

**RELATION BETWEEN DEBT AND MARKET POWER
EVIDENCE ON PORTUGUESE FIRMS**

Ricardo Miguel de Almeida Tavares

Dissertation submitted as partial requirement for the conferral of
Master in Economics of the Enterprise and Competition

Supervisor:

Prof. Luís Miguel da Silva Laureano, Assistant Professor, ISCTE-IUL Business School,
Finance Department

October 2013

Resumo

O presente estudo procura analisar os determinantes da utilização de dívida nas empresas Portuguesas não-financeiras, no período 2004-2010. É dado especial destaque ao impacto do poder de mercado, medido pelo índice de lerner, na maior ou menor utilização da dívida.

Os resultados indicam que a dívida é positivamente relacionada com o poder de mercado: um acréscimo de poder de mercado conduz a um aumento na dívida. Este resultado pode sugerir algum tipo de comportamento predatório: o aumento de poder de mercado leva as empresas a utilizar mais dívida na sua estrutura da capital, competindo com as empresas do mercado e criando um barreira às que pretendem entrar. Adicionalmente, a dimensão da empresa, o seu crescimento e rentabilidade são também determinantes com efeito positivo na dívida. A capacidade geradora de recursos internos tem um efeito fraco e negativo na dívida.

Os resultados obtidos também permitem determinar o perfil das empresas Portuguesas não-financeiras com maiores níveis de dívida: empresas de baixa liquidez, pequena dimensão, bastante lucrativas e com taxas de crescimento elevadas.

A crise financeira teve um efeito inesperado nos níveis de dívida: apesar da crise do crédito, as empresas em estudo aumentaram a sua dívida depois do início da crise.

Palavras-chave Dívida · Poder de Mercado · PME's · Índice de Lerner

Classificações JEL G32 · L1

Abstract

The present study tries to analyze the determinants of debt on Portuguese non-financial firms, during the 2004-2010 period. Special emphasis is given to the impact of market power, measured by the lerner index, in greater or lesser use of debt.

Results show that debt is positively related with market power: an increase of market power leads to an increase in debt. This may suggest some kind of predation behaviour: as market power rises, firms tend to use more debt on their capital structure, fighting the incumbents and creating an entry barrier for the entrants. Additionally, size of firm, growth and profitability are also determinants with a positive effect on debt. Capability of generating internal resources have a weak and negative effect on debt.

The results allow us to identify the profile of the Portuguese non-financial firms with higher levels of debt: firms with low liquidity, of smaller size, higher profitability and higher growth rates.

The financial crisis had an unexpected effect on debt levels: despite the credit crunch, studied firms raised their debt after the beginning of the crisis.

Keywords Debt · Market Power · SME · Lerner Index

JEL Classification G32 · L1

Contents

Resumo.....	I
Abstract	II
Contents.....	III
List of Tables.....	V
List of Figures	VI
Acknowledgements	1
Executive Summary	2
1. Introduction.....	4
2. Literary review.....	6
2.1. Main theories	6
2.2. Context specific effects	11
2.2.1. Legal System.....	11
2.2.2. National environment.....	11
2.2.3. Specific industry	11
2.3. Other determinants of debt	12
3. Research hypothesis, data and methodology	14
3.1. Research hypothesis	14
3.2. Data.....	14
3.2.1. Dependent variable	14
3.2.2. Independent variables	15
3.2.2.1. Main independent variable – Lerner Index.....	15
3.2.2.2. Return on Assets	15
3.2.2.3. Size of the Firm.....	15
3.2.2.4. Growth Rate	15
3.2.2.5. Uniqueness of Assets	16
3.2.2.6. Current Ratio.....	16
3.2.2.7. Capability of Generating Internal Resources	16
3.3. Methodology.....	17
4. Empirical results	19
4.1. Descriptive statistics analysis	19
4.2. Pearson correlation coefficients analysis.....	20

4.3. Regression analysis.....	21
Conclusion.....	26
References	28
APPENDIXES	32

List of Tables

Table 1 - Summary of main theories: relation between debt and market power.....	10
Table 2 – Expected impact of independent variables on the debt ratio (dependent variable). 16	
Table 3 – Descriptive statistics of all variables	23
Table 4 – DR means for panel splitting by independent variable	23
Table 5 – DR means for panel splitting by financial crisis (before and after the beginning)..	24
Table 6 – Correlation matrix of all variables.....	24
Table 7 – Regression results on the determinants of the debt ratio using Fixed Effects.....	25

List of Figures

Figure 1 - Evolution of the average debt ratio for the sample period 20

Acknowledgements

I would like to thank my supervisor Prof. Luís Laureano, for his supervision on the elaboration of this work. His comments, suggestions and availability were always welcomed, appreciated and useful.

I would also like to thank Dr.^a Alécia Faro, for her helpful contributions and all the knowledge shared.

The utmost thanks go to my family: my mother, my brother Miguel and my grandparents José and Marta, for all the support, understanding and patience shown over the last year.

Finally, thanks to my friends and colleagues who in one way or another, have supported me throughout this dissertation.

Executive Summary

All firms need capital: in an early time, when they are created, and later, when they decide to expand. In recent years, with the accentuation of the international crisis, the credit (scarce resource in itself), has become even more scarce, for both firms and consumers. Also, these days the competition in many markets is intense. Associated to these new scenarios, the costs of production fall (dragging prices with them), meaning that companies with high cost structures must relocate to other places, or move towards insolvency. Some, even without new competition, suffer from reduced demand, driven mainly by a drastic reduction in disposable income, caused by an aggressive fiscal policy (particularly in Portugal). Despite, some can, not only born and survive, but even grow and became competitive.

This work tries to find a relation between the debt and market power, using a sample of Portuguese non-financial firms obtained from the AMADEUS Database. The data is grouped in an unbalance panel dataset of 4.712 firms, from 2004 to 2010, totalizing 14.416 firm-year-observations. Using panel data methodology, we use the market power (introducing the lerner index as proxy) as a main determinant of leverage used by firms (using the debt ratio as proxy). We control for several other determinants of leverage, such as profitability, liquidity, size, capability of generating internal resources, and growth.

Results show that debt is positively related with market power: an increase of market power leads to an increase in debt. This may suggest some kind of predation behaviour: as market power rises, firms tend to use more debt on their capital structure, fighting the incumbents and creating an entry barrier for the entrants. Additionally, size of firm, growth and profitability are also determinants with a positive effect on debt. Capability of generating internal resources has a weak and negative effect on debt.

The results also allow us to identify the profile of the Portuguese non-financial firms with higher levels of debt: firms with low liquidity, of smaller size, higher profitability and higher growth rates.

The financial crisis had an unexpected effect on debt levels: despite the credit crunch, Portuguese non-financial firms sought more debt after the beginning of the international crisis (2009 and 2010).

