term finance, affecting the STD and TD. The found results for LTD do not allow us to verify the proposition stated by Ross (1977) that high levels of growth being associated with reduced bankruptcy risk would lead to more favourable credit conditions and consequently higher debt levels associated with investment.

5.5.4 Asset Structure

DATA 2007-2017

Results point to a meaningful relationship with LTD (table 7: stand.β =+0,315, P-value =0,00) and STD (table 7: stand.β = -0,247, P-value =0,00) confirming the Hypotheses H4b and H4c. Our conclusion is that the tangibility of assets is an important explanatory determinant for LTD and it can induce a replacement of STD for LTD. These results are consistent with the findings of Vieira and Novo (2010) and Proença (2012).

In what concerns the TD, we found that Asset Structure has no significance in predicting it (table 7: P-value =0,29). Along with this conclusion, we can clarify that the determinant has no statistical impact and as so, we have to refuse the H4a, in other words, we did not prove that there is a positive relation between firm Asset Structure and total debt.

Pre-crisis vs. Crisis period

We did not find relevant differences between values for Pre-crisis and Crisis years as we can conclude from the coefficient of Crisis.Asset Structure in table 10 (TD: P- value =0,15; STD: P-value =0,62; LTD: P-value =0,26). Asset Structure is statistical insignificant with TD in the Pre-crisis period (table 8: unstand.β=+0,07, P-value = 0,05) and in the Crisis period (table 9: unstand.β=+0,01, P-value = 0,53).

In what concerns the relationship between Asset Structure with LTD and STD, the relationships remain statistical significant in both periods, being LTD positively related (table 8: unstand.β=+0,32, P-value = 0,00; table 9: unstand.β=+0,27, P-value = 0,00) and STD negatively related (table 8: unstand.β=-0,25, P-value = 0,00; table 9: unstand.β=-0,26, P-value = 0,00). Other studies (Muijs, 2015) found a relationship between Asset Structure and the Crisis period (before the crisis, tangibility does not influence LTD and that changes during the crisis and the opposite happens with the STD).

Our results clearly point that, in Portugal, banks are prepared to provide Long-Term Credit to companies, using important tangible assets as collateral. As that already happened before the crisis, the crisis did not induce a major change in this credit policy.

5.5.5 Non-Debt Tax Shield

DATA 2007-2017

The estimated standardized β coefficients allow us to conclude that Non-Debt Tax Shield has a relevant negative impact in TD (table 7: stand.β =-0,087, P-value =0,00) and LTD (table 7: stand.β =-0,125, P-value =0,00). However, the results for STD show that the variable has no statistical significance in predicting the ratio level (table 7: P-value = 0,55). This means that the Hypotheses H5a and H5b are accepted and the Hypothesis H5c is not validated

Pre-crisis vs. Crisis period

We did not find relevant differences between values for Pre-crisis and Crisis years

as we can conclude from the coefficient of Crisis.NDTS in table 10 (TD: P- value =0,08; STD: P-value =0,09; LTD: P-value =0,08).

In what concerns the relationship between NDTS with TD and LTD, the relationship is statistical significant being negatively related with TD in both periods (table 8: unstand.β=-0,93, P-value = 0,00; table 9: unstand.β=-0,56, P-value = 0,00) and with LTD (table 8: unstand.β=-0,67, P-value = 0,00; table 9: unstand.β=-0,64, P-value = 0,00). The relationship with STD is insignificant in both periods (table 8: unstand.β=-0,25, P-value = 0,14; table 9: unstand.β=-0,08, P-value = 0,38).

The negative relationship between Non Debt Tax Shield and LTD is consistent with findings in several empirical studies (e.g. Michaelas, 1999; Proença, 2012).

The results are compatible with the arguments of the Trade-Off theory that companies with high Non-Debt Tax Shields have less incentive to use debt.

