FUNDAÇÃO GETÚLIO VARGAS
ESCOLA DE ECONOMIA DE EMPRESAS DE SÃO PAULO

Gilberto Orestis Picareta Giannakopoulos

Effects of Capital Structure on Markups and Competitive Performance
Evidence from Portugal

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Campo do Conhecimento:
International Master in Finance

Orientador Prof. Dr. Cláudia Custodio e Marcelo Fernandes

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Resumo

Este estudo avalia os efeitos da estrutura de capital nas margens de lucro e no desempenho competitivo. Aplica teorias relativas à contra ciclicidade das margens de lucro, e aos resultados do mercado do produto de Chevalier e Scharfstein (1996), a dados portugueses, seguindo a metodologia de Campello (2001). Utilizando dados de painel de empresas pertencentes à indústria transformadora Portuguesa, a análise fornece evidencia para a contra-ciclicidade de margens de lucro e de um efeito conjunto de dívida e recessão económica nas margens de lucro. Tendo por base o recenseamento de empresas Portuguesas, a análise não fornece evidência de uma relação significativa entre a estrutura de capital e o desempenho competitivo.

Palavras Chave: Estrutura de capital, margens de lucro, desempenho competitivo, crise

Abstract

This paper examines the effects of capital structure on markups and competitive performance. It applies theories of markup counter cyclicality and product market outcomes by Chevalier and Scharfstein (1996) to Portuguese data following the methodology from Campello (2001). Using industry level panel data of the Portuguese manufacturing industry, the analysis provides evidence for markup counter cyclicality and a joint effect of leverage and economic downturn on markups. Using a firm level census of Portuguese companies the analysis provides no evidence for a significant relationship between capital structure and competitive performance.

Keywords: capital structure, markup, competitive performance, crisis

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Introduction

A common way of competition between firms in an industry is price competition. In more mature industries when products tend to be perceived as a commodity by consumers, many companies compete on the basis of prices. Firms increase market share by cutting prices thereby also reducing their markup. Particularly, in times of crisis a firm's capital structure can restrict the extent to which a firm can reduce its markup. During economic downturns tighter covenants and the related cost of debt can restrict a company's ability to compete. This paper investigates the effect of capital structure on competitive behaviour of Portuguese companies. This is analysed at two levels. First, by looking at the effect of leverage on markups during demand shocks at the industry level and, second, by analysing competitive performance over the business cycle at the firm level. [1]

A firm in an aggressive competitive environment will reduce markups through the reduction of prices. The reduction of prices is seen as investment in market share- or sales growth (Chevalier & Scharfstein, 1996). However, in the case of demand shocks, for example, during a crisis, a firm might be constrained to decrease prices, as it requires cash flow to nourish its capital structure (Klemperer, 1995). The expectation is that a relatively highly leveraged firm will have less ability to reduce markups as its capital structure requires it to cover costs associated with its debt. Consequently, during economic downturns the leveraged firm will be unable to compete with predatory pricing imposed by relatively low-leveraged counterparts. An obstacle in this analysis is endogeneity caused by a confounding variable implying that capital structure and

[1] The industry-adjusted level of leverage characterises the capital structure whereas competitive performance is described by industry-adjusted sales growth. Markups are the difference between price and the cost of producing a product. Demand shocks can be either positive or negative and manifest themselves in periods of booms and recessions, respectively.

[2] Before analysing Portuguese data Campello's work (2001) was replicated on his own data. The

behaviour may be influenced by a third variable, which has not been included in the model because it is unobservable. To overcome this obstacle the paper analyses performance following events affecting competitors' ability to compete under their given capital structure. The event is the systemic 2008 financial crisis, which could not be previously anticipated by market participants.

Using industry level panel data of the Portuguese manufacturing industry, the analysis provides evidence for markup counter cyclicality and a joint effect of leverage and economic downturn on markups. From the firm level census data of Portuguese companies the no evidence for a significant relationship between capital structure and competitive performance is derived.

The paper is divided into four sections. Section one introduces the foundations of the studies of capital structure and provides a literature review on academic research about the impact of capital structure on competitive performance. The second section presents data, results, interpretation, and limitations for the industry-level analysis. The third section has the same structure for the firm-level analysis. In the fourth section conclusions are summarised, major limitations are presented, and themes for further research are elaborated.

1. Literature Review

This paper's goal is to analyse how capital structure influences a firm's and its competitors' behaviour. In business and economics academia much work has been devoted to the study of capital structure of a firm. The Modigliani-Miller theorem

represents the foundation for research on capital structure. In their scenario of a perfect capital market, the choice between equity and debt does not matter, since under the assumption of no transaction- and bankruptcy costs, firm value is unaffected by the choice of financing (Modigliani & Miller, 1958). The leveraged firm as opposed to the unleveraged firm has a higher cost of equity due to the financial risk associated with debt but the total value remains unaffected. This is why in their scenario with taxes an all-debt capital structure is considered optimal. Moreover, the move from Modigliani and Miller's perfect scenario into reality along with its imperfections, made theoretical and empirical researchers evolve in two different directions.

First, there is the study of the effect of capital structure on relationships of agents inside the firm. This direction deals with agency cost and has been fundamentally influenced by Jensen and Meckling's paper (1976) who describe a value loss from information asymmetry between management and outside investors in a theoretical framework. An optimal capital structure can be reached by trading off the cost of debt such as cost of financial distress and agency cost against the benefit of debt. The benefit of debt is often associated with the tax shield but debt can also have a disciplining effect on management (Harris & Raviv, 1990). Furthermore, the static tradeoff- and pecking order theory have provided theoretical explanations for the importance of choosing different modes of financing (Myers, 1984). A series of authors empirically tested these theoretical models and found confirming- and disconfirming evidence creating an academic dialogue about the applicability of these theories, for example between Shyam-Sunder and Myers (1998) and Chirinko and Singha (2000).

