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The Effect of Capital Structure on Company Performance in Product Market Competition Across Business Cycles

Evidence from the Euro Area Manufacturing Industries

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PREFACE AND ACKNOWLEDGEMENTS

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ABSTRACT

The purpose of this study is to examine capital structure - company performance relation across the business cycle. Besides, this study also provides a further analysis of this relationship in different industry concentration levels to examine company's ability to compete in product markets. This study uses a sample of Euro Area active and listed manufacturing companies from 2005 to 2015 periods. The findings suggest that higher debt will consequently create the disciplinary effect and motivate companies to perform better. However, in the presence of economic recessions, there is a significant negative effect of using debt on sales performance. After conducting a more in-depth analysis by considering the industry concentration level, this negative impact of the use of leverage is more prominent in a low concentrated industry. In contrast, a greater use of debt has no significant impact on sales performance in a highly concentrated industry.

Keywords: capital structure; company performance; business cycle; industry concentration

JEL Classification: G32, H22

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1. Introduction

Industrial development can provide a significant contribution to the economy. Increases in industrial development can help a country meet its domestic demand for consumer goods. By focusing on increasing the domestic production of goods, a country can reduce expenditure on imports and increase its gross domestic product (GDP).

According to Eurostat, in 2012 the manufacturing sector in the EU countries generated EUR 1,620 billion in value added. This statistic makes manufacturing the largest contributor to non-financial commercial value added. It accounts for more than a quarter of EU total value added (26.2%). Besides, this sector employs 30 million persons. It is becoming the second largest sector in the EU-28's non-financial commerce regarding its contribution to the level of employment (22.4%). In 2014, countries in the Euro Area provided almost three-quarters of the contribution to the overall EU-28 GDP. However, as seen in Figure 1, the contribution of Euro Area manufacturing to its value added (as a percentage of its GDP) fell from around 19.2% to 16% between 2000 and 2015. This relative decline shows that deindustrialization is taking place with harmful consequences for the economy. Besides having an impact on job creation, another important aspect of deindustrialization is that it might also have a significant impact on company performance in EU countries. This sector also accounts for over two-thirds of EU exports. For this reason, the manufacturing industry clearly plays an important role in European countries' economies. A strong manufacturing sector can serve as a powerful engine for economic growth.

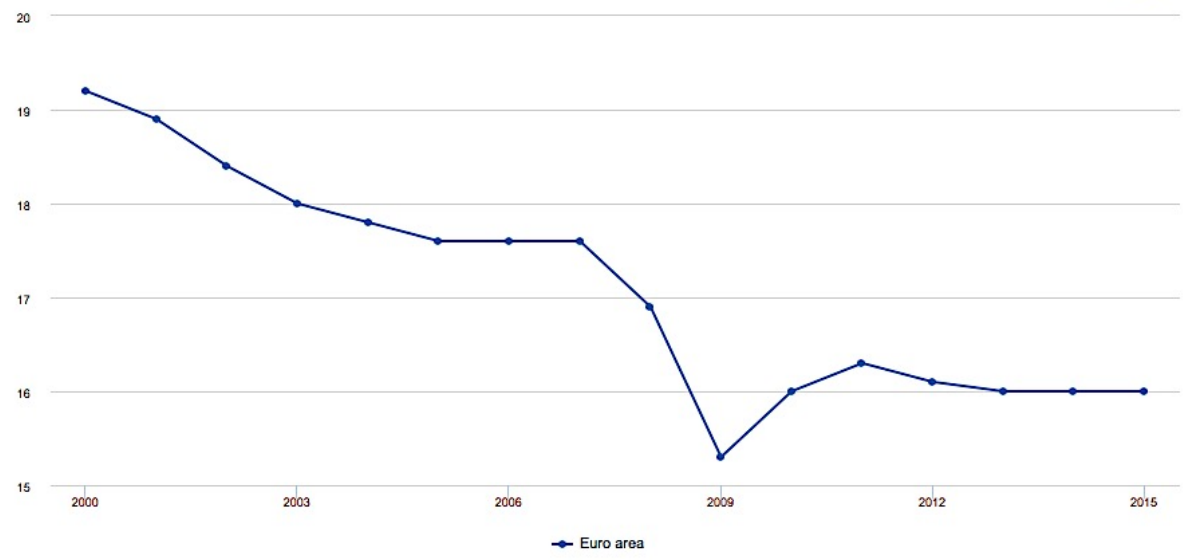

Figure 1: Euro Area manufacturing sector contribution as a percentage of its GDP
(Source: World Development Indicator, 2016)

The manufacturing sector can indeed make a major contribution to economic growth. However, the manufacturing sector, compared to the services sector, is more sensitive to economic shocks or other economic conditions, such as a recession. As stated in the 2014 European Competitiveness Report, the economic crisis and the recession that took place between 2008 and 2013 were more detrimental to the manufacturing sector. Based on this situation, it might be interesting to conduct research on how companies in this sector can maintain their performance in product markets especially when economic downturns occur. By maintaining the performance and competitiveness of manufacturing companies, this industry can continue to meet its domestic demand, help to reduce imports, provide significant contributions to economic growth and clear the path for EU countries towards economic prosperity. Figure 2 below gives a general idea of how company performance can contribute to economic growth.

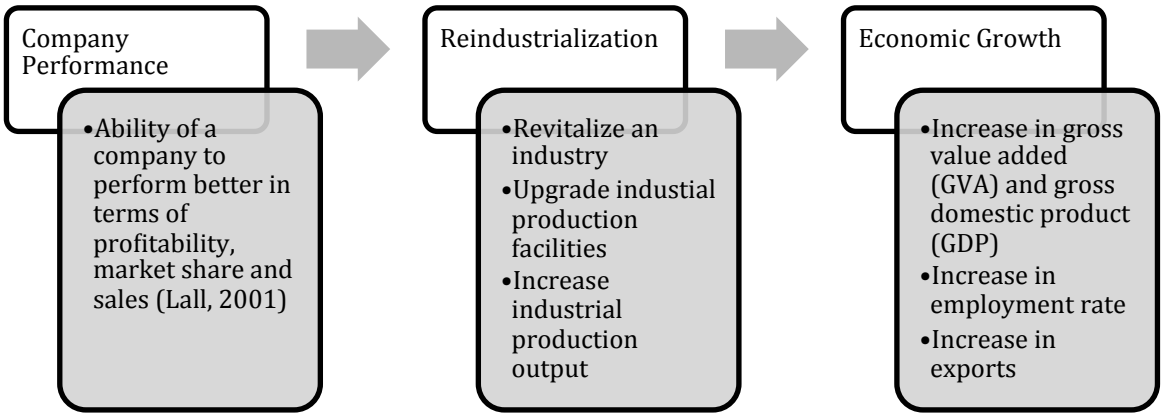

Figure 2: Company's contribution to economic growth

First of all, before discussing further how to increase company performance, the meaning of company performance itself will be explained. According to Neely et al. (1995), company performance refers to a company's action that shows efficiency and effectiveness. Company performance is also defined as a multidimensional concept of defining the success of business, in other words, the ability of a company to achieve its objective (Civelek et al., 2015). This objective can be measured in the form of reducing the level of inventories, shortening the rate of turnover, increasing market share, and profitability. This study focuses on analyzing the effect of making financial decisions on company performance to examine what companies can do to achieve their objective to perform better. In this case, financial decision-making is limited to the choice of funding used by the company to run its operation, in other words, its capital structure.

Most previous researchers studied the capital structure and its relationship with principal-agency problems (Jensen and Meckling, 1976; Kochhar, 1996), conflicts that might arise between company managers and their investors. The agency theory shows one of the impacts of capital structure on a company. However, the capital structure might also affect company performance in product markets. This research also examines its impact on company performance if it is measured relative to the performance of other competitors in the same industry, to deepen our understanding of the impact of the capital structure. This relative measurement helps us understand a company's ability to compete and outperform other rivals. On the one hand, Bolton and Scharfstein (1990) suggested that leverage will maximize a competitor's incentive to predate. Highly leveraged companies will suffer competitive disadvantages in product markets. On the other hand, some studies report contrasting findings. Higher leverage is also likely to be associated with better company performance and competitiveness. Brander and Lewis (1986), however, provided evidence of the limited liability effect of debt. Due to this effect, companies with higher debts will behave more aggressively compared to other companies with no debts.

Capital structure is regarded as an internal factor that affects company performance. However, in the real business world, there is also an uncontrollable external factor that might have an impact on a company's overall activities. For instance, as mentioned above, performance in the manufacturing sector was affected by the economic downturn that took place between 2008 and 2013. An examination of this situation shows that an economic downturn can be expected to affect market participants, e.g. how they react in their financing decisions, and might also affect their outcomes in product markets. To address this issue, the effect of economic conditions on examining the relationship between capital structure and company performance is included in this study. Opler and Titman (1994) implied that highly leveraged companies tend to lose their market share and earn lower profits than their competitors. When an economic recession happens, highly leveraged companies seem to suffer greater losses in market share. It means that recessions have a negative impact on company performance. Their findings are consistent with those of Campello (2003, 2006).

Figure 3 depicts the outline of this research. By using sample data of manufacturing companies in countries in the Euro Area, this research is expected to provide a clear answer to what companies can do, concerning capital structure decision-making, to increase their performance following a period of recession. In its estimation, this research makes use of OLS regressions as a baseline comparison model. In addition to OLS regressions, it is also important to do panel fixed effects regressions. It is because panel fixed effects regressions

will control for unobservable factors that are correlated with the variables in a regression (Blumenstock, n.d.). There might be unobservable factors because data used in this research fall into several categories such as sub-industries. Each sub-industry has different characteristics that might affect the variables. A basic OLS regression model often fails to take these factors into account. Therefore, panel fixed effect models are necessary to eliminate the effects of unobservable factors, in other words, omitted variable bias.

These regressions are repeated separately between companies in concentrated industries and competitive industries to examine whether or not leverage and recession have different impacts according to industry concentration level. When only a few large companies dominate an industry, then that industry is regarded as highly concentrated. It also means that competition between companies in that industry is low. According to a paper by Fosu (2013), an increase in leverage is associated with predatory behavior by other companies in highly concentrated product markets. This finding is supported by several other theoretical predictions (Chevalier, 1995a, 1995b; Kovenock & Phillips, 1997; Opler and Titman, 1994).

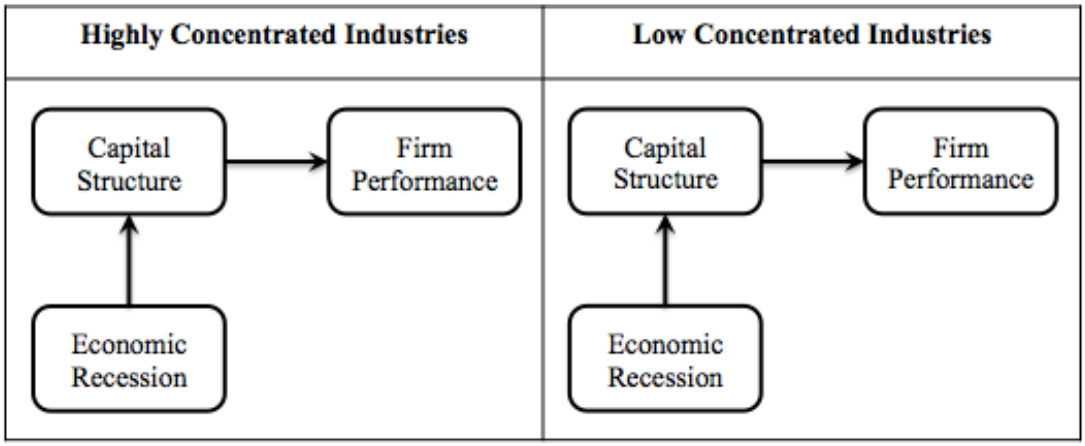

Figure 3: Research outline - The effect of capital structure on company performance in highly concentrated and low concentrated industries during an economic downturn

Nevertheless, several concerns need to be taken into account in implementing this research to reduce potential bias in the results. Primarily, changes in capital structure that occur as a consequence of economic recessions are unanticipated. This means that managers and other market participants do not anticipate them before they happen in the market. These recessions should also happen to industry as a whole. In other words, they should not be industry-specific.

This research also has to take into account that there might be a reverse causality problem between capital structure and company performance. Prevention of the reverse causality

occurrence should be considered when building the regression model. After considering these conditions, research can be conducted to understand how capital structure affects changes in sales, as a proxy for company performance, if changes take place in macroeconomic conditions in both highly and low concentrated industries.