5.5.6 Liquidity

DATA 2007-2017

When approaching the Liquidity obtained values, we found a negative relationship with TD (table 7: stand.β =-0,53, P-value =0,00) and STD (table 7: stand.β =-0,60, P-value =0,00), and statistical insignificance with LTD (table 7: stand.β =+0,02, P-value =0,22), validating the hypotheses H5a and H5c, and reject H5b.

It should be highlighted that the coefficients found represent an important explanatory level for TD (stand.β = -0,53) and STD (stand.β = -0,60).

These results clearly confirm our Hypothesis H5a and H5c and both are consistent with the Pecking Order theory for the TD and STD.

Pre-crisis vs. Crisis period

When comparing the two time periods, concerning the relationship of Liquidity with TD, we did not find relevant differences between values for Pre-crisis and Crisis years as we can conclude from the coefficient of Crisis.Liquidity in table 10 (table 10: unstand.β=-0,06, P-value =0,45). We also complement by analysing table 8 – pre-crisis

(TD: unstand.β =-0,06, P-value =0,00) and 9 - crisis (TD: unstand.β =-0,06, P-value =0,00) which show us that the explanatory variable is significant and negatively related in both periods.

In what concerns STD, we found relevant differences between values for the Pre-crisis and Crisis years as we can conclude from the coefficient of Crisis.Liquidity (table 10: unstand.β =-0,06, P-value =0,00), being the impact of Liquidity on explaining STD negatively higher in the Pre-crisis period. We also complement by analysing table 8 – pre-crisis (STD: unstand.β =-0,07, P-value =0,00) and table 9 - crisis (STD: unstand.β =-0,06, P-value =0,00) that the explanatory variable is significant and negatively related in both periods.

In terms of LTD, we also found relevant differences between values for the Pre-crisis and Crisis years as we can conclude form the coefficient Crisis.Liquidity (table 10: unstand.β =-0,01, P-value =0,00), meaning the crisis effect changed the relationship between Liquidity and LTD. Although that, we found by analysing table 8 – pre-crisis (LTD: unstand.β =+0,02, P-value =0,00) and table 9 - crisis (LTD: unstand.β =-0,01, P-value =0,59) that the explanatory variable is significant only in the Pre-crisis period.

Somehow, this could mean that given the strong deleveraged occurred in the Crisis period, current assets have been used to reduce long-term debt. The lower levels of investment during the Crisis period could also explain the lack of significant relationship between Liquidity and long-term debt.

6 CONCLUSIONS

The period analysed has been characterized by a relevant reduction of debt ratios, namely the TD and STD as a result of increased perceived risk, a significant decrease in the offer of credit and also a considerable reduction in credit demand given the weak performance of the economy.

Even in this period of important deleverage, the determinants considered in this study maintain a considerable explanatory degree of capital structure in the Portuguese manufacturing industry.

We found crucial the definition and separation of the TD between STD and LTD. This consideration allowed us to draw most interesting conclusions on how the determinants selected, influence each type of debt and the structure of debt.

Size, Profitability, Asset Structure, and Non-Debt Tax Shield are important in explaining LTD while Size, Asset Structure and Liquidity are important to explain STD. Finally, TD is mostly explained by Profitability and Liquidity.

In our study, we differentiated two periods, one for the years 2007-2008 where the effects of the crisis were still not very evident and the period 2009-2017 during which the effects were deeply felt in the Portuguese manufacturing industry.

The regression models for these periods show a slightly higher explanatory prediction level (R^2 and Adjusted R^2) for the years 2007-2008 when compared with the Crisis period pointing to other explanatory determinants in this latter period.

When comparing the estimated β coefficients and the correspondent P-values for these two periods, we found the most significant differences for the variable Size, when explaining the STD and TD, and for the variable Profitability when explaining all the three debt ratios considered. These differences can be related to the increasing financing needs that companies faced along the Crisis period.

The variable Growth shows significant differences in the Crisis period when explaining TD and STD. The conclusion seems to be that sales Growth requires additional needs of Short-term finance in the Crisis period, affecting STD and consequently TD.