The second direction of research concerns the study of the effect of capital structure on relationships of agents outside a firm. This involves competitors, consumers and the resulting product market outcomes. The variables analysed are price, costs, and quantity. A firm's choice of these variables has been observed to affect competition. Furthermore, capital structure in turn impacts the equilibrium strategies and payoffs (Harris & Raviv, 1991). Literature in this line of study adopts the view that managers are incentivised to maximise equity value rather than profits. There are two main opposing theories that explain how capital structure influences competitive outcomes.

First, based on Jensen and Meckling's idea that by taking on more debt equity holders are induced to take riskier actions, Brander and Lewis' theory (1986) of strategic commitment suggests that a relatively highly leveraged firm has an incentive to pursue strategies that raise returns in good states but lower return in bad states. They argue that firms with higher leverage cut their prices to attain a higher market share even during negative demand shocks.

Second, Bolton and Scharfstein (1990) posit that firms with a lot of debt financing have a disadvantage as opposed to their less leveraged competitors. Competitors with less financial constraints can draw a firm out of competition by setting extremely low prices. Contrary to the theory of strategic commitment Bolton and Scharfstein's predatory pricing theory implies that particularly in periods of low demand financially constrained firms can suffer from not being able to keep up with price competition.

Chevalier and Scharfstein (1996) revisit this idea and find that debt-financed firms are more likely to cut their investment in market share building during recessions. In their

sample from the US American supermarket industry they observe that during periods of negative demand shocks liquidity-constrained firms boost short-run profits by raising prices. In this case the increase in prices leads to a loss in market share.

Further, Campello (2001) provides evidence for Chevalier and Scharfstein's results. Campello examines a sample from the US manufacturing industry and finds that relatively high leveraged companies have higher markups during recessions but not during booms. This implies that during recession firms change their competitive behaviour due to their capital structure. Further, Campello's findings show that capital structure's impact on competitive behaviour is contingent on the capital structure of other competitors in the same industry. However, during booms capital structure does not lead to differentiated behaviour. The evidence for counter cyclicality of markups (Cheavlier and Scharfstein, 1996; Campello, 2001) is challenged in Nekarda and Ramey's paper (2013) on cyclical behaviour of the price-cost markup.

From the two directions presented the latter is fairly unexplored. This paper aims to 'reanimate' the debate by extending the work of Chevalier and Scharfstein (1996) and of Campello's (2001) with an industry-level analysis of the Portuguese manufacturing industries and a firm-level analysis with a census of Portuguese companies. The analysis closely follows the theoretical approach from Campello's paper (2001). It examines the effect of capital structure on markups to test Bolton and Scharfstein's predatory pricing theory (1990). Further, it analyses a firm's competitive performance contingent on its capital structure and associated 'financial fragility' during demand shocks.

Whereas Bolton and Scharfstein (1990) solely used debt to define financial fragility, this paper opts for Campello's method (2001) by considering a firm financially fragile only under three conditions. First, the firm has to be highly leveraged relative to its industry rivals. Second, it is in a market where debt financing is low.

The contribution of this work is the following. First, the analysis of Campello (2001) is replicated using a more recent and detailed dataset of companies operating in the Portuguese manufacturing sector and includes firm level data. Second, the more recent data captures the period of the financial crisis in Europe, which represents a vastly stronger negative demand shock than the ones studied in previous research. Third, a census of all Portuguese companies is used for the firm level analysis, compared to a sample as in previous work by Campello (2001). This allows for a more accurate measurement of the effects of capital structure.

2. Industry Level Analysis

In terms of methodology this section replicates Campello's (2001) industry analysis. This section aims to test the theory of counter cyclicality of markups brought forward by Chevalier and Scharfstein (1996). Consequently, the expectation is that during recessions markups increase. The resulting hypothesis states:

H_0: Negative economic activity has no positive effect on markup

H_A: Negative economic activity has an effect on markup

It also investigates debt's effect on cyclicality of markups. Following Bolton and Scharfstein's initial theory (1990) there should be a joint effect of debt and recession on markups. Accordingly, the hypothesis states:

H_0: Debt and negative economic activity have no joint positive effect on markup

H_A: Debt and negative economic activity have a joint positive effect on markup

The resulting empirical model allows testing for countercyclical markups on the industry level and for the effect of leverage on markups. The regression involves the dependent variable markup and the three explanatory variables economic activity, industry leverage, and the interaction term of economic activity and leverage. The model is stated in equation 1.

Equation 1: Empirical Model

$$\text{Markup}_{i,t} = c + \alpha(-\Delta \log(GDP)_t) + \beta Leverage_{i,t-1} + \gamma\left[Leverage_{i,t-1} \times (-\Delta \log(GDP)_t)\right] + \varepsilon_{i,t}$$

The $-\Delta \log(\text{GDP})$ serves as proxy for decreasing economic activity. A positive alpha coefficient means that during recession markups increase. Just like in Campello (2001) leverage is lagged one period. This diminishes the simultaneity between markup and leverage. The OLS regression uses heteroscedasticity-consistent standard error estimates to correct against a potential violation of the OLS assumptions. To understand Campello's (2001) data and methodology his dataset and results were replicated. Similar findings were obtained. The methodology was changed in a few aspects to better fit the context of the Portuguese data but did not have an impact on the qualitative results. Details about the replication can be found in the appendix.

2.1 Data

As for the data used, the paper generally aims to use similar types of data and variables as deployed by Campello (2001)[2]. The panel data ranges from 2004 to 2013 and includes industry-level data from 22 industries of the Portuguese manufacturing sector resulting in a total of 198 observations. The industries are classified according to the Portuguese industry classification 'Classificação Portuguesa das Actividades Económicas Rev.3' (CAE 3.0) and are denoted with the codes 10 to 31. Most data have been compiled through the database of the 'Instituto Nacional de Estadística' (INE), the national statistics bureau in Portugal. Three primary series have been constructed.

