



LISBON  
SCHOOL OF  
ECONOMICS &  
MANAGEMENT  
UNIVERSIDADE DE LISBOA

**MASTER IN FINANCE**

**MASTER FINAL WORK**

**Does the market structure matter for firms'  
profitability?**

**Portuguese Manufacturing sectors**

**2004-2011**

**MARGARIDA DO RIO HOMEM E SOUSA**

**OCTOBER 2015**



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## **Acronyms and Abbreviations**

BdP – Banco de Portugal

CAE – Classificação Portuguesa das Actividades Económicas

CR4 – Four firm concentration ratio

EU – European Union

Eurostat – European Statistics

ESS – Efficiency Structure – Scale efficiency

ESX – Efficiency Structure – x-Efficiency version

HHI – Herfindahl-Hirschman Index

INE – Instituto Nacional de Estatística

MP – Market Power

MS – Market Share

NACE – Nomenclature of Economic Activities

PORDATA – Base de dados Portugal Contemporâneo

RMP – Relative Market Power

ROA – Return on Assets

ROE – Return on equity

SCIE – Sistema de Contas Integradas das Empresas

SCP – Structure Conduct Performance

SIC – Standard Industrial Classification

SNC – Sistema de Normalização Contabilística

USA – United States of America

## Abstract

The present investigation aims to study the impact of market structure in the financial performance of Portuguese manufacturing sectors since 2004 till 2011. The sample build for this study includes 257 manufacturing sectors. Probit models are adopted and the dependent phenomena is financial performance (measure alternatively by profitability and Return on assets). Market structure (measured by HHI, Market Share and CR4) and financial performance association is the core of the analysis.

The main conclusions are: positive association between financial performance measured by profitability and ROA and concentration measures measured by Herfindahl-Hirschman Index (HHI) and Market share; Factors as advertising and taxes do not appear to have an impact in financial performance of firms'; when market share and HHI are included in the same model the HHI gets inconclusive and non-significant.

**Key words:** *Market structure; Profitability; Firm growth; Concentration; Manufacturing*

*JEL CODE - L11 Production, Pricing, and Market Structure • Size Distribution of Firms; L22 Firm Organization and Market Structure; D40 Market Structure, Pricing, and Design (General); L6 Industry Studies: Manufacturing; E32 Business Fluctuations Cycles*

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## **1 Introduction**

The goal in this dissertation is to study the financial performance (e.g. profitability) of the Portuguese manufacturing sector and observing how it is affected by the market structure (e.g. perfect competition, monopoly, oligopoly), which relates to the number and size distribution of firms in a market. The period studied (2004-2011) includes different phases of the business cycle, contributing to the study of the impact of current crisis on the non-financial sectors. Since it is an embryonic investigation (has far as the author knows this study was never done in Portugal for this sector and period), the results here obtained try to contribute to shed some light on the association among: market structure, financial performance and business cycle.

In the literature related to market structure and firm performance it is possible to find four empirical studies: Structure-Conduct-Performance (SCP), Relative Market Power (RMP), Efficient-Structure Hypothesis (ESS) and X-efficiency version (ESX), although the SCP and RMP exceed. The SCP theory is based on concentrated markets taking into account that prices in those markets lead to discouraging consumption (Berger, 1995; Bain 1956). The RMP focuses on companies' profitability when companies have large market share imposed in the market due to power engaged in business and pricing (Berger, 1995). Normally, the market power is accomplished by factors that companies use such as the level of advertising, the size of the firm and the high firm growth.

ESX and ESS are both based in explaining that lower costs lead to higher profits. The difference is that ESX focuses on how management and the consequences of a good or bad administration combined with production technology can lead to a better financial performance of firms. On other hand, ESS supposes that management is

similar among firms, although the technology used to produce might be more developed in some firms than others.

The reasons for the associations between high performance and market concentration is sustained in several factors: the use of advertising in order to reach consumers (Levy, 1985; Shepherd, 1972; Sutton, 2006; Bothwell et. al, 1984); the strategic location of the companies, for example near the centre of cities where the access is easier (Shepherd, 1972); and the size of firms used to impose their market power (Sutton, 2006; Bothwell et. al, 1984; Cabral & Mata, 2013; Evans 1987).

The choice for Portuguese manufacturing industry as object of study is justified because it is a representative sector in the Portuguese industry corresponding to 14% in the Portuguese gross domestic product (Pordata) and many industries depend on it. To test our research hypothesis, the database information and variables were extracted from the micro database of firm-level accounting data *Sistema de Contas Integradas das Empresas* (SCIE) and from *Instituto Nacional de Estatística* (INE, 2014).

The selection of the period 2004-2011 is explained by the macroeconomic changes that occurred during this period and the assumption that they were reflected in the firms and sectors. In Portugal, the unemployment rate in 2004 was 6.6, in 2008 reached 7.6 and in 2011 stroked 12.7 these numbers are references to realize the impact of financial crisis in the Portuguese industry. These rates are contextualized in a period with a variation of Gross Domestic Product between 2004 till 2008 of 15% and from 2008 till 2011 of -2%. (Pordata, 2015). Since 2004 till 2008 the gross domestic product was growing at an average rate of 1.38% of, since 2008 and till 2011 the gross domestic product presents an average growth rate of -0.97% (Pordata).



In order to test and modelling the association between market structure and profitability in Portuguese manufacturing firms/sectors, the most relevant variables associated to the market structure model are: Concentration, Market Share and the logarithm of the turnover or number of employees (both scale variables). Concentration was computed by Herfindahl-Hirschman Index known as HH Index or HHI and the Market Share (MS) as a percentage (share) of the volume of turnover in each firm in the total of the sector where the firm belongs. The indicator C4 of concentration is also computed and the Lerner index is taken into account but it is not calculated due to lack of data. Financial performance will be based on two indicators: profitability and return on assets (ROA).

This dissertation use sector-level data (N=257 in each of the 8 years) for the estimation of Probit models where the dependent variable is having or not positive financial performance. All of the manufacturing industry in Portugal is covered by the 257 sectors considered. It was necessary to aggregate by sector the information made available originally at firm-level in SCIE. Although before aggregating the database, indicators and variables are computed at firm level. The data for every year was collected from SCIE, and was originally available in separate files by year. Concentration, market share and profitability were calculated for each sector as well as the information such as firm size, advertising, productivity, among others.

This dissertation is divided in four sections: the first one describe the theoretical background of the research and the measures and indicators for the performance and market structure analysis. Section 2 describes the data source and sample construction as well as the methodologies of analysis adopted. Section 3 shows and discusses the

empirical results and in Section 4 the conclusions and future lines of research are summarized.

## **2 Literature Review**

### **2.1 Concepts and Theoretical Approaches**

Several studies which relate concentration, market structure and firm performance are summarized in the Literature Summary Review (Table A.I of the appendix) organized by countries, sectors and databases, research question, method(s) used and main findings.

Markets are considered to be concentrated when they are dominated by few numbers of large firms (Sutton, 2008). Several studies have been made concerning the market structure, its causes and impacts and about firms' performance determined by market share has received increasing attention in the industrial sector since 1970 (Kurtz & Rhoades, 1992). The impact of concentration on profitability is one of the research questions present in the literature, although the majority of the studies focus on banks or financial sectors instead of non-financial firms as is the case of this present research. Most of those studies conclude for a positive association between profitability and market structure (e.g. Mirzaei, et al. 2013; Berger, 1995; Bothwell et. al 1984). However, some studies conclude that the relation does not exist (Smirlock, 1985 and Thomadakis, 1977). The banking sector and banks are different from manufacturing sector and firms, not just on its market structure (banking sector has in general a high concentration level), but also on its culture, organization, corporate governance and

regulation. Consequently, the theoretical and empirical literature about concentration in banks is not completely suitable to the study of manufacturing sector.

This section focus on the key elements that compose the market structure always considering the theories behind it and the studies made during last 50 years since 1965. Market share, market structure and concentration are strongly associated phenomena. Market structure through this dissertation is taken as a synonym of market position.

Four empirical studies support the positive relation between concentration or market structure and firm performance (e.g. profitability):

- (i) The Structure-Conduct Performance hypothesis (SCP) related to concentration (Berger, 1995 & Bain, 1956)
- (ii) The Relative Market-Power hypothesis (RMP) related to market share (Berger, 1995)
- (iii) The Efficient-Structure hypothesis (ESX) – X-efficiency version (Leibenstein, 1975)
- (iv) The Efficient-Structure hypothesis (ESS) – scale efficiency version (Leibenstein, 1975)

The SCP explains the higher profitability in concentrated sectors by showing that in concentrated markets prices are higher due to the imperfection in the market. The RMP is different from SCP because it states that only the firms that have large market shares and a range of high diversified products are able to set competitive prices and consequently earn higher profits compared with those earned by the other firms. Usually, the explanation for that higher level of profits is that those firms use advertising, location and size to impose their power. That conclusion was empirically

tested by testing market share, concentration and profitability “(...) it is only the inclusion of market share that removes the positive coefficient on concentration in the profitability equations...” (Berger, 1995, p.429). Meaning that, when both variables are considered the correlation between financial performance and concentration does not exist although if just one of those variables is considered the probability of having a relation is much higher.

The ESX and the ESS, compared with the RMP and the SCP are simpler theories. According to them, the positive relationship between concentration and profitability arises from the lower costs which turn into higher profits. Therefore, firms gain large market shares and that leads to high concentration levels in the sector where they belong. The difference between both, the ESX and the ESS theories, is that the ESX assumes that some firms have better management and/or production technology while the ESS defends that there is a similar management among the firms, although some firms have more efficient production technology than others (Leibenstein, 1975).

Some authors attempt to explain why the market structure and profitability are related (Wernelfelt et al. 1989), some even tried to identify the properties of industries contributing to above-average profitability (Allen et al. 1983; Mirzaei, et. al. 2013; Pontuch, 2011) and others tried to understand the most relevant features in profitability of firms (Shepherd, 1972; Smirlock, 1985).

Summarizing, these four theories suggest that the relation between the market structure and the firm performance could be strong although really dependent on other factors different from market structure. Next points present briefly the associations found in the literature.

### **2.1.1 Firm Performance and Profit, Market Structure, Market Position, Market Power and Concentration**

Profit rates frequently present a relation to the market structure (Shepherd, 1972). When the relation is positive with concentration the reason for this could be the benefits from market power. Market power is normally the influence that a firm can have on its sector. The market power is the link between concentration and profitability meaning the ability of a company to manipulate the price set to its own benefit (Allen, 1983). Consequently, firms with more market power can set the prices, gain more profit and at the same time maintain their market share.

Concentration is linked to profitability because it increases the profit rates for big firms but not for small firms. In high concentrated markets, firms tend to be more profitable, unless there are exceptions and smaller firms are equally efficient and the profit from small and large firms is the same (Rocha, 2007).