This work is presented as follows: in the second chapter, we review the main literature about the determinants of leverage, namely the market power. This review is separated in main theories, context specific effects and other debt determinants.

The third chapter is dedicated to the research methodology: we describe the data, variables (dependent and independent) and the methodology used.

In chapter four are shown and described all the empirical results: descriptive statistics analysis, correlation analysis and regression analysis.

Ultimately, we resume the conclusions and suggest some future lines of work in this area.

1. Introduction

Nowadays, it is known that there is a relation between the firm's financial decisions (capital structure) and its behaviour in the product market (output decision). During years, the academic community developed separated studies of financial and output decisions, trying to provide a solid understanding of each one of them, solo: in financial theory, the output level is considered not to be affected by the capital structure. On the other hand, on the economic analysis, the capital structure of a firm is not considered on the strategic interaction between producers. It was like this until the 80s, with some exceptions during the 60s and 70s.

All firms need capital: in an early time, when they are created, and later, when they decide to expand. In recent years, with the accentuation of the international crisis, the credit (scarce resource in itself), has become even more scarce, for both firms and consumers. Also these days the competition in many markets is intense. Associated to these new scenarios, the costs of production fall (dragging prices with them), meaning that companies with high cost structures must relocate to other places, or move towards insolvency. Some, even without new competition, suffer from reduced demand, driven mainly by a drastic reduction in disposable income, caused by an aggressive fiscal policy (particularly in Portugal). Despite, some can, not only born and survive, but even grow and became competitive.

Here is the motivation for this work. In a context of aggressive competition and difficult access to credit, how can some companies keep up and compete on profitable conditions? What is the capital structure of these companies? Is there a relation between debt and Portuguese companies' market power? These are the main questions that we propose to answer.

This work tries to find a relation between the debt and market power, using a sample of Portuguese non-financial firms obtained from the AMADEUS Database. The data is grouped in an unbalance panel dataset of 4.712 firms, from 2004 to 2010, totalizing 14.416 firm-year-observations. Using panel data methodology, we use the market power (introducing the lerner index as proxy) as a main determinant of leverage used by firms (using the debt ratio as proxy). We control for several other determinants of leverage, such as profitability, liquidity, size, capability of generating internal resources, and growth.

We find that market power is positively related to debt. An increase in market power, leads firms to use more leverage. This suggests a predation behaviour of Portuguese non-financial firms mainly to maintain or increase their market power.

This work is presented as follow: in the next chapter, we review the main literature about the relation of product market competition and capital structure. This review is separated in main theories, context specific effects and other debt determinants.

The third chapter is dedicated to the research methodology: we describe the data, variables (dependent and independent) and the methodology used.

In chapter four are shown and described all the empirical results: descriptive statistics analysis, correlation analysis and regression analysis.

Ultimately, we resume the conclusions and suggest some future lines of work in this area.

2. Literary review

The studies on the relationship about capital structure and product market competition can be divided in two groups: the main theories, and the context specific effects.

2.1. Main theories

One of the first studies, considered a milestone among this theme is the study of Telser (1966). The author concluded that both capital intensity and firm size seem to explain concentration level. In another words, financially strong firms can practice extreme low prices as a way to eliminate rivals in the market.

Brander and Lewis (1986) analysed this relation in an assumed industry, where the financial decision precedes the decision about the competition. As firms increase their debt, they will pursue more aggressive output strategies, which promotes the shareholders' interests (in good times). Taking a more risky position, an eventual bankrupt state (in bad times) will be ignored by the shareholders, as they are not personally liable for the debts of the firm. As so, visionary shareholders will use this financial decision to influence the output market in their favour. According to the authors, this strategy leads to a predatory behaviour. In case of a response on the same basis, both firms end up worse. An exception may happen when managers are not shareholders. In this case, the managers will act more cautiously, since they are concerned about keeping their jobs.

This situation was studied by Bolton and Scharfstein (1990: 104), referring that “...*there is a tradeoff between deterring predation and mitigating incentive problems: reducing the sensitivity of the refinancing decision to the firm's performance discourages predation, but exacerbates the incentive problem.*”. This means that the financial option taken for preventing predation from a rival implies an incentive problem. Besides that, this same study indicates that the use of debt turns the firm more vulnerable to its rivals on product market. For that reason, it is more recommended to get an internal source of financing.

Maksimovic (1988) showed that capital structure affects the equity holders incentives to collude in the product market. In a context of a model of repeated oligopoly, there is a limit on firm's debt level. In the absence of bankruptcy costs, this limit depends of the size of the market, the discount rate, the elasticity of demand, beside the usual factors that affect product

market equilibrium in oligopolies. Another important conclusion is that warrants may decrease the equilibrium output in oligopolies.

The kind of debt (long or short term debt) and its relation with the product market was examined by Glazer (1994). The author's main conclusion is that long term debt can probably result in a collusion or an excess of competition among firms. As a consequence of this, the prices tend to fluctuate more. Thus, by issuing long term debt, a firm gives a signal to its rivals that can be available to take part of a collusion, or ready to stiffer competition.

Evidence from Opler and Titman (1994) suggests that there is a positive relationship between a firm's financial position and its performance during industry downturns. More highly leveraged firms tend to lose market share and operating profits in comparison to their rivals. This relation is more pronounced in firms in which research and development expenditures take an important role and in those operating in more concentrated industries.

Phillips (1995) studied this relation on four specific industries, confirming the existence of a relationship. In three industries (fiberglass insulation, tractor trailer and polyethylene), the output is negatively associated with the average industry debt ratio. Firms have high financial leverage and entry is relatively difficult. The fourth industry (gypsum) has a positive relation between output and debt. Firms have low financial leverage and entry barriers are relatively low.

Chevalier (1995) found evidence on the American supermarket industry that product market competition is strongly affected when firms increase their leverage. Particularly, in markets where *LBO* (leverage buyouts) have occurred, new firms are attracted to entry and incumbent attracted to expand.

Still using the supermarket industry, Chevalier and Scharfstein (1996) verified that, in a recession context, supermarket chains with high financial constrains tend to raise their prices more than others with less constrains. In response, these raise their prices too, showing that in this case, a shock is applied to a group of firms and passes on to the rivals, competing on the same market. As prices of all the firms in the market rise, those with more constrains are less affected by market share losses.

Kovenock and Phillips (1995, 1997) studied this relation with the investment and plant closing decision. They argue that debt plays a role in very competitive industries: firms which have lack of productivity in their plants, operating in very competitive markets, if they

increase their debt, they will eventually decrease their production and may even close down some plants. On the other hand, the probability of competitors closing plants is small, if leveraged firms have high market share.

Scott Morton (1997) examined the cases in which a merchant enters in an established market (in the period 1879-1929). The market is dominated by an incumbent cartel with several members. What happened is that the entrants with less financial resources, less experience, smaller size or poor trade conditions are fought by the incumbents, with a predation behaviour. These results are consistent with a predation behaviour, depending on their capital structure.