1.1 Research topic and contribution

As discussed in the previous section, company performance and competitiveness in the manufacturing sector can induce the revitalization of an industry and provide a significant contribution to economic growth. Therefore, this research aims to analyze what companies in manufacturing industries can do, particularly in terms of financial decision-making, to perform better during an economic recession and thus continue to contribute to a country's economic growth. More specifically, this research will first analyze the impact of the choice of capital structure on companies' performance relative to their competitors during times of recession. Secondly, to gain further insight into factors that might potentially affect company performance and competitiveness, this analysis is conducted in two different groups of industries based on their concentration levels. Hence, the research questions of this study are specified as:

1. What is the relationship between capital structure and company performance in manufacturing industries?
2. What is the relationship between capital structure and company performance in manufacturing industries during an economic recession?
3. What is the relationship between capital structure and company performance during an economic recession in either a highly concentrated industry or a competitive industry?

This research topic is relevant to both practitioners and academia. From a practitioner's point of view, the most important implication is that it can provide additional knowledge to companies engaged in the manufacturing industry about the consequence of making a decision related to a company's capital structure that will affect its competitive outcomes while also take into account economic conditions and industry concentration level. By knowing these consequences, companies can also be expected to have more skills in creating new investment strategies, strengthening their position in their respective markets, achieving their goals and being able to compete with other companies. From the perspective of research and academia, this study contributes to the existing literature on the relationship between capital structure and company performance (Modigliani and Miller, 1958; Jensen, 1986;

Aghion et al., 1999), and the relationship between leverage and company competitiveness in product markets (Bolton and Scharfstein, 1990; Chevalier 1995a, 1995b; Chevalier and Scharfstein, 1996; Phillips, 1995; Kovenock and Phillips, 1997; Brander and Lewis, 1986) across the business cycle (Opler and Titman 1994; Campello, 2003; Campello; 2006) by critically analyzing the relationship between leverage and company performance following changes in economic conditions while also taking into account the effect of the level of concentration in the industry. This study is also first to research this topic by using a sample of companies from countries in the Euro Area.

1.2 Limitation of the study

This study does inevitably have some limitations, as it would be practically impossible to analyze all companies in the various manufacturing industries. The sample data were all gathered from a database that provides data only on publicly listed companies. For this reason, private companies are not included in this study. Consequently, this study does not cover all manufacturing companies in countries in the Euro Area. However, the use of a relatively large number of data points is expected to represent the actual capital structure–company performance relationship in countries in the Euro Area.

1.3 Findings and structure of the study

This study finds that, based on the sample data, leverage has a significant positive relationship with company performance, which means that if a company increases its debt relative to a competitor in the same industry, that company will increase its relative sales performance. However, in the presence of economic recessions, there is a significant negative effect of using debt on sales performance. After conducting a more in-depth analysis by considering the industry concentration level, this negative impact of the use of leverage is more prominent in a low concentrated industry. In contrast, a greater use of debt has no significant impact on sales performance in a highly concentrated industry.

The remainder of this paper is structured as follows. Chapter 2 identifies and analyzes important related literature on capital structure and its relationship with product market competition. Chapter 3 describes the selection and characteristics of the dataset and explains the empirical model used in this study. Chapter 4 covers the empirical analysis along with a detailed explanation of the empirical results. Finally, Chapter 5 not only concludes the findings and implications of this research, but also indicates its limitations and makes suggestions for potential future research.

2. Literature Review

2.1 Capital structure, company performance and product market competition

Company capital structure represents the proportion of different sources of funds used by a company to finance its operation and growth. Existing theoretical studies have provided an important understanding of the relationships between capital structure choices and product market competition. These studies suggested that capital structure could influence a company's performance in product markets since financial arrangements can transform a company's incentive to outperform its rivals. A study by Bolton and Scharfstein (1990) about the consequence of product market competition in a leverage-performance relationship implied that leverage, which is used to mitigate agency problems, would maximize a rival's incentive to predate. This predation can convince other companies that it would be more profitable to exit the industry. In other words, the degree to which companies can finance investment with internally generated funds is one of the important determinants of product market success. Indebted companies could suffer a significant competitive disadvantage in product markets.

Other studies that provide indications of the nature of rival companies' reaction following an increase in a company's leverage are those of Chevalier (1995a, 1995b) and Chevalier and Scharfstein (1996). By using U.S. supermarket industry data, Chevalier (1995a, 1995b) demonstrated the relationship between local entries' encouragement and rivals' expansion associated with the announcement or presence of LBO companies. A dramatic use of leverage will affect product market competition, which is evident from an increase in competitors' market value. Thus, LBO companies will compete less aggressively in the industry. Besides, when rivals are less leveraged, they will charge lower prices. This price decrease will increase the probability of exit for LBO companies. This finding suggests that highly leveraged companies are more susceptible to predation in product markets than less leveraged companies.

Phillips (1995), who examined four different industries in the U.S., presented evidence that the product market industry is influenced by capital structure. According to this paper, drastic changes take place in market share and plant closings following changes in a company's capital structure. High leverage affects product markets, more specifically the output decisions of companies and their competitors, and this can be seen as a plausible reason not to behave aggressively and undertake investments opportunities.

In line with the findings of previous studies, Kovenock and Phillips (1997) found evidence to support the above-mentioned models. They extended existing work by taking into account market structure and plant-level efficiency. The market structure was used as a determinant of investment, while plant-level efficiency was a determinant of plant-closing decisions. They found that debt is negatively associated with a company's investment. However, it is positively correlated with plant closure. They also found that the capital structure and concentration interaction terms strongly affect the significance of these effects. Specifically, highly leveraged companies in concentrated industries are more likely to cut their investment and close down plants. In other words, when companies are highly leveraged, rivals are more likely to increase their investment, which will result in predatory pricing in concentrated product markets.

Several other studies, however, drew a different conclusion on the relationship between leverage, company performance and market competition. The study of Brander and Lewis (1986) considered a two-stage model with demand uncertainty. This model helped them to analyze the impact of companies' capital structure on their product market behavior. They provided a basic knowledge of limited liability provisions of debt financing, which indicates that changes in capital structure lead to changes in product output strategy. Due to the limited liability of debt, when the use of debt is increasing, companies may choose to behave or trade more aggressively by increasing their output compared to a situation without debt. By implementing this strategy, returns for equity holders may increase if the company is doing well.

According to existing literature, contradicting conclusions exist regarding the relationship between capital structure, company performance, and product market competition. Some papers conclude that the use of leverage may increase competitors' market value and harm company performance (Bolton and Scharfstein, 1990; Chevalier, 1995a, 1995b; Phillips, 1995; Kovenock and Phillips, 1997). In contrast, another paper has different findings. Brander and Lewis (1986) found that the use of leverage might increase a company's output and thus increase company performance.

2.2 Capital structure and company performance across business cycles

Based on a paper by Opler and Titman (1994), which studied the interaction between capital structure and market competition in economic downturns, highly indebted companies are more likely to lose their market share and have lower operating profits than rivals with less

leverage during economic downturns. Specifically, this relationship is more noticeable for companies in industries with a high concentration level.

Moreover, Chevalier and Scharfstein (1996) extended the leverage-performance literature by showing that highly leveraged companies are more likely to increase their prices relative to their competitors during an economic downturn. Leverage limits companies' capacity to make investments and to increase their market shares, because the higher the leverage, the higher a company's default probability, which will restrict its attempts to improve current performance. In general, companies will behave less competitively during a recession. However, less leveraged companies are expected to gain competitive advantages by increasing their market share compared to highly leveraged companies in concentrated industries. Therefore, large numbers of leveraged companies in the industry are expected to decrease product market competitiveness.

Consistent with Chevalier and Scharfstein (1996), Campello (2003) found that leverage has a negative impact on relative-to-industry company sales growth. Highly leveraged companies experience a significant decline in their sales growth in situations in which their rivals are relatively less leveraged during macroeconomic downturns. This finding can be seen as evidence of less competitive behavior associated with economic recessions. Furthermore, in his subsequent research, Campello (2006) also found that companies with average debt might increase their market share. However, companies with leverage exceeding their industry standard will not be able to expand their sales and may even suffer market share losses. Put differently, after some point, increasing leverage may lead to sales underperformance.

2.3 Product market competition measurement

The Herfindahl-Hirschman Index (HHI) is a measure of concentration level in a variety of contexts (Rhoades, 1993). It can be used to measure the concentration level of household income and is also considered a useful tool for analyzing merger activities. In addition, this methodology can also be used to measure the degree of market competition. Due to the relative ease of calculating the HHI, it has been widely used in previous literature, e.g. as in Campello (2006), Grullon and Michaely (2007) and Fosu (2013). The HHI uses market concentration level as an indicator of competition. According to Beiner et al. (2011) and Giroud and Mueller (2010), the HHI is measured as the sum squared of the 50 largest company market shares in the industry. If there are less than 50 companies in the industry, then the HHI is calculated based on all companies in that particular industry.

According to Rhoades (1993), as a result of squaring the market shares, this method gives heavier weight to companies with large market shares than to companies with small market shares. Consequently, if the result of the HHI calculation is high (high concentration), reflecting a small number of companies with large market shares, competition in that particular market is weak. In contrast, if the result of the HHI calculation is low (low concentration), reflecting a large number of companies with small market shares, it implies that strong competition exists in the market. When the HHI approaches its maximum value of 10,000, it shows that a monopoly exists in which one company in the market has 100 percent market share. Otherwise, if the HHI is close to zero, this implies that there is a purely competitive market that consists of many companies with relatively small market shares.

However, there is a primary caveat of using the HHI calculation. As suggested by Claessens and Laeven (2004), a measure of competition is affected by other factors in addition to company performance and should consider a more structural approach. These other factors are, for example, country's macro-performance, country's economic stability or the threat of industry new entry. HHI is considered as a very simple measure that might fail to incorporate the various complexities in the real market. As such, the HHI calculation might not be the best indicators of the degree of competition.

2.4 Hypothesis

As described in the previous section, existing literature has provided different conclusions on the relationship between capital structure, company performance, and product market competition. Based on this condition and the objective of this research, the following hypotheses will be tested in this paper.

Hypothesis 1: *Companies that use higher leverage compared to their competitors within the same industry will lose their market shares*

This first hypothesis is formed based on the literature presented in the previous section, which implies that less leveraged companies will behave more aggressively and maximize investment opportunities. As a result, less leveraged companies will perform better and increase their market shares.

Hypothesis 2: *During an economic downturn, companies that use higher leverage compared to their competitors will lose their market shares*

The second hypothesis is derived based on the literature on capital structure and company competitiveness across business cycles. Previous studies suggest that highly leveraged companies experience a significant decline in their sales growth when their rivals are relatively less leveraged during economic downturns.

Hypothesis 3: *During an economic downturn, companies that use higher leverage compared to their competitors within a highly concentrated industry will lose their market shares*

The last hypothesis of this study is also derived based on the literature on capital structure and company competitiveness across business cycle by correspondingly taking into account the industry concentration level. Previous studies suggest that the negative relationship between leverage and company performance is more noticeable within highly concentrated industries.

3. Data and Methodology

3.1 Data sample

Initially, to simplify the data collecting process, a list of companies was made using Orbis. By using Orbis, researchers can simply apply search strategies to filter data. Several filters were used in this research to get all required data. The filters are world region, the category of companies, company status, and industry classification. These filters represent the criteria of data that are required to conduct this research. World region is applied to filter the area where companies are located. In this case, companies are limited to those that operate in Euro Area countries. The category of companies is limited to very large and large companies, as this category has the complete available data. The status of companies is limited to publicly listed companies. This company status was selected as Compustat Global, one of the databases used in this research, only provides publicly listed company data. Finally, the industry classification is limited to companies in the manufacturing sector as covered by NACE Rev. 2 Section C. NACE, which stands for *Nomenclature statistique des Activités économiques dans la Communauté Européenne,* which is the industry standard classification system used in the European Union and is approved by the European Commission. It represents a large range of statistical classifications according to economic activity. It has a similar function to the Standard Industrial Classification (SIC) that is commonly used in the USA. NACE Rev.2 is the most revised version of NACE. Section C represents all manufacturing sectors in Europe with codes ranging from 1000 to 3499. Table 1 below summarizes the Orbis search strategy used in this research. As can be seen from this table, applying all filters leaves a list of 1,131 companies that match the criteria. This list of companies contains company names and ISIN codes. ISIN codes are identification codes that are used to search all required company level data.