### **2.1.2 Market position: static and dynamic approach**

According to Shepherd (1972): “The premise in static analysis is that a *firm’s market position* (defined by its market share, industry concentration and barriers, and possibly other elements) affects its attainable *degree of profitability*” (p. 25), being the profitability measured by the average rate of return on invested capital.

Dynamic analysis reached the same conclusion when comes to financial performance of firms. The time element that differentiates these two approaches (static and dynamic) is very important, because in a short period of time for some firms (typically the ones with low turnover) the entrance of others is a threat, for bigger firms may be an opportunity to forego the short run monopoly prices and profits to avoid the

entrance (Grossack, 1965). As this dissertation includes different phases of the business cycles due to the years involved, dynamic analysis needs to be considered. Throughout this dissertation it will not only be investigated the relation between the market structure and profitability regarding industrial firms, but it will also link that aspect with the business cycle influence adopting a dynamic analysis instead of the usual static analysis.

Besides the structural elements of market structure it is also need to consider the elements behind the business involvement. This way, other explanatory factors are taken into consideration to analyse market structure, for example, the firm size and growth and the advertising and innovation activities. The existing literature regarding these variables is very rich (see for example Evans, 1987 and Bass & Wittink, 1978).

### **2.1.3 Firm size and growth**

The size of a firm is influenced by scale economies and/or other benefits associated, which influences positively the profits of a firm (Kurtz et. al. 1992). But firm size may also contribute negatively for companies' growth and profit. This effect can be explained by the increase that the absolute size of a firm may have in the average costs, leading to a decrease in profit rates due to the constrained sacrificing profits by sales maximizing firms (Shepherd, 1972).

In general, firm size and advertisement are considered as entry barriers (Levy, 1985), although they can be studied separately. Most companies already operating in the market have advantage, either by the power that they hold through advertising either by the size and consequently new firms (usually smaller that are already installed) have more difficulties in entering into a market, selling and differencing their products, mainly if the market is not growing.

Firm growth for a given period can be measured as the percentage change in turnover during the period under analysis. It is connected to total profits and to the estimation of market shares and weights (Shepherd, 1972). It is likely that the firm growth raises the profitability of a company, although sometimes “excess of growth” might, on the contrary, reduce profitability or/and if firms use prices to achieved the expected growth, profit may be compromised too. Firm growth, size and age are linked phenomena and depend from each other. Firm growth and firm age have usually an inverse relationship, so as a firm gets older (higher age) it’s growth tends to decrease (keeping firm size constant) – a nonlinear relationship. The same happens for growth and size, because, when firm age is held constant, as companies became bigger, growth becomes smaller (Evans, 1987).

#### **2.1.4 Advertising and innovation**

Usually advertising has a positive relationship with concentration, Sutton (2006). There is an evidence that bigger firms have through commercials, posters, outdoors, Web, TV, among others, companies can persuade the consumers to buy their products, and, more important, at the price set from the firm. A high advertising-intensity is an entry barrier as it contributes to increase the profitability and the growth of firms and is also a source of product differentiability (Levy, 1985). Innovation, which can be measured by different forms, also impacts on concentration and consequently on firm performance (Shepherd, 1972; Scherer, 1965; Allen, 1983).

#### **2.2 Measures and Indicators of concentration of financial performance**

Market structure can be measured by different methods: market share, concentration, Lerner index and four-firm concentration ratio. Financial performance can be measured by several ratios: profitability, return on assets (ROA) and return on

equity (ROE). Table A.II of the appendix summarizes those and others variables included in the descriptive statistics and models.

**Market share** of a firm can be measured as the percentage of the turnover of a firm in the total turnover of the industry/market (Shepherd, 1972; Rocha, 2010; Kurtz & Rhoades, 1992), this gives an idea of the size of the company when comparing to its competitors.

$$MS = \frac{\text{Turnover of firm } i}{\text{Total turnover of the industry } x}$$

This index varies between 0 and 1, meaning the 1 that just exists one company operating in the sector (i.e. monopoly) and near 0 refers to a sector where there are a very large number of firms operating each of them with no significant power in the market, it means a perfect competition. The total turnover of the industry is usually measured at a high desegregated level of sector classification (in the current empirical study the 5-digit level of CAE code is adopted).

Several indexes, like the Herfindahl-Hirschman Index (HHI) and the Lerner Index are used to study concentration, although the first one is the most popular and easier to compute because of data availability.

**Herfindahl-Hirschman Index** is computed by:

$$HHI_w = \sum_{i=1}^{i=n} X_i^2$$

Where,  $X_i^2$  is the market share of the  $i^{th}$  firm and  $n$  is the number of the firms in the industry (Hrazdil, 2012; Levy, 1985; Pervan, Milkota & Sain, 2012; Pontuch, 2011;



Rocha, 2010). This index computed by sector varies between 0 and 1. If the value is near 0 it means a very large number of companies operates in that sector, if the value is 1 it means that there is a situation of monopoly. It increases both if the size of the firm increases and if the number of small firms gets smaller and it has the advantages of being sensitive and taking into account the size of the firms and it also includes the the number of firms operating. However some limits are indicated to this index such as being a static measure of size (Grossack, 1965).

**Four firm concentration ratio (CR4):**

$$CR4 = \sum_{i=1}^4 MS$$

This measure is used very often (e.g. Hradzil & Zhang, 2012; Berger, 1995; Ali & Yeung, 2014) and is the sum of the market share of the four leading firms in the market. It varies between 0% and 100%, meaning the 0% that no firms are operating in the market and 100% means that the one to four leading firms have the entire market share of the sector. It provides an overview about how the market is distributed based on the turnover of the top firms. Using the same logic of construction, the CR5 is also computed for example EU banking sector (Structural Indicators for the EU Banking Sector online – European Central Bank, 2015)

The **Lerner Index** is computed by firm:

$$\frac{(P - MC)}{P}$$

Where  $P$  is the firm price and  $MC$  it's marginal cost at the profit maximizing rate of output (Elzinga & Mills, 2011). As the difference between price and marginal cost gets bigger more monopoly power the firm has. Given the data available for the

current research (the SCIE microdata) it is not possible to compute this Lerner index, as there is no information for market prices. This index is also complex to compute for multi-product or multiservice firms.

**Profitability** of a company can be measure by:

$$\text{Profitability} = \frac{\text{Net income after tax}}{\text{Company's Turnover}} * 100$$

This ratio exhibits the percentage of return in terms of turnover, meaning throughout one year the value created by the firm (Shepherd, 1972).

**ROA** is the ratio that measures how profitable a firm is relative to its assets.

$$\text{ROA} = \frac{\text{Net income after tax}}{\text{Total assets}}$$

As mentioned before some authors instead of using profitability as the dependent variable of financial performance tests the hypothesis of relationship between profit rates and market structure with ROA. (e.g. Berger, 1995) The return on equity (ROE) is also used to evaluate financial performance.

### **2.3 Market structure and business cycle**

As it is going to be analysed in the period between 2004 and 2011 a very important event happened – the subprime crisis with the consequent Great Recession in US and the impact in all developed economies namely in the EU economies. As Taylor (2009) argued: “The classic explanation of financial crises, going back hundreds of years, is that they are caused by excesses—frequently monetary excesses—which lead to a boom and an inevitable bust.” (p.1). Portugal was affected by the financial crisis as well as by a sovereignty debt crisis. For all Portuguese companies it was a period of

several changes and challenges, and so it is important to explain them and the consequences that this might had for firms (their market position, performance and growth). The present research, studying the association market structure-firm performance, includes into the analysis the impact of recent crisis on the Portuguese manufacturing firms, as it will be detailed later on (see section 2.1.1.). Because this sector is very relevant for production and employment in Portugal, it is a good sample of what happened through crisis and can give an overview how the Portuguese industry reacted to adverse shocks.

The whole process of awareness of the crisis that began, the adjustments needed to combat it and the failure thereof, emphasized the scale and the impact that this period had and still has in terms of countries, their economies and the population that composes them. This leads directly to the main issue related to impact of market structure on firms profitability and how financial crisis affected management decisions and economic growth.

#### **2.4 Portuguese market structure dynamic (2004-2011)**

In Portugal, “The main macroeconomic aggregates reveal a decrease in economic activity between 2008 and 2012, a tendency followed by the business sector indicators” (...) “The contraction in economic activity spread to near all the non-financial enterprise sectors.” (INE, 2012, p. 7). This point leads directly to the research question of this investigation, creating an expectation on different levels of economic activity before and after 2008.

More than one decade ago, Cabral and Mata (2003), in a reference work of concentration studies and based on *Quadros de Pessoal* (an administrative linked employer-employee database) concluded that in the Portuguese manufacturing firms the

firm size distribution is not independent of the size of the firm and the distribution is quite skewed to the right which is explained by financial constraints. By financial constraints they mean financial restrictions in the company, normally more severe in the younger firms. Bank loans are normally more difficult to grant to younger firms since confidence in them is not so great. As they are recent on the market, the results can still be very volatile, not ensuring compliance with finance benefits which differs from big firms that are already solid in market. Thus, the financial performance of younger firms tend to be lower, as the market may have a group of companies that owns most of the market share being difficult for smaller to stay in it. The study is based on a database (the SCIE) that has weak or none information about the age of the firm and the financial restrictions faced by firms. Consequently, it is not possible to study the hypotheses of Cabral and Mata (2003).

### **3 Concentration and Market Position Dynamics in the Portuguese**

#### **Manufacturing Sector (2004-2011): Empirical analysis**

##### **3.1 Data Source and Sample**

The database used in this empirical research is the SCIE from 2004 till 2011. The SCIE is an accounting firm-level micro database that covers enterprises of all sizes (micro, small, medium and large) and legal form (*Sociedades* and *Empresas em Nome Individual*). The information available is anonymized (there is no identification of the firms name) and gathers also annual data from individual companies and Statistical Portugal Registry's (INE, 2014).

This database has one big advantage over other databases: while others databases are restricted to some companies and some information about them (for example Amadeus database does not include all the firms namely the microfirms), the SCIE includes firms of all sizes and detailed accounting information in particular since 2010 and for societies. To have a real knowledge of the market position of each firm in a specific market or the market structure in one sector, information from *all* the firms operating in that market must exist.

The accounting nature of the data makes the Portuguese SCIE similar to Worldscope<sup>1</sup> and the Compustat<sup>2</sup>. The Worldscope database with accounting harmonized information about companies worldwide (Worldscope Database, 2007) and the Compustat, database, created in 1962 and now associated to S&P, which is used very often for the study of market structure in United States (Compustat Database, 2003).

One disadvantage is that concerning the amount of data needed to elaborate the annual report it takes time to be set to published by Statistics Portugal, so in 2015 was published the company's information of 2013 (INE, 2015). Other disadvantage of SCIE database is the data used does not have any information about mergers and acquisitions that happened in the firms. For the firms not created during the 8 years under analysis there is no information about the year of creation. However, it includes information about the beginning and the end of firm's activity (for birth for 2004-2011 and for death 2004-2009).