Zingales (1998) looked at the trucking industry and concluded that firms with high debt levels were not able to invest and take place in the price war that followed the market deregulation (during President Carter's administration, on the late 70's). Thus, they ended out of the market.

Showalter (1999) also found empirical evidence of the relation between debt levels and behaviour on product markets, but with some limitations. His analysis went further and showed that firms tend to increase debt usage when the level of uncertainty of demand rises, and reduce debt usage when the level of uncertainty of costs rises. Another important conclusion is that firms tend to compete in prices (Bertrand model) then output (Cournot model).

Campello (2003) analysed data from 20 manufacturing industries and concluded that debt impacts negatively in industries where rivals are less levered during recessions. However, this does not apply during booms.

Farr and Lord (2003) used data from seven American integrated steel companies to confirm that firms can design their capital structure to provide an observable compliance with a collusive agreement. Another conclusion is that leverage is positively related to price elasticity of demand. Thus, when a group of firms chooses financial leverage as a mechanism to enforce collusion, there is an upper limit on the amount of nonconvertible debt that each firm can issue. This upper limit varies positively with changes in price elasticity of demand.

Riordan (2003) studied a group of literature and reached two important conclusions: first, the level of industry and the market competition impact on the firm's capital market constrains;

second, capital markets constrain a firm's output strategy, and as a consequence, determines its' behaviour in the product market.

Wanzenried (2003) linked a firm's capital structure choice with its output market decisions in a differentiated goods duopoly. The author could confirm that firms operate changes in their capital structure to enhance their strategic position in output markets.

Fairchild (2004) developed a model of price competition (Bertrand), in differentiated products. The author concluded that leverage tends to soften price competition, since firms discount the future more heavily. Another goal of this study was to determine if the relation between intensity of competition and leverage is positive or negative. An increase on the intensity of competition tends to motivate the firms to increase leverage, to soften price competition. However, this combination of increasing intensity of competition and leverage can be dangerous, by resulting in a fall of prices and firm values.

Campello (2006), studies the relation between leverage and sales performance of 115 companies over 30 years. The main conclusion is that the moderate debt taking by a firm can result in an increase of its market share. Leader firms in concentrated industries cannot expand their sales using leverage, if their leverage already exceeds the industry pattern. In those same industries, leader firms less leveraged have positive sales growth-debt sensitivities.

Tarzijan (2007) constructed a Cournot duopoly with demand uncertainty, played in two stages, with a goal of studying the role of debt as a strategic instrument to prevent a company from entering in a market. Results show that as the number of markets where the entrant can enter rises, the incumbent's incentive to deter entry with the use of debt falls. This means that the entrant will prefer to have a bigger number of alternative markets to get in instead of only one.

Chen *et al.* (2007) related the leverage of a firm and its timing, introducing products on the market, concluding that firms with higher leverage and delay on the introduction of products face a disadvantage, when compared to their rivals.

The relation between capital structure, investment and product market decisions was studied by Clayton (2008). He used an extension of the model used by Brander and Lewis (1986), with the decisions as follow: first, financial structure, then investment and at last, quantities to be distributed in the product market. The first decision (financial structure) has an effect on

the next ones (investment and output), due to the limited liability of equity. When debt is chosen, the firm increases output, raising the benefit of lowering marginal cost, which is an increase of the benefit of the investment. They concluded that debt commits firms to an aggressive output decision, resulting on an increase in their own output and a decrease in the rivals' output.

Lee (2010) states that the choice for a long term debt means a competitive disadvantage to the competition in the product market. This is due to the difficulty of getting external financial resources when competition is tough. The author says this is a real cost that must always be considered when firms decide policies regarding their capital structure and calls it “*market power cost of debt*”. Therefore, firms under a competitive pressure of their rivals see their debt capacity limited.

Andersen *et al.* (2010) found that the use of leverage by publicly listed companies in New Zealand promotes an increase in sales on a relative-to-industry basis (via lower product prices). This will allow firms to compete more aggressively with their rivals and so increase their market share. However, when the increase target is achieved, they tend to maintain their levels of debt, as a way to ensure that the sales continue to grow in the future.

Just like Campello (2003), the findings of Ramachandran and Rao (2010) are also consistent with the ones of Chevalier and Scharfstein (1996): firms with a higher adjusted debt ratio inside an industry grow less in sales. This means that highly levered firms are constrained in recessions. When firms are smaller, the effects are even worse, since they experience lower sales and higher expenses.

More recently, Fosu (2013) states that financial leverage has an important positive effect on firm performance. Another conclusion is that firms in competitive industries take advantage from leverage, whilst those in uncompetitive industries are likely to suffer adverse effects of leverage.

Table 1 - Summary of main theories: relation between debt and market power

Kind of Relation	Research
Positive	Brander and Lewis (1986), Maksimovic (1988), Phillips (1995), Chevalier and Scharfstein (1996), Showalter (1999), Farr and Lord (2003), Wazenried (2003),

Kind of Relation	Research
	Fairchild (2004), Campello (2006), Tarzijan (2007), Clayton (2008), Andersen <i>et al.</i> (2010), Fosu (2013).
Negative	Telser (1966), Bolton and Scharfstein (1990), Glazer (1994), Opler and Titman (1994), Chevalier (1995), Kovenock and Phillips (1995, 1997), Scott Morton (1997), Zingales (1998), Campello (2003), Chen <i>et al.</i> (2007), Lee (2010), Ramachandran and Rao (2010)

2.2. Context specific effects

Three context effects were identified: legal system, national environment (culture) and specific industry.

2.2.1. Legal System

The legal system in which firms operate is an important determinant of capital structure. La Porta *et al.* (1997) worked on a sample of 49 countries, concluding that those which protect less the investors, have smaller and narrower capital markets (debt and equity).

Still related with the legal system effect, La Porta *et al.* (2000) underline the importance of the protection given by the legal system to the corporate governance (relating the above approach with the next one).

2.2.2. National environment

Another specific effect is related to the country. Gaud *et al.* (2007) document that the national environment affects capital structure. According to the authors, corporate governance and market timing impact capital structure. Looking to the relation on the other side, market (and operating) performance affects, in a significant way, the choice between debt and equity.

2.2.3. Specific industry

Pandey (2004) analysed the effects on debt of product market competition in Malaysian firms. He concluded that at lower and high market power, firms use more debt. In intermediate

states of market power, the use of debt is reduced. The author suggests that this is related to the market itself, agency problems and bankruptcy costs.

Studying the Chinese listed firms, Fairchild *et al.* (2011) realised the existence of significant differences in the debt ratios and product market competition across industries. They concluded that the relation between product market competition and leverage depends on industry type, firm's size and growth opportunities. There is also a dynamic aspect on this analysis: firms tend to adjust their leverage ratios through time. The overall conclusion is that there is a linear and inverse relationship between competition and leverage, suggesting the presence of a predation behaviour.

