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RESUMO/ABSTRACT

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Keywords: capital structure, financing policy, financial crises

JEL: G01, G32

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The determinants of capital structure of Portuguese firms¹

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February 04, 2016

Abstract

This paper investigates the determinants of capital structure based on a sample of 2,804 non-financial Portuguese firms, from 2000 to 2009. A standard capital structure model is estimated controlling for firm-specific and market factors commonly used in the literature. The model is further estimated for sub samples of firms based on size, growth opportunities and leverage, as well as for the time periods before and during the international financial crisis. The result show that firms' capital structure decision seems to conform more with the pecking order theory, rather than with the tradeoff theory. This is also true for different groups of firms based on size, growth opportunities and leverage. Finally, the results suggest that firms have adjusted their leverage as the international 2008 crisis begun.

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1. Introduction

Since Modigliani and Miller (1958) that corporate leverage decisions have been widely studied. Nowadays, the financial and economic crisis has highlighted even more the importance of these decisions at a micro level, through the effect on firm value, and at a macro level, through the effect on the economy. One of the main debates over the capital structure decision relies on its determinants. Our primary aim is to investigate the determinants of non-financial firms' capital structure using a cross section and time-series variation in a sample of 2,804 Portuguese firms, spanning 19 sectors, from 2000 until 2009.

Our contribution relies on the data set and on the methodology we use to examine the determinants of firms' capital structure. We use recent data from Portuguese firms, which allows us to consider in our analysis the periods before and after the beginning of the current financial crisis. Portugal is an interesting case study since in 2011 it received a bailout from the IMF, the European Central Bank and the European Commission, and therefore our sample covers some part of the period where the financial constraints of Portuguese firms were particularly important. In addition, we not only investigate the determinants of leverage for a full sample of Portuguese firms but we also conduct this analysis for sub samples of firms based on some of their specific characteristics.

Two competing theories contribute to the debate of firms' leverage decisions: the pecking order and the tradeoff theory. Myers (1984) proposed the pecking order theory in which there is a financing hierarchy of retained earnings, debt and then equity. Alternatively, according to the tradeoff theory of capital structure the firms' choice of leverage is a tradeoff between the benefits and the costs of debt. A major benefit of debt may come from the tax advantage of interest deductibility (Kraus and Litzenberger

(1973)) but it also includes the mitigation of agency problems since debt has the disciplining role due to the associated reduction in free cash flow (Jensen (1986)). On the other hand, the costs of debt include the direct bankruptcy costs (Warner (1977) and Weiss (1990)), as well as indirect costs such as debt overhang (Myers (1977)), asset substitution (Jensen and Meckling (1976)) and asset fires (Schleifer and Vishny (1992)). The tradeoff theory predicts that the net benefits of debt rise for low leverage firms but decrease as leverage becomes high, implying that the net benefits are a nonlinear function of leverage.

We borrow from the empirical corporate finance literature on non-financial firms that has explored the determinants of capital structure of non-financial firms, from Titman and Wessels (1998) to Harris and Raviv (1991), Rajan and Zingales (1995), Frank and Goyal (2009) and Korteweg (2010). Our results are in line with most of these studies by providing mainly a rejection of the tradeoff theory.

We address the determinants of firms' leverage as follows. First, for all firms in our sample we conduct stylized regressions where the dependent variable is a standard measure of firms' leverage, in particular the book leverage, and the independent variables are a set of common firm-specific factors analyzed in the literature as profitability, size, growth opportunities, tangibility, liquidity, stock level, asset turnover, depreciations and firms' age, and other market variables as the GDP growth, inflation, the return on the national stock index and the term spread. We also control for a binary variable intended to measure the effect of the years of the recent international crisis on leverage. Our aim is to compare the results with the predictions of the pecking and tradeoff theories of capital structure and to further explore which theory is validated and consequently which theory is rejected.

Second, in order to explore whether the effect of these factors on firms' leverage varies across some firms' characteristics, we estimate the leverage regression for sub samples of firms according to their size, growth opportunities and leverage. In addition, we carry out these estimations for sub samples according to the time period in order to investigate whether these factors affect differently firms' leverage for different economic cycles (before and during the international financial crisis).

We show that firms' capital structure decision do not conform with the tradeoff theory predictions as firms with more tangible assets and with less growth opportunities tend to have less leverage. Also, older firms are less levered, as they are better known in the markets and should be able to more easily issue equity relative to younger firms, where the adverse selection problems are more severe. In favor of the validation of the tradeoff theory we only find the result that larger firms tend to have higher leverage as they are likely to face lower default risk, and firms with more depreciations have less leverage.

When estimating the leverage model for sub samples based on firms' size, growth opportunities and leverage we find that most variables still do not conform with the predictions of the tradeoff theory. The novelty relies on the magnitude of the coefficients and on the behavior of some particular variables like asset turnover, depreciations, inflation and GDP growth. In addition, we find that the time period considered plays a role on the way some of the firm-specific and market variables affect the capital structure decision.

