



The Relationship between Capital Structure and Product Market Competition

Student: Xiaomeng Xu (s1210122)

Supervisors

1st Prof. Dr. Rezaul Kabir

2nd Dr. Xiaohong Huang

(12th October, 2013)

Master Thesis Business Administration

Track: Financial Management

Abstract

This thesis examines the impact of product market competition on capital structure of listed firms in the Netherlands during the period 2003-2011. Ordinary Least Squares (OLS) regression analysis is used to investigate this impact. The dependent variables used in the regressions are book leverage ratio and market leverage ratio whereas the independent variables include concentration ratio and R&D. We also control for firm size, growth opportunity, non-tax debt shield and tangibility. Industry types and years are two dummy variables.

Statistically significant positive relationships between concentration ratio and both book value of long term debt ratio and market value of long term debt ratio are observed respectively. The finding indicates that the product market competition negatively influences capital structure. We also find no evidence of a relationship between R&D and capital structure. In terms of R&D, we can't find the relationship between product market competition and capital structure.

Acknowledgements

First and for most, I would like to express my deepest gratitude to Prof. Dr. Rezaul Kabir, my first supervisor. He supports the topic of my thesis and encourages me to move forward. His timely critical comments and helpful guidance have been of great value for me. I am impressed by his wide knowledge and scientific way of thinking which have benefited me so much. I also appreciate Ms Xiaohong Huang's help, my second supervisor. Her way of critical thinking impresses me. Her valuable comments and suggestions improve the quality of my thesis.

I am grateful to my parents for their constant love and support. They are always thinking for me sharing my happiness and sorrow. I would like to thank my friends in University of Twente for their support. I really had a great time with them in the Netherlands. We are friends forever! Last but not least, I also would like to show my greatest appreciation to my manager Anabel Almagro who employs me while I am a student. She supports me to work on my thesis. Thanks to my best colleagues Tanvi and Joanna who support and inspire me to keep on working.

Table of Content

Abstract	i
Acknowledgements	ii
1 Introduction.....	1
1.1 Introduction to Capital Structure	1
1.2 Introduction of Product Market Competition	2
1.3 Problem Statement	4
1.4 Structure.....	5
2 Literature Review	7
2.1 Product Market Competition	7
2.1.1 Porter’s Five Forces	8
2.1.2 Concentration.....	10
2.1.3 Research and Development	11
2.1.4 Product Market Competition Impacts Firms’ Performance	14
2.2 Capital Structure.....	15
2.2.1 Theories of Capital Structure.....	15
2.2.2 Determinants of Capital Structure	18
2.3 The Impact of Product Market Competition on Capital Structure.....	20
2.3.1 Industry Concentration and Capital Structure	20
2.3.2 R&D and Capital Structure.....	24
3 Hypotheses	28
3.1 Industry Concentration.....	28
3.2 R&D.....	30
4 Methodology and Data.....	32
4.1 Methodology	32
4.1.1 Methodology for Testing the Impact of Industry Concentration on Capital Structure	32
4.1.2 Methodology for Testing the Impact of R&D on Capital Structure	35
4.2 Variables	36
4.3 Data	44
5. Result	47
5.1 Descriptive Statistics.....	47
5.2 Empirical Result	51

5.2.1 Empirical Result on Hypothesis 1	51
5.2.2 Empirical Result on Hypothesis 2	57
5.3 Robustness Test.....	59
6 Conclusion	61
6.1 Main Findings	61
6.2 Limitation and Future Research	63
Reference	65
Appendix 1. The major industry sectors classified by BvD.....	71

1 Introduction

Although what are the determinants of capital structure is not a new question, optimal capital structure has been one of the concerned topics from last century till now. This master thesis is aiming to illustrate the relationship between product market competition and capital structure of the listed firms in the Netherlands over 2003-2011. A brief introduction is offered in this chapter which gives introduction to both capital structure and product market competition. What's more, before statement of the research question, the reason why this topic is interesting and the contribution of this thesis are provided as well. Last but not the least, the structure of this thesis is presented in the end.

1.1 Introduction to Capital Structure

The modern theory of capital structure is believed to start with the Miller and Modigliani theorem. Modigliani and Millers (1958) introduced the controversial topic whether capital structure is determined by cost and profits of financial leverage or by market opportunities. In their assumed perfect capital structure, regardless of transaction cost, information asymmetry, distortionary taxation and bankruptcy costs, firm value is irrelevant with capital structure. Due to the unrealistic assumption, the debates about the effect of capital structure were stimulated after introduction of Modigliani & Millers' capital structure irrelevance propositions. Afterwards, Modigliani and Miller (1963) relieved the perfect capital structure assumption and corrected their conclusion by introducing statement that capital structure impacts a firm's value.

Optimal capital structure matters to firms' value. Firms finance either through issuing debt to banking sectors or issuing equity on stock market. When debt is issued as a funding source, firms benefit from a tax-shield since income taxes are paid after obligatory interest. Thus, firms' value is added because of less payment cash in taxes. On the contrary, debt funding causes a financial distress which leads to a high probability of bankruptcy. Shareholders' residual claims can't get paid prior creditors. Firms' value is reduced as a result. A bunch of literatures focus on the factors influencing capital structure. The main theories which support to explain firm's capital structure decisions are trade-off theory, pecking order theory and time to market theory. Trade-off theory focuses on the trade-off between debt tax shield and risk of bankruptcy. The pecking-order theory favours internal financing to debt financing. The last resort is equity. Market timing theory argues that market performance determines when and how much to issue equity based on technical analysis and fundamental analysis (Antoniou et al., 2002; Frank & Goyal, 2008; Baker & Wurgler, 2002).

Since there is no conclusion what an optimal capital structure is, the determinants of capital structure have been examined by numbers of scholars. Certain key determinants of firms' debt financing decisions have been identified such as firm size, probability of bankruptcy, growth opportunity, non-debt tax shield and tangible assets, etc. (Rajan & Zingales, 1995; Antoniou et al., 2002; Booth et al., 2001).

1.2 Introduction of Product Market Competition

Many European countries have fallen behind US in productivity and growth rates due to lack of product market competition (Griffith, 2001). According to Roberts (1999), product market competition drives firms to high profitability as well as increases

efficiency by reducing agency costs (Griffith, 2001). Tracing back to the work of Stigler (1958) which proposes a theory called “Survivor Principle” where competition weeds weak firms out. And instead, more effective firms survive in the industry. Furthermore, a firm’s expansion is affected by its competitors. Firms will have greater market power and pricing power when they dominate their industry under high industrial concentration.

Market Structure-Conduct-Performance (SCP) Paradigm identifies the interaction between product market competition and performance to a better understanding (Edwards, et. al., 2006). In this paradigm, structure and conduct of an industry affect its performance. Structure is expressed by market concentration which directly relates to the degree of competition. Less concentrated industry consists of numbers of peer firms. When a firm exists in a less concentrated industry, the firm faces a high degree of competition. Thus the firm has less bargaining power and pricing power (Shneyerov & Wong, 2010). On the other hand, if the industry contains only one firm to an extreme extent, monopoly, the industry will be equipped by higher entry barriers. The Conduct of a firm, including price competition, advertising expenditure, research and development, is a way to build product differentiation from its peers (Bettignies, 2006). As mentioned in the work of Bandt and Davis (2000), firms are not only affected by its competitors within its industry, but also compete with other firms beyond their industry. The higher entry barriers and more product market differentiation make an industry show lower product market competition.

Higher degree of product market competition stimulates a firm to pay more efforts in innovation. What’s more, firms tend to act more efficiently when they are located in an industry with higher degree of competition. As researched in the study of Bucci (2006), it

is indicated that higher product market competition will lead to higher productivity and gain more profit.

1.3 Problem Statement

As stated above, product market competition in an industry impacts a firm's performance, and capital structure directly influences a firm's performance. Thus, it raises my curiosity whether the impact of product market competition on firm's performance is caused by product market competition among firms. Since firms which under different degrees of product market competition, have different capital structures. Determinants of choosing an optimal capital structure are still under research. Product market competition is assumed to be one of the determinants of capital structure. However, the majority of researches on determinants of capital structure study the characters in terms of firm level, such as firm size, profitability, growth opportunity and tangibility so on. Yet, to my best knowledge, only a couple of empirical researches study on the impact of product market competition on capital structure. Scharfgrödsky (2002) concludes that debt ratio positively relates to degree of product market competition. Nevertheless, the limitation of this paper is that the author only conducts the research in terms of oligopolies and monopolies rather than in overall product market. Chevalier (1995) investigates the relationship between capital structure and product market competition based on the evidence from American supermarket industry. An increase of leverage leads a firm to competing in the local market to add more market shares while its competitors tend to exit. It is indicated that the increase in financial leverage softens product market competition. However, what about the other way around is not researched by Chevalier (1995). Due to lacking of the empirical evidence on how product market competition influences capital structure, this

thesis will contribute to enrich the literatures by investigating Dutch firms in terms of market level instead of firm characteristics.

The reason why the Netherlands is chosen to study is that even though the Netherlands is a small country with fewer firms than China or the USA, the firms within the Netherlands compete with each other to a variety of extent among industries. The concentration ratios of the firms within the Netherlands vary to a large extent. What's more, to my best knowledge, there is no literature as to this topic towards Dutch product market. Thus, the other contribution of this thesis is to fill in this empty cell as to the Netherlands.

Accordingly, the research question is formed as:

- “How does product market competition influence capital structure of the listed firms in the Netherlands?”

To answer the main research question, two sub research questions are formed as below:

- “How does concentration ratio influence capital structure of the listed firms in the Netherlands?”
- “How does conduct of R&D influence capital structure of the listed firms in the Netherlands?”

Both concentration and R&D influence the entry barriers and product differentiation which are two ways to interpret product market competition.

1.4 Structure

The remainder of the master thesis is organized in seven chapters. Chapter 2 provides a literature review which summarizes both theoretical and empirical articles regarding to

this topic. Relevant hypotheses are formed in chapter 3. Chapter 4 explains the research methods and data collection. The methodology is selected after comparing the others from other empirical researches and data collection is from database Orbis. Thereafter, the empirical research and robustness test are analysed in chapter 5. Chapter 6 offers an overall conclusion and gives both limitations of the study and suggestions for future research.

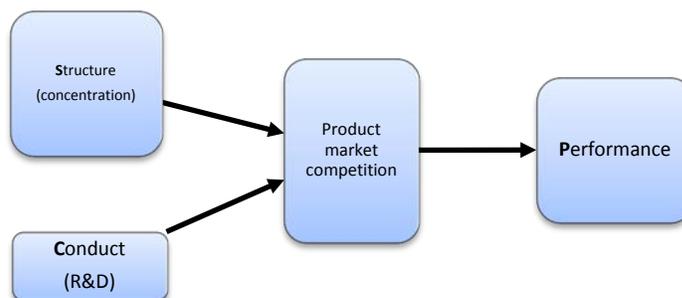
2 Literature Review

This chapter outlines relevant literatures review towards product market competition and capital structure. Section 2.1 summarizes the literatures review of product market in four aspects which are Porter's five forces, industry concentration, R&D and impact of product market competition on performance. Section 2.2 provides the literatures review of capital structure through two layers which are theories of capital structure and determinants of capital structure. The last section, 2.3 illustrates the relationship between product market competition and capital structure.

2.1 Product Market Competition

Structure-Conduct-Performance (S-C-P) model was first proposed by Bain and Scherer in 1930's. They well have explained the mechanism of product market behaviours (Antoniou et.al., 2002). The S-C-P model supports market structure and conducts of firms can yield market performance. In this model, as shown in Figure 1, structure is expressed by concentration of an industry. Conduct can be expressed by R&D of a firm in this industry. Both structure and conduct can affect product market competition.

Figure1. The relationship between Structure-Conduct-Performance (SCP) model and product market competition.



2.1.1 Porter's Five Forces

In this section, Porter's five forces explain the behaviours of product market competition. These five forces express two factors of product market competition, which are entry barriers and product differentiation. Both concentration and R&D which influence the entry barriers and product differentiation are two proxies of product market competition.