Table 1: Orbis Search Strategy on Making a List of Companies

Filters Applied	Search Result
All companies available in Orbis database	164,338,436
World region/Country/Region in country: **Euro Area**	32,922,699
Category of companies: **Very large & large companies**	263,484
Listed/Unlisted companies: **Publicly listed companies**	6,408
Industry classification: **NACE Rev. 2 Section C**	1,131
Total Companies	1,131

As stated before, ISIN codes resulting from the Orbis company list are used to gather the company level data required in this research. This research utilizes company level data from Compustat Global and Datastream. Companies' yearly total debt, property plant and equipment (PPE) and totals assets were collected from Compustat Global, whereas company profitability and sales were gathered from Datastream.

The selected sample period of this research is 2005 to 2015. This period is expected to be long enough to capture several changes in macroeconomic conditions that have an impact on economic activities in the market. Originally, there were 9,516 observations. However, for data-cleaning purposes, companies without the complete data required in this analysis (i.e. available information on sales, total debt, PPE, profitability and total assets) were excluded. The remaining observations relate to 8,770 company-year data. Companies belonging to industries with less than ten companies were also excluded to minimize any bias results and unreasonable benchmarking for industry adjustment when calculating industry-adjusted variables (Campello, 2003). Here is the list of manufacturing industries that are excluded from the sample as they have less than ten companies:

- Manufacture of tobacco products
- Manufacture of leather and related products
- Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
- Manufacture of coke and refined petroleum products
- Manufacture of furniture
- Other manufacturing (jewelry, musical instruments,sport goods, etc.)
- Repair and installation of machinery and equipment

This industry adjustment calculation helps to analyze companies' performance and competitiveness relative to their rivals in the same industry. After applying this criterion, the remaining matched data for all years provide panel data of 7,106 observations. Table 2 provides descriptive information on all variables analyzed in this research.

As can be seen from Table 2, *SalesGrowth*, ΔPPE, *ROA* and *Leverage* data are extremely skewed, which indicates that the data are not symmetric and far from normally distributed. These panel data contain extreme observations that can cause the regression results to be biased. By considering this situation, all abnormal data are then excluded by winsorizing all continuous variables (except size) at the 1% and 99% levels to reduce the impact of extreme observations.

Table 2: Descriptive Statistics of the Overall Sample

This table reports summary statistics for the variables used in the regression estimations (before industry-year adjustments). The sample contains 7,106 company-years of data in the 2005 to 2015 period that are collected annually from Compustat Global and Datastream. *SalesGrowth* is the annual change in sales at time t, given by ($Sales_{i,t} - Sales_{i,t-1}$) /$Sales_{i,t-1}$, where sales data are gathered from Datastream. *Size* is log normal of a company's total assets, gathered from Compustat Global. ΔPPE is the annual change in property plant and equipment at time t, given by ($PPE_{i,t} - PPE_{,t-1}$) /$PPE_{,t-1}$. PPE, gathered from Compustat Global. *ROA* is EBIT (Datastream) over total assets (Compustat Global). *Leverage* is the ratio of book value of total debt to book value of total assets. Included companies are from industries selected in the Nace Rev.2 manufacturing sector. Observations only relate to companies that belong to industries containing at least ten companies.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	N	Mean	Median	SD	Min	Max	Skewness
SalesGrowth	7,106	0.106	0.040	1.960	-1	143.636	59.471
Size	7,106	12.587	12.306	2.118	6.745	19.673	0.519
ΔPPE	7,106	0.096	0.004	1.229	-1	60.500	31.951
ROA	7,106	0.054	0.059	0.313	-21.030	10.011	-38.302
Leverage	7,106	0.272	0.240	0.641	0	50.813	69.351

Furthermore, to examine the impact of macroeconomic conditions on capital structure and company performance, this research also required real GDP growth. Real GDP growth data were gathered from OECD and Trading Economics. These data are required to decide whether the countries where the manufacturing companies operate are experiencing an economic recession or not. If the country has two consecutive quarters of negative real GDP growth during a year, then that particular year is regarded as a recession year.

3.2 Methodology

The methodology used in this research to predict industry-adjusted company performance, as a function of before base-year company's relative sales growth, the relative change in investment spending, size, profitability, relative leverage and macroeconomic condition, is an OLS regression. This study resembles and modifies the previous cross-sectional–time series regression model constructed by Opler and Titman (1994). They used a dummy variable to indicate the level of debt used by companies, while this study uses a continuous leverage variable. Although this study does use a continuous leverage variable in its baseline model, it does make use of a leverage dummy variable later in the robustness check section to increase the certainty of the regression results. The baseline model (Equation 1) of this study is specified as follows.

$$SalesGrowth_{i,k,t} = \alpha + \beta_1 SalesGrowth_{i,k,t-1} + \beta_2 Size_{i,k,t-1} + \beta_3 \Delta PPE_{i,k,t-1} + \beta_4 ROA_{i,k,t-1} + \beta_5 Leverage_{i,k,t-1} + \beta_6 Recession_t + \beta_7 Leverage_{i,k,t-1} \times Recession_t + \varepsilon_{i,k,t}$$

Table 3: Variable Description, Expected Signs and Theoretical Reasoning

The first column shows the name of each of the variables included in Equation 1. The second column indicates the type of each variable. DV stands for Dependent Variable, CV stands for Control Variable and IV stands for Independent Variables. The third column provides a detailed description of each of the variables included in Equation 1. The fourth column shows the expected sign, which might result from the relationship between each independent variable with a dependent variable (relative sales growth) in Equation 1. The fifth column provides a brief theoretical reasoning behind each expected sign in the third column.

Variables	Type	Variable Description	Expected Sign	Theoretical Reasoning
$SalesGrowth_{i,k,t}$	DV	Relative sales growth of company *i* that belongs to industry *k* at time *t*	n/a	n/a
$SalesGrowth_{i,k,t-1}$	CV	Relative sales growth of company *i* that belongs to industry *k* at time *t-1*	+	• According to Margaritis and Psillaki (2010), sales growth serves as a proxy for growth prospects and has a positive effect on company performance.
$Size_{i,k,t-1}$	CV	Company size *i* that belongs to industry *k* at time *t-1*	-	• According to Jensen (1986), larger companies are prone to incentive problems and more likely to have underperforming lines of business. • Large companies might be associated with a high degree of moral hazard, resulting in the need for increased monitoring (Himmelberg et al., 1999).
$\Delta PPE_{i,k,t-1}$	CV	Relative change in property plant and equipment (PPE) of company *i* that belongs to industry *k* at time *t-1*	+	• Companies with a higher change in PPE are expected to outperform their rivals because these companies can make much greater investments (Fosu, 2013)
$ROA_{i,k,t-1}$	CV	Relative return on assets of company *i* that belongs to industry *k* at time *t-1*	+	• According to Margaritis and Psillaki (2010), past profitability is expected to have a positive effect on company performance as the company has better management and can be expected to be more efficient.
$Leverage_{i,k,t-1}$	IV	Relative leverage of company *I* that belongs to industry *k* at time *t-1*	-	• Following Campello (2003), leverage has a negative impact on relative-to-industry companies' sales growth.
$Recession_t$	IV	Recession dummy at time *t*, which takes the value of 0 if the economy is in an expansion and 1 if the economy is in a recession period	-	• In a period of recession, companies are under more pressure from a macroeconomics environment. Thus, the relationship is expected to be negative.
$Leverage_{i,k,t-1} \times Recession_t$	IV	An interaction term, the product of relative leverage of company *i* in industry *k* at time *t-1* and recession dummy at time *t*	-	• Highly leveraged companies are expected to lose a significant market share during an economic downturn compared to their less leveraged rivals.

where $SalesGrowth_{i,k,t}$ is relative sales growth of company *i* that belongs to industry *k* at time *t,* $SalesGrowth_{i,k,t-1}$ is relative sales growth of company *i* that belongs to industry *k* at time *t-1,* $\Delta PPE_{i,k,t-1}$ is relative change in property plant and equipment (PPE) of company *i* that belongs to industry *k* at time *t-1,* $Size_{i,k,t-1}$ is company relative size *i* that belongs to industry *k* at time *t-1,* $Leverage_{i,k,t-1}$ is relative leverage of company *I* that belongs to industry *k* at time *t-1,* $Recession_t$ is the recession dummy at time *t*, which takes a value of 0 if the economy is in an expansion and 1 if the economy is in a recession period and $Leverage_{i,k,t-1} \times Recession_t$ is the interaction term between leverage and the recession dummy.

The above regression equation helps to test whether or not companies with higher leverage – compared to their rivals – are more likely to experience a decline in relative-to-industry company performance during economic downturns. In the estimation performed, this study controls for any heteroscedasticity problem by using Huber-White's robust variance-covariance estimator. This method is expected to produce consistent standard errors for OLS regression coefficient estimates if there is a heteroscedasticity problem. Table 3 shows a detailed description of each variable in Equation 1, the expected signs of each variable and the theoretical reasoning behind each expected sign.

3.2.1 Measurements of variables

Dependent variable. The dependent variable for this model is relative sales growth as seen in Equation 1. In this case, relative sales growth means the calculation of each company's sales growth is industry-adjusted. Firstly, each company's individual sales growth should be calculated to get the relative sales growth. Sales growth is defined as the change in a company's net sales divided by its previous year's net sales, that is $(Sales_{i,t} - Sales_{i,t-1}) / Sales_{i,t-1}$, where i and t indexes are company i at time t (Fosu, 2013). Previously, many researchers used sales growth as a proxy for company performance (Opler and Titman, 1994; Campello, 2003). The use of sales growth is supposed to provide a combining effect of pricing decisions and other market strategies, such as fixed investments, expenditure on research and development (R&D) and the use of promotion. This effect can capture the changes in a company's share of its industry's sales (Campello, 2003). After calculating each company's sales growth, then the industry mean sales growth should also be calculated. Finally, relative sales growth is measured as the difference between each company's sales growth and its industry mean sales growth (Opler and Titman, 1994). An increase in relative-

to-industry mean sales growth means the company is competing more aggressively compared to its industry rivals.

Independent variables. The independent variables for this model are relative leverage and recession dummy variable. The first independent variable, relative leverage, represents the proportion of sources of finance or the structure of capital used by the company to run its business relative to its competitors within the same industry. Primarily, each company's leverage should be calculated. Leverage is defined as book value of total debt divided by book value of total assets. Using the book value of total debt helps reduce reverse causality between capital structure and company performance since book values are less sensitive to markets' assessments about future company performance (Campello, 2006). Next, relative leverage is calculated as the difference between each company's leverage and its industry-mean leverage. An increase in relative-to-industry leverage means the company uses higher debt compared to its competitors within the same industry. As seen in Equation 1, this model uses the previous year's (one year lagged) relative leverage. It means that this model assumes that the impact of a company's decisions concerning the uses of debt as a source of financing will be detectable in the following year. Therefore, for example, a 2005 relative leverage will be matched with a relative sales growth in 2006. The use of one year lagged relative leverage also helps to mitigate the reverse causality problem that might arise between capital structure choices and company performance.

The second independent variable is the changes in macroeconomic conditions or business cycles. The proxy is the recession dummy, which has a code of 0 assigned to non-recession years and a code of 1 for recession years. To decide whether a year is considered as a recession year or not, this study uses a simple recession approximation rule. According to Blanchard and Simon (2001), an economic expansion will begin when there are two consecutive quarters of positive growth. In contrast, a recession will begin when there are two consecutive quarters of negative growth. Thus, for the purpose of this study, a year is considered as a recession year if it has two consecutive quarters of negative real GDP growth.

In addition to the two main independent variables, the OLS regression in this study also includes an interaction term, which helps to examine the relationship between leverage and the performance of a company across business cycles. In other words, the interaction term helps to analyze whether leverage will have a positive or a negative impact on a company's performance in the presence of economic recession. In this case, the recession dummy will act as a moderating effect.