First, the markup series, generally price over cost, is calculated according to Campello's (2001) simplified version of Bil's (1987) definition of markup. One major advantage of Bil's measure is that it overstates markup cyclicality less than other common measures like the one used by Rotemberg and Woodford (1991). It allows the incremental cost of one hour of labour to change with the level of hours worked in an industry[3]. One drawback for Bils' measure, however, is that productivity shifts over the business cycle are not reflected. This is due to the fact that it takes gross output over the whole period thereby calculating only one productivity level and does not show when workers are more or less efficient during sub periods. Also it does not take into account whether workers are more or less productive in times of economic downturn or growth.

[2] Before analysing Portuguese data Campello's work (2001) was replicated on his own data. The regression outputs can found in the appendix 3.

[3] Note: The cost of an hour of labour increases if overtime hours have been worked – that is more than 40 hours per week. However, in the sample reported working hours rarely trespassed the 40-hour threshold. The author expresses his doubts about the correctness of reported overtime hours as relatively little overtime hours have been reported for the Portuguese manufacturing industry. The investigation of the correctness, however, lies beyond of the scope of this paper.

Equation 2: Markup

$$Markup_t = \ln(P_t) - \ln(w_t) - \ln\left(1 + \mathrm{rV}'(H_t)\right) - \ln\left(\frac{H_t j_t N_t}{Y_t}\right) - trend - constant$$

P	price of a product
w	hourly average wage
r	legal overtime premium
H	weekly average hours
V(H)	overtime hours
j	number of weeks in a period
N	number of production workers per industry
Y	gross output

Generally, markup is price over marginal cost. As can be seen in Equation 2 the markup series is calculated with Price P, hourly wage w, weekly average hours H, overtime hours V(H), the number of weeks in a period j, number of production workers N, the gross output Y and the variable V'(H). V'(H) equals one when the weekly average hours of work in the industry exceed 40 hours and zero otherwise.

Most of the data used was retrieved as yearly data. If not – it was converted into yearly data by taking averages or sums. A general obstacle in the data collection was the conversion between two CAE formats, namely CAE 2.1 and CAE 3.0. To solve this, the CAE brochures as well as conversion tables were used to convert all data into the final classification CAE 3.0 (Instituto Nacional de Estatística, 2003; 2007). In a few cases availability of data for specific time ranges was lacking, for example, for gross output. After contacting INE the missing data was provided.

Price P was taken from the INE and is a typical index of output prices that allows for cross-industry comparison. The output price is the price producers receive from the purchaser for one unit of good produced minus taxes from sale and plus any sort of tax and subsidies the entity receives from the sale of that good. The index takes into

account any legal entity operating in that industry. This feature is important later on when using the INE data together with the census data.

On the cost side, hourly wage w is obtained via the gross wages and salaries in industry series and the total amount of hours worked series – both obtained from the INE. Similarly, effective weekly average hours H, and number of production workers N were taken from the same source for each industry, respectively.

In line with Campello (2001), overtime hours V(H) were derived as the weekly average hours H that exceed 40. This is not very accurate since overtime hours can be worked even if the weekly average hours are below 40. For instance, a worker can accumulate overtime hours on one day before the closing of a big order but still work less than 40 hours in a week. However, as the actual series of overtime hours is not available and could not be provided by the INE, the former method is adopted.

The gross output Y is obtained from the INE for each industry. Gross output measures two components. First, it measures an industry's sales to other industries – the intermediate inputs. The second component is the sale to final users in the economy, which represents GDP.

For the overtime premium r, a legal overtime premium of 50% is used for the first hour of overtime and 75% for the second. This is in line with the Portuguese labour standards that prevailed in the applicable period (Economias, 2015).

The second series is the leverage series, which is computed as the asset-weighted average long-term debt-to-asset ratio illustrated in Equation 2. The leverage series is compiled on the basis of a census of all Portuguese companies operating in the manufacturing industry. This data as well as the census of all Portuguese companies

was obtained via an institution of the INE 'IES - Informação Empresarial Simplificada' (Instituto Nacional de Estatistica, 2015). As can be seen in Equation 3 the calculation includes total assets 'Total do Activo bruto' and total long-term debt 'Total Dividas a terceiros a médio e longo prazo'.

Equation 3: Leverage

$$\text{Leverage}_t = \sum_{i=1}^{N} \frac{\boldsymbol{assets_i}}{\sum_{j=1}^{N} \boldsymbol{assets_j}} \cdot \frac{\boldsymbol{debt_i}}{\boldsymbol{assets_i}} = \sum_{i=1}^{N} \frac{\boldsymbol{debt_i}}{\sum_{i=1}^{N} \boldsymbol{assets_i}}$$

(weight based on assets x debt-to-asset ratio)