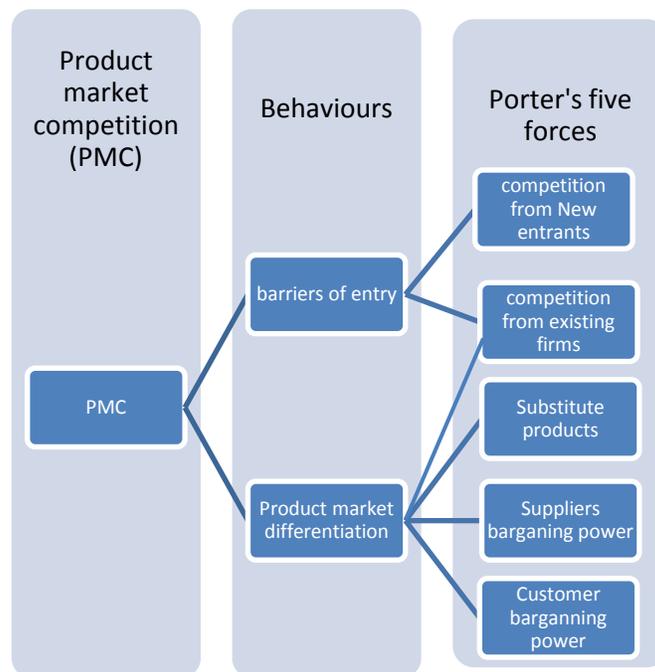
Product market competition used to be defined too narrowly by managers. Beyond existing firms in an industry, other four forces drive a firm to be competitive, including customer, suppliers, potential entrants and substitute products. Tracing back to 1979, Porter proposed five competitive forces which shape a firm's strategy. Understanding of five forces can help a firm to gain its power staking out a position. The firm will be profitable and less vulnerable to attack (Porter, 2008). Although types of industries differ, the five forces align among each industry.

According to Porter (2008), firstly, new entrants desire to gain market share by raising competition on prices and costs. Higher entry barriers enable a firm earn higher potential profits with less aggressive investments. Second, powerful suppliers charge higher price to capture more value. A firm in an industry acts as both a supplier and a customer to some extent. If suppliers are more concentrated near monopoly, they will be more powerful. Moreover, suppliers can invest more in Research and Development (R&D) to raise the degree of products differentiation. Differentiated products are more competitive than generic products. Thirdly, groups of customers are the flip side of suppliers. Customer will be more powerful when they have higher negotiating leverage especially for price-sensitive customers. On the contrary, if the products are differentiated and higher switching costs are for the customers, they will have less bargaining power. The

next is the threat of substitutes which functions similarly as an industry's products. Although substitutes are usually overlooked, they threaten an industry's profitability by placing a ceiling on prices. Finally, existing companies in an industry are affected by four aforementioned forces. Simultaneously, existing firms compete with each other. This kind of rivalry takes many forms such as price discounting, advertisement campaigns, and new product introductions.

Accordingly, as shown in the figure 2, all these five forces are interacted with product market competition through two elements. One is barriers of entry and the other one is product differentiation. As explained in the first chapter, two proxies of product market competition, concentration ratio and R&D, can explain the two elements aforementioned.

Figure 2. Connections among product market competition, competition behaviours and Porter's five forces.



2.1.2 Concentration

In terms of an industry concentration, product market competition is measured by such factors as the number of competitors in an industry, the heterogeneity of products and the cost of entry and exit (Griffith, 2001). Edwards et al (2006) proposes a hypothesis that industry concentration encourages firms to collude. Therefore, degree of industry concentration is negatively related to degree of competition. Industry concentration generates from competition and the reason is that firms increase profits by reducing prices and expanding market share with low cost structure. Halbersma et al (2007) investigates hospital market in the Netherlands. The hospital market is divided into seller concentration (hospital) and buyer concentration (insurers). The gains of hospital industry are divided between sellers and buyers based on their bargaining power. Seller in a higher concentration market gets higher price-cost margins, vice versa. It is indicated that more concentrated market has less price competition. James et al (2011) suggests that market concentration affects the incentives. With the incentives, firms offer high quality products and maintain a high reputation. Thus, the firm will gain more market share from its competitors. Normally, monopolies gain higher margin facing less threat from rivalry.

A level concentration is an outcome of the profit maximizing decisions of existing and potential companies in an industry. Entry decision of a new entrant depends on the expected profit, demand and cost factors which is called post-entry competition determined by entry barriers (Manuszak, 2000). Market size favours different numbers of firms. Variation in market size breakeven offers the changing information of competition. If the size is enlarged, it means there enters new firms. Manuszak (2000) studies concentration ratio and product market competition in the American brewing

industry. The research holds that prices competition tend to raise the competitive level since a number of firms are growing in an industry. New entrants will influence product market competition. As to another aspect, concentrated market structure favours technological progress and economic growth (Symeonidis, 1996). Symeonidis (1996) implies a trade-off between short run allocated gains under competitive structure and long run economic improvement under more concentrated structure. To an extreme point, monopoly power is caused by static allocated inefficiency. Concentration matters to regulators and to the degree of competition as well. Cohen (2004) does the research in small market banks and thrifts product market. The study indicates the information about unobserved firms' profitability reflecting competitiveness of different industries and the information is provided through product market concentration. Entry decision depends on couples of factors including fixed costs, post-entry competition and other simultaneous operating firms. Under the assumption that all existing firms earn positive profits, new entrants will earn negative profits in a short run due to limited profit room. Accordingly, new entrants influence an industry's concentration ratio and in turn affect the intensity of product market competition.

2.1.3 Research and Development

A firm's conduct of Research and Development (R&D) influences product differentiation and thereafter barriers of entry are raised due to high degree of product differentiation. R&D plays a vital role for a firm to adapt quickly to changing market conditions (Maria & Wulf, 2010).

Relation between innovation and product market competition has been a long-standing question (Minniti, 2010). Classical Schumpeterian view indicates that high degree of

competitive advantage is raised by innovation and technical progress which are affected by R&D. Purposive R&D is a source to motivate technical progress. According to five forces, product differentiation is one of the forces to raise the competitive advantage. And product differentiation is considered to be one of the main, largely exogenous, components of product market competition (Matraves & Rondi, 2005). Creation of new products or innovation of existing goods raise the degree of product differentiation which helps a firm attract new customers and maintain current customers gaining more market share (Bucci, 2006). Engaging in R&D activities contributes to produce products with high quality and generate products differentiation as well. It helps a firm to compete with its peers and in turn weaker firms fade away. Thus, fewer firms are existing in the industry, and the level of product market competition is reduced (Minniti, 2010). Accordingly, it is suggested that the intensity of R&D is inversely related to product market competition.

Fraja & Silipo (2002) does a research in four regimes of R&D competition among duopolists in different industries. The four regimes are full competition, coordination of strategies, joint venture and full collusion in R&D. One of the natures of R&D is that when one firm does R&D, other firms, acted as competitors, will be affected. Fraja & Silipo (2002) suggest the extent of product market competition is one of the three forces to affect firms' interaction. R&D expenditure results in competition. Lee (2009) uses a discrete-choice model of demand to interpret competitive market pressure faced by each firm, indicating that both introduction of new products and change in product quality lift the competitive market pressure. Besides R&D intensity and expenditure, Lee (2009) introduces technical competence. R&D elasticity of technical regarded as technical

competence represents for the degree of facility in production of quality. Responding to product market competition, firms invest in R&D to gain strong technical competence. It is indicated that competition favours innovation which in turn raises competition pressure. Firms with high level of technical competence are benefited from competitive market pressure.

Tang (2006) argues that the behaviour of firms investing in R&D programs to seek profitable opportunity is raised by product market competition. Even in the same industry, firms may produce different products. He defines constant arrivals of competing products an indicator to show product market competition. If the arrivals of competing products are general similar products, the market competition is high. The result of Statics Canada 1990 Survey of Innovation shows constant innovation make firms perceived product competition. It is critical for a firm to win product market competition by engaging in R&D. High degree of product differentiation helps a firm earn more market shares than its competitors. On the other hand, product differentiation raises the level of entry barriers. What's more, some firms are weeding out due to decrease of the market share exploited by their competitors. As a result, the degree of the competition of this industry reduces.

R&D is a way to interpret the degree of product market competition. Accordingly, similar concluding remarks of relevant literatures indicate that R&D inversely relates to product market competition.

2.1.4 Product Market Competition Impacts Firms' Performance

Product market competition influences firms' performance. Both concentration of an industry and a firm's conduct of R&D contribute to product market competition. Beiner et. al. (2011) does an empirical research investigated 200 Swiss firms during 2002-2005 about relationship between the intensity of product market competition and firm values. Higher degree of competition intensity stimulates stronger incentive schemes for manager. Such conditions as entry and exit barriers, openness of economy and competitive environment influence the conduct of management. Business decision and conduct determines a firm's performance. Efficient and better managerial activities or strategies reduce marginal costs equip an advantage for the firm to take away business from its rival. As a conclusion, intense competition reduces agency cost and positively affects productivity growth. Similar empirical research done by Griffith (2001) on UK establishments over the period from 1980 to 1996 indicates that increasing in product market competition leads to an increase in efficiency and high growth rate. Agency costs are reduced due to product market competition. Griffith, (2001) takes Nash-Cournot competition into consideration. Nash-Cournot suggests that in homogeneous good market, availability of information is a key effect of competition. Product market competition positively effects productivity. However, the degree of impact on efficiency varies among different types of industries. Januszewski et al. (2002) examines the impact of product market competition on productivity growth based on the empirical evidence of 500 German firms during 1986 to 1994 on firm level. Fierce competition aligns managers' goals to aim to produce efficiently. Effective production will raise a firm's productivity growth. However, product market competition may add risk of bankruptcy for inefficient

firms. Nevertheless, product market competition weeds less efficient firms out of their industries. Higher degree of product market competition leads a firm to have higher level productivity and earn more profit with increasing its market share.

2.2 Capital Structure

This section firstly explains theories of capital structure. Theoretical ideas on how a firm to decide a financing method is provided. Secondly the literatures regarding determinants of capital structure are reviewed. The determinants are firm characteristics at firm level. These firm characteristics are regarded as control variables during the empirical stage.

2.2.1 Theories of Capital Structure

The question “How do firms choose their capital structure?” is one of most controversial issues in modern corporate finance (Antoniou, et. al., 2002). Firms tend to finance new investment by raising debt capital only if the retained earnings are insufficient. There are several models to interpret capital structure which are static trade-off theory, dynamic trade-off theory, pecking order theory, the market timing theory and agency cost theory (Luigi & Sorin, 2009).

According to trade-off theory, a firm chooses the proportion of debt and equity by balancing the costs and benefits to have an optimum capital structure in a long term (Fama & French, 2002). Similarly argument is explained by tax shields theory which favours debt to a larger extent than equity. Interest is paid before tax payment so that firms benefit from a tax liability. Tax saving is one of the advantages as a result of using debt, while the disadvantage is the cost of potential financial distress (Ahmadinia et. al., 2012). Trade-off theory covers two types of trade-off which are static trade-off and

dynamic trade-off. The static trade-off is a result of historical data. The benefit of issuing debt is earnings from tax shield. But the problem is that it is difficult to match the financial leverage ratio when a firm uses debt financing in order to limit tax payments. The reason is using debt financing can't be completely reflected by the taxes (Frank & Goyal, 2008). Contradicted to static trade-off theory, the debt dynamic policy argued there is no target financial leverage ratio. Higher profits refer to more taxable incomes shielded by debt service (Hennessy & Whited , 2005). Firms tend to invest and finance under less uncertainty. These current investment and financing decisions are based on future financing needs with the firms' forecasting perspectives. Regarding the empirical findings of (Hennessy & Whited , 2005), there always exists a negative relationship between financial leverage and lagged measures of liquidity.

Pecking order theory argues that the asymmetric information increases the cost of financing. The three sources for the financing are internal funds, debt and equity. Firm prefers internal financing to external financing, and prefer to debt over equity when other elements are under control (Frank & Goyal, 2008). When firms focus on equity financing, the problem is that firms may issue too much equity at the wrong time resulted from asymmetric information problem. What's more, investors may overvalue or undervalue the share price due to asymmetric information problem. Similar situation is explained in the article of Halov & Heider (2011) who suggest internal financing could avoid asymmetric information problem. Shareholders have information disadvantage compared to managers of the firm. Shareholders care more about cash flow, because with sustainable cash flow, they will be get paid with the retain earnings. External financing costs future cash flow so that managers prefer internal financing at the first place.

The third theory is the market timing which argues that market performance based on technical or fundamental analysis determines when and how much to issue equity (Miglo, 2010). Past market valuation affects the capital structure persistently and the temporary fluctuations in market valuations will lead capital structure to permanent changes away from initial level (Baker & Wurgler, 2002). Market timing theory states that the firms will issue new stocks when the price is overvalued and buy back when undervalued. And similar statement is that managers are able to time the market. Therefore managers tend to issue equity when they believe the cost is low and repurchase the equity when they expect the cost is irrationally high (Luigi & Sorin, 2009). It seems that the capital structure of the firm is determined by managers' estimation towards market performance (Baker & Wurgler, 2002). Managers' estimation is not measured in this thesis, and neither is market timing theory taken into consideration.

Agency cost theory argues that a manager dilutes his ownership by issuing outside equity with the benefits from sharing the cost with the new owners. However, new owners are willing to pay for new equities since they realize the agency problem (Vilasuso & Minkler, 2001). And the separation of ownership in a professionally managed firm may cause managers to have an insufficient work effort, to choose inputs or outputs as to their own preferences, in turn to minimize firm value (Berger & Patti, 2006). When leverage relatively high, further borrowings may produce significant agency costs of outside debt. Higher expected financial pressure or bankruptcy costs will happen (Tsuji, 2011).