The remainder of this paper is organized as follows. Section 2 presents the model of firms' capital structure and examines the predictions of the tradeoff and pecking order theories. Section 3 analyses the data and the descriptive statistics of the

main variables. Section 4 discusses the results of the leverage model for the full sample and for the sub samples of firm-specific factors and time periods. Section 5 concludes.

2. The model of firm's capital structure

We estimate a firm's leverage regression where the dependent variable is a measure of leverage and the explanatory variables are a set of firms' specific variables and macroeconomic variables, in line with the corporate finance literature (from Titman and Wessels (1988), to Rajan and Zingales (1995) and Frank and Goyal (2009)). The regression equation of firm's leverage is, therefore, expressed as follows:

$$Lev_{it} = \beta_0 + \beta_1 X_{it} + \gamma_1 M_t + u_{it} \quad (1)$$

where Lev is the book leverage and u a stochastic error term. X_{it} is a set of firm's characteristics, including profitability (Prof), the natural logarithm of total assets (Size), firm's growth opportunities (Growth), tangibility (Tang), liquidity (Liq), stock level (Stock), depreciation (Depr), the number of firm's years (Age), and M_t is a vector of macroeconomic variables, including the GDP growth (GDPGR), inflation (Infl), the natural logarithm of stock market volatility (StMktRisk), the term structure of interest rates (Term) and a binary variable for the years of the recent international financial crisis (Crisis).

Leverage (Lev) is defined as the ratio of total liabilities to total assets. We use book leverage since market values of equity are only available for publicly traded firms. Nevertheless, as pointed out by Fama and French (2002), Flannery and Rangan (2006), Huang and Ritter (2009) and De Jong *et al.* (2011) using book or market leverage does not yield substantial differences in the results. In our sample there are only 42 listed firms out of 2,804 full sample firms.

Profitability (Prof) is either measured as the return on assets (the ratio of net income over total assets) or the return on equity (the ratio of net income over book equity), in line with Frank and Goyal (2009) and Berger and di Patti (2006), respectively. Most empirical studies have found a negative relation between profitability

and leverage (see Frank and Goyal (2009)), a result that is understood as a rejection of the tradeoff theory, in particular the agency hypothesis, and a validation of the pecking order theory. On one hand, according to the agency theory of capital structure, we should expect a positive relation between profitability and leverage due to the disciplining role that debt has on managers, associated with the reduction in free cash flow (Jensen (1986)). On the other hand, the pecking order theory predicts a negative relation between profitability and leverage due to the fact that more profitable firms are willing to use internal financing rather than external financing, in particular debt.

Firm's size (Size) is measured as the value of total assets. The effect of this variable on leverage is likely to be positive according to the empirical corporate finance literature (Titman and Wessels (1988), Rajan and Zingales (1995), Booth *et al.* (2001), Aggarwal and Jamdee (2003) and Frank and Goyal (2009)). Larger firms tend to have higher leverage as they are likely to face lower default risk and this idea is generally understood as a prediction of the tradeoff theory.

Firm's growth opportunities (Growth) are measured by changes in the natural logarithm of total assets, in line with the suggestion by Frank and Goyal (2009) and Chackraborty (2013). Most empirical corporate finance papers have found a negative relation between growth and leverage (Rajan and Zingales (1995), Aggarwal and Jamdee (2003) and Frank and Goyal (2009)), a result supported on the tradeoff theory idea that growth increases costs of financial distress, reduces free cash flow problems, and exacerbates debt-related agency problems (Frank and Goyal (2009)). By contrast, the pecking order theory implies that firms with more investments should accumulate more debt over time, assuming that profitability is hold fixed. As a consequence, growth opportunities and leverage are positively related under the pecking order theory.

Tangibility (Tang) is measured as the ratio of fixed assets over total assets, as proposed by Frank and Goyal (2009), Margaritis and Psillaki (2010) and Chackraborty (2013). According to the tradeoff theory, we should expect a positive relation between tangibility and leverage as high tangibility reduces the costs of financial distress and mitigates debt-related agency problems (Titman and Wessels (1998), Rajan and Zingales (1995), Aggarwal and Jamdee (2003), Frank and Goyal (2009) and Korteweg (2010)). Tangible assets are easier for outsiders to value and therefore lowers expected financial distress costs. Also, tangibility makes more difficult for shareholders to substitute high-risk assets for low-risk ones (high tangibility reduces the asset substitution effect and hence increases leverage – Jensen and Meckling (1976)). The pecking order theory suggests opposite predictions. It argues that low information asymmetry associated with tangible assets makes equity issues less costly. As a consequence, firms with high tangible assets should have less leverage.

Liquidity (Liq) is defined as cash and short-term securities as a percentage of short-term debt. Although the tradeoff and the pecking order theories make no clear prediction on how liquidity affects leverage, we should expect firms with more liquidity buffers to be less leveraged, in line with the results found by Antão and Bonfim (2012) in an empirical study about the dynamics of capital structure of Portuguese firms.