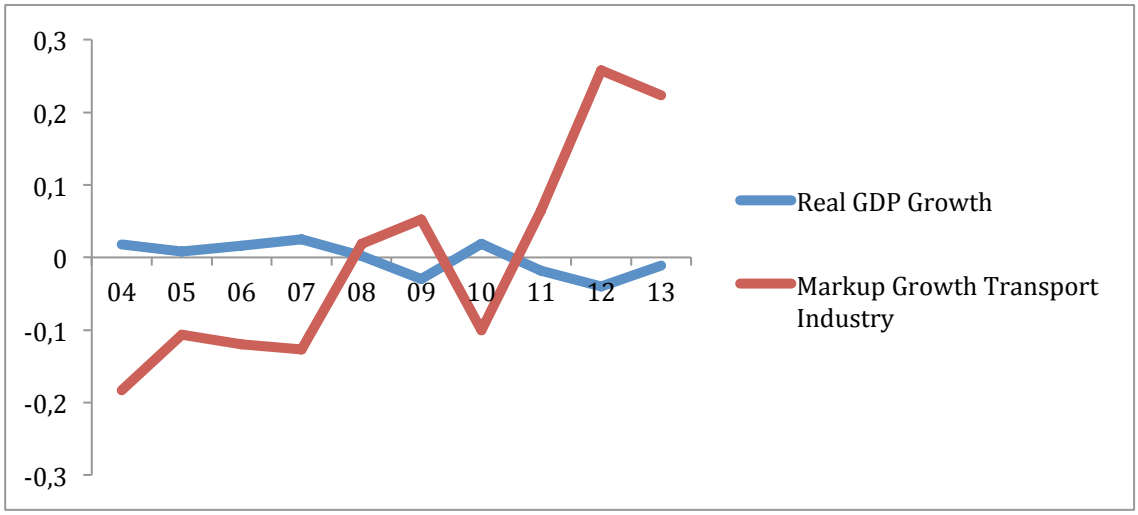
The author chose not to use the average industry debt-to-asset ratio series of the INE. Given that the asset-weight provides a more representative picture the measure at hand was preferred over the afore-mentioned average. This way, small companies, for instance, with unusual financing patterns do not impact the result as much as larger and more significant companies. The leverage series ranges from 2004 to 2013 and is based on data from the census of all companies of the Portuguese manufacturing industry and data obtained directly from the INE for the more recent years. After data cleansing this amounted to approximately 1.9 million observations. Data had to be converted from CAE 2.1 to CAE 3.0 as previously described. Summary statistics for leverage of the different industries are provided in Table 1.

Third, the real GDP index series was retrieved from Bloomberg (2015). Real GDP is GDP adjusted for inflation and, thus, reflects movements in economic activity.

Table 1: Summary Statistics Industry Leverage

CAE 3.0	Name	Mean	SD
10	Food	0,13	0,03
11	Beverages	0,14	0,05
12	Tobacco	0,12	0,07
13	Textiles	0,14	0,04
14	Apparel	0,13	0,03
15	Leather	0,15	0,08
16	Wood	0,12	0,02
17	Paper	0,15	0,02
18	Printing	0,12	0,01
19	Coke	0,15	0,03
20	Chemicals	0,09	0,02
21	Pharmaceuticals	0,09	0,03
22	Rubber & Plastic	0,12	0,02
23	Other non-metallic	0,14	0,02
24	Basic Metals	0,08	0,03
25	Fabricated Metal	0,10	0,02
26	Computer	0,08	0,05
27	Electrical Equipment	0,11	0,04
28	Machinery & Equipment	0,09	0,02
29	Motor Vehicles	0,10	0,05
30	Transport	0,19	0,09
31	Furniture	0,20	0,10

Graph 1: Markup over time: Markup countercyclicality in transport industry



In Graph 1 the red line represents markup growth of the transport industry. The blue line represents real GDP growth. This example clearly illustrates the counter cyclicality

of markups. When the economy grows markup falls and during economic downturn markup increases[4].

2.2 Results from the industry level analysis and interpretation

Following the two hypotheses the analysis involved two regressions. First, a standard Ordinary Least Squares regression of markup against the proxy of negative economic activity $-\Delta \log(GDP)$ was performed. Second, markup is regressed against negative economic activity, lagged leverage, and an interaction term between lagged leverage and negative economic activity to test if there is a joint effect of leverage and economic activity on markups over the given period.

In the first regression of markup against the proxy of negative economic activity demand shocks $-\Delta \log(GDP)$, a negative correlation of economic activity and industry markups is found. The results in Table 2 show that for a 1,00% decline in real GDP there is a 5.33% increase in markups. Further, the negative coefficient of economic activity is significant at the 1.00% significance level as it has a p-value of 0.00%. This rejects the null hypothesis of no effect. The R-squared statistic assesses the strength of the relationship between the model and the response variable. 13.27% of variation in the dependent variable is explained by the model. This is acceptable taking into account that other factors are likely to have significant effect on markups. Some of those factors are explored in the next regression. The OLS regression uses heteroscedasticity-consistent standard error estimates to correct against a potential violation of the OLS assumptions. To test for cyclicality the same regression is run using economic growth as

[4] Note that this example has been chosen for illustrative purposes. Not all industries show an obvious pattern of markup counter cyclicality as in this example.

independent variable. The results provide support for counter cyclicality[5]. Note, however, that the effect of economic downturns increases markups more than economic growth decreases markups. To find support for the theory by Chevalier and Scharfstein (1996) that firms increase prices during economic downturn, the regression is run using log of prices instead of markups. The regression shows a significant positive impact of economic downturn on prices[6]. The result from the Portuguese manufacturing industry provides evidence for countercyclical behaviour of markups. This means that in the given time between 2004 and 2013, on average, firms of the Portuguese manufacturing sector increased markups in response to economic downturns. Hence, these results are in line with Chevaliers and Scharfsteins (1996) theory of markup counter cyclicality and Bolton and Scharfstein's (1990) predatory pricing theory. This is also consistent with Campello's (2001) work for the United States.

The results for the second regression of markups against negative economic activity, lagged leverage, and an interaction term between lagged leverage and negative economic activity are shown in table 3. Here an ordinary least squares fixed-effect regression[7] is applied. The fixed effect regression looks only at within industry variation. It allows controlling for unobserved heterogeneity as long as it is fixed over time. Further, the interaction term allows testing for a combined effect of leverage and negative economic activity. The coefficient of the interaction term is positive and large.

[5] The output for the regregssion of economic growth on markups can be found in appendix 3.
[6] The output for the regression of economic downturn on price can be found in the appendix 3.
[7] More information on motivation for using a fixed effect regression can be found in the appendix 2.

Table 2

OLS Regression Markups on the Negative Economic Activity (N = 198)

Table 2 shows the OLS regression of markups on the negative log of economic activity between 2004 and 2013 on the basis of yearly data.