2.2.2 Determinants of Capital Structure

Capital structure refers to the constitution of debt and equity. Firms finance through debt or equity or combination securities seeking profit maximization. Researching on determinants of capital structure has been popular since last century.

Size: Larger firms show lower level of bankruptcy risk. Due to the stability of their cash flow, larger firms benefit from a high level of debt ratio. According to Antonious et al. (2002), larger firm has higher debt capacity and expected to generate more benefit. What's more, larger firms face a less degree of information asymmetry and therefore the larger firms are easy to raise debt at a lower cost. Besides, larger firms benefit from scale economies so that the cost of debt is expected to be lower. Due to high earnings volatility, firms will have a risk of dropping earnings level below the level of their debt service commitment. Both trade-off theory and pecking order theory support that firms of larger size tend to have a higher leverage. Therefore, the leverage positively relates to firm size.

Probability of bankruptcy: The probability of bankruptcy is one of the determinants of capital structure. In the article of Verwijmeren & Derwall, (2010), it is explained that bankruptcy is resulted from a costly losses of income and firm specific human capital. And the bankruptcy will happen to a firm when the firm failed to payback its debt. Accordingly, the way to reduce the change of bankruptcy is to reduce the firms leverage. Thus, we expect higher level of bankruptcy risk leads to lower leverage ratio.

Profitability: Firms with high profitability are likely to generate cash internally. Based on pecking order theory, firms tend to issue less debt when they have enough internal funding. The article of Rajan & Zingales (1995) concludes that the relationship between

profitability and debt ratio is negative. However, regarding trade-off model of capital structure, higher expected profitability comes with higher benefits of debt and lower costs of financial distress. The cost of issuing debt causes potential financial distress so that firms with lower expected profit will have lower level of leverage. Thus there is a positive relationship between book leverage and profitability.

Growth opportunity: The firms with more growth opportunities invest in new project. Retained earnings are firstly used to finance in the projects according to pecking order theory. Thus, firms with high growth opportunity tend to fund with their own cash before issuing debt. The research of Awan et.al (2010) investigates the debt policy of listed manufacturing firms operating in Pakistan during the period 1982 to 1990. They conclude that the growth opportunity is a key determinant of capital structure. Since the firms tend to issue equity when the stocks are overvalued, and firms should reduce the debt level to gain a growth opportunity, the negative relation between Market-Book Ratio and debt ratio is suggested. However, according to trade-off theory, debt pays out interest leaving less cash for projects. If a firm find their financing need exceeding retained earnings, the firm will prefer to have more debt. Thus a positive relationship is predicted by trade-off theory (Delcoure, 2007).

Tangibility: Tangible assets are used as collateral when a firm borrows from financial institutions. Creditors will own these tangible assets if financial distress happens to the firm. More tangible assets make a firm face lower cost of debt and less probability of bankruptcy. Firms possessing more tangible assets can borrow debt easier than the firms with mainly intangible assets. Thus, higher tangibility implies high debt capacity. The

relationship between tangible assets and debt ratio is expected to be positive (Harris & Raviv, 1991; Booth et al., 2001).

2.3 The Impact of Product Market Competition on Capital Structure

This section combines product market competition and capital structure stating the relationship between the two. Since the proxies of product market competition are industry concentration and conduct of R&D, two parts are explained regarding impact of concentration on capital structure and impact of R&D on capital structure respectively.

2.3.1 Industry Concentration and Capital Structure

Concentration of an industry plays a vital role in gaining market power. Competitors' reaction is taken into account by a firm in an industry with several peers. This kind of interaction is explained by product market competition. Several literatures study how concentration ratio of an industry influences capital structure. Istitieh & Fernandez (2003) focuses on concentration of an industry influencing strategic decision of the management – capital structure. They investigate in Spanish manufacturing firms between 1993 and 1999. The development of a firm follows two disciplines. One is industrial organization and the other one is the firm's strategic management. Both industrial organization and strategic management are influenced by market structure – concentration ratio of the industry. Capital structure is observable and not body can change it without investment or production decisions. Rival companies will alter their strategic decisions when they aware the capital structure choice of their peers changes. And the strategic decisions are regarded as the capital structures of firms. In terms of employment, other things equal, a lower leveraged firm can negotiate better contract terms with employees. With less susceptible threat, people are more likely to work for

less leveraged firms within an industry. The more firms in an industry, the firms will choose less debt to ensure the stability of their business. Istitieh & Fernandez (2003) argue that firms in a less concentrated industry are more likely to reduce their debt level compared to the firms in a highly concentrated industry.

The empirical research of Naha & Roy (2011) stands on the angle of financial institutions. Financial institutions such as banking sectors concern the risk of default when they lend debt to a firm. 50 firms from eight different industries in Indian manufacturing sector covered from the year 1985 to 2005 are investigated. When concentration ratio increases, a firm dominates in the industry to a larger extent. The dominated firm faces less intensity of market competition and therefore it has less risk of bankruptcy. Creditors have less uncertainty of the refund of the borrowings. Therefore, it is easier for a dominated firm to access to the capital market. As a result, the financial leverage rises when concentration ratio is high. The similar argument is stated by Schargrotsky (2002) who does the research in American newspaper industry examining the effect of product market competition on capital structure. Even though Schargrotsky (2002) doesn't focus on the concentration ratio, he studies two groups of firms which are oligopolies and monopolies. It is concluded that the debt ratio of oligopolies is less than that of monopolies by regressing debt ratios on product market competition controlling for size, profitability non-debt tax shields and growth opportunities. If a firm faces a high degree of competition, it will use capital from deeper pockets to capture more market share. The deeper pocket of capital is internal capital. When internal capital ran out, bank would not like to lend loan to them. Fewer tangible assets make a firm face more uncertainty. Since

monopolies are more concentrated than oligopolies, the concentration level is assumed to positively impact debt level.

Another empirical research of Chevalier (1995) studied local supermarket industry in America. Market structure is interpreted by concentration which was measured by market share. This research brings attention to a firm perspective mainly to discover the impact of capital structure on product market competition. A firm tends to enlarge market share in order to gain more profit so that the firm has ability to pay back the bank loan. As market share expands, the concentration ratio of the industry tends to increase. Therefore, capital structure positively influences concentration ratio. As to other way round, Chevalier (1995) doesn't do the empirical research. However, he states that firms with larger market share tend to expand and thereby firms require more financing fund. However, whether the funding prefers debt or equity is for future research.

Table 1. Summary of selected literatures towards impact of product market structure on capital structure

This table presents the empirical research reviews regarding the impact of industry concentration on capital structure. In the table the sample, examine period, measurement of capital structure, measurement of market structure and main findings of each article are reported.

Research	Sample	Examine Period	Measurement of Capital Structure	Measurement of Market Structure	Main Finding(s)
Istaitieh & Fernandez (2003)	1502 Spanish manufacturing firms	1993-1999	Total Debt ratio	4-firm Concentration ratio	The higher centration ratio the higher total debt ratio
Nana & Roy (2011)	50 firms	1985-2005	Short term debt ratio; long term debt ratio	HHI	No relation between long term debt ratio and market structure. Positive relation between short-term debt ratio and HHI.
Schargrodsky (2002)	21 firms	1964-1995	Total debt ratio	NA	Monopoly has more debt than that of oligopoly
Chevalier (1995)	85 Metropolitan Statistical Areas	1985-1991	Leverage buyout	HHI	More concentrated firms tend to finance more.

2.3.2 R&D and Capital Structure

The study of capital structure strives to illustrate the choice of combination of firms' financing sources and securities. The choice of optimal capital structure has been being a central topic in corporate finance. That R&D as a proxy of product market competition influences capital structure has been studied by several researches. R&D investments are definitely one of the forces driving corporate failure and driving an innovative competitive strategy. However, financial behaviour of R&D differs among different industries with different degree of competition (O'Brien, 2003).

Efficiency of financial market is associated with product market competition. Boost technological change and innovation aggregate economic growth. Both internal retained earnings and external funds can be raised by firms for new investments. As to a relative mature firm with a steady state of equilibrium, external funding is required only when the firm faces technological shock. Issuing debt to the banking sector is one of the ways to obtain external financing. Collateral is essential to the debt financing. Since the result of R&D investment in intangible assets is full of uncertainty, R&D investments are easier to finance by issuing equity on stock market. It is indicated a positive correlation between R&D intensity and equity financing. As a consequence, a negative relationship exists between R&D intensity and debt ratio of a firm. An empirical research of Chi (2010) covers 342 Chinese private listed firms over the period from 2004 to 2008. He concludes the negative relationship. Banking sectors concern about the payback of loans, so that when they offer loans, the risk of default is taken into consideration. For the reason that R&D is uncertain for generating profit, banking sectors will offer a high price forming the loans. To another aspect, due to finance conservative behaviours of firms, when

future competition is expected to be intense, the current debt will be lower. Instead, firms tend to invest more in equity on stock market. As we all know, shareholders are benefit from retained earnings. Therefore, the risk of uncertainty is transferred to shareholders. Besides the uncertainty of R&D, information asymmetry is another reason why the firms tend to issue equity for R&D investment financing. Because of information asymmetry, shareholders have an information disadvantage about the firm's performance relative to managers. Cash flow is required for shareholders who advocate cash pay-outs. However, debt financing forces managers to pay out future cash flow. Due to the long-term risky R&D investment, firms rely more on equity financing than debt financing in order to retain sustainable cash flow. Therefore a negative correlation exists between R&D intensity and capital structure. As stated by Aghion et al. (2004) and Belin et.al., (2009), the more innovation committed by a firm, a greater degree of asymmetric information exists. Thus, the firms have more R&D input, the less capital structure they will have. However the result of Loof (2004) indicates that the relationship between R&D and capital structure depends on the size of financial sector. That's why the results of Loof (2004) vary across four countries. The research of Loof (2004) investigates how R&D impacts capital structure based on the evidence of a panel dataset gathered from listed firms across different countries at the Stockholm Stock Exchange during the period from 1991 to 1998. Financial sector size matters for firms to access to external financing. The size of financial sector positively correlated with macroeconomic growth. Bigger financial sector shows a better state of macroeconomic growth. Stock market behaves better in a well-developed economic environment. The firms are more willing to issuing equity on stock market for financing of R&D investments. The US and UK have the

largest financial market above average value, while Sweden is below the mean value. Differences in both systems of taxation and equity capital supply lead to different behaviours regarding optimization of capital structure. In U.S firms, the relation shows a significant positive sign between R&D and debt ratio. While, less significant positive relation exists in UK firms. However, in Swedish market the debt ratio tend to decline with the increase in R&D.

Table 2. Summary of selected literatures towards impact of R&D on capital structure

This table presents the summary of empirical researches concerning the impact of R&D on capital structure. In the table, sample, examine period, measurement of capital structure, measurement of R&D and main findings of each research are reported.

Research	Sample	Examine Period	Measurement of Capital Structure	Measurement of R&D	Main Finding(s)
Chi (2010)	342 Chinese private listed firms	2004-2008	Total debt ratio	R&D expenditure/ total assets	Negative sign between R&D and capital structure.
Belin et.al., (2009)	43755 observations (French firms).	1994-2004	Bank debt out of total debt ratio	R&D expenditure/ total sales	Negative correlation between R&D and Capital structure
Aghion et al. (2004)	900 listed companies	1990-2002	Total debt ratio	R&D expenditure/ total sales	When R&D intensity >10%, negative relation. As to a same firm, negative relation.
Loof (2004)	483 listed US firms, 122 UK firms, 117 Swedish firms (1991 ¹) and 221 Swedish firms (1998)	1991-1998	Market leverage	Intangibles	U.S.: positively relation between R&D and capital structure. UK: positive relation. Sweden: negative relation.

¹ Unbalanced panel data as to Swedish firms.

3 Hypotheses

Hypotheses are developed in this chapter as to how product market competition influences capital structure in two aspects. One is industry concentration and the other one is conduct of R&D. The Hypotheses are formed based on the literature reviews explained in chapter 2.

3.1 Industry Concentration

The research from Schargrotsky (2002) examines the effect of product market competition on capital structure of firms in American newspaper industry. The dominated firm faces less intensity of market competition. Therefore dominated firm has less risk of bankruptcy. Creditors have less uncertainty of the refund of the borrowings. Therefore, it is easier for a dominated firm to access to the capital market. As a result, the financial leverage rises when concentration ratio is high. The paper finds that the debt ratio of oligopolies is lower than that of monopolies by regressing debt ratios on product market competition controlling for size, profitability non-debt tax shields and growth opportunities. Since the oligopolies' concentration ratio is less than monopolies', the result indicated that as the degree of concentration ratio reduces, debt ratios fall as well. Similar outcome, according to Chevalier (1995) who investigates an event study of the relationship between capital structure and product market competition in US supermarket industry, is that the product market competition becomes soft due to concentration ratio reduction and thereby debt ratio reduces (Chevalier, 1995). A firm tends to enlarge market share in order to gain more profit so that the firm has ability to pay back the bank loan. As market share expands, the concentration ratio of the industry tends to increase.