Stock level (Stock) is measured as inventory over total assets. Although there is no clear prediction on how this variable affects leverage according to the tradeoff or pecking order theories, we control our estimation for this variable since it captures the intensity of capital.

Depreciation (Depr) is one of the proxies for non-debt tax shields (Frank and Goyal (2009)) and is measured as depreciation over total assets. DeAngelo and Masulis (1980) and Korteweg (2010) show that the non-debt tax shields are a substitute for the

tax benefits of debt financing and, therefore, we should expect depreciation expenses to be negatively related to leverage. This is also a prediction of the tradeoff theory.

Firm's age (Age) is the numbers of firm's years. The tradeoff theory predicts that older firms with better reputations in debt markets face lower debt-related agency costs and, therefore, these firms should have relatively more leverage. An opposite prediction is made by the pecking order theory. This theory argues that more mature firms are better known and they should be able to more easily issue equity relative to younger firms where adverse selection problems are more severe (Frank and Goyal (2009)).

As regards the macroeconomic variables included in our regression, the GDP growth (GDPGR) is measured as the annual percentage change of gross domestic product, inflation (Infl) is the annual percentage change in average consumer price index, stock market volatility (StMktRisk) is the annualized standard deviation of daily Portuguese Stock Index (PSI-20) return and the term structure of interest rates (Term) is the difference between the 10 year interest rate and the 3 month interest rate on government bonds. The crisis variable (Crisis) is a binary variable that takes the value of one for the years of the recent international crisis (2007-2009) and zero otherwise (2000-2006). This selection of macroeconomic variables follows Frank and Goyal (2009), with the exception of the crisis variable that is new to the literature. We believe that controlling for this variable is important since Portugal is one of the European countries most affected by the recent international crisis, with obvious consequences on corporate leverage decisions.

3. Data and descriptive statistics

The data come from two sources. Information about firms' consolidated balance sheets and income statements is obtained from the Amadeus database, information about publicly traded firms' stock prices and dividends from Thompson Financial's Datastream database and information about Portuguese economic data from the World Economic Outlook database of the IMF. Our sample covers the period 2000-2009, which allows us to examine seven years before the international financial crisis (2000-2006) and three years where the markets have been affected by the crisis (2007-2009). Our sample consists of 19,362 firm-years observations, comprising 2,804 firms, across 19 sectors. Table 1 depicts the number of firms and firm-years across sectors in our sample.

(Insert Table 1 here)

Table 2 shows the descriptive statistics for the variables we use in our estimations. Portuguese firms have substantial levels of leverage. The median book leverage is 64%, whereas the median book leverage in Frank and Goyal (2009) is just 24%.

(Insert Table 2 here)

These high levels of the leverage ratio are accompanied by a high standard deviation (21%). Figure 1 depicts the distribution of the book leverage and it is clear an important dispersion of the variable, varying from 0% to almost 100%.

(Insert Figure 1 here)

The descriptive statistics of the book asset value show a considerable heterogeneity in the cross section. The median total book assets is 71,347 thousand euros while the standard deviation is 689,316 thousand euros, and the smallest firm has

an asset value of 3,64 thousand euros while the largest firm has an asset value of 40,261,557 thousand euros.

Comparing some of our statistics with the statistics of Frank and Goyal's (2009), we realize that Portuguese firms are on average less profitable – the median return on equity is 8%, lower than the 12% of Frank and Goyal's (2009) firms. The return on equity shows considerable dispersion, with a standard deviation of 30%. In addition, tangible assets represent on average 26% of total assets and the median growth of total assets is 0.64%.

Our sample period is characterized by low economic growth, as the GDP median growth is 0.78%. It ranges, however, from a minimum of -2.56% to a maximum of 3.92%, revealing some economic instability. Note that although the median inflation is 2.5%, it reached a minimum of -0.84% and a maximum of 4.40%. This economic instability is accompanied by a high standard deviation in stock market returns for the Portuguese stock index.

Finally, Table 3 depicts the correlation coefficients among the main firm-specific variables. Larger firms tend to be less profitable. A firm's growth opportunities are positively related with profits and leverage. Furthermore, firms with more profits tend to have less leverage.

(Insert Table 3 here)

4. Results

We examine the estimation of the leverage model in three sections. We start off by discussing the results for the full sample of firms and then move forward for the debate of the results for sub samples of firms' characteristics. Finally, we explore the determinants of leverage for the sub periods before and during the international financial crisis.

4.1 Determinants of firms' capital structure for full sample

In this section we discuss the estimation of Equation (1) using the full sample of firm-years observations. Table 4 presents the results using as profitability measure the Return on Assets. We omit from the results the estimation using as profitability measure the return on equity since it provided very similar results in terms of significance and sign of the estimated coefficients. Column 1 depicts the estimation for all variables in the model and column 2 shows the estimation of a refined model with only the statistically significant parameters.² In order to decide whether to apply a random or fixed effects estimator we used Hausman (1978) test. A rejection using this test suggested that the key random effect assumption (unobserved effect is uncorrelated with each explanatory variable) is false, and then the fixed effects were used.