Markups	*Coef.*	*Robust SE*
Negative Economic Activity	5.3328**	0.8797
Constant	0.0219	0.0173
R^2	0.1327	
F	36.74**	
Root MSE	0.2589	

*$p < .05$. **$p < .01$.

This suggests a remarkable joint effect of leverage and negative activity. More precisely, it means that higher debt during recession led markups to increase more significantly. This finding is significant at the 5% significance level. Consequently, the null hypothesis of no joint effect is rejected. Again, this is in line with Chevalier and Scharfstein' finding (1996) and Campello's finding (2001).

The result suggests that highly leveraged firms are the ones that tend to increase markup when GDP goes down. The industry analysis has provided evidence for both – markup counter cyclicality and a joint effect of leverage and economic downturn on markups.

2.3 Limitations

A general issue with the interpretation of the regression is that markup movements can very well be affected by other unknown variables that are captured by the proxy for economic downturns. As Campello (2001) points out there are a lot of factors that can

have an impact on markups and move together with economic activity. An obvious example are costs that affect the entire industry such as energy prices.

To find direct support for the idea that firms with relatively more debt increase their prices in response to demand shocks the same regression is run with prices instead of markups and leads to comparable significant results. The underlying idea is that companies may very well decrease markups due to an increase of costs.

Table 3

FE-OLS: Markups on economic activity, lagged leverage, and interaction term (N=198)

Table 3 shows the Fixed Effects OLS regression of markups on the negative log of economic activity, leverage, and an interaction term of leverage and negative economic activity for the time period between 2004 and 2013 on the basis of yearly data.

Markups	*Coef.*	*Robust SE*
Negative Economic Activity	1.3147	2.2103
Leverage	0.6474	0.7501
Leverage*Negative Economic Activity	30.7425*	
R^2	0.2434	
F	3.91**	
Root MSE	0.2574	

*$p < .05$. **$p < .01$.

3. Firm Level Analysis

Whereas the industry-level analysis dealt with markups, this section focuses on the effect of leverage on competitive performance contingent on capital structure. The primary measure for competitive performance is a firm's industry-adjusted sales

growth. The theoretical link with the findings from the industry analysis is that firms compete primarily on the basis of prices and that, by setting lower prices, they can accelerate sales growth to attain a higher market share. Following Campello (2001), this section identifies exogenous shocks to the competitive environment. For the Portuguese economic environment, the 2008 financial crisis has been considered the worst crisis since the Great Depression (Reuters, 2009). It affected firms' financial structure in a way that could not be anticipated by investors or managers. The 2008 crisis' systemic nature makes it an ideal setting for testing. The effect of the crisis was not only felt in certain firms or industries but affected almost all industries at the same time. Still, according to the theoretical model of Chevalier and Scharfstein (1996), firms should react differently contingent on their capital structure. Therefore, the objective of this section is to analyse and compare sales-debt sensitivity between high leveraged and low leveraged firms.

3.1 Data

The analysis is performed on firm level data. The existence of financial data for a large set of small and medium Portuguese companies differentiates this analysis from previous work. Whereas previous work relied on either industry averages or samples this analysis is based on a census of Portuguese companies. The census of firm-level financial data was obtained via the 'IES - Informação Empresarial Simplificada'[8] (Instituto Nacional de Estatistica, 2015). Data on sales, fixed assets, total assets, and leverage were collected for all Portuguese firms for the time range from 2004 to 2010. The original sample size is 2.4 million observations. Many of these observations were

[8] More information on data and source can be found in appendix 4.

excluded from the final testing during the process of data cleansing. Data cleansing involved the removal of small companies and individuals that were subject to simplified accounting and, as a consequence, did not report leverage or assets. Examples for these companies were small cafes, auto repairs, and individuals such as lawyers. Further, for many companies no more data existed after 2007. A possible explanation for this is that many companies went out of business following the 2007 financial crisis. Thus, the remainder is the universe of registered companies in Portugal with organised accounting that provided a data horizon large enough for testing. The final test was performed on the basis of 410,336 observations using yearly data.

3.2 Analysis

Campello's methodology (2001) involves a two-step regression. This helps to reduce the probability of a type I error. That is the probability of inferring that capital structure has a significant effect when in fact it does not. The literature review demonstrated links between capital structure and competitive performance. However, a series of other factors can influence the competitive performance of a firm. Therefore, the empirical model includes three other variables next to leverage. First, past performance measured as one lag of sales growth was taken into account. Second, investments in property, plant, and equipment (PPE) were considered. The underlying intuition is that good investments in PPE improve a firm's competitive performance. In manufacturing, for instance, obtaining automation machinery or a larger production site to increase capacity is likely to be followed by an increase in sales assuming the existence of demand. Third, investments into strategic assets or in Research and Development can also result in performance increases. In the first-step regression sales growth is

regressed against its past value and the past change in PPE, the past value of total assets, and past leverage as shown in Equation 4.

Equation 4: First-step regression

$$\Delta\log(Sales)_{i,t} = c + \alpha\Delta\log(Sales)_{i,t-1} + \beta\Delta\log(PPE)_{i,t-1} + \gamma\log(Assets)_{i,t-1} + \delta Leverage_{i,t-1} + \varepsilon_{i,t}$$

To measure competitive performance a firm's industry-adjusted sales growth is used. The advantage of this measure is that it can be compared across industries. The drawback is that competitive performance is not only measured by market share. It also depends largely on how well a company is able to put its strategy into practice, and how the stock market evaluates that reflected in the share price (Kaplan & Norton, 2001). However, relative market share was preferred due to its comparability and representativeness of product market competition. Equation 5 shows the calculation of a company's industry-adjusted sales growth. The difference between company sales growth and industry sales growth is divided by the absolute value of industry sales growth. The absolute value is used to overcome the fallacy of negative and positive growth numbers. Looking at Equation 4 imagine company sales growth being positive and industry sales growth negative. Without using the absolute value of industry sales growth in the denominator, the resulting number for company industry-adjusted sales growth would be negative although the company clearly grew relative to the industry.