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<sup>1</sup> Additional information about COMPUSTAT (S&P) is online: <http://extranet.datastream.com/Data/Worldscope/index.htm>

<sup>2</sup> Additional information about COMPUSTAT (S&P) is online: <http://www.spcapitaliq.com/our-capabilities/our-capabilities.html?product=compustat-research-insight>

### **3.1.1 Sample and Sample Characteristics**

This dissertation contemplates all subsectors (five digit level of CAE code) of the manufacturing industry from 2004 till 2011. It covers 257 industrial sectors, since CAE code 10110 (Cattle Slaughter) till CAE code 33200 (Installation of Machines and Industrial Equipment) (2-digit CAE code from 10 to 33). The list of all 257 sectors is in the second column of Table A.II in Appendix, where the sectors are ranked by HHI for 2011. The total numbers of firms in the file for 2004 is 87,901 and in 2011 are 72,049.

For 2011 there are a total of 279 variables, for the period 2004-2009 the number of total variables available from SCIE is much small – between 79 variables for 2004 and 84 for 2009. Table A.III in Appendix presents some of the SCIE's original variables used to compute the ratios, indexes, indicators and variables included in the models and described in Table I.

## **4 Methodology**

After the sample selection, the variables and ratios for each firm were calculated. The unit of observation is the firm. Some variables were already explained and discussed in the Section 1.2 – Measures and indicators. Table I includes dependent and independent variables to be used in the modelling process the literature references, the methods of computation and the description.

**Table I – Variables and Indicators – Sources, Calculation and Description**

<b>Variable/Author</b>	<b>Calculation</b>	<b>Description</b>
<b>Financial performance (*)</b>		
<b>Profitability (*)</b> Sheperd, W. (1972); Hansen, G., Wernerfelt, B. (1989); Wernerfelt, B. (1989); Bothwell, J. L., Cooley, T. F., & Hall, T. E. (1984); INE (2012); Ali et. al (2014)	$\frac{\text{Net income after tax}}{\text{Turnover}} * 100$	The company's ability of generate net income from sales and services.
<b>ROA(*)</b> Sheperd, W. (1972); Berger, A. (1995); Bothwell, J. L., Cooley, T. F., & Hall, T. E. (1984)	$\frac{\text{Net Income after tax}}{\text{assets}}$	Measures in relation to its assets how profitable a firm can be
<b>ROE</b>	$\frac{\text{Net income}}{\text{Total equity}}$	Measures whether the return on equity is set to an acceptable level compared to the yields of the capital market and expenditure funds
<b>Market Structure</b>		
<b>Herfindahl Index</b> Berger, A. (1995); Shepherd, W. (1972); Pontuch (2011); Martin, S. (1979); Smirlock (1985); Ali et. al (2014); Roche, F. (2010); Hradzil, Zhang (2012)	$\Sigma (\text{MS of each firm in the market}^2)$	Measures the concentration in a sector or market
<b>Market share (MS_VN)</b> Shepherd, W. (1972); Berger, A. (1995); Kurtz, R., Rhoades, S. (1991); Hansen, G., Wernerfelt, B. (1989); Bothwell, J. L., Cooley, T. F., & Hall, T. E. (1984); Bass et. al. (1978); Thomadakis (1977); Mázon, C. (1993); Smirlock (1985); Mirzaei et. al (2013); Fernandes et. al (2014)	$\frac{\text{Turnover of firm } i}{\text{Total turnover of the industry } x}$	The percentage of an industry/ total sales earned by a company in a specific period  Sum at a five digit level
<b>Four-firm concentration ratio (CR<sub>4</sub>)</b> Pervan, Milkota & Sain (2012); Allen, R. (1983); Ali et. al (2009); Levy, D. (1985); Hradzil, Zhang (2012)	$CR4 = \sum_{i=1}^4 MS$	The four leading firms in the industry.

<b>Table I (cont.) - Other Independent Variables</b>		
<b>Debt-to-equity ratio</b> Bothwell, J. L., Cooley, T. F., & Hall, T. E. (1984) <b>Similar computation by authors:</b> <u>Leverage:</u> Ali et. al (2014); Xu, J. (2012) <u>Interest expenses:</u> Ali et. al (2014)	$\frac{\text{Total liabilities}}{\text{Shareholder's equity}}$	Ratio that compares the liabilities of the firm to its shareholders equity; Capital Structure; Informs about the debt of each sector and the firm's dependence compared to its creditors
<b>Adverting intensity</b> Bothwell, J. L., Cooley, T. F., & Hall, T. E. (1984); Martin, S. (1979); Levy, D. (1985); Sutton (2006) <b>Similar computation by authors:</b> <u>Research &amp; development/book assets:</u> Ali et. al (2014) and (2009); Lang et. al (2014) <u>Research &amp; development/sales:</u> Xu, J. (2012); Bass et. al (1978)	$\frac{\text{Firm advertising}}{\text{Turnover}}$	Ratio of advertising based on the sales revenue. Can be calculated only for 2011
<b>Hall-Tideman Index</b> Pervan, Milkota & Sain (2012)	$HTI = \frac{1}{(2 \sum_{i=1}^N s_i s_{i-1}) - 1}$	Although one author referred this index in our analysis we are not going to consider it
<b>Firm size<sub>ASS</sub></b> Hansen, G., Wernerfelt, B. (1989); Shepherd, W. (1972)	Log (net total assets) Log (turnover) Log (employees)	We can compute: Firm size <sub>TUR</sub> (turnover) and Firm size <sub>EMP</sub> (employees) Measure the dimension of the firm when comparing to the others in the market
<b>Investment</b> INE	$\frac{\text{Gross fixed capital}}{GVAcf} * 100$	Represents the weight of gross fixed capital formation in the gross value added cost of factors
<b>Productivity</b> INE	$\frac{GVAcf}{\text{Employees}}$	Represents the contribution of labour used by the company generated by each individual
<b>Growth rate</b> Berger, A. (1995); Shepherd, W. (1972); Hansen, G., Wernerfelt, B. (1989)	$\frac{\text{Revenue } t - \text{Revenue } t - 1}{\text{Revenue } t - 1}$	Is the percentage change in the total revenues during one year in a firm Calculated with revenue, turnover and/or employees
<b>Gross margin rate of exploration</b> INE, 2007	$\frac{GOS}{\text{turnover} - \text{taxes} + Gsubs} * 100$	The percentage of sales that gets available to cover financial expenses

Source: Own Construction based on the referred authors, SCIE and INE (2015).

(\*) For the Probit models both *ROA* and *Profitability* (means by sector) are computed. Using the means from each of these two variables measuring sectoral financial performance we built a *dummy variable*: the negative or zero values = 0 (zero), and the other values (positive) are = 1(one).



In the first phase of the analysis the unit of observation is the ‘firm’ (the number of firms in each file per year varies from 72,000 till 87,900), however in order to test, analyse and take conclusions regarding the sectors (e.g. market structure and financial performance) it was necessary to *aggregate* all the firms belonging to the same sector. The variables and indicators of interest were aggregated by sector considering different functions (mean, standard deviation and sum). In the new file created after aggregation, the unit of observation is the sector (each year has 257 observations for each variable) includes all years, and is crucial to compute the measures of concentration (HH index, MS or CR4 presented in Section 1.2) which are used when constructing our explanatory models. For each year in the process of aggregation three measures are created: the sum (e.g. of the total turnover by sector, essential to compute the HH index of the sector); the mean (e.g. the mean of worker per firm, a measure of the average size of the firm in the sector); and the standard deviation (e.g. the dispersion of profitability among the firms belonging to each sector). So, we get for each year three ways to observe each variable (list of variables studied by sector definitions and main statistics are in Table I). For example, for turnover we get: the *turnover\_mean*; *turnover\_sd* and *turnover\_sum*. The file with 257 sectors has 257 observations for each of the eight years under analysis.

To summarize, we have originally from SCIE one database and file per year and for all non-financial firms and sectors. Then we select only the firms belonging to the manufacturing sector (around 81,000 observations per year). Finally we build a new file by sector (each year with 257 observations) using three aggregated functions (sum, mean and standard deviation). After this, we combine all eight years information in one single file.

To test the impact of market structure on the performance of the firms or sectors two type of data files were used: files where the unit of observation is the *firm* (few results are shown in this dissertation because the results were of weak statistical quality and there is no space to present them) and files where the unit of observation is the *manufacturing sector* (257 observations per years correspondent to 257 subsectors of manufacturing sector). Following the literature, the core of the results and conclusions here presented are associated to the *sectors*.

Before constructing and testing the models it is fundamental to investigate the correlations between the variables and ratios, because for example if the profitability and the return on assets (both variables describing financial performance) are correlated it is not suitable in an econometric perspective to use both in the same model, as it would compromised the quality of the results. As we did not have sufficient space it was only possible to include some of the correlations matrices (Tables A.IV, A.V and A.VI in Appendix).

The two key phenomena under analysis are: market structure and financial performance. The market structure can be measured by different ways as explained in Section 1.2 and Table I. The financial performance can be evaluated by different measures and ratios as illustrated in Table I. The models tested here to investigate the relation between financial performance and market position are of two types: linear model (estimated by Ordinary Least Square method) and Probit model.

The dependent variable for linear models is the value of the performance indicator (a continuum variable) and the dependent variable for the Probit models is a binary variable built from the continuum values of the financial performance of the firm

(Profitability or ROA). There is literature using these two approaches (see Table A.I). For example, the linear regression model is used by Shepherd (1972) Berger (1995); Tabacco (2009) and the Probit models are adopted by (Kurtz & Rhoades (1992)).

For the Probit models both ROA and Profitability (see Table I) means by sector are computed and using the means from each of these two variables we built a dummy variable: the negative or zero values are equal to ‘zero’, and the other values (positive) are equal to ‘one’. As will be demonstrated later on we tried different independent variables together with market position variables to explain the financial performance of firms. Different variables were tested as predictors for financial performance in each sector, and their definitions are in Table I.

## 5 Results and Discussion

The first thing that we should shed light on is whereas the period in analyse show an increase in concentration through the manufacturing industry. The variables considered were the HH index based on turnover for the year 2004 and 2011. This way we reached 0.0428 concentration level for 2004 and 0.0549 for 2011 (Table II), based just on this calculations we observed an increase in the concentration of manufacturing firms.