(Insert Table 4 here)

The results show that among the firm-specific variables all estimated coefficients are statistically significant at the 1% level. Moreover, the sign of most coefficients suggests a rejection of the tradeoff theory of capital structure and a

² Although stock market index volatility and the term structure are part of the empirical model presented in Equation (1), we decided to omit these variables from the results as in all estimations, for the full sample and sub samples, these variables did not revealed to be statistically significant.

validation of the pecking order theory, in line with Rajan and Zingales (1995) and Frank and Goyal (2009). In particular, we find that more profitable firms, with more tangible assets, and with less growth opportunities tend to have less leverage. Also, older firms are less levered, confirming a prediction of the pecking order theory, as they are better known in the markets and should be able to more easily issue equity relative to younger firms, where the adverse selection problems are more severe.

There are, however, two coefficients that exhibit signals in line with the predictions of the tradeoff theory. First, we find that larger firms tend to have higher leverage as they are likely to face lower default risk. Second, firms with more depreciations over assets have less leverage, and this is due to the fact that according to the tradeoff theory depreciation is one of the proxies for non-debt tax shields and we should expect non-debt tax shields to be a substitute for the tax benefits of debt financing and, therefore, depreciations expenses to be negatively related to leverage.

As regards the coefficients of liquidity and stock level, we confirm Antão and Bonfim's (2012) results that firms with more liquidity buffers and with low levels of stock tend to have more leverage.

Finally, we discuss the results of the macroeconomic variables and of the binary variable crisis. Among the macroeconomic variables, only the inflation coefficient is statistically significant, in this case at a 5% level. Firms tend to have more leverage in periods of high inflation, a result that is in line with the predictions of the tradeoff theory, according to Taggart (1985), as discussed by Frank and Goyal (2009). Taggart (1985) shows that the real value of tax deductions on debt is higher when inflation is expected to be high and, as a consequence, the tradeoff theory predicts leverage to be positively related to inflation. Another explanation for this positive relation is the adoption of a market timing strategy in debt markets if managers issue debt when

expected inflation is high relative to current interest rates. The results show that during a crisis firms exhibit on average greater debt levels, as the coefficient associated with the binary variable crisis is positive and statistically significant at the 1% level.

Overall, we conclude from the full sample estimations that the Portuguese firms' capital structure decisions do not seem to comply with the predictions of the tradeoff theory, but rather with the predictions of the pecking order theory. Additionally, firms' leverage decisions are affected by the economic cycle, a subject that we will further discuss in section 4.3.

4.2 Determinants of leverage for specific firms' characteristics

In this section we explore the determinants of leverage for sub samples of firms, according to some firms' characteristics. We estimate Equation (1) for smaller versus larger firms, low growth versus high growth firms and low leverage versus high leverage firms. As in Frank and Goyal (2009), we investigate whether the determinants of firms' capital structure vary according to some firm-specific characteristics and whether the predictions of the tradeoff and pecking order theories depend on these characteristics.

Table 5 shows the estimation results for the sub samples of firms. The criterion used to split the sample into these categories of firms is the median of the corresponding variable – book asset value for size, percentage change in book asset value for growth opportunities and book leverage for leverage. Thus, smaller (larger) firms have an asset value below (above or equal) its median, low (high) growth firms have a percentage

change in book asset value below (above or equal) its median, and low (high) leverage firms have a book leverage ratio below (above or equal) its median.³

(Insert Table 5 here)

The results that we obtain for the sub samples of firms' size (columns 1 and 2 of Table 5) are somewhat analogous to the results of the full sample, with the exception of two firm-specific variables, asset turnover and depreciation, and the macroeconomic variable inflation. Contrary to the full sample and to the small firms' estimations, where it was not statistically significant, the asset turnover coefficient is now statistically significant in the regression of larger firms, at a 5% level. For larger firms, a greater asset turnover leads to greater leverage. Moreover, the negative relation between depreciation and leverage only holds for larger firms, as for this estimation the coefficient is statistically significant at a 1% level. Although the coefficient associated with inflation was statistically significant in the full sample regression, it became not significant for the estimations of the sub samples, at least at a 10% level.

The estimations for larger versus smaller firms also indicate that firms' growth opportunities have a greater impact on leverage in smaller firms, as the coefficient of growth for these firms is more than twice the coefficient for large firms. A similar effect appears in the crisis variable, revealing that smaller firms have increased more their debt level during the international financial crisis when compared with larger firms.