Equation 5: Industry-adjusted sales growth

$$Relative\ to\ industry\ sales\ growth_{i,t} = \frac{Company\ sales\ growth_{i,t} - Industry\ sales\ growth_{i,t}}{\left|Industry\ sales\ growth_{i,t}\right|}$$

$$Sales\ growth_{i,t} = \frac{sales_{i,t} - sales_{i,t-1}}{sales_{i,t-1}}$$

To obtain the PPE and the total assets variables relative to the industry average, PPE and total assets were adjusted according to the same principle as industry-adjusted sales growth. This way a company is not defined by its own measure but relative to its competitors. This is important when later dividing into high debt and low debt groups.

Leverage is measured as the long-term debt-to-asset ratio and also relativised against industry leverage. Unlike the other variables industry leverage is calculated by using the asset-weighted long-term debt-to-asset ratio as can be seen in Equation 6. This measure is better than a simple average due to its asset-weight. This weight lets the financing patterns of significant companies influence the industry average more than the financing of smaller negligible companies. Hence, a representative picture is obtained.

Equation 6: Leverage

$$\text{Leverage}_{it} = \sum_{i=1}^{N} \frac{\boldsymbol{assets_{it}}}{\sum_{j=1}^{N} \boldsymbol{assets_{jt}}} \cdot \frac{\boldsymbol{debt_{it}}}{\boldsymbol{assets_{it}}} = \sum_{i=1}^{N} \frac{\boldsymbol{debt_{it}}}{\sum_{i=1}^{N} \boldsymbol{assets_{it}}}$$

(weight based on assets x debt-to-asset ratio)

First, the regression from the empirical model in Equation 4 is run over the entire data set to test the fit of the model. The results are displayed in Table 4.

The regression result in Table 4 shows that investment in PPE from the preceding year has a positive impact on current sales. The most remarkable impact is from assets. An

investment in assets leads to a significant increase in sales. Most importantly, leverage significantly impacted sales growth. Contrary to initial expectations the results show that last year's change in sales growth has no impact on current year's sales growth. All stated results are significant at the 1% significance level.

Table 4

OLS: Sales growth on itself, PPE, assets, and leverage (N=410,336)

Table 4 shows the OLS regression of sales growth on its past value and the past change in PPE, the past log of total assets, and past leverage between 2004 and 2010 on the basis of yearly data. All explanatory variables are lagged one period to reflect previous period's effect of decisions on competitive performance.

Sales Growth	*Coef.*	*Robust SE*
$Sales\ Growth_{t-1}$	0.0000117	0.0000144
$PPE\ Growth_{t-1}$	0.0044285**	0.0006788
$Assets_{t-1}$	7.3000658**	1.210572
$Leverage_{t-1}$	2.50e-06**	4.68e-07
R^2	0.0002	
F	21.52**	
Root MSE	70.162	

*$p < .05$. **$p < .01$.

However, the R-squared of 0.02% and a large MSE do not suggest a good fit. Note that the regression is also run with four lags of sales and four lags of PPE under the

assumption that investments could take more time to materialise[9]. However, there are no significant relationships for any lag larger than one.

In the second step, for each regression run the leverage coefficient, δ, is extracted and set up as time series. The leverage coefficient series is then run against four lags of economic activity and a time trend. The proxy for economic activity is - Δ log(GDP) as used in the industry level analysis. The regression model can be seen in Equation 7.

Equation 7: Second-step regression

$$\delta_t = c + \sum_{k=1}^{2} \phi_k \Delta \text{Activity}_{t-k} + \gamma Trend_t + \upsilon_t$$

3.3 Results from the firm level analysis and interpretation

Campello's theory (2001) posits that firms that are highly leveraged relative to their industry rivals will have higher sales debt sensitivity than firms that are less leveraged relative to their industry peers during economic downturn. To compare high and low debt firms two groups are created representing the bottom 25 per cent and the top 25 per cent in a ranking based on industry-adjusted leverage. The effect is that industries are ranked according to the degree of competitor's leverage level for each year t. Thereafter, the bottom 25 per cent and the top 25 per cent are extracted resulting in two groups – low debt industries and high debt industries. The resulting data set is 100,037 observations per group. The high debt and low debt datasets are used to perform the first-step regression from Equation 5. Thereafter, for each year the delta coefficient is

[9] The regression output for the four lags version of the model is reported in the appendix of this paper

extracted and saved as time series. The resulting time series is then regressed against one lag of economic activity as described in the second-step regression in Equation 7. The outputs for these regressions are reported in appendix 3. Unfortunately, no inference can be drawn from these regressions. This is mainly due the limited number of observations that stem from the small time range and frequency of the data. Remarkably, the coefficient for high debt companies is a lot larger (-6.12) than the one for the low debt companies (-2.99). This would imply that that the more leveraged firms experience more sales debt sensitivity and would be in line with the expectation and Campello's (2001) findings that relatively highly leveraged firms suffer more market share loss than their relatively low leveraged rivals. Although the coefficients point into the expected direction they are not significant. In addition to that, the number of observations that this result is based on is not sufficient. Consequently, no direct support for the presented theory is obtained from the firm-level analysis.[10]

3.4 Limitations

The primary limitation in the firm level analysis is the lack of longitude and frequency. Whereas the dataset covered a census of all Portuguese companies the given time range of the firm level data only goes from 2004 to 2010. Using yearly frequencies this results in only seven periods. In the first step regression in Table 4 all but one coefficient are significant. However, when moving to the second step regression observations are reduced to the number of periods t namely 7. When running the second regression two observations are lost due to the lag and the change. Five observations, although they

[10] Note that the same analysis was performed from an industry perspective. This involved calculating the averages of the company industry-adjusted leverage for each industry. Industries were ranked according to their leverage and the top 25 per cent and bottom 25 per cent were extracted. The two-step regression was run on these groups and similarly insignificant results were obtained as through former method.

represent coefficients derived from a much larger dataset, cannot capture the sales debt sensitivity with respect to economic downturns. To counteract this deficit there are two solutions. Either a dataset with larger longitude is used or a higher frequency such as quarterly or monthly data obtained. In his paper Campello (2001), for example, used quarterly data from 1976 to 1996. With this frequency and longitude of Campello's data that allowed for more precise and time sensitive results.