Abzari *et al.* (2012) reached a similar conclusion. They studied 603 firm-year observations in 8 Iranian industries, between 2001 and 2009. They could observe that there is an important industry effect, which influences the capital structure decision and affects product market. As a consequence, the authors argue that firms should consider the kind of industry prior to choosing the capital structure and the competitive strategy. Under these considerations, firms will be able to compete properly in the product market.

2.3. Other determinants of debt

Trying to complement the explanation of the debt ratio with the lerner index, we will use a group of other main determinants of debt. These include: profitability, size of the firm, growth rate, uniqueness of assets, current ratio and capability of generating internal resources.

- **Profitability**

Myers and Majluf (1984) use a model of the issue-investment decision to conclude, among other things, that firms should build up financial slack by restricting dividends when investment requirements are modest. The slack can be used when investment is needed, instead of external funds (expect negative sign of coefficient). Jensen (1986) and Brander and Lewis (1986) argue that firms with high profitability tend to use more debt (expect positive sign of coefficient).

- **Size of the firm**

The effect of the size of firm on its debt ratio is, in theory, uncertain. Istitieh & Rodriguez (2006) argue that the effect is positive, while Rajan and Zingales (1995) defend the opposite.

- **Growth Rate**

Companies that grow are more likely to expect a future profit and, as a consequence, more freedom of choice in future investments. Because we will be using the total assets, we will expect a positive sign of coefficient. The main difference between this variable and size of the firm is that growth rate introduces a dynamic component.

- **Uniqueness of Assets**

Titman and Wessels (1988) conclude that the debt ratio is negatively related with the uniqueness of assets.

- **Current Ratio**

Current ratio is the relation between current assets and current liabilities. With this variable we try to measure the current nature of the assets. According to Guney *et al.* (2011), more liquidity improves the solvency of a firm, which could mean more leverage (positive relation with the debt ratio). The authors also argue that, if a firm has a high long-term debt, its current ratio does not affect the debt ratio.

- **Capability of Generating Internal Resources**

Jensen (1986) states that the firms more able to generate more free cash flow are willing to have more debt on their capital structure. With more free cash flow, companies tend to increase leverage to obtain a bigger tax benefit. However, Guney *et al.* (2011) use the pecking order theory to justify a possible negative relation: a firm may prefer to employ equity financing, specially if under asymmetric information.

3. Research hypothesis, data and methodology

This chapter identifies the research hypothesis and provides a full description of the data and the variables used to perform the empirical work. It also describes the methodology and assumptions used to study the relation between market power and debt.

3.1. Research hypothesis

On the development of this study, we will consider the following hypothesis:

H1: Debt ratio and lerner index are positively related: an increase of market power (increase margins) contributes to an increase in debt. This may suggest a predation behaviour of firms, trying to maintain or gain market power;

H2: Debt ratio and lerner index are negatively related: an increase of market power (increase margins) contributes to a decrease in debt. This may suggest a pattern of firms more close to the deep pocket.

3.2. Data

The sample used on this dissertation was obtained from the AMADEUS Database and include only Portuguese non-financial firms (excluded all financial firms such as “financial services and insurance”, since their capital structure tends to be very different than the other firms, due to regulation constrains). The data was cleaned from the absent of values and then applied a winsorization at 1% and 99% levels. These procedures resulted in an unbalanced panel of 14.416 firm-year-observations, containing data from 2004 to 2010.

3.2.1. Dependent variable

We choose the debt ratio as our dependent variable.

$$DR = \frac{\textit{Total Liabilities}}{\textit{Total Assets}} \quad (1)$$

According to Rajan and Zingales (1995), the choice of the proxy of capital structure depends on the objective of the analysis. As the referred authors, we consider this as an appropriate definition of financial leverage.

3.2.2. Independent variables

3.2.2.1. Main independent variable – Lerner Index

Considering the main goal of this work, there were at least three variables that could be used as a proxy of product market competition and to relate with the debt ratio: q-Tobin, Lerner Index or the Herfindahl-Hirschman Index. The utilization of the q-Tobin requires market values, which are very difficult to obtain. To use the *HHI*, requires information about the industry, which was not accessible. As so and following Ross (1981), we decided to use the Lerner Index.

$$LI = \frac{P - MC}{P} \cong \frac{Sales - Operating Expenses}{Sales} \quad (2)$$

3.2.2.2. Return on Assets

The main goal of using the Return on Assets is to have a measure of profitability.

$$ROA = \frac{Operating Profit}{Total Assets} \quad (3)$$

3.2.2.3. Size of the Firm

Just like Guney *et al.* (2011), we will be using this measure calculated as the natural logarithm of total assets.

$$S = \ln(Total Assets) \quad (4)$$

3.2.2.4. Growth Rate

We decided to use a growth rate with the variation of total assets, and expect a positive relation with debt, as Guney *et al.* (2011) suggest.

$$GR = \frac{Total Assets_{(t)} - Total Assets_{(t-1)}}{Total Assets_{(t-1)}} \quad (5)$$

3.2.2.5. Uniqueness of Assets

Just like Guney *et al.* (2011), we will use the ratio of operating expenses to sales.

$$UA = \frac{\text{Operating Expenses}}{\text{Sales}} \quad (6)$$

3.2.2.6. Current Ratio

We use the current ratio as a proxy for a firm's liquidity.

$$CR = \frac{\text{Current Assets}}{\text{Current Liabilities}} \quad (7)$$

3.2.2.7. Capability of Generating Internal Resources

We will use the ratio of operational cash flow to total assets, as Guney *et al.* (2011) did.

$$CGIR = \frac{\text{Operational Cash Flow}}{\text{Total Assets}} \quad (8)$$

Table 2 – Expected impact of independent variables on the debt ratio (dependent variable)

An Increase in the Independent Variables	Expected sign
Lerner Index	+ / -
Return on Assets	+ / -
Size of the Firm	+ / -
Growth Rate	+
Uniqueness of Assets	-
Current Ratio	+ / -
Capability of Generating Internal Resources	+ / -

3.3. Methodology

Our first step is to provide an overview of all the variables used (dependent and independent). We do this in four ways: first, we briefly report the main descriptive statistics; second, we split the panel using the median of independent variables (number of splits as the independent variables) and compared means, using t-tests; third, we made another split (until and after 2007), and again compared means of the debt ratio, using a t-test, trying to find any evidence of the impact of the financial crisis; four, we performed a correlation analysis, using the Pearson's Correlation Coefficients to determine the magnitude of correlation as well as the direction of the relationship between all variables. The main goal of this procedure is to find possible cases of multicollinearity.

The second step is an analysis of the relationship between a firm's debt level and its determinants, namely the market power, through the use of the panel data methodology (or longitudinal data). In order to decide the most appropriate estimation method (pooled *OLS*, Fixed Effects (*FE*) and Random Effects (*RE*)), we conduct two tests. The first - F test - will decide between the use of pooled *OLS* and Fixed Effects.