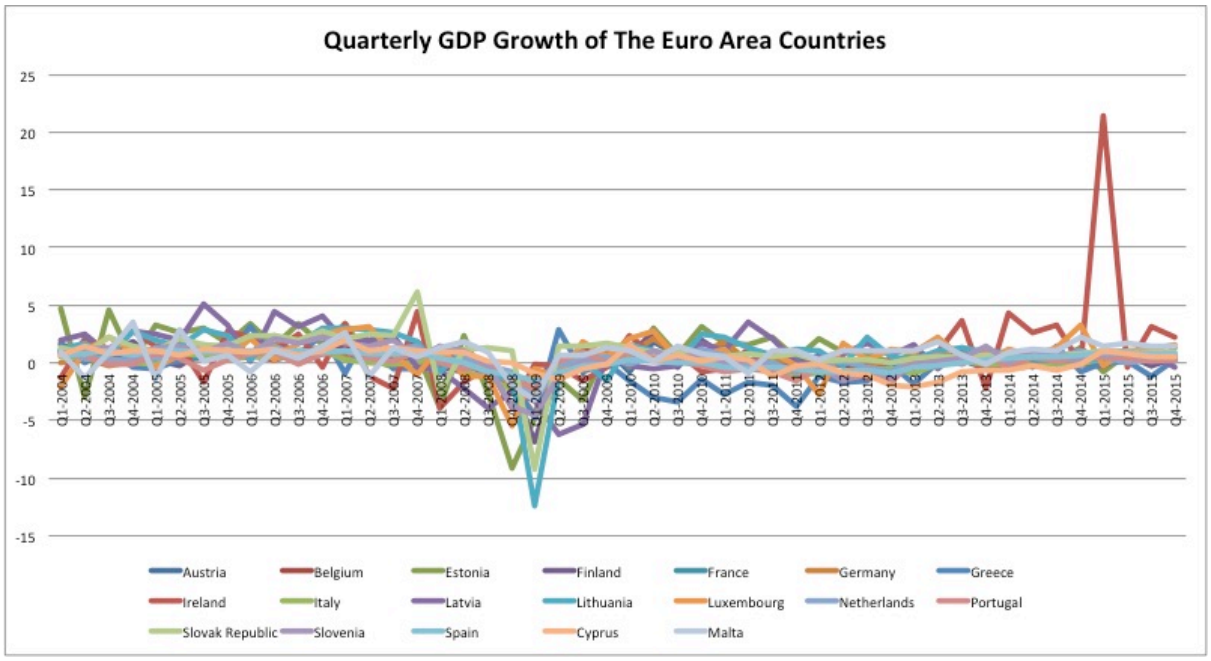

Figure 4: Quarterly GDP Growth of The Euro Area Countries (Q1:2004 – Q4:2015)

Control variables. The control variables for this model are at the company level and include one year lagged sales growth, size, change in property plant and equipment (PPE) and company profitability. One year lagged change in sales is included to control for company-specific characteristics that may contribute to its performance over time. Moreover, controlling for one year lagged change in PPE and size is important as larger companies might be expected to outperform their rivals because these companies can make much greater investments (Fosu, 2013). Furthermore, the larger a company, the greater the possibility that it is associated with a degree of moral hazard. The presence of this problem increases the need of company monitoring (Himmelberg et al., 1999). Following Campello (2006), sales growth tends to be associated with company profitability. Leverage ratios may also correlate with profitability. Thus, to gauge the effect of leverage on sales performance, this research also has to control for profitability. Company profitability is measured as EBIT over total assets. Due to large differences in total assets, company size is measured as the natural logarithm of company's total assets.

Regardless of the direction of the impact, controlling for the impact of one year lagged sales growth, size, change in property plant and equipment (PPE) and profitability on the following year's sales growth is required for the purpose of this study. It is because these variables might be determinants of sales growth and might also have a correlation with leverage (Opler and Titman, 1994). The use of one year lagged variables is included to reduce a potential reverse causality that might arise when using this model. All control

variables are adjusted relative to the industry mean. This industry adjustment can help to describe relationships among the variables to the dynamics of competition in the sample companies.

The next chapter will not only show the regression results but also show a robustness checks session and a discussion of financial and economic interpretation derived from the regressions.

4. Empirical Results

4.1 Sample characteristics

Before discussing the results of this research, it is important to look at the characteristics of these companies in the manufacturing sector in both recession and non-recession periods. Table 4 shows manufacturing industry characteristics that are included in this analysis. Panel A describes industry characteristics in recession periods, while Panel B describes industry characteristics in non-recession periods. Based on this table, in general, companies' average sales growths in recession years are negative and lower than those in non-recession years. This difference indicates that companies in manufacturing industries do indeed perform worse in recession years. Companies that suffer the largest sales decline are those engaged in the manufacture of pharmaceutical products, base metals, motor vehicles and computer industries. These declines might represent reductions in the demand for products in these industries. Pharmaceutical companies are often considered as volatile, rapidly evolving and uncertain (Smit and Trigeorgis, 2004). If an economy is in a good state, the sales of pharmaceutical companies can grow by as much as 84.31%. However, when an economy is in a bad state, their sales decline to about 54.64%. This large decline can be regarded as a result of industry volatility. For example, shocks in a company's economic condition will mostly affect its sales. Nevertheless, pharmaceutical companies can still maintain their sales growth much better than companies in other industries. One possible reason is that pharmaceutical companies have unique and innovative products as their value drivers (Smit and Trigeorgis, 2004). These companies have a good adaptive capacity and can evolve their company strategies rapidly according to the current situation, e.g., the current economic condition.

Decreasing demand for motor vehicles, new machines and equipment might also happen as a result of a cost reduction strategy in a recession period. Customers or companies tend to focus on maintaining and repairing their existing vehicles, machines and equipment rather than buying new ones. When the demand for motor vehicles, new machines and equipment decreases, the demands for base metals also decreases. It is because base metals are used to produce machinery, equipment, and motor vehicles, as well as for the production of ships and spacecraft and the construction of physical structures such as buildings, factories, and infrastructures.

In contrast, companies manufacturing food products experience a slight increase in sales in recession periods. One possible reason for this is that food products, regardless of

economic conditions, will still be categorized as primary needs. Consequently, the demand for products in these industries will still exist across the business cycle.

Table 4: Distribution of Companies in Manufacturing Industries in the Euro Area and Their Sample Characteristics in Recession and Non-Recession Periods

The sample consists of 641 active and listed companies, in 17 industries under Nace Rev.2 manufacturing section C, in the 2005 to 2015 period. A year is regarded as a recession year if it has two consecutive quarters of negative real GDP growth. Sales growth is measured as the average of percentage change in the company's sales one year after a recession year. ROA is the average EBIT over total assets. Leverage is measured as the average of book value of total debt divided by book value of total assets. A change in PPE is defined as the average of percentage change in property plant and equipment.

Panel A: Recession Years						
Nace Rev.2	Description	Obs	Sales Growth	ROA	Leverage	Change in PPE
10	Food Products	239	7.31%	-3.73%	52.40%	1.18%
11	Beverages	80	-0.05%	4.81%	29.29%	6.05%
13	Textiles	105	-6.60%	-1.91%	35.50%	-1.29%
14	Clothing	85	-0.48%	5.88%	24.89%	2.89%
17	Paper Products	87	1.68%	3.49%	34.42%	0.09%
18	Printing and Recorded Media	109	-3.11%	0.37%	30.98%	-4.28%
20	Chemical Products	143	5.24%	4.04%	27.62%	33.91%
21	Pharmaceutical Products	122	54.64%	2.17%	24.71%	6.54%
22	Rubber and Plastic Products	94	2.13%	4.42%	28.78%	1.41%
23	Other Non-Metallic Products	166	-0.06%	2.83%	29.33%	-2.20%
24	Base Metals	159	-4.45%	4.70%	32.97%	0.53%
25	Fabricated Metal Products	71	0.48%	6.89%	26.20%	2.34%
26	Computer, Electronic, Optical	285	-0.41%	2.85%	24.00%	8.67%
27	Electrical Equipment	96	4.90%	4.56%	24.17%	3.69%
28	Machinery and Equipment	248	2.87%	7.62%	27.02%	31.61%
29	Motor Vehicles, Trailers	73	-4.48%	3.51%	37.00%	-0.16%
30	Other Transport Equipment	66	2.68%	4.31%	23.25%	3.11%
Panel B: Non-Recession Years						
Nace Rev.2	Description	Obs	Sales Growth	ROA	Leverage	Change in PPE
10	Food Products	392	5.03%	6.09%	29.73%	8.59%
11	Beverages	233	2.05%	6.07%	22.40%	9.84%
13	Textiles	134	2.95%	5.27%	33.14%	10.84%
14	Clothing	181	6.81%	12.56%	22.99%	4.43%
17	Paper Products	177	3.56%	5.25%	30.00%	1.10%
18	Printing and Recorded Media	150	-1.12%	6.64%	25.97%	-4.32%
20	Chemical Products	374	12.65%	5.31%	25.63%	12.98%
21	Pharmaceutical Products	354	84.31%	-4.68%	26.00%	6.38%
22	Rubber and Plastic Products	186	10.77%	7.85%	26.71%	13.39%
23	Other Non-Metallic Products	282	5.33%	6.39%	28.00%	6.00%
24	Base Metals	258	13.86%	9.75%	30.09%	16.68%
25	Fabricated Metal Products	150	8.90%	6.98%	25.30%	7.29%
26	Computer, Electronic, Optical	805	9.33%	7.61%	22.92%	14.72%
27	Electrical Equipment	198	7.26%	8.19%	20.44%	5.55%
28	Machinery and Equipment	648	9.34%	8.62%	21.50%	14.35%
29	Motor Vehicles, Trailers	199	11.42%	7.37%	33.82%	15.47%
30	Other Transport Equipment	157	10.94%	5.13%	22.57%	9.92%

4.2 Regression results

Table 5 reports the results of Equation 1 in predicting the mean industry-adjusted sales growth in the 2005-2015 period. Of most interest are the coefficient estimates of the effect of leverage on company performance in manufacturing industries and the estimation of the effect of leverage on company performance in economic recession periods.

Table 5: Regression Results Predicting Mean Industry-Adjusted Sales Growth in the 2005-2015 Period

The dependent variable is company annual *SalesGrowth* in industry *i* at time *t*, given by ($Sales_{i,t} - Sales_{i,t-1}$) /$Sales_{i,t-1}$. *Size* is the natural logarithm of company total assets. ΔPPE is the change in property plant and equipment, given by ($PPE_{i,t} - PPE_{,t-1}$) /$PPE_{,t-1}$. *ROA* is a company's profitability defined as EBIT over total assets. *Leverage* is calculated as the book value of total debt divided by total assets. All variables are adjusted for their two-digit Nace Rev.2 industry-year means. A *recession* dummy is used as a proxy for an economic downturn that is equal to 1 if the country in which companies are operating is in a recession year and otherwise it is 0. The sample period is 2005-2015 and sampling is restricted to manufacturing industries covered in Nace Rev.2 (1000-3399). Observations are industries with at least ten companies. Column (1) and (2) use OLS regressions. In column (1), the estimator corrects the error structure for heteroscedasticity by using the Huber-White estimator. In column (2), the estimator corrects the error structure for both heteroscedasticity and autocorrelation by using Newey-West estimator. Column (3) and (4) use panel fixed effects regressions that correct for both heteroscedasticity and autocorrelation.

VARIABLES	(1) OLS	(2) OLS	(3) Fixed Effects	(4) Fixed Effects
$SalesGrowth_{i,k,t-1}$	0.144***	0.144***	-0.132***	-0.155***
	(0.019)	(0.018)	(0.013)	(0.029)
$ROA_{i,k,t-1}$	0.402***	0.402***	0.661***	-0.129
	(0.099)	(0.097)	(0.117)	(0.089)
$\Delta PPE_{i,k,t-1}$	-0.023	-0.023	-0.069***	0.068***
	(0.016)	(0.015)	(0.019)	(0.019)
$Size_{i,k,t-1}$	-0.008**	-0.008**	-0.236***	-0.179***
	(0.004)	(0.004)	(0.030)	(0.020)
$Leverage_{i,k,t-1}$	0.429***	0.429***	0.841***	0.147***
	(0.077)	(0.079)	(0.129)	(0.049)
$Recession_t$	-0.044***	-0.044***	-0.007	-0.029***
	(0.016)	(0.016)	(0.022)	(0.010)
$Leverage_{i,k,t-1} \times Recession_t$	-0.049	-0.049	-0.044	-0.082
	(0.139)	(0.136)	(0.134)	(0.051)
Constant	-0.110***	-0.110***	-0.031	-0.107***
	(0.010)	(0.009)	(0.019)	(0.013)
Observations	7,106	7,106	7,106	7,106
R-squared	0.054	0.054	0.138	0.836
Number of company	757	757	757	757
Adj. R-squared	0.053	0.053	0.136	0.832
Year FE	NO	NO	YES	YES
Sub-industry FE	NO	NO	NO	YES

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

According to the results in column (1), the coefficient of leverage is positive and economically significant at the 1% level. This positive coefficient estimate on the leverage variable suggests that companies that use more debt make market share gains compared to more conservatively financed competitors in the industry. This implies that leverage has a positive impact on sales growth. If companies increase one percentage point of their leverage relative to their rivals in the same industry, their sales growth will increase 42.9% compared to the other companies.