Under oligopoly condition, it implies a positive relationship between product market competition and capital structure. Same result of Naha & Roy (2011), it suggests a positive relationship between concentration ratio and debt ratio. Firms would employ more financing funds to maximize production when there are opportunities to earn higher profits (Naha & Roy, 2011). According to pecking order theory, retained earnings are the first financing source. Debt is the second financing source prior equity. Istitieh & Fernandez (2003) uses unbalanced panel dataset of 5042 observations of 1502 Spanish manufacturing firms during 1993 to 1999. Despite of distinguish monopolies or oligopolies, they found a positive correlation between concentration ratio and financial leverage. Firms follow two types of disciplines which are industrial organization and strategic management as explained in previous section. Market structure, concentration ratio of an industry, influences both industrial organization and strategic management. Without investment or production decision, capital structure can't be changeable. Choices of capital structure are strategic decisions for the managers. Rival companies will alter their strategic decisions when they observe the change of capital structure choice of their peers. People are more likely to work for less leveraged firms within an industry since leverage firms are less susceptible threat. The more firms in an industry, the firms will choose less debt to ensure sustainability of their business. Firms in a less concentrated industry are more likely to reduce their debt level compared to the firms in a highly concentrated industry (Istitieh & Fernandez, 2003).

Therefore take the product market as a whole the hypothesis are formed below:

H1: Higher extent of concentration will lead to higher degree of debt ratio.

3.2 R&D

The aspect of conduct is R&D which is one of the driven forces to pursue an innovative competitive strategy. R&D intensive firms show lower debt level than non-R&D firms (Bah & Dumontier, 2001). Technological change and innovation simulate capital structure change. External funding can be obtained from either debt or equity. Collateral is essential to the debt financing from banking sector. Since the result of R&D investment in intangible assets is full of uncertainty, R&D investments are easier to finance by issuing equity on stock market. It is indicated a positive correlation between R&D intensity and equity financing. As a consequence, a negative relationship exists between R&D intensity and debt ratio of a firm. Future more, due to the long R&D investment cycles, managers tend to transfer the risk to the lenders, the shareholders, instead of being bankruptcy. Risk of default is taken into consideration when banking sectors offer loans. R&D is uncertain for generating profit, banking sectors will offer a high price form the loans. Hence, firms tend to invest more in equity taking the advantage of lower cost on stock market compared with high cost of debt financing. Information asymmetry is another reason why the firms tend to issue equity for R&D investment financing. Because of information asymmetry, shareholders have less information about the firm's performance relative to managers. As stated by Aghion et al. (2004), more innovative firms will form a greater degree of asymmetric information. Cash flow is demanded by shareholders who care about the cash pay-outs. However, debt financing forces managers to pay out future cash flow. To sustain enough cash flow, firms rely more on equity financing than debt financing. Therefore, it's supposed to be an inversed relationship between R&D expenditure and capital structure. In these papers, debt ratio is defined as

total debt over total assets, while, in this thesis, considering the long R&D investment cycle, only long-term debt is measured. The hypothesis is formed as below.

H.2: Higher R&D expenditure a firm invest leads to a lower level of long term debt ratio.

4 Methodology and Data

This chapter outlines the methodology which is used to test hypotheses of impacts of industry concentration and conduct of R&D on capital structure in the first section. The second section details variable construction towards dependent variable, independent variables, control variables and dummy variables. Data collection is detailed in the third section where a description of the sampling criteria and steps to be followed in collecting the data are clearly outlined.

4.1 Methodology

This section illustrates methodologies for testing the two hypotheses. Before explanation of the methodology which I use to test the impact of product market competition on capital structure, the methodology review of previous studies is outlined firstly in each part.

4.1.1 Methodology for Testing the Impact of Industry Concentration on Capital Structure

In order to explore the relationship between industry concentration and capital structure, many prior literatures use different research methods. The methodology proposed by MacKey & Phillips (2005) is modified to test the importance of industry to capital structure decisions. Their model applies simultaneous equation framework where technology and risk may take place simultaneously within industries. Generalized method of moments (GMM) is used to estimate the simultaneous equations. GMM is a method of moment's estimation indispensable for complicated estimation problems. It is attractive since in many circumstances they are robust to failures of auxiliary distributional

assumptions which are not required to identify key parameters. GMM is used in econometrics. However, due to my knowledge limitation, I am not able to perform GMM in this thesis. Raya (2008) applies classical multiple linear regression model to test the impact of industry concentration on capital structure of Philippine firms. Ordinary least squares (OLS) model is used to estimate the relationship in each industry. Schargrotsky (2002) uses OLS regression to test the how industrial concentration influences capital structure. OLS regression is the most widely-used regression technique for examining product market competition parameters in decision of capital structure. However, OLS can't estimate the simultaneity between variables. To mitigate the simultaneity bias, lagged variables are regressed in the model (Schargrotsky, 2002; Rajan & Zingales, 1995). Regression is applied by using a pool panel data covering the full period (Schargrotsky, 2002; Istaitieh & Fernandez, 2003; Fuso, 2013). The advantage is that plenty enough observations are examined when the number of firms is limited. What's more, it is better to interpret the impact of a variable in a long term. Some articles dissect cover period into a couple of sub-periods. The cover period 1997-2006 is dissected into two 5-year periods for the reason that Asia experienced a financial crisis during the period 1997-2000 which may influence the final conclusion (Raya, 2008). Chen & Jiang, (2001) divide the sample period into 1993-1995, 1994-1996, and 1995-1997 with one year lead between sub-periods. It is an efficient way to reduce measurement error caused from year to year random fluctuations. While, regressing in such a short sub-period, the significant level is too low because of data limitation.

To test the impact of industry concentration on capital structure, I follow the research method of Schargrotsky (2002) which collects an unbalanced panel data of 22 firms with

321 firm-year observations from 1964 to 1995. A cross-sectional study is used to regress on product market competition, debt ratio on firm size, profitability, growth opportunities and non-debt tax shields. The measurement of product market competition is measured as whether monopoly or oligopoly. To test the effect of concentration on capital structure in my thesis, the leverage of the firms is regressed on concentration of the firm's industry controlling for firm size, growth opportunities, non-debt tax shields and tangibility. The control variables are taken advantage of previous researches (Deesomsak et al., 2012; Berger & Petti, 2006; Chevalier, 1995; Manuszak, 2000; Baert & Vennet, 2008).

The regression equation is:

$$\text{Leverage}_{it} = \beta_1 \text{Concentration}_{it} + \beta_2 \text{Growth opportunity}_{it-1} + \beta_3 \text{Firm size}_{it-1} + \beta_4 \text{Non-debt tax shield}_{it-1} + \beta_5 \text{Tangibility}_{it-1} \quad (1)$$

Where, all the variables are yearly based. The dependent variable Leverage_{it} is book long-term debt ratio and independent variable is concentration ratio which is measured as 4-firm concentration ratio at industry level (Shaik et al. 2009; Selarka, 2011; Nain & Wang, 2012; Adam & Khalifah, 2012). The classification is explained in section 4.2. Control variables are Growth opportunities, firm size, non-debt tax shield and tangibility. Growth opportunity is measured as market to book ratio. Firm size is measured as natural logarithm of sales. Non-debt tax shield is the ratio of the sum of Depreciation and Amortization to total assets. Tangibility is the ratio of fixed assets to total assets. These control variables are lagged consistent with prior literatures (Rajan & Zingales, 1995; Berger & Petti, 2006; Schargrodsky 2002). Lagging the control variables helps to alleviate endogenous problem (Schargrodsky, 2002; Rajan & Zingales, 1995). Two

dummy variables are industry types and the years. These variables and calculations are discussed in section 4.2.

4.1.2 Methodology for Testing the Impact of R&D on Capital Structure

Regarding the impact of R&D on capital structure, previous empirical studies apply different models. Loof (2004) builds on a dynamic modelling approach which is not in scope of my knowledge. Schargrodsky (2002) and O'Brien (2003) use OLS regression analysis to test the impact of R&D on capital structure. Aghion et. al. (2003) apply GMM model to both full sample of the firms and sub-sample of the firms excluded non-R&D firms. In my thesis, I apply OLS regression analysis to test the relationship between R&D and capital structure following the methodology of O'Brien, (2003). O'Brien (2003) includes lagged dependent variables as predictor variables in the OLS regression models. The dependent variables are stock variables whose past levels are likely to cause influence on the present levels. He chooses lagged dependent variables for modelling instead of random-effects or fixed effects models for two reasons. One is that random-effects models are for experimental study which includes all possible explanatory variables. The other reason is that fixed effects capture the factors which are constant or display little change over time within a firm. Since leverage shifts slowly and it takes time for actual leverage ratio to shift to their optimum level. Therefore, all independent variables are lagged one year for the leverage model where the independent variables are contemporaneous values.

The regression equation is:

$$\text{Leverage}_{it} = \beta_1 \text{Leverage}_{it-1} + \beta_2 \text{R\&D}_{it-1} + \beta_3 \text{Growth opportunity}_{it-1} + \beta_4 \text{Firm size}_{it-1} + \beta_5 \text{Non-debt tax shield}_{it-1} + \beta_6 \text{Tangibility}_{it-1} \quad (2)$$

Where, all the variables are calculated on yearly base. Leverage is dependent variable measured as book long-term debt ratio. Independent variable is relative R&D intensity for firm *i* in the year *t*. Control variables are growth opportunity, firm size, non-debt tax shield and tangibility. These control variables and dependent variable are same with those in model (1). Two dummy variables are industry types and years. The computations of these variables are discussed in section 4.2.

4.2 Variables

This section details the variables construction including dependent variable, independent variables, control variables and dummy variables.

Leverage

The dependent variable is capital structure. The proxy is financial leverage. Two measures of financial leverage are book financial leverage and market leverage which differ in whether equity is book value or market value. Market value is future-oriented while book value focuses on historical performance of a firm (Loof, 2004). Loof (2004) chooses market value of leverage due to a future perspective required when he analyses firms' growth opportunities. Frank & Goyal, (2009) prefer book value over market value of leverage since they believe market value is not reliable for financing policies.

In my thesis, I choose book financial leverage ratio to test the hypotheses. Market value financial leverage ratio is used to perform robustness tests. Reviewed amounts of articles regarding capital structure, the proxies of capital structure are short term debt ratio, long

term debt ratio and total debt ratio (Vilasuso & Minkler, 2001; Ahmad et al., 2012; Abor, 2005; Halov & Heider, 2011). Choosing an approach to interpret leverage takes advantage of paper written by Rajan and Zingales (1995). Six different leverage measurements were analysed which are total liability/ total assets, total debt/ total assets, total debt/ net assets, total debt/ capital, EBIT/ interest expense, EBITDA/ interest expense. The first four measurements are related to financial leverage. The ratio of total liability to total assets may overstate leverage due to accounts payable and untaxed reserves included in total liability. Total debt/ total assets can be affected by level of trade credit. Total debt/ net assets can be affected by assets held against pension liabilities that is nothing to do with financing. The ratio of total debt to capital where capital is calculated as total debt plus total equity was considered to be the best representation of past financial decisions (Rajan & Zingales, 1995). Since R&D is a long term investment and the effort of R&D can't be seen in a short term, the financial leverage is measured as long term debt over capital.

Accordingly, the proxies of dependent variable, capital structure, are book value of long term debt ratio and market value of long term debt ratio. Book long term debt ratio is measured as the ratio of long term debt to the sum of total debt and book value of equity. Market value of long term debt ratio is measured as the ratio of long term debt to the sum of total debt and market value of equity.

Concentration

To my best knowledge, prior studies take advantage of the literature of Tirole (1988) when they determine the measurement of concentration (Raya, 2008). Tirole (1988)

identified 3 measurements of concentration namely, the m-firm concentration ratio (CR), Herfindahl-Hirschman Index (HHI), and the entropy ratio. Most empirical researches choose m-firm concentration or HHI instead of entropy ratio, because entropy ratio is an information ratio involving stochastic process (Raya, 2008). 4-firm CR is calculated as the sum of the market share of four biggest firms in an industry in many empirical studies regardless monopolies (Shaik et al. 2009; Selarka, 2011; Nain & Wang, 2012; Adam & Khalifah, 2012). For the firms in perfect competition market the concentration ratio is near 0 called no concentration. When the CR is between 0.5 and 0.9, the industry is under oligopoly and when the CR is ranging from 0 to 0.5, the industry is under imperfect competition (Mahajan, 2006). HHI takes the firm size into consideration measured by summing up all the square value of the market share of each firm competing in the market. Basically, HHI is ranging from 0 to 1, where 0 indicates firms in a perfect competition industry and 1 indicates the firm under monopoly (Valta, 2012). To conclude CR and HHI, the higher the values suggest the weaker competition of the market. For both HHI and CR, market share is calculated as the ratio of firm's sales to total sales in the firm's industry (Tirole, 1988). In my thesis, 4-firm CR is used to test the hypotheses and HHI is used to perform robustness tests.