Estimating a *FE* model, we obtain a result [F(3827, 10582)=28,52; p<0,001] which allow us to reject the null hypothesis, at the 1% level of significance. This means that *FE* is preferred to pooled *OLS*.

Next, we compared *FE* to *RE*, by conducting the Hausman test. The Hausman test (Hausman, 1978) is used to test the *RE* regression against the *FE* regression. If the null hypothesis is rejected, the fixed effects regression is more appropriate than the random effects regression. *FE* and *RE* models are estimated prior to the test. The result obtained [$\chi^2(5)=1116,06$; p<0,001] means that the null hypothesis of that the coefficients estimated by the efficient *RE* estimator are the same as the ones estimated by the consistent *RE* estimator is rejected. Under these circumstances, *FE* is the most appropriate way to examine the relationship between debt and all the determinants used. The regression model to estimate the debt ratio presents, analytically, the following expression:

$$DT_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 S_{it} + \beta_3 CGIR_{it} + \beta_4 ROA_{it} + \beta_5 LI_{it} + \beta_6 UA_{it} + \beta_7 GR_{it} + \alpha_i + \varepsilon_{it} \quad (9)$$

Where,

DT_{it} = debt ratio of firm i in year t.

CR_{it} = current ratio of firm i in year t.

S_{it} = size of firm i in year t.

$CGIR_{it}$ = capability of generating internal resources of firm i in year t.

ROA_{it} = return on assets of firm i in year t.

LI_{it} = lerner index of firm i in year t.

UA_{it} = uniqueness of assets of firm I in year t.

GR_{it} = growth rate of firm i in year t.

ε_{it} = error term.

β_j = coefficient for each independent variable (β_0 is an intercept parameter).

α_i = unknown intercept for each firm.

4. Empirical results

In this chapter we conducted an empirical work that is divided in two areas. First, the main descriptive statistics and the Pearson correlation coefficients to understand the relationships that can be established between variables. Second a panel data analysis using a FE regression in order to determine the relation between debt and market power.

4.1. Descriptive statistics analysis

Table 3 shows the main descriptive statistics for all the variables. Starting by the dependent variable (debt ratio), firms have, in average, 90% of their assets as liabilities. The minimum debt ratio is 0,4147, and 75% of the studied panel are above 0,8530. This means that Portuguese non-financial firms have a high leverage level.

Turning out focus to the independent variables, lerner index varies from 0,0006 (companies with no market power, operating in perfect competition) to 0,6303 (companies with a dominant position). In average, firms in panel have a low market power, about 7%.

The average of current ratio is 1,8160. 75% of the panel is above 1,0741, which means some comfort in terms of liquidity situation.

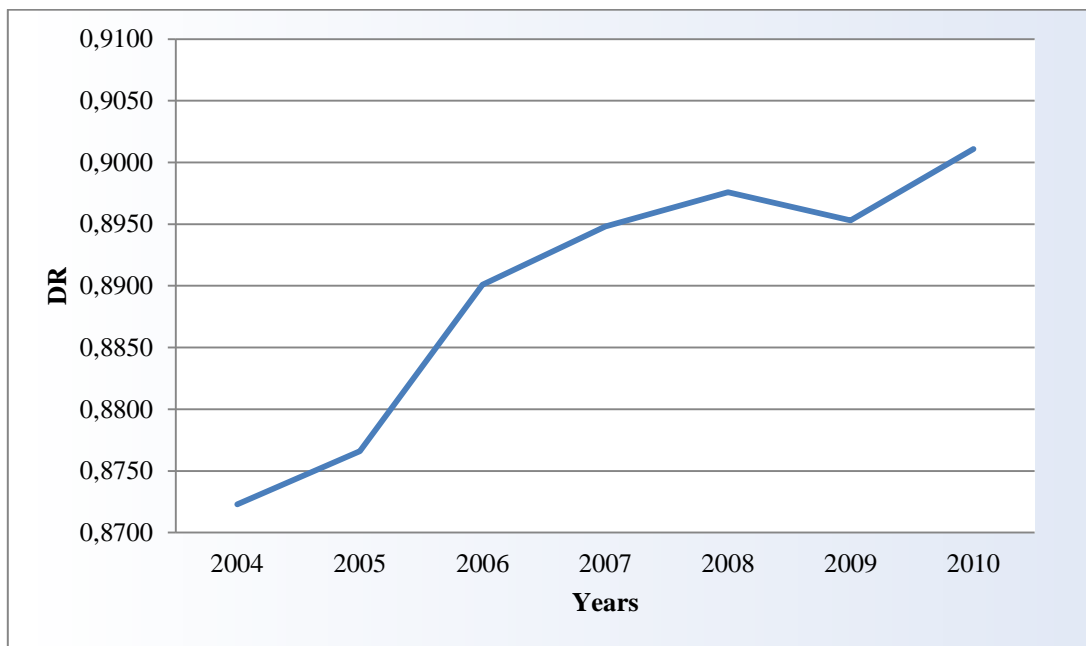
In terms of profitability, *ROA* varies between -0,0068 and 0,4281. Once its mean value (0,0842) is much more close to the minimum, we can say that the firms in the panel, in average, have a weak profitability. Finally, the growth rate: this variable has a considerable amplitude (-0,374 to 4,4138), meaning that the panel contains a wide variety of cases (firms that grew and others who saw theirs assets reduced). In average, firms from panel grew 20%.

Another interesting analysis is the comparison of various means of the variable debt ratio, by splitting the panel in two (at the median point) according to the independent variables. This allow us to take some empirical conclusions about the relation of dependent and independent variables. The results are shown in Table 4. By the comparison of liquidity (current ratio) with the debt ratio, we conclude that the firms with less liquidity have a higher debt ratio (in average). In terms of size, the firms with lower *S* values are the ones, in average, with high debt ratio. Analysing *ROA*, we conclude that firms with higher profitability get also, in average, the high values of debt ratio. Looking at the *GR*, we see that the firms which grow more have, in average, higher values of the debt ratio. This results allow us to construct a profile, in which the firms with higher debt ratio are, in average, the ones with lower liquidity,

smaller size, high profitability and high growth. It is important to say that all means were subjected to the t-test. The null hypothesis is that the two population means are equal. With the exception of *CGIR*, *LI* and *UA*, we rejected the null hypothesis, which means that the results are statistic significant for a level of significance of 0,01 (2-tailed).

With the goal of looking at some effect of the financial crisis, we made a final split at the panel, now in terms of years: 2004 to 2007 and 2008 to 2010. We find that the DR mean of the second part of panel (2008 to 2010) is higher than the period before (0,8983 comparing to 0,8850). This difference in means (please see Table 5) is statistic significant for a level of significance of 0,01 (2-tailed). This is somehow an unexpected result because after the beginning of the financial crisis, the economy faced a credit supply shock. This rising effect is visible on Figure 1.