As regards the estimation results for the sub samples of firms' growth opportunities (columns 3 and 4 of Table 5), most variables exhibit the relations of the full sample estimation. The difference in the results relies on the coefficients associated with stock level and depreciations, which are no longer statistically significant for high growth firms. In addition, although the inflation coefficient is significant for the full

³ As in the full sample regression, profitability is measured as the return on assets, given that the use of the return on equity provides very similar results.

sample regression, it is no longer statistically significant for the sub samples. As concerns the crisis variable, we now observe that our earlier prediction that firms have greater debt levels during the international financial crisis does not apply to low growth firms. Finally, by comparing the magnitude of some of the coefficients of these two regressions, the results show that there is not much difference in this magnitude, with the exception of the profitability coefficient that indicates a greater impact of profitability on leverage for high growth firms.

We now discuss the estimation of the leverage regression considering the split of the sample into low and high leverage firms (columns 5 and 6 of Table 5). Once again, most variables show the same type of relation with leverage as in the full sample regression. Nevertheless, it is worthwhile to analyze some new results. First, the asset turnover coefficient exhibits a negative sign for high leverage firms, in opposition to the positive sign that we obtain for low leverage firms. Second, among the macroeconomic variables, we finally obtain significant coefficients for the GDP growth. Even so, the coefficients exhibits opposite signs as the high leverage firms tend to have greater leverage for low GDP growth, whereas low leverage firms exhibit greater leverage for high GDP growth. Finally, the comparison of the magnitude of some coefficients of these estimations reveals that the effect of profitability on leverage is greater for high leverage firms, whereas the impact of firms' size and liquidity is greater for low leverage firms.

Overall, we conclude that the sign displayed by most variables for different estimations of the leverage model based on size, growth and leverage is the same. The novelty relies on the magnitude of the coefficients and on the behavior of some particular variables like asset turnover, depreciations, inflation, GDP growth and crisis.

4.3 Leverage and the international financial crisis

The data we use to estimate the determinants of leverage covers two distinctive periods of the European economy, namely before and during the recent financial crisis (2007 to 2009). Thus, in this section we investigate whether these determinants vary according to the economic cycle, by estimating two leverage regressions for the sub periods 2000 to 2006 and 2007 to 2009. Before we proceed with the discussion of the leverage regression it is worthwhile, however, to examine the evolution of the mean leverage from 2000 to 2009, as shown in Figure 2. Overall, it is characterized by a mixed trend. After a slight increase in the mean leverage from 2000 to 2001, reaching 65.19% in 2001, we then observe three consecutive years of decrease, leading to a mean of 63.86% in 2004. Next, it follows four consecutive years of increase, which made the mean leverage in 2008 close to the level of 2000, around 64.75%. From 2008 to 2009 there is a drop on firms' mean leverage as it goes from 64.79% to 63.33%. This drop is probably explained by the financing problems firms were already experiencing as a consequence of the international financial crisis.

(Insert Figure 2 here)

Table 6 presents the estimation of the leverage model for the sub periods 2000 to 2006 and 2007 to 2009. Among the firm-specific variables, profitability, size, growth, and liquidity exhibit the same signal and significance as in the full sample regression. The exceptions are the variables tangibility, stock level, asset turnover, depreciation and firms' age. Firms with high tangible assets tend to have less leverage only for the crisis regression. The stock level coefficient is not significant in both regressions. As regards asset turnover, while before the international financial crisis it has no effect on leverage, it is negatively related with leverage in the period of crisis. Moreover, the non-debt tax shield effect of depreciations does not hold for the crisis period. At last, it is interesting

the signal and significance of the age coefficients as they are statistically significant in both regressions at a 1% level but with opposite signals. Whereas before the international financial crisis firms' age leads to less leverage, a prediction of the pecking order theory, during the international crisis older firms engage in more leverage, in line with the tradeoff theory. This result suggests that during financial crisis older firms with better reputations in debt markets face lower debt-related agency costs and, therefore, these firms comply better with external financing problems that exist in debt markets.

(Insert Table 6 here)

The results of the macroeconomic variables indicate that leverage can be determined differently by macroeconomic conditions before and during the crisis. While GDP growth is positively related to leverage during the financial crisis, it has no effect on it before the crisis. As for inflation is concerned, we find that it has a negative effect on leverage in a period of crisis but a rather positive effect in a non-crisis period.

5. Conclusion

This paper investigates the determinants of capital structure of Portuguese firms and is motivated by a substantial cross-sectional variation in firms' leverage. Portugal has received a bailout in 2011 from the IMF, the European Central Bank and the European Commission and is particularly interesting to therefore examine the factors affecting Portuguese firms' leverage.

Our sample includes 2,804 non-financial firms covering 19 sectors, from 2000 to 2009. Corporate finance style regressions of leverage are estimated for a full sample of firms and then for sub samples based on firms-specific characteristics as size, growth opportunities and leverage. In addition, the capital structure model is estimated for the time periods before and during the recent international financial crisis, allowing us to discuss the effect of the crisis on firms' capital structure.

This paper is, as far as we are concerned, the first to study the determinants of Portuguese firms' leverage for a more recent time period, with data covering the periods before and during the recent international crisis. Besides, our contribution to the literature relies on the fact that we investigate the determinants of firms' leverage for sub samples of firms based on size, growth opportunities and leverage, making possible the discussion on whether the estimation results depend on these specific factors.