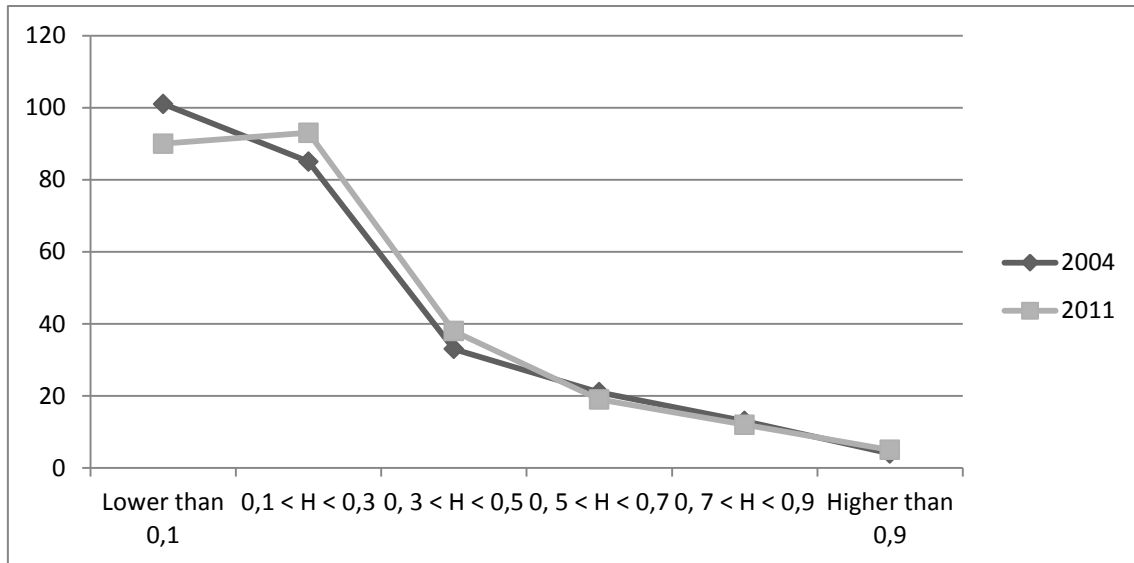
**Table II - Evolution of average concentration in manufacturing industry**

Portugal, 2004 and 2011

		2004	2011
HHI average		0.0428	0.0549
Total number of companies		87901	72049
Total number of sectors		257	257
$\phi$ average (Variance)		0.007	0.009
Source: Own calculations based on SCIE microdata at firm level			

**Figure 1 - Distribution of the HH concentration index**

Portugal, 2004 and 2011



Vertical axis: Number of sectors between the intervals of concentration

Horizontal axis: Interval of HH concentration index

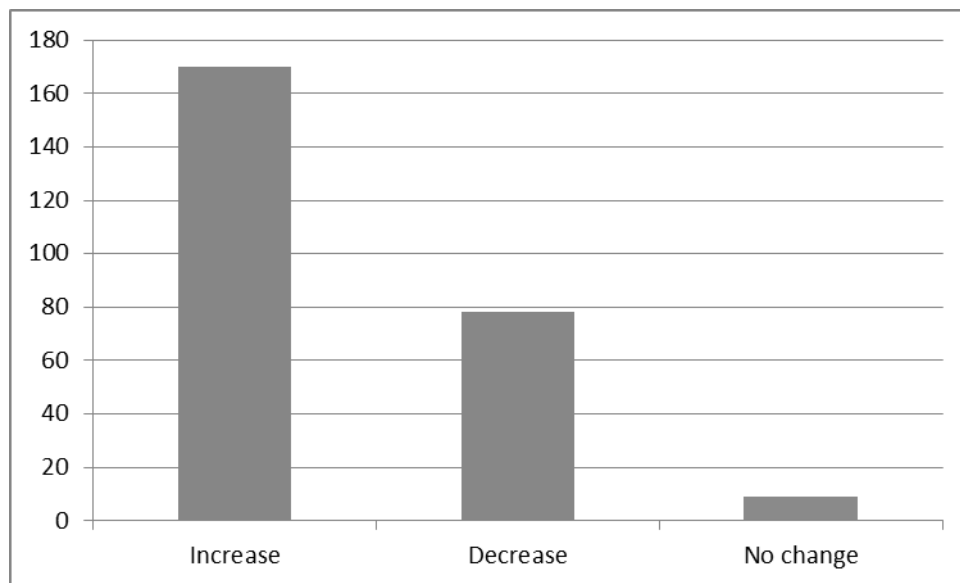
Source: Own calculations based on SCIE microdata

Figure 1 shows the distribution of average concentration in Portuguese manufacturing industry for 2004 and 2011. The increase of the medium HHI from 2004 to 2011 corresponds to an increase in concentration which is also confirmed by the increasing values of HH index from 2004 to 2011 in most of the 257 sectors (Table A.II, two last columns). These descriptive data suggest that the downturn of the business cycle that occurred between 2008 till 2011 affected the market structure in general but with signs and intensities different in each of the 257 sectors (Table A.II).

Figure 1 seems to show that few sectors have high levels of concentration, because in 257, just 17 in 257 have HH index higher than 0.7 in 2004 and in 2011. The limits considered were based in Bank of Portugal (*Análise do Sector de construção, Banco de Portugal, 2014*)

Using a different measure of market position, the CR4, the results for the years 2007 (before the crisis shock) and 2011 are represented in Figure 2. The figure represents the change of the four leading firms for each sector between those 2 years and shows that concentration increases in 170 sectors while in 78 decreases.

**Figure 2 – Difference between 2007 and 2011 in CR4 (four leading firms)**



Sectors where concentration increase from 2007 to 2011	170
Sectors where concentration decrease from 2007 to 2011	78
Sectors with no change	9

Examples of highly concentrated sectors in both years are: *Manufacturing, starch and related products* and *Tire Manufacturing and Chambers of Air*. In 2004 the *Collection and initial processing of precious metals* and the *Repair and maintenance of other transport equipment* were highly concentrated, while in 2011 the *Collection and Primary Processing of Lead, Zinc and Tin, Manufacturing Optical Instruments and Equipment and Manufacture of Macaroni, Couscous and others* enter to the list of most concentrated sectors – See Tables III to VI.

A subsample of the sectors with a HHI equal or higher than 0.82 (limit for 2004 and 2011, and corresponding to a representative sample of the 257 sectors) is selected and the top 7 or 10 of more concentrated sectors are shown. These results contrast to those in Tables V and VI that also illustrate the relevance of the size of the sector (evaluated in this analysis by the sum of the turnover of all firms operating in that sector) to the sector position of the firm. In both tables (V and VI) is observed the top concentrated sectors were obviously the percentage of market share is 100%, in most cases these sectors have less firms which hold the entire market share. *Baking* and *Sugar Industry* since 2004 that stay in the top concentrated sectors as any severe change occurred in those markets.

**Table III – Top Concentrated Sectors ranked by HHI and Total turnover (2004)**

CAE	Sector	HHI	Turnover (€)
10620	Manufacture of starches, starch products and similar	0.97	28 641 554
24410	Collection and initial processing of precious metals	0.97	667 633
33170	Repair and maintenance of other transport equipment	0.93	73 111 221
22111	Tire manufacturing and air cameras	0.92	364 974 145
10860	Manufacture of homogenised food and dietary	0.89	472 290 296
33160	Repair and maintenance of aircraft and spacecraft	0.89	149 633 674
27520	Manufacture of non electric domestic appliances	0.84	213 723 635
10892	Manufacture of broths, soups and desserts	0.84	64 494 076
23110	Manufacture of flat glass	0.83	64 036 044
23522	Manufacture of plaster	0.82	64 571 08

**Table IV - Top Concentrated Sectors ranked by HHI and Total turnover (2011)**

CAE	Sector	HHI	Turnover (€)
10620	Manufacture of starches and starch products	0.99	37 303 429
22111	Tire manufacturing and air cameras	0.97	755 885 446
10730	Manufacture of macaroni, couscous and similar	0.96	106 659 558
26701	Manufacture of instruments, optical equipment and non	0.95	38 593 231
24430	Collection and primary processing of lead, zinc and tin	0.92	31 827 682
23552	Manufacture of plaster	0.89	7 014 222
10821	Manufacture of cocoa and chocolate	0.82	23 457 516

**Table V - Top Concentrated Sectors ranked by MS and Total turnover (2004)**

CAE	Sector	MS	Turnover (€)
10620	Manufacturing of starch, starches and related products	100%	28 641 554
10711	Baking	100%	957 885 231
10810	Sugar industry	100%	29 094 144
10860	Manufacturing of homogenised food and dietary	100%	472 290 296
32991	Manufacturing of pens, pencils and similars	100%	735 802

**Table VI - Top Concentrated Sectors ranked by MS and Total turnover (2011)**

CAE	Sector	MS	Turnover €
10711	Baking	100%	1 085 590 274
10810	Sugar industry	100%	330 819 148
10821	Manufacture of cocoa and chocolate	100%	23 457 516
13101	Preparation and spinning of cotton type fibers	100%	149 946 840
32992	Iron manufacturing run, buttons and similars	100%	37 528 000

Source: Own calculations based on SCIE microdata

Tables VII to X, summarize the main results obtained from the Probit models that were applied to test the relation between market position and financial performance. The meaning of the name of each variable tested is in Table XI. All are based on data by sector (N=257).

The first model tested was the Probit using ROA as the dependent variable. The first evidence that comes out when analysing Table VII is the positive sign in the HHI from 2004 till 2007 and the non-significance from 2008 till 2011. The explanation for that is the crises shock that affected Portugal from 2008. The positive sign for this variable explains that when the concentration of firm increases the financial performance of firms increases too. In this model the scale variable does not seem to have any impact in the explanation of financial performance as for all years because it appears as non-significant. The majority of variables included in this model (*taxesshareGOS*,

*GFCFshareturn, Osubsshareturn, SESshareturn, Cpersshareturn*) do not shown any conclusion appearing as non-significant or with negative sign for just one or two years. This way it is not possible to analyse deeply this results. In 2004 the likelihood ratio chi-square of 23.49 and a Pseudo R of 0.0802 tell us that this model as a whole is statistically significant. Table VII.2 shows the marginal effects in the model estimated for year 2004. For example, for one unit increase in sector concentration (*hhi\_SV500101\_mean*) the probability of having a positive ROA (*ROA\_01\_04*) increases by 25%.