4. Conclusions

This paper investigated the effect of capital structure on competitive behaviour on two levels. First, the effect of leverage on markups during demand shocks was analysed on the industry level. The result of the analysis provided evidence for Chevalier and Scharfstein's theory of counter cyclicality of markups (1996). A 1% decline in real GDP was followed by a 5.3% increase in markups. However, the markup-increase for GDP decline was stronger than the markup-decrease for GDP growth. Another important result from the industry analysis provided support for Bolton and Scharfstein's original theory (1990). Their theory suggested that during economic downturns more debt-constrained firms are unable to keep up with price competition and, consequently, increase markups. Accordingly, a positive joint effect of debt and economic downturns on markups is observed. Both results – markup counter cyclicality as well as the joint effect of leverage and debt on markups – are in line with Campello's findings (2001).

Second, the effect of capital structure on competitive performance was examined at the firm level. The analysis of sales-debt sensitivity is meant to test the theory that

industries in which competitors are highly leveraged experience higher sales debt sensitivities. The general model provides a bad fit. Nevertheless, there is a significant effect of leverage on competitive performance. However, the final test on subgroups representing relatively high leveraged and relatively low leveraged companies as compared to their industries does not yield significant results. Consequently, no significant results about the effect of capital structure on competitive performance could be established. In conclusion this paper provides evidence for markup counter cyclicality and a joint effect of debt and negative economic activity, at industry level.

Overall the evidence from the Portuguese companies provides support for former theories on the industry level. For the firm level analysis, however, no significant result could be obtained. This is due to the fact that the employed model required more observations in terms of longitude and frequency. For this the author would like to encourage revisiting the proposed methodology within the Portuguese context at a later point in time with more accumulated data or with a higher data frequency. Moreover, results are subject to a series of limitations of which three are worth mentioning. First, leverage, markups, competitive performance, and resulting product market outcomes might be influenced by a third unobserved variable. Second, a relatively small time range and data frequency can have very well biased the accuracy of the results. Third, although a theoretical model from the US was successfully applied in the Portuguese context, the Portuguese manufacturing industries and their companies are a very small portion of the global market. In fact the Portuguese GDP represents only around 0.4% of the world GDP for the applicable period (Trading Economics, 2015). This leads to doubts about the representativeness of the result on a global scale. Further, the European

market has been on a decline and economic powers such as China, India and Indonesia provide interesting and possibly more relevant grounds for future academic research. This is why the author encourages further research and testing of the theory supported within this paper on emerging market economies.

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APPENDIX

Appendix 1: The 'robust' option in STATA

This Appendix clarifies the mechanics of the robust option and how it corrects for potentially violated assumptions in the regression. Using 'robust' standard errors solves many problems relating to unfulfilled assumptions (Verardi and Croux, 2009). A side-effect of using the option is a more conservative approach to testing.

SATA's 'robust' option was used for each regression in this paper and has the following mechanics. It weighs the observations differently based on how well behaved these observations are, making the OLS a weighted least square regression. The robust option obtains the Cook's distance estimate. The Cook's distance estimate measures the effect of deleting a given observation. Data points with large residuals may distort the outcome and accuracy of a regression. It holds that the larger the estimate, the more distorting the data point. The robust regression drops any observation with Cook's distance greater than 1. Thereafter an iteration process begins in which weights are calculated on the basis of residuals. Two types of weights are used. First, Huber weighting that gives observations with small residuals a weight of 1 and observations with larger residuals smaller weight. Second, via biweighting all cases with a non-zero residual get a slightly reduced weight. This results in the most influential point being dropped and the cases with large absolute residuals are down-weighted (Verardi and Croux, 2009). The resulting model corrects for a potential violation of the assumptions.

Appendix 2: Fixed Effects Regression in STATA

Appendix 2 aims to clarify the specificities and motivation behind using a fixed effects model in the industry analysis of the paper. The analysis is based on panel data – data comprising information across time and space. The standard pooled regression assumes that the average values of the variables and the relationships between them are constant over time and across all the cross-sectional units in the sample. Consequently, it does not fit panel data, as average values will very likely differ across entities (Brooks, 2008). The fixed effects regression is different in that is assumes fixed effects. It imposes time independent effects for each entity that are possibly related with the regressor. It accounts for effects on the time level t and in the entity level i. A standard fixed effects model is shown in Equation A2.1.

Equation A2.1 Fixed Effects model

$$y_{it} = \alpha + \beta x_{it} + \mu_i + v_{it}$$

The disturbance term is divided into an individual specific effect μ_i and the remainder disturbance v_{it} that varies over time and entities. The individual effect μ_i includes the variables that affect the dependent variable cross-sectionally but not over time. In the dataset of the analysis this can be the industry a firm operates in. The remainder disturbance captures the effect of variables that vary over time and entity. The fixed effects model is appropriate for the panel data used because the objective is to measure fixed effects such as industry and time variant effects such as markups. The Durbin-Wu-Hausman test is often used to discriminate between the fixed and the random effects model.