In line with most recent empirical studies, as Frank and Goyal (2009) and Korteweg (2010), our results do not validate the tradeoff theory of capital structure as older and more profitable firms, with more tangible assets and with less growth opportunities tend to be less levered. In favor of the validation of the tradeoff theory we only find the result that larger firms tend to have higher leverage as they are likely to face lower default risk, and firms with more depreciations have less leverage.

The estimation of the leverage model for sub samples based on firms' size, growth opportunities and leverage reveals that most variables display a sign in accordance with the full sample estimation, providing a rejection of the tradeoff theory. The difference in the results relies on the magnitude of the coefficients and on the behavior of some particular variables like asset turnover, depreciations, inflation and GDP growth. We find that some of these variables also affect differently firms' leverage depending on whether we consider the time period before or during the recent international financial crisis.

Our paper suggests that the recent international financial crisis has determined a reduction on the level of Portuguese firms' leverage and that the capital structure decision does depend clearly on a set of firm-specific and market factors. This raises important challenges for managers as they have to adjust constantly their financing decisions to the evolution of the current European market conditions. Future empirical research should aim to examine the determinants of Portuguese firms' capital structure according to the sector where these firms operate in order to investigate whether there is a sector effect on leverage. Another interesting development of this work is to investigate the determinants of capital structure for Portuguese publicly traded firms with the purpose of finding possible differences in the results.

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Table 1. Number of firms and number of observations by sector

The sample consists of 2,804 Portuguese firms from the Amadeus database from 2000 to 2009.

Sector	N° of firms	N° of observations
Agriculture, Forestry and Fishing	28	233
Mining and Quarrying	22	175
Manufacturing	756	6,602
Electricity, Gas, Steam and Air Conditioning Supply	24	166
Water Supply, Sewerage, Waste Management and Remediation Activities	21	177
Construction	356	2,875
Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles	816	6,633
Transportation and Storage	135	1,013
Accommodation and Food Service Activities	81	585
Information and Communication	53	375
Financial and Insurance Activities	109	736
Real Estate Activities	130	809
Professional, Scientific and Technical Activities	71	529
Administrative and Support Service Activities	133	947
Public Administration and Defence, Compulsory Social Security	2	12
Education	10	56
Human Health and Social Work Activities	31	200
Arts, Entertainment and Recreation	18	123
Other Service Activities	8	44
Total	2,804	22,290

Table 2. Descriptive statistics

The sample consists of 2,804 Portuguese firms from the Amadeus database from 2000 to 2009.

	N	Mean	St. Dev.	Min.	Max.	Distribution		
						25 th	50 th	75 th
Book leverage (%)	22287	64.378	20.902	0	99.973	52.121	68.128	79.691
Profitability (%)	22270	3.243	7.024	-85.016	87.771	0.307	2.027	5.397
Total assets (M€)	22287	71.300	689	0.003643	40,300	6,924	14,900	33,900
Growth opportunities (%)	19466	0.637	2.599	-32.938	108.552	-0.193	0.334	1.052
Tangibility (%)	22287	25.879	22.860	0	99.937	7.577	20.128	38.087
Liquidity (%)	22284	6.000	10.094	0	100	0.570	2.186	6.577
Stock level (%)	22287	17.709	19.340	0	99.976	2.252	12.676	26.010
Assets turnover (%)	22287	163.367	189.415	-9.121	4.337.813	67.821	124.129	196.989
Depreciation / assets (%)	22287	4.082	3.968	0	40.501	1.338	2.992	5.613
Age	22206	27.690	18.303	0	108.000	15.000	24.000	36.000
GDP growth	22290	0.776	1.643	-2.562	3.922	-0.006	0.781	1.964
Inflation (%)	22290	2.487	1.311	-0.841	4.402	2.362	2.597	3.086
Stock market risk (%)	22290	15.898	6.416	8.370	33.070	10.530	13.970	18.650
Term structure of interest rates (%)	22290	1.499	0.891	0.238	2.983	0.653	1.937	2.125
Crisis (1 for 2007-2009)	22290	0.351	0.477	0	1	0	0	1

Table 3. Correlations

The sample consists of 2,804 Portuguese firms from the Amadeus database from 2000 to 2009. Numbers between brackets indicate p-values.