**Table VII – Model Probit with ROA as the dependent variable**

Dependent Variable	ROA_01_04	ROA_01_05	ROA_01_06	ROA_01_07	ROA_01_08	ROA_01_09	ROA_01_10	ROA_01_11
<b>Independent Variables</b>								
<i>hhi_SV500101_mean</i>	Pos	Pos	Pos	Pos	Ns	Ns	Ns	Ns
<i>Logturnover</i>	Ns	Ns	Ns	Ns	Ns	Ns	Pos	Ns
<i>TaxesshareGOS</i>	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
<i>serviceshareturn</i>	Pos	Pos	Ns	Ns	Ns	Ns	Ns	Ns
<i>Cpersshareturn</i>	Neg	Ns	Ns	Ns	Ns	Neg	Ns	Ns
<i>SESshareturn</i>	Ns	Neg	Ns	Ns	Ns	Ns	Ns	Ns
<i>GFCFshareturn</i>	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
<i>GOSshareturn</i>	Pos	Pos	Ns	Ns	Ns	Pos	Pos	Pos
<i>marginshareturn</i>	Ns	Ns	Neg	Ns	Ns	Pos	Ns	Ns
<i>Osubsshareturn</i>	Ns	Ns	Ns	Ns	Ns	Neg	Ns	Ns
<i>RDshareempl_11</i>	-	-	-	-	-	-	-	Ns
<i>publicityoperesult_11</i>	-	-	-	-	-	-	-	Ns
<i>publicityproduction_11</i>	-	-	-	-	-	-	-	Ns
<i>publicityturnover_11</i>	-	-	-	-	-	-	-	Neg
<i>SV804400_mean_11</i>	-	-	-	-	-	-	-	Ns
<b>Number of obs</b>	257	257	257	257	257	257	257	257
<b>LR chi2</b>	23,49	29,59	20,43	20,36	13,75	44,48	28,23	23,51
<b>Prob &gt; chi2</b>	0,0091	0,001	0,0655	0,026	0,1848	0,0000	0,0017	0,0525
<b>Pseudo R</b>	0,0802	0,0971	0,0655	0,0672	0,0543	0,189	0,0971	0,0965

Pos – Positive signal; Neg – Negative signal; Ns – not significant; For the meaning of each variable see table XI

Source: Own computation based on SCIE data



**Table VII.2 – Marginal effects of 2004 (Dependent Variable: ROA)**

variable	dy/dx	Std. Err.	z	P> z	[ 95% C.I. ]	X
hhi_SV..	.2523537	.132	1.91	0.056	-.006367 .511075	.228662
Logtu~04	.0475086	.05713	0.83	0.406	-.06446 .159477	6.06682
Taxes~04	.0004087	.00161	0.25	0.800	-.002756 .003574	.824106
servi~04	.0017494	.001	1.75	0.080	-.000208 .003707	23.2573
CPers~04	-.0028441	.0017	-1.67	0.094	-.006173 .000485	37.0067
SESsh~04	-.0020738	.00226	-0.92	0.359	-.006508 .002361	31.8355
GFCFs~04	.0029077	.00281	1.04	0.300	-.002595 .008411	6.40067
GOSsh~04	.0073235	.00278	2.64	0.008	.001884 .012763	15.646
margi~04	.0021558	.00181	1.19	0.234	-.001396 .005708	12.3092
OSubs~04	-.0010116	.04524	-0.02	0.982	-.089682 .087658	.21402

When considered Profitability as dependent variable in a Probit model and using the HHI measured by employees (Table VIII), for the years 2004, 2005, 2010 and 2011 the predictors, with positive impact, are: market share, the size by employees and the gross operating surplus by turnover. In this case, it is evident the positive relationship between the variable representing financial performance (*Profitability*) and the average market share of the firms in the sectors (*MS\_TO*). So, the results suggest that financial performance and concentration are associated. HH index appears as a non-significant variable, reaching to the same results as Smirlock (1985): once market share and concentration *are both included in a model as explanatory variables* the concentration coefficient gets insignificant.

**Table VIII – Model Probit with Profitability as dependent variable**

	2004	2005	2006	2007	2008	2009	2010	2011
<b>Dependent variable</b>	Profit.	Profit.	Profit.	Profit.	Profit.	Profit.	Profit.	Profit
<b>Independent variable</b>								
hhi_employe	N/S	N/S	N/S	N/S	N/S	N/S	N/S	<b>Neg</b>
MS_TO	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>
logemployee	<b>Pos</b>	<b>Pos</b>	N/S	N/S	N/S	N/S	<b>Pos</b>	<b>Pos</b>
GOSturnover	<b>Pos</b>	<b>Pos</b>	N/S	N/S	N/S	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>
Number of obs	257	257	257	257	257	257	257	257
Prob > chi2	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000
LR chi2	29,96	34,01	40,56	41,70	26,72	27,94	30,41	27,08
Pseudo-R	0,1196	0,13	0,1452	0,1468	0,1261	0,1238	0,1129	0,1237

Pos – Positive signal; Neg – Negative signal; N/s – not significant. For the meaning of each variable see table XI

Source: Own computation based on SCIE data

A different specification of the probit model with profitability as dependent variable was tested again – see table IX – and it proves once again that if HH index and market share are not included in the same model we get a positive relationship between financial performance and market share for all years except one. The exception, year of 2009 presents market share as non-significant. Probably this happens because of the greatest economic shock occurred between the year of 2008 and 2009 when there were negative impacts from the side of domestic and external demand thus reducing profitability conditions (costs cannot reduce immediately, specially fixed costs) and also the negative impacts from restrictions on the use of credit by domestic companies.

The rate of exploration margin (*Mgexpl*) shows that it is not a good variable to explain financial performance, being the exception year 2005 when the impact is positive. This model for year 2011 reveals some quality evaluated by the Pseudo R and

the Prob > chi2. However the model for year 2006 is the best. In 2005-2007 and 2010-2011 the profitability is positively predicted by the market share and the scale evaluated by the log of the value of assets. The table IX.2 includes the marginal effects for 2011, and shows that one unit of increase in the market share increases the probability of positive profits by 1.1%. Similarly, and a unit of increase of the value of assets (log) which evaluates the firm size (average) in each sector increases the probability of having positive profits by 6.2%.

**Table IX – Model Probit with Profitability as dependent variable**

Dependent variable	2004	2005	2006	2007	2008	2009	2010	2011
	Profit.	Profit.	Profit.	Profit.	Profit.	Profit.	Profit.	Profit.
Independent variable								
MS_VN	Pos	Pos	Pos	Pos	Pos	N/S	Pos	Pos
debttoequity	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
Mgexpl	N/S	Pos	N/S	N/S	N/S	N/S	N/S	N/S
Logassets	N/S	Pos	Pos	Pos	N/S	N/S	Pos	Pos
Number of obs	257	257	257	257	257	257	257	257
Prob > chi2	0,0000	0,0000	0,0000	0,0000	0,0000	0,0197	0,0000	0,0003
LR chi2	22,71	34,15	41,48	45	30,13	11,7	29,51	21,37
Pseudo-R	0,0907	0,1305	0,1485	0,1585	0,1423	0,0519	0,1095	0,0957

Pos – Positive signal; Neg – Negative signal; N/s – not significant - For the meaning of each variable see table IX

Source: Own computation based on SCIE data

**Table IX.2 – Marginal effects of 2011(dependent variable: Profitability)**

variable	dy/dx	Std. Err.	z	P> z	[ 95% C.I. ]	X
MS_~n_11	.0110363	.00306	3.60	0.000	.005031 .017042	4.27507
deb~n_11	-.0000443	.00034	-0.13	0.897	-.000714 .000625	7.90601
M~1_mean	-8.25e-07	.00000	-0.67	0.505	-3.2e-06 1.6e-06	2807.17
Logas~11	.0616821	.03513	1.76	0.079	-.007163 .130527	6.35413

Profitability is tested as dependent variable in a different Probit model. The independent variables are in this specification: HHI measured by turnover (*hhi\_turnover*), the size measured by turnover (*logturnover*), the gross operating surplus measured by turnover (*GOSTurnover*) and the market share (*MS\_TO*). Table X present the results. Once more, the variable concentration measured by HHI is non statistical significant in most of the years contrary to the variable associated to the market share which has a positive association with the financial performance for all years. The scale variable (logarithm of turnover) shows that for almost every year (excluding 2007 and 2008) is a positive predictor of profitability.

**Table X – Model Probit with Profitability as dependent variable**

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
<b>Dependent variable</b>	Profit.	Profit.	Profit.	Profit.	Profit.	Profit.	Profit.	Profit
<b>Independent variables</b>								
<i>hhi_turnover</i>	<b>Neg</b>	N/S	<b>Pos</b>	N/S	N/S	<b>Neg</b>	N/S	N/S
<i>logturnover</i>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	N/S	N/S	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>
<i>GOSTurnover</i>	<b>Pos</b>	<b>Pos</b>	<b>Neg</b>	N/S	N/S	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>
<i>MS_TO</i>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>	<b>Pos</b>
Number of obs	257	257	257	257	257	257	257	257
Prob > chi2	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
LR chi2	31,35	37,01	42,99	42,87	26,52	32,04	31,98	26,82
Pseudo-R	0,1252	0,1415	0,1539	0,151	0,1252	0,142	0,1187	0,1225

Pos – Positive signal; Neg – Negative signal; N/s – not significant - For the meaning of each variable see table XI

Source: Own computation based on SCIE data

**Table XI – Description of variables used in the models of tables VII, VIII, IX and**

**X**

<b>Variable name</b>	<b>Meaning</b>
hhi_SV500101_mean	Mean of the turnover HHI inndex
Logturnover	Scale variable (logarithm turnover)
Taxes share GOS	Taxes relativized by the gross operating surplus
Service share return	Services relativized by the turnover
Cpers share return	Cost of personnel relativized by turnover
SES share return	Supplies and external services relativized by turnover
GFCF share return	Gross fixed capital formation relativized by turnover
GOS share return	Gross operating surplus relativized by turnover
margin share return	Commercial margin relativized by turnover
Osubss share return	Operating subsidies relativized by turnover
Rd share emplo_11*	Research & development relativized by employees
publicity oper result_11	Publicity relativized by operating result
publicity production_11	Publicity relativized by production
publicity turnover_11	Publicity relativized by turnover
SV804400_mean_11	Spending on advertising
HHI_employees	HHI measured by employees
MS_TO	Market share measured by turnover
log employees	Scale variable (logarithm employees)
debt to equity**	Ratio that compares the liabilities of the firm with shareholders equity
Mge expl**	Gross margin rate of exploration
log assets	Scale variable (logarithm assets)
hhi_turnover	HHI measured by turnover

\*the \_11 means that these variables were only calculated for the year 2011

\*\*See table I

#### **4. Conclusions and future research lines**

The financial performance of companies is something unavoidable for them, being always on the main objectives of each company to achieve the best performance every year. The research question of this study was linked with the existence of a direct relationship between market structure and the financial performance of the companies in the manufacturing industry sector in Portugal. Several conclusions were drawn:

First, the financial performance (measured by profitability and ROA) has a positive relationship with concentration measures in most of the years studied (2004 to 2011). The probability of a positive profitability or a positive ROA (both financial performance

measures) increases when concentration increases. There are differences across time, but when the market share is used (concentration measure) the association exists in most of the years. The results suggest that the answer to the question “*Does the market structure matter for firms’ profitability?*” is positive.

Second, the scale variables representing the average size of the firms in each sector (evaluated by number of employers, turnover or value of assets) in some models shows a positive relationship with financial performance, but in many others the associated coefficients were statistically non-significant.

Third, factors as advertisement and taxes were tested as predictor of financial performance but the results were inconclusive.

Fourth, when included in the same model both concentration (measured by HH index) and market share, the concentration measure HH index gets, in general, inconclusive and non-significant;

Fifth, the quality of the results from probit models estimated for years 2008 and 2009 were in general very weak or with mixed and unexpected results. It is likely that this reflects structural shocks in manufacturing sectors as a consequence of the crisis.