Figure 1 - Evolution of the average debt ratio for the sample period



4.2. Pearson correlation coefficients analysis

In Table 6 we present the Pearson linear correlation coefficients for all variables. With two exceptions, the correlations are statistically significant at the 0,01 level or at the 0,1 level. The strongest correlations are -1, between *LI* variable and *UA* variable and 0,8523, between *CGIR* variable and *ROA*. In the first case, the perfect negative correlation suggests a dependency. In the second case (*CGIR* and *ROA* variables), the strong correlation represents the increase on the profitability when the firm is capable of generating internal resources. Considering the

relation between the dependent variable and all the independent we find a negative weak correlation to the *CR* variable, *S* variable and also to the *LI* variable. All other four variables have a positive and weak correlation to the *DR*, with emphasis on the *ROA* variable. All correlations between dependent variable and independent variable are statistically significant at the 0,01 level or 0,1 level.

4.3. Regression analysis

We pretend to investigate the main theories in literature that receive support from our panel data. The FE method led us to the following model:

$$DT_{it} = 0,5159244 - 0,001476 CR_{it} + 0,0401686 S_{it} - 0,0879693 CGIR_{it} + 0,0702866 ROA_{it} + 0,0085881 LI_{it} + 0,0049382 GR_{it} \quad (10)$$

When we look at the expression, we see that *UA* is not present: it was omitted on estimation because of collinearity (as we suspected, at section 4.2.).

The effect of the independent variables on the dependent is described as follow:

Current Ratio:

This result is consistent with the results of Guney *et al.* (2011). Its negative (and low) coefficient means that firms probably prefer long-term debt (which the effect is not captured by the current ratio). Although Portuguese non-financial firms present a good level of liquidity, that is not a strong determinant for the choice of debt.

Size of Firm:

The size of Portuguese non-financial firms is positively related with their debt ratio. Our result is consistent with Istitieh and Rodriguez (2006) and Guney *et al.* (2011).

Capability of Generating Internal Resources:

This variable has a negative effect on the debt ratio. This result suggests that Portuguese non-financial firms with the capability of generating internal resources first choose the option for equity financing instead of debt. This result is consistent with the pecking order theory

referred by Guney *et al.* (2011): Portuguese non-financial firms may prefer to employ equity financing, especially if under asymmetric information.

ROA:

The profitability of Portuguese non-financial firms affect positively the choice of debt. Firms with higher profitability tend to use more debt on their capital structure. This result is consistent with Jensen (1986) and Brander and Lewis (1986).

Lerner Index:

Market power has a positive effect on the debt ratio (despite the statistic non-significant of its coefficient). This means that as market power increases (prices rise) firms tend to increase their debt levels. This is consistent with Showalter (1999).

Growth Rate:

Growth (as measured by the variation of total assets) of a firm is positively related with the debt ratio. Firms achieving higher growth levels tend to increase their debt levels on their financing structure. This result is consistent with the results of Guney *et al.* (2011).

Table 3 – Descriptive statistics of all variables

Variables	Mean	Standard deviation	Minimum	25th percentile	Median (50th percentile)	75th percentile	Maximum	Number of observations
<i>DR</i>	0,8914	0,1124	0,4147	0,8530	0,9251	0,9711	0,9995	14.416
<i>CR</i>	1,8160	1,6081	0,2010	1,0741	1,3652	1,9274	11,6850	14.416
<i>S</i>	9,4508	1,3251	6,2746	8,5981	9,4059	10,2201	13,4197	14.416
<i>IR</i>	0,1021	0,0769	-0,0008	0,0463	0,0832	0,1371	0,3903	14.416
<i>ROA</i>	0,0842	0,0837	-0,0068	0,0254	0,0571	0,1152	0,4281	14.416
<i>LI</i>	0,0731	0,1059	0,0006	0,0135	0,0358	0,0843	0,6303	14.416
<i>UA</i>	0,9269	0,1059	0,3697	0,9157	0,9642	0,9865	0,9994	14.416
<i>GR</i>	0,1966	0,5616	-0,3734	-0,0189	0,0790	0,2312	4,4138	14.416

Table 4 – DR means for panel splitting by independent variable

DR mean													
Less liquid	More liquid	Smaller size	Bigger size	Less <i>CGIR</i>	More <i>CGIR</i>	Less profitable	More profitable	Less market power	More market power	Less <i>UA</i>	More <i>UA</i>	Less growth	More growth
0,9081*	0,8747*	0,8983*	0,8845*	0,8912	0,8916	0,8838*	0,8990*	0,8921	0,8907	0,8907	0,8921	0,8765*	0,9063*

* Significant at the 0,01 level (2-tailed).

Table 5 – DR means for panel splitting by financial crisis (before and after the beginning)

<i>DR</i> mean	
2004-2007 (before beginning of crisis)	2008-2010 (after beginning of crisis)
0,8850*	0,8983*

* Significant at the 0,01 level (2-tailed).

Table 6 – Correlation matrix of all variables

	<i>DR</i>	<i>CR</i>	<i>S</i>	<i>CGIR</i>	<i>ROA</i>	<i>LI</i>	<i>UA</i>	<i>GR</i>
<i>DR</i>	1							
<i>CR</i>	-0,1025**	1						
<i>S</i>	-0,0771**	0,0855**	1					
<i>CGIR</i>	0,0251**	0,0524**	-0,0769**	1				
<i>ROA</i>	0,1012**	0,1249**	-0,0894**	0,8523**	1			
<i>LI</i>	-0,0154*	0,2804**	0,2956**	0,2430**	0,3249**	1		
<i>UA</i>	0,0154*	-0,2804**	-0,2956**	-0,2430**	-0,3249**	-1	1	
<i>GR</i>	0,0994**	-0,0495**	-0,0995**	-0,0036	0,0350**	-0,0147*	0,0147*	1

** Correlation is significant at the 0,01 level.

* Correlation is significant at the 0,1 level.

Table 7 – Regression results on the determinants of the debt ratio using Fixed Effects

Independent variable	Expected sign (as in Table 3)	Estimated coefficient
<i>CR</i>	+ / -	-0,001476 (-2,24)*
<i>S</i>	+ / -	0,0401686 (12,51)**
<i>CGIR</i>	+ / -	-0,0879693 (-2,81)**
<i>ROA</i>	+ / -	0,0702866 (2,62)**
<i>LI</i>	+ / -	0,0085881 (0,71)
<i>GR</i>	+	0,0049382 (3,29)**

** Significant at the 0,01 level. * Significant at the 0,05 level.

Prob > F = 0,0000

Adj R-squared = 0,8856

Conclusion

This study is a contribution to the literature, since it uses the lerner index as a proxy of market power as the main determinant of debt ratio, as proxy of leverage. Another important contribution comes from the fact of being related to Portuguese firms. Our main intend is to investigate the relation between leverage (debt ratio) and market power (lerner index) on Portuguese non-financial firms. The main objectives were two: in one hand, determine the kind of relation between debt and market power (positive or negative); on the other hand, taking into account the main existing theories in literature, try to determine a pattern followed by Portuguese non-financial firms as to what determinants are relevant in the choice of their debt levels.