The explanatory variable Liquidity when explaining LTD is statistically relevant

for the Pre-crisis period and not relevant for the Crisis period. These findings can be related with the lower investment along this period and the use of current assets to reduce long-term debt.

It is also interesting to note that the estimated β coefficients of the other explanatory variables do not show deep differences. For future research, it would be interesting to analyse other determinants that may explain the behaviour of debt ratios along the Crisis period.

Concerning the two main explanatory theories of capital structure – Pecking Order and Trade-Off - our study presents results, which are more consistent with the arguments defended by the Pecking Order theory.

The variables Size, Profitability and Liquidity present results consistent with the Pecking Order theory. On the other hand, the variables Size and Asset Structure do not show a strong explanatory level for the TD, which should in fact happen according to the Trade-Off theory. Only the values obtained for the Non-Debt Tax Shield are consistent with the Trade-Off theory.

A final comment on the importance of the variables Size and Profitability. Size is a very important variable explaining debt structure of firms since it favours long-term debt. Profitability is a very important variable explaining the TD of firms. These are key aspects that should be addressed in order to improve significantly both the structure of debt and the levels of the leverage ratios of the Portuguese firms.

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8 ANNEXES

Annex 1: Sabi database software sample extraction taking in consideration the criteria for Medium and Large companies for the years from 2007-2017

Product name	**Sabi**	
Update number	**229**	
Software version	**79.00**	
Data update	**03/09/2018 (n° 2290)**	
Username	**Universidade do porto-10052**	
Export date	**08/09/2018**	
Cut off date	**31/03**	
1.	**Country/Region in country: Portugal**	**658.176**
2.	**NACE Rev. 2 (Primary codes only): 10 - Manufacture of food products, 11 - Manufacture of beverages, 12 - Manufacture of tobacco products, 13 - Manufacture of textiles, 14 - Manufacture of wearing apparel, 15 - Manufacture of leather and related products, 16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials, 17 - Manufacture of paper and paper products, 18 - Printing and reproduction of recorded media, 19 - Manufacture of coke and refined petroleum products, 20 - Manufacture of chemicals and chemical products, 21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations, 22 - Manufacture of rubber and plastic products, 23 - Manufacture of other non-metallic mineral products, 24 - Manufacture of basic metals, 25 - Manufacture of fabricated metal products, except machinery and equipment, 26 - Manufacture of computer, electronic and optical products, 27 - Manufacture of electrical equipment, 28 - Manufacture of machinery and equipment nec, 29 - Manufacture of motor vehicles, trailers and semi-trailers, 30 - Manufacture of other transport equipment, 31 - Manufacture of furniture, 32 - Other manufacturing**	**61.711**
3.	**Portuguese status: Activa**	**367.482**
4.	**Number of employees: 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006, for all the selected periods, min=50, max=250**	**1.637**
5.	**Sales (th EUR): 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006, for all the selected periods, min=10.000, max=50.000**	**767**
6.	**Number of employees: 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006, for all the selected periods, min=50**	**2.325**
7.	**Sales (th EUR): 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006, for at least one of the selected periods, min=10.000**	**7.504**
8.	**Sales (th EUR): 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006, for all the selected periods, min=10.000**	**1.434**
9.	**Total assets (th EUR): 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006, for all the selected periods, min=10.000**	**2.239**
	Boolean search : 1 And 2 And 3 And 6 And (8 Or 9)	
	TOTAL	**457**

Annex 2: F test calculation according to Gujarati (calculated from the formula (xv))

	R2 (Determination Coefficient)		
	TD	STD	LTD
Total without dummies (table 7) - Restricted	0,405	0,378	0,209
Total with dummies (table 8) - Unrestricted	0,417	0,389	0,215
(R2(UR) - R2(R)) / m	0,001714	0,001571	0,0008571
(1-R2(UR)) / (n-k)	0,000122	0,000128	0,0001645
F Statistic	14,02891	12,27052	5,2094631
m			7
n			4.785
k			14

- F critical (7; 4771) = 2,02 according to the statistical tables for F distribution