R&D

Many empirical studies use R&D intensity as the proxy for R&D. More of them measure R&D intensity as the ratio of R&D expenditure over sales (Loof, 2004; Chi, 2010; Aghion et al., 2004), while, the element of industry is overlooked. This thesis is supposed to test the impact of R&D in terms of product market competition on capital structure. Thus, relative R&D intensity is used taking advantage of O'Brien, (2003) who argues

that a firm's R&D intensity relative to an industry reflects the degree of competition of this industry measured as the ratio of a firm's R&D intensity to the industry's R&D intensity.

The relative R&D intensity is calculated following three steps. First, each firm's R&D intensity is calculated as the ratio of R&D expense to total sales of all the firms regardless industries. Second, compute the R&D intensity of each industry by summing up the R&D intensities of the firms in each industry. Third, compute the relative R&D intensity measured as the ratio of each firm's R&D intensity to the industry's R&D intensity. Furthermore, in order to perform robustness test, R&D intensity which is measured as the ratio of R&D expenses to total sales is applied to the models mentioned in pervious section.

Control variables

Besides the dependent variables and explanatory variables, some control variables are involved which are: firm size, non-debt tax shield, growth opportunities and tangibility.

Size

The proxy of size can be natural logarithm of total sales (Schargrotsky, 2002; Antoniou et al., 2002; Gonzalez, 2010; Barakat & Rao, 2010) or the natural logarithm of total assets (Fosu, 2013; Chi, 2010; Kurshev & Strebulaev, 2006). Since this research studies the product market, the natural logarithm of total sales will be used to be the proxy for the size of a firm (Frank & Goyal, 2003). However, total asset is denominator of leverage. In order to avoid a spurious relationship in the regression, total sales are used to be the

denominator of size. And, in my thesis, natural logarithm of the total assets will be used to do the robustness tests.

Non-debt tax shield

Non-debt tax shield is measured as the sum of depreciation and amortization divided by total assets (Schargrotsky, 2002; Deesomsak et al., 2010; Symeonidis, 1996). The tax can be reduced on the income if the firm takes on more debt, since interest of debt is tax deductible. Thus, tax shield is regarded as the substitutes for the tax benefits of debt financing. Trade-off theory indicates that firms increase financial leverage in order to create more interest tax shields (Miglo, 2010). However, non-debt tax shields such as depreciation and amortization can be used to reduce corporate tax. Therefore, potential tax shield benefit becomes weaker and non-debt tax shield is negatively related to leverage (Deesomsak et al., 2004).

Growth opportunity

The determinant of capital structure, growth opportunity has been studied in many empirical researches as discussed in the previous section. Growth opportunity is measured as market-to-book ratio, market value of common equity to book value of common equity, in some literatures (Schargrotsky, 2002; Bauer, 2004). According to the articles of Fosu, (2013); Chen & Jiang, (2001); and Dewaelheyns & Hulle, (2009), growth opportunity is measured as the change ratio of sales over one year, where growth opportunity is calculated as the ratio of sale growth to last year's sales. The higher of this value, the more growth opportunities exist. In my thesis, both methods are used to test the model.

Tangibility

Tangibility is measured as the ratio of fixed assets to total assets. Tangible assets are used as collateral when a firm issues debt to banking sector. If the firm can't pay back the bank loan due to financial distress, creditors will own these tangible assets. Otherwise, the firm will be brought to bankruptcy. Tangibility makes a firm face lower cost of debt and less probability of bankruptcy. Thus, higher tangible assets imply high debt capacity. The relationship between tangible assets and debt ratio is expected to be positive (Harris & Raviv, 1991; Booth et al., 2001).

Dummy variables

Two dummy variables are industry type and year. 5 industry dummies are defined for the 6 industry types:

1. Industry type "Publishing, printing": 1= Publishing, printing industry; 0=others
2. Industry type "Chemicals, rubber, plastics, non-metallic products": 1= Publishing Printing industry; 0=others
3. Industry type "Machinery, equipment, furniture, recycling": 1=Machinery, equipment, furniture recycling industry; 0=others
4. Industry type "Wholesale & retail trade": 1= Wholesale & retail trade industry; 0=others
5. Industry type "Post & telecommunications": 1= Post & telecommunications; 0=others

For the sixth industry, the five dummies are 0, 0, 0, 0 and 0 respectively.

8 year dummies are defined for 9 years across 2003-2011:

1. Whether the year is 2003: 1=2003, 0= other years
2. Whether the year is 2004: 1=2004, 0= other years
3. Whether the year is 2005: 1=2005, 0= other years
4. Whether the year is 2006: 1=2006, 0= other years
5. Whether the year is 2007: 1=2007, 0= other years
6. Whether the year is 2008: 1=2008, 0= other years
7. Whether the year is 2009: 1=2009, 0= other years
8. Whether the year is 2010: 1=2010, 0= other years

For the year 2011, these 8 dummies are 0 respectively.

Table 3. Variables

The table displays the proxies and interpretations of each variable. Two proxies for debt ratio are book value of long term debt ratio and market value of long term debt ratio. The proxies for concentration ratio are 4-firm concentration ratio and HHI. Two proxies for R&D are R&D intensity and relative R&D intensity. Three control variables are firm size, growth opportunity and non-debt tax shield.

Variable	proxy	Interpretation	Reference
Debt Ratio	Book value of Long term debt ratio	Long term debt/ (Total debt + book value of equity)	Vilasuso & Minkler, (2001); Ahmad et al., (2012); Abor, (2005); Halov & Heider, (2011)
	Market value of Long term debt ratio	Long term debt/ (Total debt + market value of equity)	Frank & Goyal, (2009); Loof, (2004)
Concentration	Concentration ratio	Sum of first 4 biggest market shares of an industry (Market share=a firm's sales/ the industry's total sales)	Shaik et al. (2009); Selarka, (2011); Nain & Wang, (2012); Adam & Khalifah, (2012)
	HHI	Sum of all the square values of each firm's market share within an industry. $(\sum(\text{sales}_i/\text{sales}_i)^2)$ (Market share= a firm's sales/ the industry's total sales)	Naha& Roy, (2011); Chevalier, (1995); Valta, (2012)
R&D	R&D intensity	R&D expenditure/ sales	Loof, (2004); Chi, (2010); Aghion et al., (2004)
	relative R&D intensity	R&D intensity/R&D industry intensity	O'Brien, (2003)
Control variable	Firm size	ln(total sales)	Schargrodsky, (2002); Antoniou et al., (2002); Gonzalez, (2010); Barakat & Rao, (2010)
		Ln(total assets)	Fosu, 2013; Chi, 2010; Kurshev & Strebulaev, 2006
	Non-debt tax shield	(depreciation +amortization)/ total assets	Schargrodsky, (2002); Deesomsak et al., (2010); Symeonidis, (1996)
	Growth opportunity	market-to-book ratio. (M/B)	(Schargrodsky, 2002; Bauer, 2004
		Sales i-1 - Sales i-2/ Sales i-2	Fosu, (2013); Chen & Jiang, (2001); Dewaelheyns & Hulle, (2009)
Tangibility	Fixed assets/Total assets	Harris & Raviv, 1991; Booth et al., 2001.	

4.3 Data

This thesis relies on secondary data collected from the main database of Orbis. Within Orbis, I choose classification of Bureau van Dijk (BvD) major sectors to classify the industries into 19 sectors which are listed in the Appendix. BvD is region and country specific database which provides data on companies and industry research. Since concentration ratio is 4-firm concentration ratio, the number of the firms in an industry should be above 4. What's more, financial institutions such as banking sector and insurance companies are excluded for the reason that financial industries have different capital structure from non-financial industries. Therefore, the criteria for each step to collect data are shown in the table 4. The sample is from 6 industries as shown in the table. Unbalanced panel data containing 811 firm-year observations over the 9-year period 2003-2011 is shown in the table 5. The decision of choosing 2003 as the starting point depends on the database Orbis which provides the data during the period 2003-2012. Due to uncompleted data of 2012, the end year is chosen to be 2011.

The full sample contains 811 firm-year observations. There are 109 missing observations because of missing information in Orbis. I drop 32 observations since total debt is missing for those firms reported by Orbis. Another 127 observations are dropped because Orbis reports a zero long term debt level. Therefore, the final sample contains 74 firms, 543 firm-level observations in unbalanced panel.

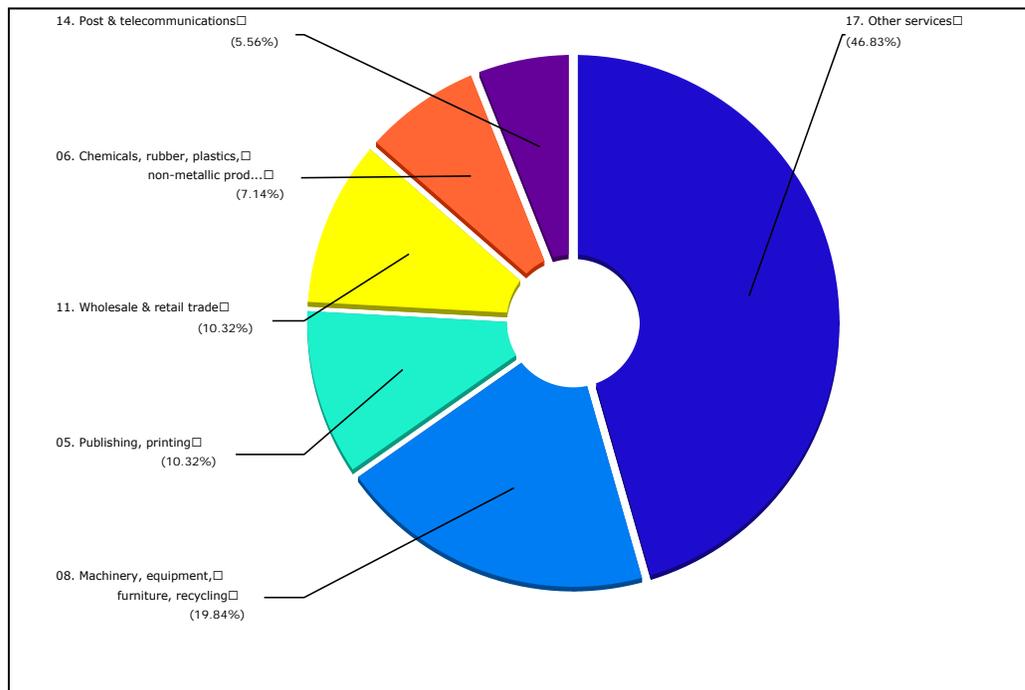
Table 4 Data collection criteria.

This table presents the criteria of data collection. The figures of each step are numbers of firms at the moment I collected the data (2013. May). First step is to choose the Netherlands as the location where there are 11497 firms. The second step is to select the status of the firms which are active. Next, public listed companies are filtered which are 186 listed companies in the Netherlands. The final step is to filter the industries classified by BvD major sectors. Six sectors are filtered where more than 5 firms exist in each sector. The total number of firms is 126.

	Criteria	Number
1	Location: the Netherlands	11497
2	Status: Active Companies	8820
3	Listing Status: Public Listed Companies	186
4	Industry: BvD major sectors, 05,06,08,11,14,17	126

Figure 4. Non-financial industries selected in the Netherlands based on BvD major sectors.

The figure shows the distribution of selected industries. As shown in the figure, No.14 sector accounts for 5.56% at the least level, while No.17 other service accounts for 46.83%. Compared with post & telecommunications sector, the sector of other services shows higher degree of competition with lower concentration ratio.



5. Result

This chapter presents the result of data analysis. First part outlines the descriptive statistics of the variables used in the regression models. Empirical results of the test are analyzed in the second part of the report.

5.1 Descriptive Statistics

In this section, table 6 gives an overview of descriptive statistics including mean, median, standard deviation, minimum and maximum of major variables used in the research across the period 2003-2011.

As shown in the Panel A, the mean value of market leverage ratio (0.199) is bigger than that of book leverage ratio (0.137). This is because market value of equity is lower than book value. It is in line with the mean value of growth opportunity (0.546) which is lower than 1.

Compared between 4-firm concentration ratio (CR) and HHI, we find that the range of HHI is much larger than that of CR. The reason is the sums market share of four biggest firms are at similar levels while the market shares of each firm differ to a larger degree. Standard deviations of growth opportunity and non-debt tax shield indicate the data is positive skewed, so that the accuracy of the regression estimates is influenced.

The mean value of sample firms' size is 12.822. Compared to the average size of Thailand firms (14.5149) and that of the firms in China (21.0476), the listed firms in the Netherlands are not large corporates (Deesomsak et.al., 2004; Antoniou et.al., 2002).