Since the lerner index (market power) is positively related to debt ratio (leverage), the results seem to indicate that Portuguese non-financial firms are more close to a predation behaviour: firms tend to look for debt in order to maintain or increase their market power, fighting the incumbents and creating an entry barrier for the entrants. If the demand is uncertain, its rivals will respond, raising the prices too. This allow us to confirm hypothesis H1 and reject hypothesis H2.

Another interesting conclusions:

- Size, growth and profitability are positive determinants of debt;
- Capability of generating internal resources is negatively related to debt: this result reinforces the use of debt for predation behaviour;
- In average, Portuguese non-financial firms sought more debt after the beginning of the international crisis (2009 and 2010).

The results allowed us to identify a profile of Portuguese non-financial firms with higher debt:

- Lower liquidity;
- Smaller size;
- High profitability;
- High growth rates.

Because of the limitations of this work, due mainly to the difficulty of getting data of non-listed Portuguese firms, we suggest that future studies in this area should try to include a variable as a proxy of uncertain demand. This would allow to confirm if the raise of prices is really followed by its rivals, due to uncertain demand. We also think that the study of Portuguese firms should try work on an analysis by sector, and region. From the unexpected result on the higher usage of debt after the beginning of the financial crisis, it could be interesting to study how this happened (what sources of debt were used in times of credit crunch) and also if this trend is observable in other countries, namely European.

References

Abzari, M., Fathi, S. & Torosian, A. 2012. Inter-industry differences in capital structure and product market competition: Evidence from Iranian companies. *Interdisciplinary Journal of Contemporary Research in Business*, 3(9): 395-402.

Anderson, H. D., Chen, J. & Smith, D. 2012. The relationship between capital structure and product markets: Evidence from New Zealand. *Review of Quantitative Finance and Accounting*, 38(1): 1–24.

Bolton, P., & Scharfstein, D. S. 1990. A theory of predation based on agency problems in financial contracting. *The American Economic Review*, 80(1): 93–106.

Brander, J., & Lewis, T. R. 1986. Oligopoly and financial structure: The limited liability effect. *The American Economic Review*, 76(5): 956–970.

Campello, M. 2003. Capital structure and product markets interactions: evidence from business cycles. *Journal of Financial Economics*, 68: 353-378.

Campello, M. 2006. Debt financing: Does it boost or hurt firm performance in product markets? *Journal of Financial Economics*, 82: 135-172.

Chen, S.-S., Chung, T.-Y., Ho, K. W. & Lee, C.-F. 2007. Intra-industry effects of delayed new product introductions. *Review of Pacific Basin Financial Markets and Policies*, 10: 415–443.

Chevalier, J. A. 1995. Capital structure and product-market competition: empirical evidence from the supermarket industry. *The American Economic Review*, 85(3): 415–435.

Chevalier, J. A. & Scharfstein, D. S. 1996. Capital-Market Imperfections and Countercyclical Markups: Theory and Evidence. *American Economic Review*, 86: 703-725.

Clayton, M. J. 2008. Debt, investment, and product market competition: A note on the limited liability effect. *Journal of Banking & Finance*, 20: 694-700.

Fairchild, J. R. 2004. Potential product market competition, financial structure and actual competitive intensity. *Mimeo*, SSRN Database.

Fosu, S. 2013. Capital structure, product market competition and firm performance: Evidence from South Africa. *The Quarterly Review of Economics and Finance*, 53(2): 140-151.

Gaud, P., Hoesli, M. & Bender, A. 2007. Debt-equity choice in Europe. *International Review of Financial Analysis*, 16(3): 201–222.

Glazer, J. 1994. The strategic effects of long-term debt in imperfect competition. *Journal of Economic Theory*, 62: 428–443.

Guney, Y., Li, L. & Fairchild, R. 2011. The relationship between product market competition and capital structure in Chinese listed firms. *International Review of Financial Analysis*, 20: 41-51.

Hausman, J. A. 1978. Specification Tests in Econometrics. *Econometrica*, 46(6): 1251-1271.

Istaitieh, A., & Rodriguez, J. M. 2006. Factor-product markets and firm's capital structure: A literature review. *Review of Financial Economics*, 15(1): 49–75.

Jensen, M. C. 1986. Agency costs of free cash flows, corporate finance and takeovers. *The American Economic Review*, 76(3): 323–329.

Kovenock D. & Phillips G. M. 1995. Capital structure and product-market rivalry: how do we reconcile theory and evidence? *The American Economic Review*, 85(2): 403–408.

Kovenock D. & Phillips G. M. 1997. Capital structure and product market behaviour: an examination of plant exit and investment decisions. *Review of Financial Studies*, 10(3): 767–803.

La Porta, R., Lopez De Silanes, F., Shleifer, A. & Vishny, R. W. 1997. Legal determinants of external finance. *Journal of Finance*, 52(3):1131–1150.

La Porta, R., Lopez De Silanes, F., Shleifer, A. & Vishny, R. W. 2000. Investor protection and corporate governance. *Journal of Financial Economics*, 58(1–2): 3–27.

Lee, C. 2010. Firms' capital structure decisions and product market competition: a theoretical approach. *Research in Business and Economics Journal*, 3: 1-17.

Lord, A. R., Farr, W. K. 2003. Collusion and financial leverage: an analysis of the integrated mill steel industry. *Financial Management*, 32(1): 127-148.

- Maksimovic, V. 1988. Capital structure in repeated oligopoly. *The Rand Journal of Economics*, 19(3): 389–407.
- Myers, S. C., & Majluf, N. S. 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*, 13(2): 187–221.
- Opler, T. & Titman, S. 1994. Financial distress and corporate performance. *Journal of Finance*, 49(3): 1015–1040.
- Pandey, I. M. 2004. Capital structure, profitability and market structure: Evidence from Malaysia. *Asia Pacific Journal of Economics and Business*, 8(2): 78–91.
- Phillips, G. M. 1995. Increased debt and industry product markets: an empirical analysis. *Journal of Financial Economics*, 37: 189–238.
- Rajan, R. G., & Zingales, L. 1995. What do we know about capital structure? Some evidence from international data. *Journal of Finance*, 50(5): 1421–1460.
- Ramachandran, V. S. & Rao, S. V. D. N. 2008. Capital structure, industry pricing, and firm performance, *International Journal of Business Insights and Transformation*, 3(2): 5-12.
- Riordan, M. H. 2003. How do capital markets influence product market competition? *Review of Industrial Organization*, 23: 179-191.
- Ross, S. A. 1981. Tobin's q Ratio and Industrial Organization. *Journal Of Business*, 54(1).
- Scott Morton, F. 1997. Entry and predation: British shipping cartels 1879-1929. *Journal of Economics and Management Strategy*, 6(4): 679-724.
- Showalter, D. M. 1999. Strategic debt: Evidence in manufacturing. *International Journal of Industrial Organization*, 17(3): 319–333.
- Tarzijan, J. A. 2007. *Capital structure and entry deterrence with multiple incumbents. The B.E. Journal of Economic Analysis & Policy*, 7(1).
- Telser, L. G. 1966. Cutthroat competition and the long purse. *The Journal of Law and Economics*, 9: 259-277.