Appendix 3: Complementary estimates and regression results

A3.1 Campello (2001) Replication: OLS Markups on -Δlog(GDP) US data (N = 700)

This table reports the OLS regression of markups on the negative log of economic activity for the time period between 1984 and 1996 on the basis of monthly data.

Markups	*Coef.*	*Robust SE*
Negative Economic Activity	6.935739**	2.140439
Constant	0.0897611*	0.0326066
R^2	0.0142	
F	10.50**	
Root MSE	0.28318	

*$p < .05$. **$p < .01$.

A3.2 Campello (2001) Replication: FE-OLS: Markups on -Δlog(GDP)), Leverage, and Leverage - Δ log(GDP) on the basis of US data (N=700)*

This table reports the Fixed Effects OLS Regression of markups on a proxy of negative economic activity, leverage and the interaction term of leverage and negative economic activity for the time period between 1984 and 1996 on the basis of monthly data.

Markups	*Coef.*	*Robust SE*
Negative Economic Activity	-3.281413	7.97016
Leverage	1.67318*	0.59271
Leverage*Negative Economic Activity	43.61785	28.75445
R^2	0.1541	
F	5.12**	
Root MSE	0.26636	

*$p < .05$. **$p < .01$.

A3.1 and A3.2 are the replication of Campello's (2001) work on the replication of the set he used. The data included sub industries of the American manufacturing industry in the time range between 1984 and 1996. The replication was done as an exercise to understand data and methodology of his paper as well as to analyse if it could be applied to Portuguese data and context. The results of the replication were similar to his original work. In the replication of the American data a major difference was the leverage series that he had obtained using a sample of company information unavailable to the public.

When comparing the findings on the American data with the findings from the Portuguese context similarities are found. A3.1 displays the positive effect of economic downturn on markups as found in the context of the Portuguese data. A3.2 shows a positive relationship between the interaction term of leverage and economic downturn. Although the latter coefficient is not very significant it is in line with the result from the Portuguese data.

A3.3 *Industry Analysis: Regressing negative economic activity against price (N = 198)*

This table reports the OLS regression of the negative log of economic activity on the logarithm of prices (instead of markups) between 2004 and 2013 using yearly data.

Price	*Coef.*	*Robust SE*
Negative Economic Activity	1.009294 **	0.3318921
Constant	0.0061897**	0.0061897
R^2	0.0513	
F	9.25**	
Root MSE	0.0945	

*$p < .05$. **$p < .01$.

The regression in A3.3 shows that during economic downturns prices increase significantly. For a 1% decrease in GDP prices increase by approximately 1%. The result is significant at the 1% level This is in line with the Chevalier and Scharfstein's (1996) theory that firms are unable to cut prices during recessions. The R-squared of the model with price is lower (5.13% < 13.27%) than of the model with markups. This means that GDP explains more variation of markups than for prices.

A3.4 Industry Analysis: OLS Markups on positive economic activity (N = 198)

This table reports the OLS regression of markups on the positive log of economic activity between 2004 and 2013 on the basis of yearly data.

Price	*Coef.*	*Robust SE*
Positive Economic Activity	-3.577047 **	0.9263732
Constant	0.0260996**	0.0173899
R^2	0.0785	
F	14.91**	
Root MSE	0.26689	

*$p < .05$. **$p < .01$.

Complementary to testing whether companies increase markups during crisis this regression tests whether companies decrease markups during booms. The result shows that for a 1% increase in GDP markups decrease by 3.58%. The result is significant at the 1% significance level. This is in line with Chevalier and Scharfstein's (1996) theory of counter cyclicality. However, it is noteworthy that markups increase stronger during economic downturns (5.33%) than they decrease during period of economic growth (3.58%).

A3.5 Second step Regressions Firm Level Low Debt Group (N=4)

This table reports the OLS regression of the time series vector extracted from the first step regression on past negative economic activity between 2004 and 2010 on the basis of yearly data. The subsample is derived on the basis of the extracted delta coefficient from the first regression for each year t and reflects the bottom 25% of companies in terms of debt.

Markups	*Coef.*	*Robust SE*
Negative Economic Activity	-2.988037	1.136014
Constant	-0.4729765	0.061911
Trend	0.1839865	0.015428
R^2	0.0142	
F	10.50**	
Root MSE	0.28318	

*$p < .05$. **$p < .01$.

A3.6 Second step Regressions Firm Level High Debt Group (N=4)

This table reports the OLS regression of the time series vector extracted from the first step regression on past negative economic activity between 2004 and 2010 on the basis of yearly data. The subsample is derived on the basis of the extracted delta coefficient from the first regression for each year t and reflects the top 25% of companies in terms of debt..

Markups	*Coef.*	*Robust SE*
Negative Economic Activity	-6.122926	10.96523
Constant	-0.2810392	0.061911
Trend	0.0614733	0.5976229
R^2	0.2421	
F	0.28	
Root MSE	0.1986	

*$p < .05$. **$p < .01$.

These regression outputs represent the final result of the firm level analysis. Despite their insignificance their coefficient point into the right direction. If this was significant – during crisis companies that are high leveraged relative to their industry peers, would have more negative impact on their sales than companies that are low leveraged relative to their industry peers (6.12 > 2.98).

Appendix 4: Data for firm level analysis

The dataset is obtained using two sources. The first source is a census of companies (IES), which includes all resident firms, excluding the financial sector and holding companies. The IES covers around 1 million companies per year for the period 2004-2010. Around seven hundred thousand are private individuals, which have a simplified reporting and are excluded from the analysis. These are small businesses without obligations of maintaining an organised accounting. Some examples are hairdress saloons, restaurants, cafes, carpenters, construction services and related, auto repair, auto sales, wholesale, diverse retail, lawyers, accountants, consultants, architects, educational services, medical services, etc. The remainder is the universe of registered companies in Portugal with organised accounting of over three hundred thousand per year. The IES contains financial information (balance sheet, P&L, investment) and some employment statistics.