As shown in the panel B, only 212 firms' R&D values are available and most of them are around zero. Book value of leverage ratio, market value of leverage ratio, firms size and growth opportunity are approximately normal distributed.

It's worthwhile to mention that the minimum values of growth opportunity (-5.539), the minimum value of non-debt tax shield (-.005) and R&D intensity (-1.063) are negative. The negative growth opportunity is caused by negative book equity. Book equity is a way to measure the value held by ordinary shareholders. The negative figure has no obvious interpretation since the firm's limited liability structure prevent shareholders' value to be negative. Therefore, the negative values of growth opportunity are excluded. The negative non-debt tax shield is caused by negative amortization value of a firm. Negative amortization value occurs when the firm fails or delays to pay the debt's monthly interest accrual on a loan or line of credit. It's weird that the value of R&D is negative. Thus, the negative values of R&D are excluded.

Table 6 Descriptive Statistics

This table presents the descriptive statistics including mean, median, the standard deviation, minimum and maximum of variables in the period 2003-2011. Book leverage is measured as the ratio of long term debt to the sum of total debt and book value of equity. Market leverage is measured as the ratio of long term debt to the sum of total debt and market value of equity. Concentration ratio (CR) is measured as sum of first 4 biggest market shares of an industry. HHI is measured as sum of all the square values of each firm's market share within an industry. Firm size is measured as ln (sales). Non tax debt shield is measured as the sum of depreciation and amortization divided by total assets. Growth opportunity is measured as the ratio of market equity to book equity. Tangibility is measured as the ratio of fixed assets to total assets. R&D is relative R&D intensity measured as the ratio of firm's R&D intensity to industry's R&D intensity.

Panel A. Full Sample of variables from 2003-2011						
	N	Mean	Median	Std. Deviation	Minimum	Maximum
Book Leverage Ratio	543	.137	0.149	.145	.001	.896
Market Leverage Ratio	543	.199	.209	.206	.001	.898
CR	54	.892	.918	.078	.752	.999
HHI	54	2.568	2.801	.622	1.437	3.834
Firm Size	543	12.822	13.667	2.696	5.268	17.968
Growth Opportunity	543	.546	.245	4.961	-5.539	112.070
Non Tax Debt shield	543	.410	.055	1.640	-.005	37.816
Tangibility	543	.536	.532	4.927	0	1.086

Panel B. R&D sample of variables from 2003-2011						
	N	Mean	Median	Std. Deviation	Minimum	Maximum
Book Leverage Ratio	212	.156	.149	.127	.001	.603
Market Leverage Ratio	212	.222	.209	.175	.001	.882
R&D	212	1.420	.061	7.651	-1.063	73.253
Firm Size	212	13.702	13.667	2.702	5.268	17.968
Growth Opportunity	212	.308	.246	.606	-5.539	3.070
Non Tax Debt shield	212	.413	.055	2.778	.005	37.816
Tangibility	212	.501	.501	2.53	.070	1.086

Ordinary least regression (OLS) can be influenced by multi-collinearity issue when high correlation exists between independent variables. Multi-collinearity test is performed as shown in table 7. Table 7 provides the multi-collinearity report. Pearson correlation coefficient is used to test the correlation between the variables. Based on the value of correlation coefficient between two interdependent variables, whether there exists multi-collinearity problem can be determined. As shown in the table, the correlation among the most of explanation variables are below 0.3, which indicates the multi-collinearity is not a serious problem. Four notable correlations as shown in the table, the highest correlation is between 4-firm concentration ratio and HHI at 1% significant level (.671). The positive relation between HHI and CR confirms both of them can be the proxies of concentration ratio. Firm size is negatively related with R&D (-.525) and another notable correlation exists between non-debt tax shield and R&D (.698). As a consequence, there are two control variable, growth opportunity and tangibility, existing in the regression model used to test impact of R&D on capital structure. Tangibility correlates with concentration ratio at a statistically significant level. Therefore, the regression on the first hypothesis takes place under two circumstances. One is including tangibility and the other one excludes tangibility.

Table 7 Correlation Matrix of Explanation Variables

This table presents the Pearson correlation coefficients matrix of explanation variables in two regression models during the period 2003-2011. The bold figures indicate the relatively high correlations. Significance levels 1%, 5% and 10% are indicated as ***, ** and * respectively.

Correlations							
	CR	Firm Size	Growth Opportunity	Non Tax Debt shield	Tangibility	RD	HHI
CR	1	-.032	.024	.085*	-.231**	.205**	.671**
Firm Size		1	-.024	-.142	.032	-.525**	-.076
Growth Opportunity			1	-.002	-.110*	-.029	.000
Non Tax Debt shield				1	-.050	.698**	.014
Tangibility					1	-.139	-.201**
RD						1	.162*
HHI							1
*. Correlation is significant at the 10% level (2-tailed).							
**. Correlation is significant at the 5% level (2-tailed).							
*** Correlation is significant at the 1% level (2-tailed).							

5.2 Empirical Result

We begin by testing how concentration ratio of an industry influences capital structure. After examining first hypothesis, the second hypothesis is tested. Robustness tests are presented in the third section.

5.2.1 Empirical Result on Hypothesis 1

Table 8, 9 and 10 report the results of first hypothesis. The dependent variable is long term book leverage ratio. The independent variable is concentration ratio. The control variables are firm size, growth opportunity, non-debt tax shield and tangibility. The dummy variables are industry type and year. All these variables are constructed in the prior section.

Table 8 presents the means of book leverage for monopoly industries and oligopoly industries. As mentioned in prior section, 4-firm concentration ratio (CR) of monopoly is above 0.9 while that of oligopoly is between 0.5 and 0.9. The mean value of book leverage among monopoly industries (0.139) is slightly bigger than that among oligopoly industries (0.136). That the book leverage ratio of monopoly is higher than that of oligopoly is in line with the conclusion of Schargrotsky (2002). However, based on independent-samples t-test, the difference is not statistically significant (t-statistics=0.347). As a result, the positive relationship can't be concluded at statistically significant level.

OLS regression is used to test the hypothesis. The model mentioned in previous chapter covers the full sample across the whole period. The OLS regression results are indicated in table 9.

As indicated in the table, eight models are tested. Model 1 and 2 take both industry dummies and year dummies into consideration. Model 3, 4, 5 and 6 take either industry dummies or year dummies into the regression. Both of the dummy variables are excluded in the model 7 and 8. Model 1, 3, 5 and 7 result from regressing on independent variable and all four control variables. The rest exclude tangibility.

From these eight models, only model 3, 4 and 6 report that concentration ratio is positively related to book leverage ratio at statistically significant levels. This indication is in line with the result of prior articles of Chevalier (1995), Istaitieh & Fernandez (2003) and Nana & Roy (2011). As explained in the previous sections, firms in highly concentrated industries have larger market share. The stability and profitability of the

dominated firms make them easier to issue debt to banking sectors. With enough tangibility as collaterals, firms tend to borrow loans from bank since they will benefit from the tax shield. Model 1, 2, 5, 7 and 8 indicate the estimated relationship is positive. However, the relationship is not at statistically significant levels.

According to the results of models reported in table 9, control variables except tangibility are found no relation with long term debt ratio. This indication is not in line with trade-off theory and also inconsistent with the conclusions of the previous researches of Korajczyk & Levy, (2003), Valta, (2012) and Kurshev & Strebulaev, (2006). According to previous researches, larger firms have easier access to financial market to issue more debt. Larger firms have more opportunities to get investment due to that larger firms have less possibility to get bankruptcy and lower cost of debt. The non-linearity between growth opportunity and leverage ratio doesn't follow the finding of prior literatures for the reason that the data of growth opportunity is highly skewed as mentioned previously. According to the conclusion of Schargrotsky, (2002) and Deesomsak et al., (2004), potential tax shield benefit from debt becomes weaker and non-debt tax shield is negatively related to leverage. However we can't see any statistically significant relationship in the table. Tangibility is reported to positively correlate with long-term book leverage ratio at statistically significant level ($\alpha=0.01$). It is in line with prior literatures (Harris & Raviv, 1991; Booth et al., 2001). Collateral should be tangible assets when a firm issues debt to banking sector. If the firm can't pay back the bank loan due to financial distress, creditors will own these tangible assets. Otherwise, the firm will be brought to bankruptcy. Tangibility makes a firm face lower cost of debt and less

probability of bankruptcy. Thus, more tangible assets imply high debt capacity. The relationship between tangible assets and debt ratio is expected to be positive.

Adjusted R square ranges from 0 to 1 indicating the goodness of fit of a model. The highest adjusted R² is 0.213 as we can see in the first model. By making use of adjusted R², we can see which variable has the highest explanatory power. Compared to growth opportunity, non-tax debt shield, and firm size, tangibility matters to the largest extent for the regression model. The adjusted R² become less than 10% when tangibility is excluded.

The adjusted R square may be caused from heteroscedasticity. In order to mitigate heteroscedasticity issue, a new regression equation is proposed by forming new variables which are reformed as the natural logarithm of original data (Cathcart et. al., 2003). Thus, the new regression model is:

$$\text{Ln (Leverage}_{it}) = \beta_1 \text{Ln (Concentration}_{it}) + \beta_2 \text{Ln(Growth opportunity}_{it-1}) + \beta_3 \text{Ln(Firm size}_{it-1}) + \beta_4 \text{Ln(Non-debt tax shield}_{it-1}) + \beta_5 \text{Ln(Tangibility}_{it-1})$$

The linearity regression result is reported in the table 10. As we can see natural logarithm of concentration ratio positively relates to book leverage ratio at statistically significant levels when industry type dummies are taken into consideration. The relation between the natural logarithm values of all the control variables and book leverage ratio are positive with statistical significance. These positive correlations are in line with prior researches. According to table 10, we can conclude that the firms in an industry of higher concentration ratio have higher level of book leverage ratio.

Table 8 Comparison of book leverage ratio between monopoly and oligopoly

This table presents comparison of book leverage ratio between monopolies and oligopolies. Sample firms are divided into two groups. If 4-firm concentration ratio (CR) of a firm is bigger than 0.9, the firm is belong to monopoly. Otherwise the firm is oligopoly.

Group Statistics					
	group	N	Mean	Std. Deviation	Std. Error Mean
Book leverage ratio	Monopoly	394	.139	.148	.007
	Oligopoly	277	.136	.141	.008
t statistics=0.347, significant level: 1%					

Table 9 OLS estimates to explanatory variables.

This table presents the result of OLS estimates. The dependent variable is long term book leverage ratio. The independent variable is concentration ratio. Control variables firm size, growth opportunity, non-debt tax shield and tangibility. Industry and year are dummy variables. These variables are defined in previous section. The regression model is $Leverage_{it} = \beta_1 Concentration_{it} + \beta_2 Growth\ opportunity_{it-1} + \beta_3 Firm\ size_{it-1} + \beta_4 Non-debt\ tax\ shield_{it-1} + \beta_5 Tangibility_{it-1}$. Significance at the 10%, 5% and 1% are indicated as *, **, *** respectively.

Dependent Variable: Book leverage ratio								
OLS estimates								
Model	1	2	3	4	5	6	7	8
CR	.390 (1.050)	1.138 (1.138)	316*** (-2.523)	.375*** (-2.783)	-.002 (-.020)	.133* (-1.661)	.020 (.264)	.114 (-1.403)
Firm Size	.001 (.353)	.002 (.651)	.001 (0.31)	.001 (.498)	.003 (1.021)	.003 (.938)	.001 (.568)	.002 (.680)
Growth Opportunity	0 (.013)	0 (-.733)	0 (.252)	0 (-.541)	0 (.254)	0 (-.673)	0 (.319)	0 (-.658)
Non-Tax Debt shield	.001 (.323)	0 (.004)	0 (-.026)	0 (.057)	.001 (.224)	0 (-.222)	0 (-.179)	-.002 (-.440)
Tangibility	.299*** (10.037)	-	.281*** (9.398)	-	.298*** (10.159)	-	.280*** (9.553)	-
Industry dummies	Yes	Yes	Yes	Yes	No	No	No	No
Year dummies	Yes	Yes	No	No	Yes	Yes	No	No
Adjusted R ²	.213	.060	.176	.037	.174	.011	.146	.000
Significant level	1% *** 5% ** 10% *							

Table 10 Linearity regression

This table reports the result of linearity regression test. The dependent variable is ln (long term book debt ratio). The independent variable is ln(Concentration ratio). The four control variables are nature logarithm of firm size, growth opportunity, non-debt tax shield and tangibility respectively. Industry type and year are dummy variables. The equation is:

$\text{Ln}(\text{Leverage}_{it}) = \beta_1 \text{Ln}(\text{Concentration}_{it}) + \beta_2 \text{Ln}(\text{Growth opportunity}_{it-1}) + \beta_3 \text{Ln}(\text{Firm size}_{it-1}) + \beta_4 \text{Ln}(\text{Non-debt tax shield}_{it-1}) + \beta_5 \text{Ln}(\text{Tangibility}_{it-1})$ Significance at 10%, 5% and 1% level are indicated as *, **, and *** respectively.