Titman, S., & Wessels, R. 1988. The determinants of capital structure choice. *Journal of Finance*, 43(1): 1–19.

Wanzenried, G. 2003. Capital structure decisions and output market competition under demand uncertainty. *International Journal of Industrial Organization*, 21: 171-200.

Wooldridge, J. M. 2002: *Introductory econometrics: a modern approach*. 2nd Edition. South-Western.

Zingales, L. 1998. Survival of the fittest or the fattest? Exit and financing in the trucking industry. *The Journal of Finance*, 53(3): 905–938.

APPENDIXES

List of Appendixes

Appendix 1 – OLS pooled estimation

Appendix 2 – Inicial FE estimation

Appendix 3 – RE estimation

Appendix 4 – Hausman test

Appendix 5 – Final FE estimation

Appendix 1 – OLS pooled estimation

```
. reg DR CR S IR ROA LI UA GR
note: UA omitted because of collinearity
```

Source	SS	df	MS	
Model	9.03267072	6	1.50544512	Number of obs = 14416
Residual	173.031846	14409	.012008595	F(6, 14409) = 125.36
Total	182.064517	14415	.012630213	Prob > F = 0.0000
				R-squared = 0.0496
				Adj R-squared = 0.0492
				Root MSE = .10958

DR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
CR	-.0082725	.000595	-13.90	0.000	-.0094388 - .0071061
S	-.0038795	.00074	-5.24	0.000	-.0053301 - .002429
IR	-.3495384	.0228812	-15.28	0.000	-.3943886 - .3046883
ROA	.4258295	.0217676	19.56	0.000	.3831621 .4684969
LI	-.0132251	.0100024	-1.32	0.186	-.032831 .0063808
UA	0	(omitted)			
GR	.0153839	.0016397	9.38	0.000	.0121698 .018598
_cons	.9408805	.0072096	130.50	0.000	.9267487 .9550122

Appendix 2 – Initial FE estimation

```
. xtreg DR CR S IR ROA LI UA GR, fe
note: LI omitted because of collinearity
```

```
Fixed-effects (within) regression      Number of obs      =      14416
Group variable: NR                    Number of groups   =      3828

R-sq:  within = 0.1366                Obs per group: min =         1
      between = 0.0070                avg =         3.8
      overall  = 0.0036                max =         7

corr(u_i, Xb) = -0.4876                F(6,10582)         =      279.06
                                          Prob > F           =      0.0000
```

DR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
CR	-.001476	.000383	-3.85	0.000	-.0022267	-.0007253
S	.0401686	.0011002	36.51	0.000	.0380119	.0423252
IR	-.0879693	.0171529	-5.13	0.000	-.1215922	-.0543464
ROA	.0702866	.0153089	4.59	0.000	.0402784	.1002949
LI	0	(omitted)				
UA	-.0085881	.0080815	-1.06	0.288	-.0244293	.007253
GR	.0049382	.0008017	6.16	0.000	.0033667	.0065098
_cons	.5245126	.0136961	38.30	0.000	.4976656	.5513595
sigma_u	.1304956					
sigma_e	.03801443					
rho	.92177755	(fraction of variance due to u_i)				

```
F test that all u_i=0:      F(3827, 10582) =      28.52      Prob > F = 0.0000
```

Appendix 3 – RE estimation

```
. xtreg DR CR S IR ROA LI UA GR, re
note: UA omitted because of collinearity
```

```
Random-effects GLS regression
Group variable: NR
```

```
Number of obs      =    14416
Number of groups   =     3828
```

```
R-sq:  within = 0.1169
       between = 0.0013
       overall = 0.0002
```

```
Obs per group: min =      1
               avg  =     3.8
               max  =      7
```

```
corr(u_i, X)      = 0 (assumed)
```

```
Wald chi2(6)      =    954.03
Prob > chi2       =     0.0000
```

	DR	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
	CR	-.0021894	.0003767	-5.81	0.000	-.0029277	-.0014512
	S	.0208417	.0008781	23.74	0.000	.0191207	.0225627
	IR	-.1730304	.0165346	-10.46	0.000	-.2054376	-.1406233
	ROA	.1497414	.014917	10.04	0.000	.1205046	.1789782
	LI	-.0121529	.0075725	-1.60	0.109	-.0269947	.0026888
	UA	0	(omitted)				
	GR	.0080602	.0007953	10.13	0.000	.0065014	.0096191
	_cons	.6990759	.0087109	80.25	0.000	.6820028	.716149
	sigma_u	.10781615					
	sigma_e	.03801443					
	rho	.88942913	(fraction of variance due to u_i)				

Appendix 4 – Hausman test

. hausman fixed random

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
CR	-.001476	-.0021894	.0007134	.0000692
S	.0401686	.0208417	.0193269	.0006629
IR	-.0879693	-.1730304	.0850611	.004564
ROA	.0702866	.1497414	-.0794548	.0034416
GR	.0049382	.0080602	-.003122	.0001011

b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(5) = (b-B)' [(V_b-V_B)^(-1)] (b-B)
 = 1116.06
 Prob>chi2 = 0.0000
 (V_b-V_B is not positive definite)

Appendix 5 – Final FE estimation

```
. areg DR CR S IR ROA LI GR, absorb (NR) robust cluster (NR)
```

```
Linear regression, absorbing indicators          Number of obs   =    14416
                                                F(    6,   3827) =    35.01
                                                Prob > F        =    0.0000
                                                R-squared       =    0.9160
                                                Adj R-squared   =    0.8856
                                                Root MSE       =    0.0380
```

(Std. Err. adjusted for **3828** clusters in NR)

DR	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
CR	-.001476	.00066	-2.24	0.025	-.0027701	-.0001819
S	.0401686	.0032111	12.51	0.000	.0338729	.0464642
IR	-.0879693	.0312786	-2.81	0.005	-.1492937	-.0266449
ROA	.0702866	.026868	2.62	0.009	.0176096	.1229636
LI	.0085881	.0121172	0.71	0.479	-.0151686	.0323448
GR	.0049382	.0015014	3.29	0.001	.0019946	.0078819
_cons	.5159244	.0307582	16.77	0.000	.4556204	.5762285
NR	absorbed		(3828 categories)			