Furthermore, recession dummy, as seen in column (1), has a significant negative impact on a company's relative sales growth at the 1% level. This negative coefficient implies that, in recessions, companies tend to lose their market shares. These findings suggest that company sales are subject to economic pressure. When the economy is in a recession period, company sales are expected to decline.

The main finding of this regression is that the coefficient of the interaction term is negative. It is not, however, statistically significant. Although the result is not significant, it still provides the general idea that an increase in a company's debt-to-asset ratio in an economic downturn could harm that company's sales and consequently lose its market share. Furthermore, this result also suggests that companies with a higher sales growth, a relatively smaller size, lower investments in PP&E and higher profits in the previous year tend to outperform their industry rivals in the following year.

Before the regressions estimation of Equation 1 are conducted, a multicollinearity test is run to analyze whether or not any bias result might arise when two or more independent variables are correlated. This test is conducted by analyzing the variance inflator factor (VIF). The result of this test, as reported in Table A.1 in the Appendix, shows that this model has no multicollinearity problem.

Furthermore, as this regression model uses lagged variables, it is important to run a first order autocorrelation test to check for autocorrelation that frequently arises when using time series data. The most common way to test for a first order autocorrelation problem is by using the Durbin-Watson test in Stata. However, this study uses Durbin's alternative test for an autocorrelation problem by using the command *durbinalt* in Stata. This alternative test was chosen because it does not require all regressors to be exogenous, where no lagged value of the dependent variable is included as a regressor, compared to the usual Durbin-Watson test. Table 6 below reports the result of Durbin's alternative test. Since the p-value is lower than 0.05, the null hypothesis has to be rejected that there is no serial correlation. In other words, an autocorrelation problem does exist at the 5% level.

Table 6: Durbin's Alternative Test for Autocorrelation

lags(p)	chi2	df	Prob > chi2
1	5.112	1	0.024

H0: no serial correlation

To fix this autocorrelation problem, one should rerun the regression model by using the Newey-West estimator. This estimator provides a covariance estimator that is consistent in the presence of both heteroscedasticity and autocorrelation. Table 5 column (2) reports the results of Equation 1 in predicting the mean industry-adjusted sales growth in the 2005-2015 periods by using the Newey-West estimator. All regression coefficients are consistent with the previous results. Leverage still has a significant positive coefficient, recession dummy has a significant negative coefficient, and the interaction term has a non-significant negative coefficient. However, this estimator produces consistent standard errors even when both heteroscedasticity and autocorrelation problems are present.

The R-squared and Adjusted R-squared in column (1) and (2) in Table 5 are both low. These numbers represent how much of the dependent variable variation is explained by the model (Brooks, 2008). One of the potential reasons why these numbers are low is the OLS regression disregards the structures of the panel data. It might also generate biased and inconsistent results because it often fails to incorporate the effect of unobservable factors that potentially correlated with the other regressors (Schmidheiny and Basel, 2011). To address this issue, column (3) and (4) uses panel fixed effects regressions to estimate Equation 1. Column (3) uses fixed effects that control for the unobserved time-specific effect, while column (4) uses fixed effects that control for both the unobserved time and sub-industry specific effects. The results in column (3) and (4) are consistent with the results in column (1) and (2) with higher R-squared and Adjusted R-squared. It means that the use of panel fixed effects regression is more efficient as it explains the variation of the dependent variables better than OLS regression.

To summarize, based on the results in Table 5, the use of higher leverage will increase company's sales growth compared to the other competitors in the same industry while holding the other independent variables in the regression model constant. However, the use of higher leverage compared to rivals in a recession period does not have a significant impact on company's relative sales growth. Furthermore, panel fixed effects regression will be used for the rest of this research as it uses panel data more efficiently and generates less biased results.

4.3 Market concentration

In the previous section, this research analyzed the effect of an internal factor, namely capital structure decision-making, and an external factor that comes in the form of economic conditions, on company performance. In this section, this study will try to analyze an external factor at an industry level, namely the industry concentration level. As discussed in Chapter 2, industry concentration indicates whether an industry consists of a few large players or many small players. A more detailed analysis of industry concentration is important since competition between companies cannot be avoided in real product markets. A decision that is made by a company can be expected to be different according to the concentration level of the industry to which the company belongs.

4.3.1 Measuring market concentration

According to Beiner et al. (2011) and Giroud and Mueller (2010), the HHI is measured as the sum squared of the 50 largest company market shares in the industry. If there are less than 50 companies in the industry, then the HHI is calculated based on all companies in that particular industry. If an industry has less than 50 companies, then HHI calculation includes all companies in that particular industry. This market competition measurement is commonly used in the USA. However, this study attempts to construct a similar measurement, as this method includes the majority of companies' market shares in industries to represent the industry concentration level. For HHI calculation, this research uses companies that are included in the data sample. The number of companies in each manufacturing industry is less than 50, except food products, chemical products, pharmaceutical products, computer-electronic and machinery-equipment industry. Hence, for these five industries, the HHI calculation only includes companies with 50 largest sales. Equation 2 below represents the HHI formula used in this study.

$$HHI_{jt} = \sum_{i=1}^{Nj} \left(\frac{Sales_{ijt}}{\sum_{i-1}^{Nj} Sales_{ijt}} \right)^2$$

where HHI_{jt} is the HHI for industry i at time t; $Sales_{ijt}$ is sales of company i in industry j at time t. This index is calculated for each industry-year that belongs to Nace Rev.2 manufacturing industries in the 2005 to 2015 period. This concentration calculation is based on company sales data from Datastream. After calculating the HHI for all industries, those industries in which the index is greater than 1800 are denoted as highly concentrated

industries (Campello, 2006). However, in this research, low concentrated industries are those industries in which the index is less than 1800. In this way, the overall samples are now divided into two categories. Thereafter, Equation (1) is again estimated separately for companies participating in highly and low concentrated industries. The results of both estimations are then compared.

This research is aware of the possible shortfall that might come from the calculation of market concentration by using the HHI. As stated in a paper by Ali et al. (2009), Compustat-based industry concentration measure are not a perfect proxy for industry concentration. It only has 13% correlation with the U.S. Census-based Herfindahl indexes. This U.S. Census-based index has a positive relation with the real company size measurements such as net sales and total assets. This concentration measure also based on all public and private companies in the industry while Compustat-based measurement only based on all public companies data available in Compustat database. According to their paper, U.S. Census-based indexes are more appropriate to represent the actual industry competition. However, as similarly done by previous researchers outside the USA (Giroud and Mueller, 2010; Fosu, 2013), this research uses the basic calculation of HHI by still considering its caveats. This is because there is limited access to this European Census-based concentration indexes data.

Table A.2 in the Appendix indicates the manufacturing industry classification according to each industry's concentration level. Over the years, beverage manufacturing has consistently been one of the most concentrated industries. Although since 2009, textile manufacturing has become the most concentrated industry with the highest HHI of all the other industries. The two manufacturing industries with the lowest HHIs are the machinery and equipment industry and the printing and recorded media industry. This means that these industries, with the lowest HHIs, consist of a large number of companies competing with one another and producing goods that are somewhat similar to one another.

4.3.2 Regression results

Table 7 reports the results of estimations of mean industry-adjusted sales growth in the 2005 to 2015 period according to each industry concentration level. All variables used are very similar to those of Table 5, however allowing for contrasts between highly and low concentrated industries. The only difference is that in this regression the sample companies are divided into two categories, highly concentrated industries in which the HHI is greater than 1800 and low concentrated industries in which the HHI is less than 1800.

Table 7: Predicting Mean Industry-Adjusted Sales Growth in the 2005-2015 Period Based on Industry Concentration

The dependent variable is company annual *SalesGrowth* in industry *i* at time *t*, given by ($Sales_{i,t} - Sales_{i,t-1}$) /$Sales_{i,t-1}$. *Size* is the natural logarithm of company total assets. ΔPPE is the change in property plant and equipment, given by ($PPE_{i,t} - PPE_{,t-1}$) /$PPE_{,t-1}$.. *ROA* is a company's profitability defined as EBIT over total assets. *Leverage* is defined as the book value of total debt divided by total assets. All variables are adjusted for their two-digit Nace Rev.2 industry-year means. A *recession* dummy is used as a proxy for an economic downturn. Column (1) and (2) include all samples, Column (3) and (4) include companies in highly concentrated industries and Column (5) and (6) include companies in low concentrated industries. Highly concentrated industries are those with a Herfindahl Hirschman Index (HHI) greater than 1800, while low concentrated industries are those with an HHI less than 1800. The sample period is 2005-2015 and sampling is restricted to manufacturing industries covered in Nace Rev.2 (1000-3399). Observations are from industries with at least ten companies. The panel fixed effects estimator corrects the error structure for heteroscedasticity and autocorrelation.

	All Sample		Highly Concentrated Industry HHI>1800		Low Concentrated Industry HHI<1800	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
$SalesGrowth_{i,k,t-1}$	-0.132***	-0.155***	-0.141***	-0.162***	-0.347***	-0.227***
	(0.013)	(0.029)	(0.019)	(0.034)	(0.024)	(0.052)
$ROA_{i,k,t-1}$	0.661***	-0.129	0.630***	-0.177	1.001***	0.101
	(0.117)	(0.089)	(0.117)	(0.111)	(0.191)	(0.132)
$\Delta PPE_{i,k,t-1}$	-0.069***	0.068***	-0.123***	0.072***	0.015	0.036
	(0.019)	(0.019)	(0.023)	(0.023)	(0.030)	(0.028)
$Size_{i,k,t-1}$	-0.236***	-0.179***	-0.301***	-0.194***	-0.185***	-0.213***
	(0.030)	(0.020)	(0.043)	(0.025)	(0.030)	(0.025)
$Leverage_{i,k,t-1}$	0.841***	0.147***	0.806***	0.136**	0.979***	0.168*
	(0.129)	(0.049)	(0.133)	(0.059)	(0.201)	(0.087)
$Recession_t$	-0.007	-0.029***	0.018	-0.036**	-0.039*	-0.019
	(0.022)	(0.010)	(0.031)	(0.014)	(0.022)	(0.013)
$Leverage_{i,k,t-1} \times Recession_t$	-0.044	-0.082	0.217	-0.031	-0.166	-0.078
	(0.134)	(0.051)	(0.152)	(0.071)	(0.183)	(0.066)
Constant	-0.031	-0.107***	-0.080***	-0.169***	0.063*	-0.053***
	(0.019)	(0.013)	(0.021)	(0.018)	(0.037)	(0.014)
Observations	7,106	7,106	4,673	4,673	2,433	2,433
R-squared	0.138	0.836	0.192	0.854	0.255	0.780
Number of company	757	757	682	682	334	334
Adj. R-squared	0.136	0.832	0.189	0.851	0.249	0.774
Year FE	YES	YES	YES	YES	YES	YES
Sub-industry FE	NO	YES	NO	YES	NO	YES

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Table 7 reveals strong evidence regarding a positive effect of leverage on sales growth in both highly and low concentrated industries. This is evident from the coefficient estimates that are significant at 1% when controlling for time-specific effect. The results are also significant at 5% and 10% when controlling for both time and sub-industry specific effects. It

simply implies that, regardless of the industry concentration level, leverage will have a positive and significant impact on a company's mean industry adjusted sales growth.

The main focus of this regression result is the relationship between the interaction term and sales growth between industries. Though, as is evident from Table 7, the use of higher leverage in a recession period still does not have a significant impact on company's relative sales growth in both highly and low concentrated industries.

4.4 Robustness Checks

This section provides additional estimations to examine how certain the previous regression coefficient estimates are. In this section, some variables are replaced by other alternative measurements. For example, instead of using industry mean, this study uses industry median to calculate industry-adjusted variables. This study also uses the leverage dummy variable instead of the leverage continuous variable. In addition, this study also adds two other measurements of industry concentration level. Lastly, after all of the new variables and measurements have been used in the regression model, the results are then compared.

4.4.1 Median Industry-Adjusted Variables

In the baseline regression model, this study uses industry mean to calculate industry-adjusted variables. The mean is often used to measure central tendency. However, under certain conditions, use of the mean to measure central tendency is no longer appropriate. When the dataset contains extreme values, the mean may not be the best way to represent the typical value in the dataset because every value in a dataset is included in the mean calculation. Use of the mean is also inappropriate when the dataset is skewed or not normally distributed.

As seen in the previous sections, the data used in this study are not perfectly normal. Hence, additional estimations are made using median industry-adjusted variables. The median will not be strongly affected by skewed data, as it is the middle score in a data set. Thus, it is expected to provide less biased results.