Sixth, the market structure of the manufacturing sector in Portugal changed during the period 2004-2011. There was an increase of concentration independently from the indicators used to evaluate it: the HHI, the Market Share or the CR4.

The fact that we do not have information regarding mergers and acquisitions might have limited this research, because normally these actions lead to changes in concentration.

During this study several questions arise for future investigation such as:

- Be seen that this is an embryonic research and it was never done for this sector and period in Portugal several deepen studies may be done concerning this industry. For example if the changes occurred after 2008 correspond to structural changes in the association concentration-financial performance;
- It is interesting to apply the same research question for other sector in the Portuguese economy. For example to the banking sector;
- Further research studying how the market position of the firm, the age and the growth are linked would be very useful not just to see the connection between them but also to use them to understand better the results obtained in investigations like the present.

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## 6. APPENDIX

**Table A.I - Literature Review Summary**

Author(s), year of publication	Database Period Country Sample	Research question	Method(s) used	Main findings
Allen (1983)	1972 USA N = 297 manufacturing industries 4 digit SIC industries	The relative impacts of efficiency and collusion on industry profit margins	Regression model extended in two ways: recognize the possible role of strategic groups in industries and a direct measure of relative efficiency in large firms. <b>Dependent variable:</b> Profitability	Low support for high concentration and high profits reflection efficiency of large firms. MP is the dominant influence in the concentration profits relation.
Ali, Klase & Yeung (2009)	1995 - 2009 USA N = 356 industries 6 digit North American Industry Classification System Manufacturing sector Compustat	Association between U.S census industry concentration measures and the information of corporate disclosure policy.	One sided Tobit regression model <b>Dependent variable:</b> management forecast	Firms in more concentrated industries: Have less informative disclosure practices; When sell new shares, they are more likely to do so via private placement. Have greater dispersion in analyst's earnings forecasts, greater errors and a higher volatility of analyst forecast revision.
Bass, Cattin & Wittink (1978)	1957, 1963 and 1970 USA N = 63 firms (cosmetic, food and tobacco)	Influence of industry concentration and advertising intensity on profitability for industry groups	Two regression models one fully constrained model with structural and firm-specific variables and a partly constrained with just structural variables <b>Dependent variable:</b> Profitability	Omitted variables could be the reason for observing industry differences in the relationship between structural variables and profitability. Profits in some industries may be higher than in others, partly because of the greater uncertainty surrounding the magnitude of the return

Author(s), year of publication	Database Period Country Sample	Research question	Method(s) used	Main findings
Berger (1995)	1980-1990 USA 3 different competitive environment (unit banking, limited branching and statewide branching states) Call Report and Summary of Deposits	The Market power (RMP and SCP) and the Efficient-structure (ESX and ESS) hypothesis for banks	OLS regression which derive a single reduced form that link the four theories <b>Dependent variable:</b> ROA and ROE	The ESX and the RMP, where market share is positively related to profitability in most cases. The integration of MS is the reason for the non-appearance of positive coefficient on concentration. Does not support ESS and SCP. Concentration negatively related to profitability. Although it seems that none of the 4 theories is sufficient to explain bank profits.
Bothwell et. al (1984)	1960 - 1967 USA N = 156 manufacturing firms from Fortune Directory	Components of profitability	Four regressions models defined by including all doubtful variables, delete one and just include some <b>Dependent variable:</b> Profitability	Advertising and profits are positively correlated. Market share and profits are positively correlated with two interpretations: firm size is an indicator of efficiency and large firm size indicates a large capital requirements barrier to entry. Advertising intensity indicates products differentiation barriers to entry.
Cabral & Mata (2013)	1984 and 1991 Portugal N = 515 manufacturing firms	Theoretically explanations for financial constraints	Derive stylized facts concerning firm size distribution and evolution over time <b>Dependent variable:</b> Firm size	Expected firm growth rates are not independent of size. FSD (firm size distribution) seems quite skewed to the right due to the incorporation of financial constraints.
Elzing & Mills	Revision of several papers: Paul Samuelson (1964); Fritz Machlup (1952); Bain (1941); Lindenberg & Ross (1981)	Origin, implementation and use of the Lerner index	Survey	Lerner Index directs the inquiry about market power to the pricing discretion of the firm and away from the firm's profit level, its absolute size, and the rhetoric of its business documents.
Evans (1987)	1976-1982 USA N = 20.000 Manufacturing	Relationship between firm size, age and firm growth	Survey	Firm growth decreases with firm age (firm size is held constant). Firm growth decreases with firm size. Firm growth decreases with firm size (firm age is held constant).

Author(s), year of publication	Database Period Country Sample	Research question	Method(s) used	Main findings
Grossack (1965)	1947 and 1954 USA N = 150 firms SIC Industries (3 digits)	Presence of monopoly power in particular industries (SIC)	Concentration ratios (HH) and linear regression model of 1954 MS of all firms investigated <b>Dependent variable:</b> Static measures of structure	Large firms in highly concentrated industries were no more able to restrict entry into their markets than large firms in the less concentrated industries, and tend to lose shares to small firms and new entrants than to each other. Static concentration is not, a reliable indicator of monopoly power.
Hashmi & Biesebroeck (2010)	1982 – 2004 USA	The relationship between market structure and innovation in the global automobile industry taking into account mergers	Markov perfect equilibrium model <b>Dependent variable:</b> prices	Negative relationship between competition and innovation and depends on the preferred definition; Firms with higher knowledge relative to their rivals tend to innovate less.
Hradzil, Zhang (2012)	1985-2007 Canada SIC and GICS codes 4 digit Manufacturing sector	Comparison between concentration ratios based on SIC system and GICS system	Correlation matrix between HHSIC, HHGICS, C4SIC, C4GICS and markups	Through industry markups GICS-based measures are better proxies for the actual industry concentration than SIC measures.
Kurtz & Rhoades (1992)	1983 - 1987 10,690 banks operating in 2165 different market, that were continuous from 1983 – 1987	The relationship between market share and profit rates	OLS regression static partial equilibrium model <b>Dependent variable:</b> Profit rates <b>Independent variable:</b> firm profits	Firms market share is directly related to profitability; Profit rates increase at a decreasing rate up to a share of 55%; Market share still positive and significant when controlling with market concentration.
Leibenstein (1966)	Revision of several papers: Cyert and March (1963); Carter and Williams (1958); Florence et. al. (1958); Kilby (1962); Neil Chamberlain (1962)	Three reasons for X-efficiency connected with firm performance	<b>Dependent variable:</b> Profitability	Firm does not depend on the assumption of cost-maximization by all firms. Not all inputs are marketed and if they are, not all are available for buyers.

Levy (1985)	1963 – 1972 USA N = 197 industries (4 digits)	Distinguish between short-term from long-term effects and estimates when concentration deviates from the equilibrium the rate of return of adjustments	Model of concentration which addresses the issue of incomplete adjustments of industry concentration <b>Dependent variable:</b> Concentration <b>Independent variable:</b> advertising intensity, plant size	The adjustment effect is of the expected sign and strongly significant. Economy variables do not have stronger effects in more concentrated industries when barriers are effective. Changes in the long-run concentration are on average anticipated over the period examined.
Martin (1979)	USA N = 209 industries 4 digit SIC industries	Advertising intensity, seller concentration and prof. are considered endogenous	<b>Dependent variable:</b> Profitability	Barrier to entry influence profitability only through their influence on concentration.
Mazón (1993)	1983-1989 Spain N = 1396 firms from <i>Central de Balances del Banco de España</i>	Relation between profitability and market share	Model based on a algebraic description of oligopoly behavior <b>Dependent variable:</b> Profitability	For more than 35% industries profitability is positively correlated with market share. Dynamic model is required to analyze firm-level profitability. Estimated conjectural variations are closer to Cournot behavior than to joint maximization.
Mirzaei, et. al (2013)	1999-2008 N = 1929 banks in 40 emerging and advanced economies	The effects on market structure, through banks specific characteristics	Panel data model building upon the empirical models in banking performance through the potential influence of market structure <b>Dependent variable:</b> Profitability <b>Independent variable:</b> Market structure using MS or concentration	Market share has no significant impact on banks profitability in emerging countries (without support for RMP hypothesis), the opposite happens for advanced economies. Market concentration has an insignificant impact.
Pervan, Mlikota & Sain (2012)	1999-2011 Croatia N = 1652 units of observations NACE 2002 3 digit level	Industrial concentration in Croatian food and beverage industry	Correlation matrix between the three measures of concentration used (HH, HTI and CR <sub>4</sub> )	Strong and statistically significant relationship between all analysed measures of concentration (three measures); Changes in concentration within different sectors vary greatly.
Pontuch (2011)	1977-2009 USA N = 77618 (all public companies) Compustat	Effects of product market concentration and financing constraints separately and jointly on the business cycle of firms	Regression model on firms profitability <b>Dependent variable:</b> profitability	Sensitivity is higher for firms in concentrated industries with an equal distribution of market power and lower for firms with higher concentration or none market power; Constrained firms are more sensitive to GDP which shows that these firms are the first to be affected by business cycle; Firms with higher market power are able to sustain above average profitability for a longer time.

Author(s), year of publication	Database Period Country Sample	Research question	Method(s) used	Main findings
Rocha (2010)	1996-2003 Brazil N = 103 sectors of activity (3 digits)	The change in market concentration in the Brazilian mining and manufacturing industries	Concentration Ratios (HH) <b>Dependent variable:</b> Concentration	The results show that the inequality factor has an important and detached role in the determination of the changes in concentration. Negative correlation between the entrance of new firms in the sector and the inequality effect.
Shepherd (1972)	1956-1969 USA N = 231 firms from <i>Fortune Directory</i>	Models of market structure, based on profitability of the firm	Static model where share, concentration, entry barriers (independent variables) are cast as determinants of profitability <b>Dependent variable:</b> Profitability	In static models is the main element despite the leading firm group, entry barriers appear to have a small implication in market structure, advertising is significant although restrict to certain industries, cases of persistent high profitability at market share > 50% are unusual.
Smirlock (1985)	1973 – 1978 Kansas City, USA N = 2700 state banks	Relationship between bank market share and bank profitability	Simplistic equation – includes both market share and concentration at the same time. <b>Dependent variable:</b> Profitability <b>Independent variables:</b> Market share and concentration	When market share is taken into account, concentration adds nothing to explain the bank profits rates. Market share is positively and significantly related to profitability. Supports the efficient structure hypothesis.
Tabacco (2015)	2007 – 2012 22 EU countries ECB	The relationship between innovation and competition on the banking sector	Two models – fixed effects and a model using lags of competition variables <b>Dependent variable:</b> concentration	Null relationship between innovation and competition for banking.
Thomadakis (1977)	1961 – 1968 USA N=158 firms from Fortune 500 list	Future oriented implications of market structure	Model that wants to understand the influence of market structure (dependent variable) on firm's performance and strategy (independent variables)	Market structure appears to imply an ability of firms to maintain and extend their current advantages into the future. Industry concentration is fulcrum in the determination of excess profits expected from held assets and firm's investment options. Interpretation of growth and MS should be separate for high and low concentration groups.
Wernerfelt et. al. (1989)	1985-1989 USA N = 60 firms from Fortune 4 digit SIC level	Two models of firm performance (economic perspective and organizational perspective)	Regression model – is supposed to measure the value of firm (dependent variable) by decomposing in two parts: one that represents the reproduction costs of the firm's current assets (economic paradigm) and other that represents the capitalized value of monopoly rents (independent variables) (organizational paradigm)	The importance of both perspectives in firm's performance. The organizational factors explain much more than the economic factors.