	Book leverage	Profitability	Log(total assets)	Growth opportunities	Tangibility	Liquidity	Stock level	Asset turnover	Depreciations	Age
Book leverage	1									
Profitability	-0.364 (0.000)	1								
Log(total assets)	-0.061 (0.000)	-0.070 (0.000)	1							
Growth opportunities	0.169 (0.000)	0.112 (0.000)	-0.051 (0.000)	1						
Tangibility	-0.089 (0.000)	-0.109 (0.000)	0.059 (0.000)	-0.069 (0.000)	1					
Liquidity	-0.131 (0.000)	0.260 (0.000)	-0.243 (0.000)	0.027 (0.000)	-0.126 (0.000)	1				
Stock level	0.061 (0.000)	-0.076 (0.000)	-0.040 (0.000)	-0.033 (0.000)	-0.154 (0.000)	-0.071 (0.000)	1			
Asset turnover	0.054 (0.000)	0.275 (0.000)	-0.525 (0.000)	-0.014 (0.059)	-0.141 (0.000)	0.317 (0.000)	0.104 (0.000)	1		
Depreciations	-0.142 (0.000)	0.081 (0.000)	-0.112 (0.000)	-0.102 (0.000)	0.645 (0.000)	0.045 (0.000)	-0.095 (0.000)	0.150 (0.000)	1	
Age	-0.262 (0.000)	-0.025 (0.000)	0.237 (0.000)	-0.131 (0.000)	0.059 (0.000)	-0.026 (0.000)	0.112 (0.000)	-0.069 (0.000)	0.022 (0.001)	1

Table 4. Book leverage for complete and reduced model

The sample consists of 2,804 Portuguese firms from the Amadeus database from 2000 to 2009. The dependent variable is the book leverage. The complete model considers all significant and non-significant coefficients whereas the reduced model only considers the significant coefficients. Numbers between brackets indicate the standard error. ***, ** and * denote statistical significance at the 1%, the 5% and the 10% level, respectively.

Dependent variable:	Leverage ratio (complete model)	Leverage ratio (reduced model)
	Coefficient	Coefficient
Constant	-16.557*** (3.500)	-16.624*** (3.422)
Profitability	-0.557*** (0.014)	-0.558*** (0.014)
Log(size)	14.673*** (0.469)	14.682*** (0.464)
Growth	0.388*** (0.029)	0.389*** (0.029)
Tangibility	-0.045*** (0.010)	-0.045*** (0.010)
Liquidity	-0.146*** (0.011)	-0.145*** (0.011)
Stock level	0.037*** (0.011)	0.037*** (0.011)
Asset turnover	-0.001 (0.001)	
Depreciations	-0.097** (0.044)	-0.098** (0.043)
Age	-0.799*** (0.061)	-0.799*** (0.059)
GDP growth	-0.001 (0.065)	
Inflation	0.155* (0.093)	0.153** (0.069)
Crisis (1 for 2007-2009)	0.895*** (0.223)	0.895*** (0.228)
R ²	0.093	0.091
N° of observations	19,362	19,362

Table 5. Firms' characteristics and book leverage

The sample consists of 2,804 Portuguese firms from the Amadeus database from 2000 to 2009. The dependent variable is the book leverage. For each firm-characteristic, the sample is divided in two sub samples, considering the median as the splitting point. Numbers between brackets indicate the standard error. ***, ** and * denote statistical significance at the 1%, the 5% and the 10% level, respectively.

Dependent variable: leverage ratio	Smaller firms	Larger firms	Low growth	High growth	Low debt	High debt
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Constant	-39.719*** (4.800)	-27.408*** (7.664)	-37.156*** (6.663)	4.918 (4.683)	-51.070*** (5.851)	49.211*** (2.695)
Profitability	-0.540*** (0.019)	-0.545*** (0.020)	-0.510*** (0.020)	-0.723*** (0.023)	-0.298*** (0.017)	-0.412*** (0.015)
Log(size)	19.481*** (0.727)	14.905*** (0.976)	16.810*** (0.861)	11.931*** (0.664)	17.161*** (0.779)	6.237*** (0.382)
Growth	0.525*** (0.044)	0.238*** (0.039)	0.311** (0.128)	0.210*** (0.037)	0.164*** (0.041)	0.183*** (0.023)
Tangibility	-0.042*** (0.014)	-0.028** (0.014)	-0.047*** (0.015)	-0.052*** (0.014)	-0.049*** (0.014)	-0.031*** (0.008)
Liquidity	-0.144*** (0.013)	-0.115*** (0.019)	-0.161*** (0.019)	-0.139*** (0.016)	-0.109*** (0.014)	-0.014 (0.011)
Stock level	0.049*** (0.014)	0.065*** (0.017)	0.047*** (0.018)	0.015 (0.015)	0.082*** (0.017)	0.021*** (0.008)
Asset turnover	-0.001 (0.001)	0.008** (0.004)	0.002 (0.002)	0.002 (0.002)	0.004** (0.002)	-0.005*** (0.010)
Depreciation	0.038 (0.057)	-0.211*** (0.066)	-0.168** (0.067)	0.052 (0.068)	-0.009 (0.061)	-0.118*** (0.035)
Age	-1.018*** (0.080)	-0.702*** (0.086)	-0.682*** (0.092)	-0.800*** (0.090)	-0.763*** (0.080)	-0.471*** (0.048)
GDP growth	-0.012 (0.082)	-0.024 (0.092)	-0.068 (0.100)	-0.101 (0.094)	0.149** (0.084)	-0.102** (0.050)
Inflation	0.183 (0.121)	0.077 (0.128)	0.016 (0.139)	0.418*** (0.140)	0.085 (0.121)	0.051 (0.07)
Crisis (1 for 2007-2009)	0.929*** (0.292)	0.539* (0.324)	0.497 (0.362)	1.151*** (0.325)	0.532** (0.301)	0.655*** (0.175)
R ²	0.11	0.10	0.07	0.12	0.02	0.08
N° of observations	9,532	9,830	9,665	9,697	9,805	9,557