	Dependent Variable: Ln (Book leverage ratio)			
	Linear estimates			
Model	1	2	3	4
Ln(CR)	6.941** (2.086)	2.524*** (2.436)	.256 (-.371)	.027 (.185)
Ln(Firm Size)	1.050*** (.3.466)	.989*** (3.283)	1.332*** (4.408)	.1.314*** (4.372)
Ln(Growth Opportunity)	.095*** (.1.810)	.095*** (2.567)	.158*** (4.339)	.159*** (4.372)
Ln(Non-Tax Debt shield)	.096* (1.810)	.087* (1.683)	.099* (1.915)	.102** (2.041)
Ln(Tangibility)	1.283*** (9.231)	1.289*** (9.485)	.1.189*** (8.631)	1.172*** (8.673)
Industry dummies	Yes	Yes	No	No
Year dummies	Yes	No	Yes	No
Adjusted R²	.219	.218	.169	.168
Significant level	1% *** 5% ** 10% *			

5.2.2 Empirical Result on Hypothesis 2

Table 11 reports the correlations among variables during the period 2003-2011. As shown in the table, relative R&D intensity is inversely related to book leverage ratio (-.017). This conclusion is consistent with prior literatures of O'Brien (2003), Belin et.al., (2009), and Chi (2010). Firms with higher R&D expenses experience higher risk of the return from uncertain R&D. Therefore, it is difficult for R&D intense firms to get debt from the bank. Other way around, the managers of the R&D intense firms tend to issue equity transferring risk to shareholders. However, this negative correlation is not statistically significant.

Table 12 reports the OLS estimates to the regression model which is used to test the second hypothesis. The model mentioned in previous section covers the whole period concerning the sample firms available to R&D expense.

As stated in the previous section, firm size and non-tax debt shield is correlated with R&D. Thus, only growth opportunity and tangibility are included in the regression model as the control variables.

As indicated in the table 12, eight models derived from the second main regression model are tested through OLS regression analysis. Two dummy variables are taken into consideration in the first model. Model 2 and 3 include either industry dummies or year dummies. And the fourth model excludes both dummy variables.

According to the table 12, R&D has little relationship with book leverage ratio. This conclusion is not consistent with the result of prior articles obtained by Belin et.al., (2009), Chi (2010), Aghion et al. (2004) and O'Brien (2003). This irrelevant relationship

is caused by the data limitation. Only 212 firms are available to R&D and among the 212 figures. Besides, most values of the R&D are around zero.

Table 11. Correlations coefficient matrix

This table presents the Pearson correlations among the variables during the period 2003-2011. Pearson correlation is used to analyse the coefficients among capital structure, explanatory variable and control variables. *, **, *** are indicated for statistically significant levels 10%, 5% and 1% respectively. The bold figures show relative high correlations.

	Book leverage ratio	Firm Size	Growth Opportunity	Non-tax Debt shield	Tangibility	R&D intensity
Book leverage ratio	1	.000	-.093	-.063	.337**	-.017
Firm Size		1	.191**	-.339**	.225**	-.525**
Growth Opportunity			1	.049	-.165*	-.029
Non-tax Debt shield				1	-.121	.698**
Tangibility					1	-.139
R&D intensity						1

Table 12 OLS estimates to explanatory variables.

This table presents OLS estimates. The dependent variable is long-term book debt ratio. The independent variable is R&D. Control variables are growth opportunity and tangibility. Industry type and year are dummy variables. The estimated β and t-statistic value in brackets are shown in the table. The regression model is $Leverage_{it} = \beta_1Leverage_{it-1} + \beta_2R\&D_{it-1} + \beta_3Growth\ opportunity_{it-1} + \beta_4Tangibility_{it-1}$. The statistically significant levels 1%, 5% and 10% are indicated as ***, ** and * respectively.

	Dependent Variable: Book leverage ratio			
	OLS estimates			
Model	1	2	3	4
R&D	-.002 (1.439)	-.002 (1.575)	-.001 (.835)	-.001 (.912)
Growth Opportunity	-.015 (-1.115)	-.013 (-.972)	-.009 (-.685)	-.007 (-.502)
Tangibility	.181*** (3.567)	.203*** (4.223)	.212*** (4.338)	.227*** (4.827)
Industry dummies	Yes	Yes	No	No
Year dummies	Yes	No	Yes	No
Adjusted R ²	.215	.221	.094	.104
Significant level	10% * 5% ** 1% ***			

5.3 Robustness Test

Robustness test is displayed in this section. In order to do the robustness test, market leverage ratio is substituted for book leverage ratio. HHI is used to replace concentration ratio. Natural logarithm of total assets is replaced with natural logarithm value of total sales. Growth opportunity is sales growth. And R&D is the ratio of R&D expense to sales instead of relative R&D intensity. Table 13 reports the regression of the robustness test, where panel A is the result of robustness test for first hypothesis and panel B is the result of robustness test for second hypothesis. Both the tests are performed by OLS regression model.

As shown in the panel A, HHI positively relates to market value of long term debt ratio at statistically significant level in model 2. This conclusion is in line with the result of the test performed in prior section. The other three models don't show statistical significance. Firm size positively relates to market leverage ratio with statistical significance ($\alpha=1\%$). While growth opportunity and non-tax debt shield are not significantly related with market leverage ratio. Comparing the adjusted R^2 between the test of prior section and that of the robustness test, the robustness test shows a better fit of test.

As shown in the panel B, R&D is not related with market leverage ratio in line with the test concluded from prior section.

Table 13 Robustness tests for two hypotheses**Panel A. Robustness test for first hypothesis.**

Panel A reports the robustness test for first hypothesis. Dependent variable is long-term market debt ratio. Independent variable is HHI. Control variables are firm size, growth opportunity, non-debt tax shield and tangibility. Two dummy variables are industry type and year. These variables are explained in previous section. The regression model is $Leverage_{it} = \beta_1 Concentration_{it} + \beta_2 Growth\ opportunity_{it-1} + \beta_3 Firm\ size_{it-1} + \beta_4 Non-debt\ tax\ shield_{it-1} + \beta_5 Tangibility_{it-1}$. Significance level 1%, 5% and 10% are indicated as ***, ** and * respectively.

	Dependent Variable: Market leverage ratio			
	OLS estimates			
Model	1	2	3	4
CR	.085 (.910)	.183** (2.102)	-.066 (-1.397)	-.052 (-1.113)
Firm Size	.009*** (2.823)	.012*** (3.511)	.013*** (3.946)	.012*** (3.764)
Growth Opportunity	0 (-.108)	0 (.082)	0 (.014)	0 (.093)
Non-debt tax shield	0 (.111)	0 (-.172)	0 (.031)	0 (-.190)
Tangibility	.509*** (14.122)	.493*** (13.267)	.511*** (14.490)	.499*** (14.180)
Industry dummies	Yes	Yes	No	No
Year dummies	Yes	No	Yes	No
Adjusted R²	.398	.350	.345	.337
Significant level	10% * 5% ** 1% ***			

Panel B. Robustness test for second hypothesis.

Panel B reports the robustness test for second hypothesis. The dependent variable is long-term market debt ratio. The independent variable is R&D. Control variables are growth opportunity and tangibility. Industry type and year are dummy variables. These variables are explained in the prior section. The regression model is $Leverage_{it} = \beta_1 Leverage_{it-1} + \beta_2 R\&D_{it-1} + \beta_3 Growth\ opportunity_{it-1} + \beta_4 Tangibility_{it-1}$. Significance at 1%, 5% and 10% levels are indicated as ***, ** and * respectively.

	Dependent Variable: market leverage ratio			
	OLS estimates			
Model	1	2	3	4
R&D	-.005 (1.209)	-.003 (1.105)	-.001 (.935)	-.002 (.982)
Growth Opportunity	-.013 (-1.012)	-.014 (-.870)	-.008 (-.671)	-.003 (-.609)
Tangibility	.182*** (4.567)	.103*** (4.312)	.211*** (4.389)	.127*** (3.827)
Industry dummies	Yes	Yes	No	No
Year dummies	Yes	No	Yes	No
Adjusted R²	.219	.201	.184	.325
Significant level	10% * 5% ** 1% ***			

6 Conclusion

Main conclusion is presented in this chapter. At the end, the discussion of limitation and further research are outlined.

6.1 Main Findings

This thesis is aiming to test the impact of product market competition on capital structure based on the evidence of listed firms in the Netherlands during the period 2003-2011. Two proxies for product market competition are concentration ratio and R&D intensity. Capital structure's proxies are book value of long term debt ratio and market value of long term debt ratio.

Two hypotheses are formed. One is that concentration ratio positively relates capital structure. The other one is that R&D intensity inversely correlates with capital structure. The main research method is to apply OLS regression model to test both the hypotheses. According to the result of first OLS regression analysis, the first hypothesis is accepted at statistic significant level indicating that there is a positive relationship between concentration ratio and capital structure. The firms in higher concentrated industries have higher book value of long term debt ratio and market value of long term debt. The result aligns with prior articles (Istaitieh & Fernandez, 2003; Nana & Roy, 2011). Concentration plays a critical role in market power. Firms in high concentrated industry have more market share with strong market power. The managers of firms in less concentrated industries pay more attention to strategically management in order to gain more market share. The more debt the risky the firm faces. On the other hand, a firm in a highly concentrated industry faces less intensity of market competition and has lower risk

of bankruptcy. It is easy to borrow money from financial institutions such as banking sector. As a result, the financial leverage rises (Chevalier, 1995). However, based on the robustness tests, hypothesis 1 only can be accepted at statistically significant level when only industry dummies are taken into consideration. The insignificant positive relationship resulting from other models is supported by Raya (2008) who doesn't find a significant relationship between market share and Philippine firms. He implies that the role of concentration ratio in enlarging capital structure is supported in largest corporations. The firms in the Netherlands are not large corporations as we compared firm size with other countries'. The firm size comparison between Dutch firms and American firms is provided in previous section. Therefore, the statistically insignificant result is reasonable.

Concerning the second hypothesis which assumes R&D is negatively related to long term debt ratio, the research finds no significant support. Based on other literatures as we summarized in the prior sections, R&D is uncertain for profit generation. And financial institutions such as banking sectors concern about the loan payback. Besides, firms tend to invest more in equity which helps the firm transfer the uncertainty to shareholders. Therefore, the more invested in R&D projects by the firms, the lower level of the capital structure is. However, based on the empirical result of this thesis, the hypothesis can't be accepted at a statistically significant level.

Concerning the research question that how does product market competition influence capital structure of listed firms in the Netherlands, two sub research questions have been formed. In terms of first sub research question, how does concentration ratio influence capital structure of listed firms in the Netherlands, we conclude that there is a statistically

significant positive relationship between concentration ratio and long term debt ratio. It means the firms in less competitive industries have more long term debt ratio. And higher concentration ratio indicates less product market competition. Thus, higher degree of product market competition leads to lower capital structure. Turning to second sub research question, how does R&D influence capital structure of listed firms in the Netherlands, we conclude that there is no notable relationship between the two elements. Thus, only based on this aspect, there is no relationship between product market competition and capital structure.

6.2 Limitation and Future Research

Few consistent results are concluded in this thesis. Apparently, several limitations are suffered in this thesis. In this part, suggestions for future research are given for limitations.

First, only two proxies of product market competition are taken into consideration in this thesis. If one proxy turns to be irrelevant, other one can't significantly interpret the relationship between product market competition and capital structure. Thus, other more proxies can be investigated for further research, such as advertisement expense, bargaining power etc.

Second limitation is the limitation of data of Dutch listed firms. The number of listed firms in the Netherlands is not big enough. Though the number of total firms covering 2003 to 2011 is 811, partial data of firms are missing. Furthermore, a portion of the available futures are zero. These zero figures influence the quality of regression analysis. Therefore, for future research, more time should be spent on data collection. Other

databases could be used as well. If time permits, collecting data from annual report can be a good way to get all the related data.

Thirdly, the model OLS has its own limitation. OLS model can negatively influence the probability of occurrence of Type I error. For the future research, More regression analyses can be applied to test the hypotheses.