**Table A.II – Herfindahl-Hirschman Index (HHI) (2004 and 2011) CAE Code, and**

**Sectors description**

**Ranked by HHI of 2011**

CAE CODE	Designation	HHI 2004	HHI 2011
10620	Manufacture of starches and starch products	0,974	0,988
22111	Tire manufacturing cameras and air-	0,917	0,970
10730	Manufacture of macaroni, couscous and similar	0,525	0,955
26701	Manufacture of instruments and optical equipment, ophthalmic not	0,782	0,954
24430	Collection and primary processing of lead, zinc and tin	0,562	0,925
23522	Manufacture of plaster	0,821	0,890
10821	Manufacture of cocoa and chocolate	0,695	0,815
26702	Manufacturing photographic equipment	0,609	0,813
27200	Manufacturing accumulators and batteries	0,662	0,811
33160	Repair and maintenance of aircraft and spacecraft	0,886	0,809
20200	Manufacture of pesticides and other agrochemical products	0,334	0,791
32300	Manufacturing of sports goods	0,170	0,790
20600	Manufacture of man-made fibers	0,577	0,777
25400	*	0,618	0,759
27330	Manufacturing devices and accessories for low voltage electrical installations	0,332	0,754
20302	Manufacture of printing ink	0,645	0,744
27520	Manufacture of non-electric domestic appliances	0,842	0,714
16211	Manufacture of wood particle boards	0,578	0,678
16212	Manufacture of wood fibreboard	0,527	0,669
26200	Manufacture of computers and peripheral equipment	0,308	0,658
24530	Casting of light metals	0,430	0,652
29100	Manufacture of motor vehicles	0,542	0,643
32991	Manufacture of pens, pencils and the like	0,633	0,632
10520	Manufacturing of ice cream	0,596	0,631
28120	Manufacture of fluid power equipment	0,391	0,621
24200	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	0,644	0,620
23132	Glassware	0,255	0,610
25910	Manufacture of steel packaging	0,682	0,605
23650	Manufacture of fiber cement	0,445	0,593
10892	Manufacture of broths, soups and desserts	0,827	0,585
25300	Manufacturing steam generators (except central heating boilers)	0,382	0,585
28110	Manufacture of engines and turbines, except aircraft, vehicle and cycle	0,387	0,582
33170	Repair and maintenance of other transport equipment	0,934	0,564
26400	Manufacture of radio and television receivers and similar consumer goods	0,327	0,545
23521	Manufacture of lime	0,381	0,520
10920	Manufacture of foods for pets	0,270	0,509
32993	Umbrellas manufacturing and umbrellas	0,137	0,488
32501	Manufacture of optical instruments ophthalmic	0,479	0,486
10830	Industry Coffee and tea	0,242	0,482
24410	Collection and initial processing of precious metals	0,965	0,453
29310	Electrical and electronic equipment manufacturing, motor vehicle	0,361	0,426
28940	Manufacture of machinery for textile, clothing and leather	0,322	0,422
21100	Manufacture of basic pharmaceutical products	0,379	0,418

CAE CODE	Designation	HHI 2004	HHI 2011
24440	Collection and primary processing of copper	0,777	0,400
10860	Manufacture of homogenised food and dietary	0,890	0,396
24450	Collection and primary processing of other non-ferrous metal	0,147	0,391
13992	Manufacture of lace	0,354	0,389
23620	Manufacture of plaster products for construction	0,490	0,384
26600	Manufacture of radiation equipment, electromedical and electrotherapeutic	0,346	0,370
20303	Manufacture of prepared dyes, vitrifiable compositions and the like	0,701	0,360
12000	Preparation tobacco	0,759	0,358
23110	Manufacture of flat glass	0,827	0,358
26511	Manufacturing electricity meters, gas, water and other liquids	0,369	0,357
10320	Manufacture of fruit juices and vegetable juices	0,702	0,349
23510	Cement manufacturing	0,344	0,347
23323	Vaults manufacturing	0,106	0,346
24520	Steel Casting	0,331	0,345
10810	Sugar industry	0,353	0,344
23311	Manufacturing tiles	0,208	0,342
10613	Processing of cereals and legumes, n.p.	0,261	0,341
24100	Steel and manufacturing of ferroalloys	0,545	0,340
17220	Manufacture of paper products for household and sanitary use	0,148	0,326
23910	Production of abrasive products	0,243	0,325
28140	Manufacture of other taps and valves	0,238	0,325
10310	Processing and preserving of potatoes	0,290	0,325
32122	Manufacture of jewellery and other items of jewellery	0,012	0,324
25920	Manufacture of light metal packaging	0,379	0,321
13950	Manufacture of non-wovens and articles, except apparel	0,570	0,320
13202	Wire weaving the wool	0,197	0,312
33150	Repair and maintenance of vessels	0,433	0,310
28150	Manufacture of bearings, gears and other transmission components	0,457	0,309
25932	Manufacture of springs	0,310	0,309
27900	Manufacture of other electrical equipment	0,213	0,304
32994	Manufacture of protective and safety equipment	0,383	0,303
23140	Manufacture of glass fibers	0,111	0,300
17110	Manufacture of pulp	0,524	0,293
23200	Manufacture of refractory products	0,274	0,292
25731	Manufacture of tools	0,191	0,290
13942	Manufacture networks	0,235	0,286
23131	Container glass manufacturing	0,230	0,283
23702	Manufacture of articles in Slate (slate)	0,229	0,282
33110	Repair and maintenance of metal products (except machinery and equipment)	0,027	0,281
25733	Manufacturing sintered parts	0,146	0,276
25940	Manufacture of fasteners, bolts and nuts	0,206	0,275
13103	Preparation and spinning of silk and preparation and texturing of synthetic or artificial filament yarns	0,255	0,269
24510	Foundry iron	0,151	0,266
26120	Manufacture of electronic circuit boards	0,499	0,265
17120	Manufacture of paper and card (except corrugated)	0,416	0,264
32110	Coinage	0,259	0,263

CAE CODE	Designation	HHI 2004	HHI 2011
26300	Manufacturing machines and equipment for communication	0,165	0,262
31093	Furniture manufacturing other materials for other purposes	0,031	0,255
26520	Manufacture of watches and clocks	0,206	0,252
28950	Manufacture of machinery for the industries of paper and paperboard	0,306	0,251
27121	Distribution equipment manufacturing and control for high-voltage electrical installations	0,354	0,248
10891	Manufacturing yeast, yeast and additives for baking and pastry	0,248	0,248
25931	Manufacturing wire products	0,239	0,241
10510	Industries of dairy products	0,232	0,239
13104	Manufacture of sewing thread	0,213	0,238
16292	Manufacture of basketware and wickerwork	0,182	0,238
14110	Clothing of leather clothes	0,093	0,237
32121	Filigree manufacturing	0,183	0,236
13105	Preparation and spinning of linen and other textile fibers	0,139	0,236
10911	Manufacture of premixtures	0,345	0,234
20411	Manufacture of soap, detergents and glycerin	0,203	0,233
25210	Manufacture of boilers and central heating radiators	0,143	0,223
32200	Manufacture of musical instruments	0,246	0,220
16295	Manufacture of other cork products	0,233	0,216
13203	Weaving wire type silk and other textiles	0,217	0,215
21202	Manufacture of pharmaceutical preparations and articles	0,198	0,214
13102	Preparation and spinning of woolen-type fibers	0,198	0,214
26110	Manufacture of electronic components	0,642	0,211
32992	Fasteners manufacturing run, buttons and the like	0,143	0,209
18200	Reproduction of recorded media	0,123	0,207
16102	Wood impregnation	0,132	0,206
28991	Manufacture of machinery for the industries of building materials, ceramics and glass	0,097	0,203
23640	Manufacture of mortars	0,276	0,198
27110	Engine manufacturing, generators and transformers	0,614	0,195
13962	Manufacture of textiles for technical and industrial use nec	0,150	0,193
13941	Cordage manufacturing	0,188	0,190
16213	Manufacture of veneer, plywood, plywood and other panels	0,148	0,189
32910	Manufacture of brooms and brushes	0,159	0,189
16293	Industry Cork preparation	0,016	0,187
10400	*	0,142	0,183
23322	Manufacturing tiles	0,146	0,182
28130	Manufacture of other pumps and compressors	0,790	0,181
18110	Newspaper printing	0,156	0,177
14190	Manufacture of other wearing apparel and accessories	0,054	0,172
32123	Working diamonds and other precious or semi-precious stones for jewelry and industrial use	0,716	0,171
10612	Peel, bleaching and other treatments rice	0,187	0,170
28910	Manufacture of machinery for metallurgy	0,258	0,169
28960	Manufacture of machinery for the plastics and rubber	0,274	0,167
20420	Perfumes, cosmetics and toiletries	0,151	0,164
24300	*	0,164	0,164
24540	Casting of other non-ferrous metals	0,039	0,162
23324	Manufacture of other ceramic products for construction	0,103	0,162
17230	Manufacture of paper products, stationery	0,215	0,162
22112	Rebuilding of rubber tires	0,095	0,161