Table 8 below shows the comparison between using mean and median industry-adjusted variables to predict sales growth in the 2005-2015 period. As seen in both Models 1 and 2, the leverage-sales growth relationship and the recession-sales growth relationship remain unchanged. All interaction terms have a negative coefficient. However, when using the media industry-adjusted variables, the coefficient estimates of interactions terms are economically significant at a 5% level. It implies that if a company uses higher leverage in a period of recession, this company will experience a market share decline. This difference might arise as a result of extreme values that are included in the industry-mean calculation. If a dataset

contains no extreme values or is perfectly normally distributed, the results when using the mean and the median should be the same. Therefore, the median in industry-adjusted calculations will be used further in this study due to the consideration that this calculation will provide less biased results.

Table 8: Regression Results Predicting Median Industry-Adjusted Sales Growth in the 2005-2015 Period

The dependent variable is company annual *SalesGrowth* in industry *i* at time *t*, given by ($Sales_{i,t} - Sales_{i,t-1}$) /$Sales_{i,t-1}$. *Size* is the natural logarithm of company total assets. ΔPPE is the change in property plant and equipment, given by ($PPE_{i,t} - PPE_{,t-1}$) /$PPE_{,t-1}$. *ROA* is company's profitability defined as EBIT over total assets. *Leverage* is calculated as the book value of total debt divided by total assets. All variables in Model 1 are adjusted for their two-digit Nace Rev.2 industry-year means. All variables in Model 2 are adjusted for their two-digit Nace Rev.2 industry-year medians. A *recession* dummy is used as a proxy for an economic downturn and it is equal to 1 if the country in which companies are operating is in a recession year and otherwise it is 0. The sample period is 2005-2015 and sampling is restricted to manufacturing industries covered in Nace Rev.2 (1000-3399). Observations are from industries with at least ten companies. The panel fixed effects estimator corrects the error structure for heteroscedasticity and autocorrelation.

	Model 1 Mean-Adjusted Variables		Model 2 Median-Adjusted Variables	
VARIABLES	(1)	(2)	(3)	(4)
$SalesGrowth_{i,k,t-1}$	-0.132***	-0.155***	-0.107***	-0.108***
	(0.013)	(0.029)	(0.023)	(0.023)
$ROA_{i,k,t-1}$	0.661***	-0.129	-0.099	-0.117*
	(0.117)	(0.089)	(0.063)	(0.064)
$\Delta PPE_{i,k,t-1}$	-0.069***	0.068***	0.072***	0.070***
	(0.019)	(0.019)	(0.018)	(0.017)
$Size_{i,k,t-1}$	-0.236***	-0.179***	-0.133***	-0.168***
	(0.030)	(0.020)	(0.013)	(0.017)
$Leverage_{i,k,t-1}$	0.841***	0.147***	0.191***	0.173***
	(0.129)	(0.049)	(0.045)	(0.047)
$Recession_t$	-0.007	-0.029***	-0.032***	-0.027***
	(0.022)	(0.010)	(0.009)	(0.009)
$Leverage_{i,k,t-1} \times Recession_t$	-0.044	-0.082	-0.113**	-0.107**
	(0.134)	(0.051)	(0.047)	(0.047)
Constant	-0.031	-0.107***	0.039***	0.053***
	(0.019)	(0.013)	(0.009)	(0.010)
Observations	7,106	7,106	7,106	7,106
R-squared	0.138	0.836	0.079	0.109
Number of company	757	757	757	757
Adj. R-squared	0.136	0.832	0.076	0.086
Year FE	YES	YES	YES	YES
Sub-industry FE	NO	YES	NO	YES

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

4.4.2 Leverage Dummy Variable

In addition to using a different measurement to calculate industry-adjusted variables, this study also uses a different measurement of leverage. According to Opler and Titman (1994),

Table 9: Regression Results Predicting Median Industry-Adjusted Sales Growth in the 2005-2015 Period Using a Different Proxy of Leverage

The dependent variable is company annual *SalesGrowth* in industry *i* at time *t*, given by ($Sales_{i,t} - Sales_{i,t-1}$) /$Sales_{i,t-1}$. *Size* is the natural logarithm of company total assets. ΔPPE is the change in property plant and equipment, given by ($PPE_{i,t} - PPE_{,t-1}$) /$PPE_{,t-1}$. *ROA* is company's profitability defined as EBIT over total assets. Model 3 uses *Leverage* that is calculated as the book value of total debt divided by total assets. Model 4 uses a leverage dummy variable, which has a value of 1 if companies are in the top three leverage deciles and otherwise it is 0. Model 5 uses leverage dummy variables, which have a value of 1 if companies are in the top sample leverage decile and otherwise it is 0. All variables are adjusted for their two-digit Nace Rev.2 industry-year medians. A *recession* dummy is used as a proxy for an economic downturn and it is equal to 1 if the country in which companies are operating is in a recession year and otherwise it is 0. The sample period is 2005-2015 and sampling is restricted to manufacturing industries covered in Nace Rev.2 (1000-3399). Observations are from industry-years of industries with at least ten companies. The panel fixed effects estimator corrects the error structure for heteroscedasticity and autocorrelation.

	Model 3		Model 4		Model 5	
	Continuous Leverage		Top 3 Leverage Decile		Top Leverage Decile	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
$SalesGrowth_{i,k,t-1}$	-0.107***	-0.108***	-0.099***	-0.101***	-0.102***	-0.103***
	(0.023)	(0.023)	(0.024)	(0.023)	(0.023)	(0.023)
$ROA_{i,k,t-1}$	-0.099	-0.117*	-0.122**	-0.138**	-0.121*	-0.137**
	(0.063)	(0.064)	(0.061)	(0.062)	(0.062)	(0.063)
$\Delta PPE_{i,k,t-1}$	0.072***	0.070***	0.080***	0.077***	0.079***	0.077***
	(0.018)	(0.017)	(0.018)	(0.018)	(0.018)	(0.017)
$Size_{i,k,t-1}$	-0.133***	-0.168***	-0.136***	-0.172***	-0.132***	-0.167***
	(0.013)	(0.017)	(0.013)	(0.017)	(0.013)	(0.017)
$Recession_t$	-0.032***	-0.027***	-0.028***	-0.022**	-0.029***	-0.025***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
$Leverage_{i,k,t-1}$	0.191***	0.173***				
	(0.045)	(0.047)				
$Leverage_{i,k,t-1} \times Recession_t$	-0.113**	-0.107**				
	(0.047)	(0.047)				
$LeverageDummy8_{i,k,t-1}$			0.040***	0.039***		
			(0.011)	(0.011)		
$LeverageDummy8_{i,k,t-1} \times Recession_t$			-0.021	-0.022		
			(0.014)	(0.013)		
$LeverageDummy10_{i,k,t-1}$					0.075***	0.067***
					(0.019)	(0.019)
$LeverageDummy10_{i,k,t-1} \times Recession_t$					-0.049**	-0.045*
					(0.024)	(0.024)
Constant	0.039***	0.053***	0.031***	0.046***	0.035***	0.050***
	(0.009)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)
Observations	7,106	7,106	7,106	7,106	7,106	7,106
R-squared	0.079	0.109	0.074	0.105	0.076	0.106
Number of company	757	757	757	757	757	757
Adj. R-squared	0.076	0.086	0.072	0.083	0.074	0.084
Year FE	YES	YES	YES	YES	YES	YES
Subindustry FE	NO	YES	NO	YES	NO	YES

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

a dummy variable is preferable to a continuous variable to represent leverage. They argue that it is difficult to specify in advance the relationship between leverage and company performance. The relationship between them may be nonlinear. Thus, to test the robustness of the results, a dummy variable of leverage will also be used to estimate the relationship between leverage and company performance.

In this section, following Opler and Titman (1994), two additional leverage dummy variables will be added to the regression model. The first leverage dummy variable is $\text{LeverageDummy8}_{i,k,t-1}$, which has a value of 1 if companies are in the top three leverage deciles and otherwise it is 0. The second leverage dummy variable is $\text{LeverageDummy10}_{i,k,t-1}$, which has a value of 1 if companies are in the top sample leverage decile and otherwise it is 0. Table 9 above reports the comparisons of using a different proxy of leverage. The findings in Table 9 suggest that the alternative measurement of leverage used in the regression provides almost similar results. Consistent with the baseline model shown in Model 3, leverage in both Models 4 and 5 positively affect company's sales growth and the coefficients are statistically significant at a 1% level. All interaction terms in both Models 4 and 5 have negative relationships with a company's industry-adjusted sales growth, although the significant results only shown in the Model 5.

4.4.3 Other Industry Concentration Level Measurements

In addition to the use of company's sales Herfindahl-Hirschman Index (from now on: HHI_Sales), to test for the robustness of the result, this study also uses two other industry concentration level measurements, namely four-firm concentration ratio and company's asset Herfindahl-Hirschman Index (HHI_Asset). Four-firm concentration ratio is calculated based on the total market shares of four largest enterprises in the industry. This ratio is well known for its simplicity in terms of its calculation. The concentration ratios range from nearly 0% to 100%. The concentration ratio will close to zero if there is a large number of companies with small market share that sell quite similar products operating in the industry. These companies do not have market power since their market shares are very low. When there are an increasing product differentiation level and a reduction of the number of companies in the industries, concentration level is increasing. Thus, large companies in this industry have significant market control. For the purpose of this study, concentration ratio greater than 80% is categorized as a highly concentrated industry. Equation 3 below represents four-firm concentration formula that is used in this study.

$$CR4_{jt} = \sum_{i=1}^{Nj} \frac{Sales_{ijt}}{\sum_{i-1}^{Nj} Sales_{ijt}}$$

where $CR4_{jt}$ is the four-firm concentration ratio for industry *i* at time *t*; $Sales_{ijt}$ is sales of company *i* in industry *j* at time *t*. This ratio is calculated for each industry-year that belongs to Nace Rev.2 manufacturing industries from 2005 to 2015 period.

Moreover, following Beiner et al. (2011) and Giroud and Mueller (2010), this study also uses company's asset Herfindahl-Hirschman Index (HHI_Asset) as an alternative measure of market concentration level. Instead of using company's sales, this index is calculated based on company's total assets. Equation 4 below represents four-firm concentration formula that is used in this study.

$$HHI\_Asset_{jt} = \sum_{i=1}^{Nj} \left(\frac{Asset_{ijt}}{\sum_{i-1}^{Nj} Asset_{ijt}} \right)^2$$

where $\text{HHI\_Asset}_{\text{jt}}$ is the HHI for industry i at time t; $\text{Asset}_{\text{ijt}}$ is company's total asset i in industry j at time t. This index is also calculated for each industry-year that belongs to Nace Rev.2 manufacturing industries from 2005 to 2015 period. Table 10 reports regression results using different measures of market concentration level.

These three measures of market concentration level might yield slightly different results. Four-firm concentration calculation only includes the four largest companies in the industry, while HHI_Sales and HHI_Asset include up to 50 companies in the industry. Four-firm concentration ratio also does not provide a lot of detail about competitiveness in the industry since it only includes four largest companies in the industry. For example, if the ratio of an industry is 80% and categorized as the highly concentrated industry, this ratio can be achieved in several ways. It could consist of four firms that have the same market shares with a total of 80% or four firms that have different market shares but has the same total, which is also 80%. Although the ratios are similar in both cases, the level of competition is expected to differ. The industry will be less competitive if one of four largest firms in the industry has significantly higher sales or market share than the other companies. In other words, it will be more competitive if companies have approximately equal market shares, so they have the same market power.

Table 10: Regression Results Predicting Median Industry-Adjusted Sales Growth in the 2005-2015 Period Using Alternative Measurements of Market Concentration Level

The dependent variable is company annual *SalesGrowth* in industry *i* at time *t*, given by ($Sales_{i,t} - Sales_{i,t-1}$) /$Sales_{i,t-1}$. *Size* is the natural logarithm of company total assets. ΔPPE is the change of property plant and equipment, given by ($PPE_{i,t} - PPE_{,t-1}$) /$PPE_{,t-1}$. *ROA* is company's profitability defined as EBIT over total assets. *Leverage* is calculated as the book value of total debt divided by total assets. All variables are adjusted for their two-digit Nace Rev.2 industry-year medians. *Recession* dummy is used as a proxy for economic downturn that is equal to 1 if the country that companies are operating is in recession years and otherwise it is 0. Model 6 includes all samples, Model 7 includes companies in highly concentrated industries and Model 8 includes companies in low concentrated industries. For Panel A and C, highly concentrated industries are those with HHI_Sales and HHI_Asset more than 1800, while low concentrated industries are those with HHI_Sales and HHI_Asset less than 1800. For Panel B, highly concentrated industries are those with four-firm concentration ratio more than 80%. The sample period is 2005-2015 and sampling is restricted to manufacturing industries covered in Nace Rev.2 (1000-3399). Observations are from industry-years with at least ten firms. The panel fixed effects estimator corrects the error structure for heteroscedasticity and autocorrelation.