Table 6. Economic cycle and book leverage

The sample consists of 2,804 Portuguese firms from the Amadeus database from 2000 to 2009. The dependent variable is the book leverage. The sample is divided in two periods, having in mind the international financial crisis: 2000 – 2006 (before crisis) and 2007 – 2009 (during crisis). Numbers between brackets indicate the standard error. ***, ** and * denote statistical significance at the 1%, the 5% and the 10% level, respectively.

Dependent variable: leverage ratio	Before crisis	During the crisis
	Coefficient	Coefficient
Constant	-34.174*** (4.929)	-1,070.676*** (247.741)
Profitability	-0.544*** (0.018)	-0.492*** (0.020)
Log(size)	18.061*** (0.698)	14.924*** (1.052)
Growth	0.370*** (0.035)	0.261*** (0.055)
Tangibility	-0.001 (0.012)	-0.168*** (0.019)
Liquidity	-0.121*** (0.015)	-0.138*** (0.019)
Stock level	0.016 (0.014)	-0.010 (0.020)
Asset turnover	0.000 (0.002)	-0.005*** (0.001)
Depreciation	-0.213*** (0.056)	0.004 (0.083)
Age	-0.966*** (0.070)	34.800*** (8.331)
GDP growth	0.042 (0.082)	17.377*** (4.074)
Inflation	0.293*** (0.152)	-2.426*** (0.613)
R ²	0.08	0.04
N° of observations	11,621	7,741

Figure 1. Distribution of book leverage

The figure shows the distribution of firms' book leverage ratio for the 22,287 firm-year observations in the sample of 2,804 Portuguese firms, from the Amadeus database covering the years 2000 to 2009.

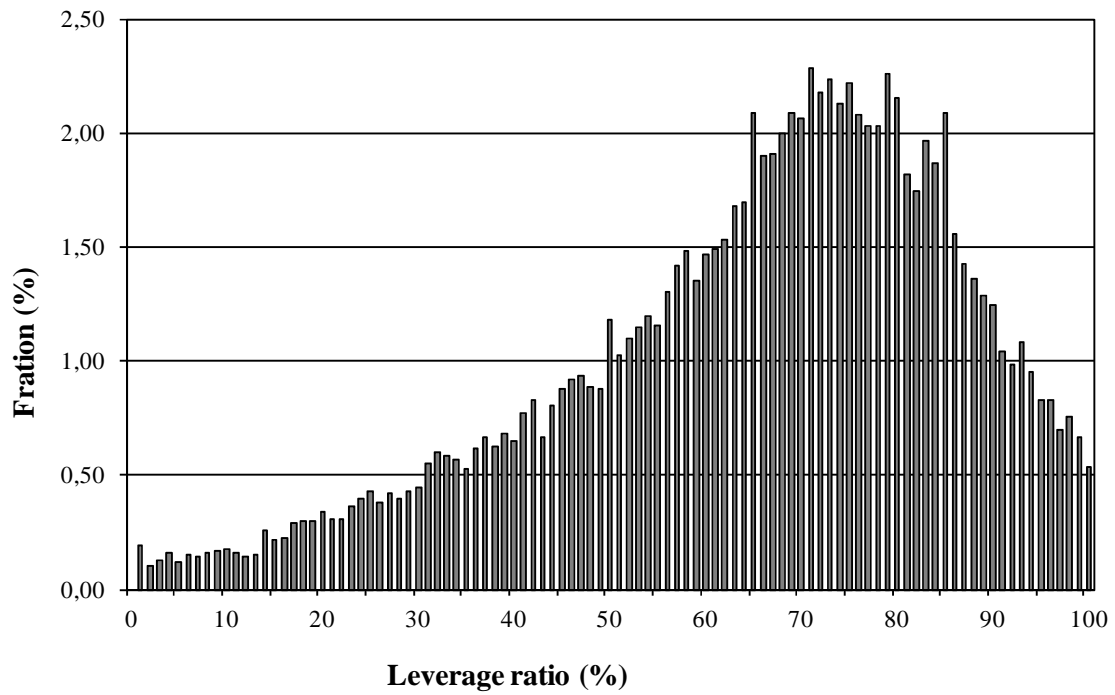


Figure 2. Evolution of mean book leverage

The figure shows the evolution of firms' mean book leverage for the 22,287 firm-year observations in the sample of 2,804 Portuguese firms, from the Amadeus database covering the years 2000 to 2009.