CAE CODE	Designation	HHI 2004	HHI 2011
27320	Manufacture of other electrical and electronic wire and cable	0,127	0,159
32400	Manufacture of games and toys	0,091	0,157
23190	Manufacturing and processing of other glass (including technical glassware)	0,098	0,153
14200	Manufacture of articles of fur skins	0,079	0,153
28410	Manufacture of machine tools for metal	0,142	0,149
27510	Electronics manufacturing	0,108	0,146
22191	Manufacture of rubber components for footwear	0,349	0,145
10203	Preserving fishery and aquaculture products in olive oil and other vegetable oils and other sauces	0,160	0,145
25290	Manufacture of other reservoirs and containers of metal	0,136	0,143
14120	Work of garments	0,096	0,139
10893	Manufacture of other food products nec	0,120	0,136
10840	Manufacture of condiments and seasonings	0,323	0,134
22230	Manufacture of plastic articles for building	0,127	0,132
23991	Manufacture of bituminous mixtures	0,542	0,132
28490	Manufacturing of other machine tools nec	0,069	0,130
13993	Manufacture of other textiles, n.p.	0,102	0,130
13930	Manufacture of carpets and rugs	0,158	0,129
10720	Manufacturing of crackers, cookies, rusks, and preserved pastry	0,135	0,127
10204	Salting, drying and other processing activities of fishery and aquaculture products	0,090	0,126
10611	Grain mill	0,066	0,126
23992	Manufacture of other products Miscellaneous non-metallic minerals nec	0,108	0,125
23630	Concrete products ready	0,082	0,118
33130	Electronic and optical equipment repair and maintenance	0,046	0,118
20100	*	0,106	0,117
22291	Manufacturing plastic components for footwear	0,165	0,116
24420	Collection and Aluminium production	0,137	0,116
10822	Manufacture of confectionery	0,101	0,107
20412	Manufacture of cleaning products, polishing and protection	0,131	0,104
10120	Poultry slaughter (meat production)	0,063	0,102
13101	Preparation and spinning of cotton-type fibers	0,063	0,100
25732	Manufacture of machine tools	0,122	0,098
16291	Manufacture of other wooden products	0,046	0,098
23312	Manufacture of tiles, mosaics and ceramic plates	0,097	0,097
26512	Manufacture of instruments and appliances for measuring, checking, navigating and other purposes, nes	0,117	0,097
17211	Manufacture of paper and paperboard (including packaging)	0,090	0,093
22192	Manufacture of other rubber products, n.p.	0,078	0,087
32996	Other miscellaneous manufacturing industries, n.p.	0,058	0,083
16240	Wood packaging manufacturing	0,045	0,082
31030	Manufacture of mattresses	0,060	0,082
16220	Parqueteria	0,064	0,080
10202	Freeze fishery and aquaculture products	0,143	0,080
25991	Metal tableware manufacturing and household articles	0,081	0,080
10850	Food manufacturing and pre-cooked dishes	0,166	0,078
13302	Stamping	0,085	0,076
23120	Shaping and processing of flat glass	0,080	0,076
17290	Manufacture of other articles of pulp, paper and paperboard	0,052	0,074
20301	Manufacture of paints (except printing), varnishes, mastics and similar products	0,071	0,073

CAE CODE	Designation	HHI 2004	HHI 2011
13303	Finishing of yarns, fabrics and textile goods nec	0,056	0,073
23690	Manufacture of other articles of concrete, plaster and cement	0,090	0,073
32502	Manufacture of orthopedic appliances and prostheses and medical and surgical instruments	0,078	0,072
27122	Distribution equipment manufacturing and control for low voltage electrical installations	0,198	0,072
25710	Manufacture of cutlery	0,062	0,071
10201	Preparation of fishery and aquaculture products	0,088	0,070
14390	Manufacture of other knitted garments	0,022	0,067
28920	Manufacture of machinery for mining, quarrying and construction	0,073	0,066
32130	Jew elery manufacturing	0,097	0,064
10390	*	0,074	0,062
23321	Manufacture of bricks	0,026	0,061
31094	Furniture finishing activities	0,039	0,061
23703	Manufacturing of granite and rocks nec	0,014	0,058
21201	Manufacture of drugs	0,049	0,058
11000	*	0,036	0,057
28930	Manufacture of machinery for food, beverage and tobacco	0,058	0,057
18140	Binding and related activities	0,035	0,057
28992	Manufacture of other special purpose machinery nec	0,039	0,056
25933	Production of metal chains	0,070	0,056
33190	Repair and maintenance of other equipment	0,080	0,056
13961	Trimings manufacturing and sirgarias	0,039	0,055
22210	Manufacture of plastic plates, sheets, tubes and plastic profiles	0,034	0,051
23400	*	0,056	0,050
17212	Manufacture of paper and cardboard packaging	0,048	0,049
32995	Manufacture of coffins in wood	0,040	0,047
10130	Manufacture of Meat Products	0,042	0,047
22220	Production of plastic packaging	0,037	0,045
31092	Metal furniture manufacturing for other purposes	0,051	0,044
13301	Bleaching and dyeing	0,021	0,044
33140	Electrical equipment repair and maintenance	0,232	0,043
28300	Manufacture of machinery and tractors for agriculture, livestock and forestry	0,053	0,043
13201	Wire w eaving cotton type	0,037	0,042
30000	*	0,068	0,042
25610	Treatment and coating of metal	0,031	0,041
27400	Manufacture of electric lamps and other lighting equipment	0,037	0,041
10912	Manufacture of prepared feeds for farm animals (except for aquaculture)	0,036	0,039
29320	Manufacture of other parts and accessories for motor vehicles	0,047	0,038
23610	Manufacture of concrete products for the building	0,015	0,038
29200	Bodyw ork manufacture of trailers and semi-trailers	0,035	0,037
15100	*	0,035	0,036
10110	Cattle slaughter (meat production)	0,035	0,036
31010	Manufacture of furniture for office and shop	0,047	0,034
13920	Manufacture of made-up textile articles, except apparel	0,045	0,033
25501	Forging, prints and laminates	0,120	0,032
33200	Installation of industrial machinery and equipment	0,115	0,031
18120	Other printing	0,023	0,030
25720	Manufacture of locks, hinges and other hardw are	0,026	0,028
14310	Manufacture of knitted and crocheted hosiery	0,015	0,025

CAE CODE	Designation	HHI 2004	HHI 2011
13910	Manufacture of knitted fabrics	0,019	0,025
28200	*	0,015	0,025
14140	Manufacture of underwear	0,022	0,024
16294	Production of cork stoppers	0,128	0,021
33120	Repair and maintenance of machinery and equipment	0,008	0,020
31091	Wood furniture manufacturing for other purposes	0,018	0,019
14133	Activities finishing garments	0,041	0,019
15202	Manufacture of components for footwear	0,015	0,018
22292	Manufacture of other plastic products n.e.c.	0,026	0,018
14132	Manufacture of other outerwear made to measure	0,015	0,017
25110	Production of metal constructions structures	0,019	0,016
10712	Pastry	0,008	0,016
25620	General mechanical engineering	0,004	0,016
13991	Embroidery manufacturing	0,015	0,014
16101	Saw milling	0,016	0,013
31020	Manufacture of kitchen furniture	0,009	0,013
16230	Manufacture of carpentry works for construction	0,009	0,013
25734	Manufacturing metal molds	0,011	0,010
18130	Printing preparation activities and media products	0,006	0,008
23701	Manufacture of marble and similar rocks articles	0,004	0,008
10711	Baking	0,007	0,007
25992	Manufacture of other fabricated metal products nec	0,008	0,007
15201	Footwear manufacturing	0,008	0,006
14131	Manufacture of other outerwear series	0,003	0,006
25120	Manufacture of doors, windows and joinery of metal	0,002	0,003

\* These sectors do not have definition in the source used

Source: INE, CAE 2015

**Table A.III – Description of some SCIE’ variables**

<b>Variable</b>	<b>Definition</b>
<b>Employees</b>	All of the individuals that in the reference period were embraced in the company’s business, regardless its duration
<b>Gross Fixed Capital Formation</b>	Acquisitions less disposals of fixed assets during the period analysed
<b>Gross Operating Surplus</b>	Summarizes the entire affection value to return on capital factor
<b>Gross value added cost of factors</b>	The fraction which remains after the payment of all taxes on production and the receipt of all subsidies on production
<b>Gross value added market prices</b>	Value created by the production process (difference between output and intermediate consumption)
<b>Income after tax</b>	The liquid value after tax either positive or negative created by the company during the year
<b>Operating result</b>	Exploration result of the firm
<b>Operating subsidies</b>	Amount of subsidies provided by the State or Community corporations
<b>Personal Costs</b>	All costs within the employees’ needs and functions
<b>Production</b>	The value of goods and services produced during the year, obtained from the volume business enterprises
<b>Services</b>	The providing services that are in the own goals or main purposes of the statistical unit
<b>Supplies and external services</b>	Represent all costs for the purchase of consumer goods other than inventory (all of the company’s purchases)
<b>Volume Business enterprises</b>	Net of sales and services of the company’s activities
<b>Spending on advertising</b>	All costs related to advertising of firms’

\* Note that for the advertising intensity the computation was only made for 2011 as for the previous years there was not available information.

Source: Author’s construction based on INE (2015)

**Table A.IV – Correlation Matrix for 2004**

	Commercial Margin_mean_04	HHI_turnover_mean_04	debttoequity_mean_04	Profitability_mean_04	MS_VN_mean_04
Commercial Margin_ Pearson Correlation	1	,229**	,013	-,013	,098
Sig. (2 ends)		,000	,834	,832	,116
N	257	257	257	257	257
HHI_turnover_mean_ Pearson Correlation	,229**	1	,147*	-,074	,662**
Sig. (2 extremidades)	,000		,018	,235	,000
N	257	257	257	257	257
debttoequity_mean_ Pearson Correlation	,013	,147*	1	,012	-,012
Sig. (2 ends)	,834	,018		,843	,854
N	257	257	257	257	257
Profitability_mean_04 Pearson Correlation	-,013	-,074	,012	1	,002
Sig. (2 ends)	,832	,235	,843		,977
N	257	257	257	257	257
MS_VN_mean_04 Pearson Correlation	,098	,662**	-,012	,002	1
Sig. (2 ends)	,116	,000	,854	,977	
N	257	257	257	257	257

\*\*Correlation is significant a 0.01 level

\*Correlation is significant a 0.05 level

**Table A.V. – Correlation Matrix for 2007**

	Commercial Margin_mean_07	hhi_turnover_mean_07	debttoequity_mean_07	Profitability_mean_07	MS_VN_mean_07
Commercial Margin_ Pearson Correlation	1	,240**	,008	-,004	,187**
Sig. (2 ends)		,000	,902	,947	,003
N	257	257	257	257	257
hhi_turnover_mean_07 Pearson Correlation	,240**	1	,036	,102	,675**
Sig. (2 ends)	,000		,562	,102	,000
N	257	257	257	257	257
debttoequity_mean_07 Pearson Correlation	,008	,036	1	,005	,026
Sig. (2 ends)	,902	,562		,931	,673
N	257	257	257	257	257
Profitability_mean_07 Pearson Correlation	-,004	,102	,005	1	,086
Sig. (2 ends)	,947	,102	,931		,168
N	257	257	257	257	257
MS_VN_mean_07 Pearson Correlation	,187**	,675**	,026	,086	1
Sig. (2 ends)	,003	,000	,673	,168	
N	257	257	257	257	257

\*\*Correlation is significant a 0.01 level

**Table A.VI– Correlation Matrix for 2011**

	Profitability	ROA	MS_VN	hhi_turnover	Commercial Margin
Profitability Pearson Correlation	1	,011*	,003	,000	,001
ROA Pearson Correlation	,011*	1	,002	,000	,001
MS_VN Pearson Correlation	,003	,002	1	,239**	,160**
hhi_turnover Pearson Correlation	,000	,000	,239**	1	,050**
Commercial Margin Pearson Correlation	,001	,001	,160**	,050**	1

\*\*Correlation is significant a 0.01 level

\*Correlation is significant a 0.05 level