Panel A: Company's Sales Herfindahl-Hirschman Index (HHI_Sales)

	Model 6		Model 7		Model 8	
	All Sample		Highly Concentrated HHI_Sales>1800		Low Concentrated HHI_Sales<1800	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
$SalesGrowth_{i,k,t-1}$	-0.107***	-0.108***	-0.097***	-0.096***	-0.220***	-0.227***
	(0.023)	(0.023)	(0.026)	(0.026)	(0.045)	(0.050)
$ROA_{i,k,t-1}$	-0.099	-0.117*	-0.132*	-0.156**	0.011	0.029
	(0.063)	(0.064)	(0.075)	(0.077)	(0.115)	(0.118)
$\Delta PPE_{i,k,t-1}$	0.072***	0.070***	0.070***	0.068***	0.057**	0.052**
	(0.017)	(0.017)	(0.022)	(0.022)	(0.027)	(0.026)
$Size_{i,k,t-1}$	-0.133***	-0.168***	-0.142***	-0.175***	-0.159***	-0.207***
	(0.013)	(0.017)	(0.016)	(0.020)	(0.019)	(0.025)
$Leverage_{i,k,t-1}$	0.191***	0.173***	0.180***	0.158***	0.243***	0.220**
	(0.045)	(0.047)	(0.053)	(0.054)	(0.085)	(0.087)
$Recession_t$	-0.032***	-0.027***	-0.040***	-0.036***	-0.017	-0.015
	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)	(0.012)
$Leverage_{i,k,t-1} \times Recession_t$	-0.113**	-0.107**	-0.083	-0.082	-0.124*	-0.102
	(0.047)	(0.047)	(0.064)	(0.064)	(0.069)	(0.068)
Constant	0.039***	0.053***	0.040***	0.057***	0.031*	0.081***
	(0.009)	(0.010)	(0.011)	(0.012)	(0.016)	(0.013)
Observations	7,106	7,106	4,673	4,673	2,433	2,433
R-squared	0.079	0.109	0.083	0.111	0.115	0.145
Number of company	757	757	682	682	334	334
Adj. R-squared	0.076	0.086	0.080	0.090	0.109	0.122
Year FE	YES	YES	YES	YES	YES	YES
Subindustry FE	NO	YES	NO	YES	NO	YES

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

According to this table, coefficient estimates for leverage in all panels and columns are consistently positive and significant. It suggests once again that higher debt will always be associated with an increase in company's sales growth regardless of the industry concentration level. All panels also suggest that the negative relationship between the interaction term and sales growth will be more prominent in low concentrated industries. In

Table 10 - Continued

Panel B: Four Firm Concentration Ratio

	Model 6		Model 7 Highly Concentrated Four Firm Concentration>80%		Model 8 Low Concentrated Four Firm Concentration<80%	
	All Sample					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
$SalesGrowth_{i,k,t-1}$	-0.107***	-0.108***	-0.129***	-0.123***	-0.134***	-0.139***
	(0.023)	(0.023)	(0.034)	(0.034)	(0.031)	(0.031)
$ROA_{i,k,t-1}$	-0.099	-0.117*	-0.180**	-0.217**	-0.116	-0.118
	(0.063)	(0.064)	(0.088)	(0.085)	(0.087)	(0.087)
$\Delta PPE_{i,k,t-1}$	0.072***	0.070***	0.048**	0.043*	0.074***	0.070***
	(0.018)	(0.017)	(0.023)	(0.023)	(0.025)	(0.025)
$Size_{i,k,t-1}$	-0.133***	-0.168***	-0.159***	-0.212***	-0.149***	-0.186***
	(0.013)	(0.017)	(0.019)	(0.023)	(0.020)	(0.026)
$Leverage_{i,k,t-1}$	0.191***	0.173***	0.163**	0.121*	0.227***	0.221***
	(0.045)	(0.047)	(0.064)	(0.063)	(0.063)	(0.065)
$Recession_t$	-0.032***	-0.027***	-0.045***	-0.039**	-0.021**	-0.018*
	(0.009)	(0.009)	(0.017)	(0.016)	(0.010)	(0.010)
$Leverage_{i,k,t-1} \times Recession_t$	-0.113**	-0.107**	-0.017	-0.023	-0.182***	-0.169***
	(0.047)	(0.047)	(0.077)	(0.077)	(0.055)	(0.055)
Constant	0.039***	0.053***	0.039***	0.072***	0.045***	0.068***
	(0.009)	(0.010)	(0.014)	(0.015)	(0.012)	(0.014)
Observations	7,106	7,106	3,000	3,000	4,106	4,106
R-squared	0.079	0.109	0.086	0.117	0.099	0.126
Number of company	757	757	465	465	549	549
Adj. R-squared	0.076	0.086	0.081	0.090	0.095	0.107
Year FE	YES	YES	YES	YES	YES	YES
Subindustry FE	NO	YES	NO	YES	NO	YES

Panel C: Company's Asset Herfindahl-Hirschman Index (HHI_Asset)

	Model 6		Model 7 Highly Concentrated HHI_Asset>1800		Model 8 Low Concentrated HHI_Asset<1800	
	All Sample					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
$SalesGrowth_{i,k,t-1}$	-0.107***	-0.108***	-0.103***	-0.104***	-0.159***	-0.160***
	(0.023)	(0.023)	(0.029)	(0.028)	(0.040)	(0.040)
$ROA_{i,k,t-1}$	-0.099	-0.117*	-0.139*	-0.159*	-0.053	-0.052
	(0.063)	(0.064)	(0.081)	(0.082)	(0.098)	(0.102)
$\Delta PPE_{i,k,t-1}$	0.072***	0.070***	0.064***	0.064***	0.079***	0.077***
	(0.018)	(0.017)	(0.023)	(0.023)	(0.028)	(0.028)
$Size_{i,k,t-1}$	-0.133***	-0.168***	-0.139***	-0.171***	-0.159***	-0.193***
	(0.013)	(0.017)	(0.017)	(0.020)	(0.020)	(0.026)
$Leverage_{i,k,t-1}$	0.191***	0.173***	0.175***	0.152***	0.218**	0.197**
	(0.045)	(0.047)	(0.056)	(0.057)	(0.087)	(0.089)
$Recession_t$	-0.032***	-0.027***	-0.037***	-0.033**	-0.025**	-0.022*
	(0.009)	(0.009)	(0.013)	(0.013)	(0.011)	(0.012)
$Leverage_{i,k,t-1} \times Recession_t$	-0.113**	-0.107**	-0.058	-0.058	-0.157**	-0.133**
	(0.047)	(0.047)	(0.064)	(0.064)	(0.064)	(0.063)
Constant	0.039***	0.053***	0.035***	0.055***	0.033**	0.067***
	(0.009)	(0.010)	(0.011)	(0.013)	(0.016)	(0.011)
Observations	7,106	7,106	4,087	4,087	3,019	3,019
R-squared	0.079	0.109	0.083	0.111	0.098	0.119
Number of company	757	757	588	588	380	380
Adj. R-squared	0.076	0.086	0.079	0.088	0.093	0.097
Year FE	YES	YES	YES	YES	YES	YES
Subindustry FE	NO	YES	NO	YES	NO	YES

***Significant at the 1 percent level, **Significant at the 5 percent level. *Significant at the 10 percent level.

low concentrated industries, these negative coefficients of interaction terms are significant except the one in Panel A Column (6). Even though it is not significant, the relationship is still negative. Thus, it can be concluded that a greater use of debt in a recession will significantly decrease company's market share if the company is operating in the low concentrated industry.

4.5 Financial and economic interpretation

The regression results suggest that debt does not always have negative impacts on company performance. In this case, the benefits of debt exceed its drawbacks. By having a control effect, the use of debt will effectively motivate companies' managers and their organization to be more operationally efficient. This operational efficiency happens as the firm's free cash flow is reduced due to interest and principal payments. When a company has substantial free cash flows, managers tend to use this available cash to invest in low-return projects or waste firm resources rather than maximizing firm value, as they have their objectives. However, if companies issue additional debt, managers are forced to increase company efficiency, and so company performance, to maintain their promise to repay the debt and its interests. In other words, by issuing debt, companies will reduce the agency cost of free cash flow (Jensen, 1986).

In addition to Jensen (1986), these regression results are also consistent with research findings of a paper by Weill (2008), who observes the relation between the use of leverage and corporate performance by taking into account the institutional environment of companies. A positive link between leverage and corporate performance will be significantly developed when firms have a more efficient legal system that may reduce moral hazard problems behavior, as the rules for creditors are more effective. Even though this study somewhat differ from what has been done by Weill (2008), in terms of data selection and model specification, his findings still provide a useful idea of how leverage can increase firm performance. Moreover, he also uses companies in manufacturing industries in European countries that can more or less explain the positive relation between debt and sales growth found in this study.

Another possible explanation behind the positive relation between debt and company performance is debt can act as a credible liquidation threat (Aghion et al., 1999). Companies that use higher debt will encourage conservative managers to pay more attention to the company's success, act more innovatively and adopt a more value-maximizing decision, to meet repayment promises and avoid liquidation. In this case, debt is considered to have a

powerful disciplinary effect that can help companies boost their performance. Thus, this finding rejects Hypothesis 1.

Based on a full sample regression, the use of higher leverage compared to rivals when there are economic recessions will significantly give negative impacts to company's relative performance. The use of higher leverage means a higher company's borrowing cost, which is considered as fixed cost. Increasing fixed cost might lead to an increasing product selling price. By considering other pricing factors constant, increasing product price as a result of a higher leverage might not be a good strategy to be implemented in the presence of economic downturns. If a company increases its price, it can initially realize higher short-term profits. However, in the longer period, it will turn to lower market shares and profits. A company should be less willing to use higher leverage because there is a possibility that its rivals will react to its new capital structure by aggressively cutting their prices to steal its market shares (Dasgupta and Titman, 1998). The possibility that less leveraged competitors will react by implementing a predatory-pricing strategy is even higher because people tend to be more price-sensitive in economic recessions (Chou and Chen, 2004). The economic environment plays a major role in the customer's spending ability and decision-making (Flacco and Parker, 1992). People will tend to choose products with lower prices, as they are willing to cut their consumption spending in recessions. This idea is supported by the fact that sales of manufacturing companies declined during a recession period, as can be seen in Table 4. This situation also triggers the trend of consumer demand to be decreasing. In this case, the benefits of using the leverage that is explained in the previous paragraphs are beaten by its drawbacks because economic recessions cause additional substantial negative impacts on the company's performance. Thus, a highly leveraged company will lose its market share compared to its competitors in recession periods because other competitors will respond to the company's new financial structure by lowering its price, which will increase their market shares as they attract more people to buy their products. This finding provides support for Hypothesis 2.

Furthermore, if this analysis is conducted differently based on the market concentration level, it appears that this negative impact is more noticeable in a low concentrated industry rather than in a highly concentrated industry. This finding rejects Hypothesis 3. The first possible explanation to support this result is that companies in this industry are competitive. It means this industry has relatively lower barriers to entry than highly concentrated industry. This causes the low concentrated industry to have a large number of companies with relatively small market shares. When it is easy to enter the market, companies that are already

operating in the industry receive more threats from new companies and experience more difficulties to gain more market shares. This industry usually also sells homogenous products. Buyers in this industry can purchase products from different companies as, in general, they sell the same price and quality of products. Consequently, supported by the explanation in the previous paragraph, companies that set higher prices as a result of using higher leverage compared to their competitors will have less bargaining power especially in the low concentrated industries. As an example, as stated in the previous section, machinery and equipment industry in Euro Area has the lowest concentration index among other 18 manufacturing industries. One of some products that are sold by companies in this industry is, for instance, hair dryer. In the European markets, there might only be a little difference between hair dryers available in the markets in terms of its drying speed, weight, size, and technology. Any hair dryer brands will still provide the same function. Therefore, if one company attempts to maximize its profit by increasing the price of its hair dryer, customers in the market will simply choose hair dryer from another company as this company sells approximately the same product type and quality with a lower price. It is still consistent with the previous mentioned idea that customers will reduce their spending during recessions, so they prefer to buy products with a lower price. That is why using higher debt compared to rivals in a competitive industry will give a negative impact on company's sales and market shares in low concentrated industries.

The second possible explanation is companies with higher leverage indirectly limit their abilities to allocate more funds for creating unique and innovative products. Having a unique and innovative product is an important aspect that can help a company to increase its market share in a low concentrated industry. It is because, as stated before, companies in this industry usually sell quite similar products. It will help a company to gain a stronger market position because customers will be more interested in company's products and are willing to pay more. However, to create innovative products, this company might have to apply new strategies such as hire new experts, conduct some research and do some promotion activities that will increase company's expenditures, e.g. R&D, marketing and employee cost. This company might not able to allocate more funds to these expenses if they have a high fixed cost as a consequence of using higher leverage. Therefore, in this case, a relative increase in the use of debt in competitive industries might reduce company performance because other competitors that use lower leverage will be able to allocate available funds to do some research, create new products and promotions activities to increase their sales. Customers will

be more aware of competitors' products. Thus, as a result, competitors will steal company's market shares.

Lome, Heggeseth, and Moen (2016) find a supporting finding in their paper. They suggest that company that devotes considerable resources to implement R&D activities will perform significantly better than its competitors during financial crisis. Companies who are not credit-constrained should remember that R&D plays an important role during downturn periods and rethink if they want to cut innovative expenditure. By investing more in R&D, companies can improve their performance and prepare them to handle the unavoidable recession better. By using 247 Norwegian manufacturers, it is shown in their paper that a group of companies with the average R&D intensity of 4.17% experiences a negative growth during 2009 recession. In contrast, a group of companies with the average R&D intensity of 10.42% experiences a positive growth during 2009 recession. The reason behind these arguments is, in a bad economic state, companies need to have a higher absorptive capacity. It can help a company to quickly adapt to the changing economic environment by being better at identifying, examining and utilizing current external condition and thus can make the company better handling external shocks and industry dynamism. In this case, one activity that can increase this absorptive capacity is R&D activities. This explanation depicts a general idea of the importance of allocating more company funds to R&D expenditure.

All of these explanations provide supporting arguments on why companies that operate in competitive industries might significantly lose their market shares if they use higher debt compared to their rivals in a recession period. In this situation, drawbacks of a company's leverage exceed its benefits as economic recessions, as a moderating effect, provide additional negative impacts on the relationship between leverage and company performance in low concentrated industries.

5. Conclusion

This study empirically examines the relation between relative-to-industry leverage and sales performance using panel data of 7,106 observations across 18 Nace Rev.2 manufacturing industries. The literature on the relation between a firm's financing decisions and its performance in product markets mostly conclude that taking higher debt in recession periods will hurt firm competitive performance relative to other rivals (Opler and Titman, 1994; Campello, 2003). However, based on the first finding of this study, it is manifested in the data that an increase in debt can improve company's relative performance.

The second finding of this study suggests that if the impact of recessions is included when examining the relationship between leverage and company performance, the drawbacks of debt will exceed its benefit. Alternatively, higher use of debt in recession periods will harm company performance. Besides examining the relationship between leverage and company performance for the whole sample, this study also conducts a further investigation by considering different concentration levels in the industry. The results suggest that higher debt taken in recession periods by a company may significantly hurt its sales and market share when the firm is competing in a competitive or low concentrated industry. The effect, however, is not significant if firms are competing in a highly concentrated industry, an industry with only a few major companies competing.

The findings of this research are intended to motivate future researchers to explore the complex relation between a company's capital structure and its real business performance. Future researchers might involve more complex product market strategies, for instance, pricing, promotion or R&D strategies, which is implemented by companies to enhance their performance and maximize value. The calculation of industry concentration level is also expected to capture a more real, structural and complex company performance, the company's external condition and the interaction between companies in the industry. Besides taking into account the industry concentration level, future research might also include different sources of debt financing, e.g. public or private sources, as they have the different characteristic that might also affect company performance.

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APPENDIX

Table A.1: Multicollinearity Test Equation (1)

To help detect if there is any multicollinearity problem among variables used in this regression, this study uses Variance Inflator Factor (VIF) test. Based on the results shown in Table 11, all variables have VIFs lower than 2 and 1/VIFs higher than 0.1. It can be concluded that there is no multicollinearity problem in this regression model.

Variables	VIF	1/VIF
Leverage	1.67	0.599561
Leverage x Recession	1.63	0.612244
ROA	1.06	0.940332
SalesGrowth	1.05	0.950898
Size	1.04	0.964106
PPE	1.02	0.983900
Recession	1.01	0.991210
Mean VIF	1.21	

Table A.2: Yearly Industry Classification Based on Market Concentration Level

This table indicates the manufacturing industry classification according to each industry concentration level. Industry concentration level is calculated by using company's sales Herfindahl-Hirschman Index. Nace Rev.2 represents the industry classification codes. All industries have a minimum of 10 companies. A highly concentrated industries are those with HHI_Sales more than 1800, while low concentrated industries are those with HHI_Sales less than 1800.

Panel A: Year 2005					
Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
11	Beverages	5,746	28	Machinery and Equipment	915
27	Electrical Equipment	4,410	18	Printing and Recorded Media	1,127
26	Computer, Electronic, Optical	2,944	25	Fabricated Metal Products	1,167
22	Rubber and Plastic Products	2,920	29	Motor Vehicles, Trailers	1,734
14	Wearing Apparel	2,811	13	Textiles	1,772
30	Other Transport Equipment	2,550			
23	Other Non-Metallic Products	2,246			
21	Pharmaceutical Products	2,151			
10	Food Products	2,136			
17	Paper Products	2,024			
24	Basic Metals	1,994			
20	Chemical Products	1,908			
Panel B: Year 2006					
Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
27	Electrical Equipment	3,953	28	Machinery and Equipment	710
11	Beverages	3,843	18	Printing and Recorded Media	1,170
26	Computer, Electronic, Optical	3,026	25	Fabricated Metal Products	1,226
22	Rubber and Plastic Products	2,779	29	Motor Vehicles, Trailers	1,681
14	Wearing Apparel	2,755	13	Textiles	1,734
30	Other Transport Equipment	2,581			
23	Other Non-Metallic Products	2,290			
21	Pharmaceutical Products	2,202			
17	Paper Products	2,136			
10	Food Products	2,082			
20	Chemical Products	2,056			
24	Basic Metals	1,996			

Table A.2 - Continued

Panel C: Year 2007

Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
27	Electrical Equipment	3,712	28	Machinery and Equipment	727
11	Beverages	3,566	18	Printing and Recorded Media	1,168
22	Rubber and Plastic Products	2,780	25	Fabricated Metal Products	1,369
14	Wearing Apparel	2,682	29	Motor Vehicles, Trailers	1,459
26	Computer, Electronic, Optical	2,671	13	Textiles	1,680
30	Other Transport Equipment	2,421			
24	Basic Metals	2,330			
21	Pharmaceutical Products	2,173			
23	Other Non-Metallic Products	2,172			
20	Chemical Products	2,105			
17	Paper Products	2,000			
10	Food Products	1,890			

Panel D: Year 2008

Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
11	Beverages	3,698	28	Machinery and Equipment	691
27	Electrical Equipment	3,545	18	Printing and Recorded Media	1,190
22	Rubber and Plastic Products	3,087	13	Textiles	1,289
26	Computer, Electronic, Optical	2,810	25	Fabricated Metal Products	1,289
14	Wearing Apparel	2,670	29	Motor Vehicles, Trailers	1,478
24	Basic Metals	2,418	10	Food Products	1,730
30	Other Transport Equipment	2,369			
23	Other Non-Metallic Products	2,171			
21	Pharmaceutical Products	2,050			
20	Chemical Products	1,912			
17	Paper Products	1,858			

Panel E: Year 2009

Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
13	Textiles	4,641	28	Machinery and Equipment	671
11	Beverages	3,867	25	Fabricated Metal Products	1,109
27	Electrical Equipment	3,333	18	Printing and Recorded Media	1,141
22	Rubber and Plastic Products	3,002	29	Motor Vehicles, Trailers	1,363
26	Computer, Electronic, Optical	2,777	17	Paper Products	1,597
14	Wearing Apparel	2,672	20	Chemical Products	1,684
21	Pharmaceutical Products	2,265	10	Food Products	1,752
30	Other Transport Equipment	2,265			
23	Other Non-Metallic Products	2,251			
24	Basic Metals	2,130			

Table A.2 - Continued

Panel F: Year 2010					
Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
13	Textiles	4,657	28	Machinery and Equipment	719
11	Beverages	3,864	25	Fabricated Metal Products	1,165
27	Electrical Equipment	3,266	18	Printing and Recorded Media	1,230
22	Rubber and Plastic Products	3,095	17	Paper Products	1,333
14	Wearing Apparel	2,701	29	Motor Vehicles, Trailers	1,627
26	Computer, Electronic, Optical	2,339	10	Food Products	1,641
30	Other Transport Equipment	2,312	20	Chemical Products	1,796
23	Other Non-Metallic Products	2,235			
24	Basic Metals	2,211			
21	Pharmaceutical Products	1,984			
Panel G: Year 2011					
Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
13	Textiles	4,746	28	Machinery and Equipment	660
11	Beverages	3,823	25	Fabricated Metal Products	1,161
22	Rubber and Plastic Products	3,071	18	Printing and Recorded Media	1,214
27	Electrical Equipment	3,069	17	Paper Products	1,435
14	Wearing Apparel	2,723	10	Food Products	1,546
30	Other Transport Equipment	2,395	29	Motor Vehicles, Trailers	1,624
23	Other Non-Metallic Products	2,230			
24	Basic Metals	2,137			
26	Computer, Electronic, Optical	2,117			
21	Pharmaceutical Products	1,955			
20	Chemical Products	1,904			
Panel H: Year 2012					
Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
13	Textiles	4,855	28	Machinery and Equipment	621
11	Beverages	3,921	25	Fabricated Metal Products	1,207
27	Electrical Equipment	3,171	18	Printing and Recorded Media	1,329
22	Rubber and Plastic Products	3,064	17	Paper Products	1,511
14	Wearing Apparel	2,742	10	Food Products	1,641
30	Other Transport Equipment	2,562	29	Motor Vehicles, Trailers	1,693
23	Other Non-Metallic Products	2,299			
26	Computer, Electronic, Optical	2,191			
24	Basic Metals	2,060			
20	Chemical Products	1,972			
21	Pharmaceutical Products	1,889			

Table A.2 - Continued

Panel I: Year 2013

Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
13	Textiles	5,242	28	Machinery and Equipment	625
11	Beverages	3,896	25	Fabricated Metal Products	1,266
27	Electrical Equipment	3,124	18	Printing and Recorded Media	1,356
22	Rubber and Plastic Products	3,047	17	Paper Products	1,485
14	Wearing Apparel	2,702	10	Food Products	1,537
30	Other Transport Equipment	2,692	20	Chemical Products	1,697
26	Computer, Electronic, Optical	2,346			
23	Other Non-Metallic Products	2,221			
24	Basic Metals	2,004			
29	Motor Vehicles, Trailers	1,977			
21	Pharmaceutical Products	1,892			

Panel J: Year 2014

Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
13	Textiles	5,877	18	Printing and Recorded Media	1,121
14	Wearing Apparel	5,223	25	Fabricated Metal Products	1,347
11	Beverages	3,919	17	Paper Products	1,437
22	Rubber and Plastic Products	3,217	10	Food Products	1,495
27	Electrical Equipment	3,095	20	Chemical Products	1,699
30	Other Transport Equipment	2,685	29	Motor Vehicles, Trailers	1,700
23	Other Non-Metallic Products	2,223			
26	Computer, Electronic, Optical	2,168			
24	Basic Metals	1,926			
21	Pharmaceutical Products	1,887			
28	Machinery and Equipment	1,844			

Panel K: Year 2015

Highly Concentrated Industries HHI_Sales>1800			Low Concentrated Industries HHI_Sales<1800		
Nace Rev.2	Description	HHI	Nace Rev.2	Description	HHI
13	Textiles	5,714	18	Printing and Recorded Media	1,229
11	Beverages	4,036	17	Paper Products	1,402
22	Rubber and Plastic Products	3,254	25	Fabricated Metal Products	1,446
27	Electrical Equipment	3,127	20	Chemical Products	1,553
14	Wearing Apparel	2,746	10	Food Products	1,625
30	Other Transport Equipment	2,729	29	Motor Vehicles, Trailers	1,686
28	Machinery and Equipment	2,077			
26	Computer, Electronic, Optical	2,057			
23	Other Non-Metallic Products	2,021			
24	Basic Metals	2,002			
21	Pharmaceutical Products	1,899			