Reference

- Abor, J. (2005). The Effect of Capital Structure on Profitability: an Empirical Analysis of Listed Firms in Ghana. *Journal of Risk Finance, Vol.6, Iss:4*, pp. 306-318.
- Adam, R., & Khalifah, N. (2012). Foreign Presence and Market Concentration in Malaysian Manufacturing Industries. *Jurnal Ekonomi Malaysia, Vol.46, No.1*, pp. 119-132.
- Aghion, P., Bond, S., Klemm, A., & Marinescu, I. (2004). Technology and Financial Structure: Are Innovative Firms Different? *Journal of the European Economic Association, Vol.2, No.2-3*, pp. 277-288.
- Ahmadinia, H., Afrasiabishani, J., & Hesami, E. (2012). A Comprehensive Review on Capital Structure Theories. *The Romanian Economic Journal, Vol.15, No.45*, pp. 3-26.
- Antoniou, A., Guney, Y., & Paudyal, K. (2002). Determinants of Corporate Capital Structure: Evidence from European Countries. *Working Paper, Centre for Empirical Research in Finance, Department of Economics and Finance, University of Durham*, pp. 1-33.
- Awan, H., Bhatti, M., Ali, R., & Quershi, A. (2010). How Growth Opportunities are Related to Corporate Leverage Decision. *Investment Management and Financial Innovations, Vol.7, No.1*, pp. 90-97.
- Baert, L., & Vennet, R. (2008). Bank Market Structure and Firm Capital Structure in Europe. *Working Paper of FINESSE, No.D.2.1*, pp. 1-46.
- Bah, R., & Dumontier, P. (2001). R&D Intensity and Corporate Financial Policy: Some International Evidence . *Journal of Business Finance & Accounting, Vol.28, No.5-6*, pp. 671-692.
- Baker, M., & Wurgler, J. (2002). Market Timing and Capital Structure. *The Journal of Finance, Vol 57, No.1*, pp. 1-32.
- Bandt, O. D., & Davis, E. (2000). Competition, Contestability and Market Structure in European Banking Sectors on the Eve of EMU. *Journal of Banking & Finance, Vol.24, No.6*, pp. 1045-1066.
- Barakat, M.-H., & Rao, R.-P. (2010). The Role of Taxes in Capital Structure: Evidence from Taxed and Non-taxed Arab Economies. *Munich Personal RePEc Archive Paper No.25472*, pp. 1-43.

- Bauer, P. (2004). Determinants of Capital Structure Empirical Evidence from the Czech Republic. *Journal of Economics and Finance*, Vol.54, No.1-2, pp. 2-21.
- Beiner, S., Schmid, M., & Wanzenried, G. (2011). Product Market Competition, Managerial Incentives and Firm Valuation. *European Financial Management*, Vol.17, No.2, pp. 331-366.
- Belin, J., Cavaco, S., & Guille, M. (2009). Financial Structure: Does R&D Affect Debt Financing. *Thematic Meeting of the French Economic Association (AFSE: "Firms, Markets and Innovation"*, pp. 1-19.
- Berger, A., & Patti, E. B. (2006). Capital Structure and Firm Performance: A New Approach to Testing Agency Theory and an Application to the Banking Industry. *Journal of Banking and Finance*, Vol. 30, No.4, pp. 1065-1102.
- Bettignies, J. (2006). Product Market Competition and Boundaries of the Firm. *Journal of Economics*, Vol.39, No.3, pp. 948-970.
- Booth, L., Aivazian, V., Demircuc-Kunt, A., & Maksimovic, V. (2001). Capital Structures in Developing Countries. *The Journal of Finance*, Vol.56, No.1, pp. 87-130.
- Bucci, A. (2006). Product Market Competition, R&D Effort and Economic Growth. *DEGIT Conference Papers*, No.c011_037, pp. 1-26.
- Cathcart, L., El-Jahel, L., & Jabbour, R. (2013). The Basel Capital Requirement Puzzle: A Study of Changing Interconnections between Leverage and Risk-Based Capital Ratios. *European Financial Management Association Meeting*.
- Chen, L., & Jiang, G. (2001). The Determinants of Dutch Capital Structure Choice. *Research Report of University of Groningen, Research Institute SOM*, No.01E55, pp. 1-27.
- Chevalier, J. (1995). Capital Structure and Product Market Competition: Empirical Evidence from the Supermarket Industry. *The American Economic Review*, Vol.85, No.3, pp. 415-435.
- Chi, B. (2010). Empirical Study on the Relationship between R&D Investment, Capital Structure, and Firm Size of China Private Listed Companies. *Technology Management for Global Economic Growth (PICMET), 2010 Proceedings of PICMET '10*, pp. 1-8.
- Cohen, A. (2004). Market Structure and Market Definition: the Case of Small Market Banks and Thrifts. *Economics Letters*, Vol.83, No.1, pp. 77-83.

- Deesomsak, R., Paudyal, K., & Pescetto, G. (2004). The Determinants of Capital Structure: Evidence from the Asia Pacific Region. *Journal of Multinational Financial Management*, Vol.14, No.4-5, pp. 387-405.
- Delcours, N. (2007). The Determinants of Capital Structure in Transitional Economies. *International Review of Economics & Finance*, Vol.16, No.3, pp. 400-415.
- Dewaelheyns, N., & Hulle, C. (2010). Capital Structure Dynamics in Private Business Groups. *AFI Working Paper*, No.1045, pp. 1-34.
- Edwards, S., Allen, A., & Shaik, S. (2006). Market Structure Conduct Performance (SCP) Hypothesis Revisited using Stochastic Frontier Efficiency Analysis. *American Agricultural Economics Association Annual Meeting, Long Beach, California, Selected Paper*, pp. 1-24.
- Fama, E., & French, K. (2002). Testing Trade-off and Pecking Order Predictions about Dividends and Debt. *The Review of Financial Studies*, Vol.15, No.1, pp. 1-33.
- Fosu, S. (2013). Capital Structure, Product Market Competition and Firm Performance: Evidence from South Africa. *The Quarterly Review of Economics and Finance*, Vol.53, No.2, pp. 140-151.
- Fraja, G. D., & Silipo, D. B. (2002). Product Market Competition, R&D, and Welfare. *Research in Economics*, Vol.56, No.4, pp. 381-397.
- Frank, M., & Goyal, V. (2008). Trade-Off and Pecking Order Theories of Debt. *Handbook of Empirical Corporate Finance*, Vol.2, Chapter 12, pp. 136-171.
- Gonzalez, V., & Gonzalez, F. (2011). Firm size and capital structure: Evidence using dynamic panel data. *Applied Economics*, Vol.44, No.36, pp. 4745-4754.
- Griffith, R. (2001). Product Market Competition, Efficiency and Agency Costs: An Empirical Analysis. *IFS Working Paper 01/12*, pp. 1-33.
- Halbersma, R., Mikkers, M., Motchenkova, E., & Seinen, I. (2007). Market Structure and Hospital-Insurer Bargaining in the Netherlands. *TILEC Discussion Paper No.2007-006*, pp. 1-48.
- Halov, N., & Heider, F. (2011). Capital structure, asymmetric information and risk. *Quarterly Journal of Finance*, Vol 1 (4), pp. 767-809.
- Harris, M., & Raviv, A. (1991). The Theory of Capital Structure. *The Journal of Finance*, Vol.46, No.1, pp. 297-355.

- Hennessy, C., & Whited, T. (2005). Debt Dynamics. *The Journal of Finance*, Vol.60, No.3, pp. 1129-1165.
- Istaitieh, A., & Fernandez, J. (2003). Stakeholder Theory, Market Structure and the Firm's Capital Structure: An Empirical Evidence. *Working Paper Series*, pp. 1-37.
- James, D., Dana, J., & Fong, Y.-f. (2011). Product Quality, Reputation, and Market Structure. *International Economic Review*, Vol.52, No.4, pp. 1059-1076.
- Januszewski, S., Koke, J., & Winter, J. (2002). Product Market Competition, Corporate Governance and Firm Performance: an Empirical Analysis for Germany. *Research in Economic*, Vol.56. No.3, pp. 299-332.
- Korajczyk, R., & Levy, A. (2003). Capital Structure Choice: Macroeconomic Conditions and Financial Constraints. *Journal of Financial Economics*, Vol.68, No. 1, pp. 75-109.
- Krasauskaite, E. (2011). Capital Structure of SMEs: Does Firm Size Matter?--Empirical investigation of the Baltic countries. *Aarhus University Business and Social Sciences Master thesis*, pp. 1-88.
- Kurshev, A., & Strebulaev, I. (2006). Firm Size and Capital Structure. *Moscow Meetings Paper*, pp. 1-41.
- Lee, C. (2011). Firms' capital structure decisions and product market competition: a theoretical approach. *Research in Business and Economics Journal* Vol.3, pp. 1-15.
- Loof, H. (2004). Dynamic Optimal Capital Structure and Technical Change. *Structure Change and Economic Dynamics*, Vol.15, No.4, pp. 449-468.
- Luigi, P., & Sorin, V. (2009). A Review of the Capital Structure Theories. *Annals of Faculty of Economics*, Vol.3, No.1, pp. 315-320.
- MacKey, P., & Phillips, G. (2005). How Does Industry Affect Firm Financial Structure? *Review of Financial Studies*, Vol.18, No.4005, pp. 1433-1466.
- Mahajan, S. (2006). Concentration Ratios for Businesses by Industry in 2004. *Economic Trends* 635, pp. 1-23.
- Manuszak, M. (2000). Endogenous Market Structure and Competition in the 19th Century American Brewing Industry. *International Journal of Industrial Organization*, Vol.20, No. 12, pp. 673-692.

- Maria, G., & Wulf, J. (2010). The Flattening Firm and Product Market Competition: The Effect of Trade Liberalization on Corporate Hierarchies. *American Economic Journal: Applied Economics*, Vol. 2, No.4, pp. 105-127.
- Matraves, C., & Rondi, L. (2005). Product Differentiation, Industry Concentration and Market Share Turbulence. *Working Paper Ceris-Cnr*, pp. 1-26.
- Miglo, A. (2010). The Pecking Order, Trade-Off, Signaling, and Market-Timing Theories of Capital Structure: a Review. *Social Science Research Network Working Paper Series*, pp. 1-26.
- Minniti, A. (2010). Product Market Competition, R&D Composition and Growth. *Economic Modelling*, Vol.27, No.1, pp. 417-421.
- Modigliani, F., & Miller, M. (1963). Corporate Income Taxes and the Cost of Capital: A Correction. *American Economic Association*, Vol.53, No.3, pp. 433-443.
- Naha, S., & Roy, M. (2011, July). Product Market Competition and Capital Structure of Firms: the Indian Evidence. *Journal of Quantitative Economics*, Vol.9 No.(2), pp. 140-153.
- Nain, A., & Wang, Y. (2012). The Anti-Competitive Effects of Minority Stake Acquisitions. *Working Paper of Desautels Faculty of Management, McGill University*, pp. 1-54.
- O'Brien, J. (2003). The Capital Structure Implications of Pursuing a Strategy of Innovation. *Strategic Management Journal*, Vol.24, No.1, pp. 415-431.
- Porter, M. (2008). The Five Competitive Forces That Shape Strategy. *Harvard Business Review*, Vol.1, pp. 78-93.
- Rajan, R., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *Journal of Finance*, Vol.50, No.5, pp. 1421-1460.
- Raya, D. (2008). Concentration Ratios, Financial Leverage and Profitability: The Case of Selected Philippine Corporations, 1997-2006. *Philippine Management Review*, Vol.15, pp. 100-118.
- Roberts, P. W. (1999). Product Innovation, Product-Market Competition and Persistent Profitability in the U.S. Pharmaceutical Industry. *Strategic Management Journal*, Vol.20, Iss:7, pp. 655-670.
- Schargrodsky, E. (2002). The Effect on Product Market Competition on Capital Structure: Empirical Evidence from the Newspaper Industry. *EconPapers*, pp. 1-36.

- Selarka, E. (2011). Corporate Governance, Product Market Competition and Firm Performance: Empirical Analysis of Indian Corporate Sector. *Working Papers Series of Madras School of Economics*, pp. 1-20.
- Shaik, S., Allen, A., Edwards, S., & Harris, J. (2009). Market Structure Conduct Performance Hypothesis Revisited Using Stochastic Frontier Efficiency Analysis. *Journal of the Transportation Research Forum*, Vol.48, No.3, pp. 5-18.
- Shneyerov, A., & Wong, A. (2010). The Rate of Convergence to Perfect Competition of Matching and Bargaining Mechanisms. *Journal of Economic Theory*, Vol.145, No.3, pp. 1164-1187.
- Stigler, G. (1958). The Economies of Scale. *Journal of Law and Economics*, Vol.1, pp. 54-71.
- Symeonidis, G. (1996). Innovation, Firm Size and Market Structure: Schumpeterian Hypotheses and Some New Themes. *OECD Economics Department Working Papers*, No.161, pp. 1-43.
- Tang, J. (2006). Competition and Innovation Behaviour. *Research Policy*, Vol.35, No.1, pp. 68-82.
- Tirole, J. (1988). The Theory of Industrial Organization. *Massachusetts: The MIT Press*, pp. 1-50.
- Tsuji, C. (2011). Recent Development of the Agency Theory and Capital Structure. *Economics and Finance Review*, Vol.1, No.6, pp. 94-99.
- Valta, P. (2012). Competition and the Cost of Debt. *Journal of Financial Economics*, Vol.105, No.3, pp. 661-682.
- Verwijmeren, P., & Derwall, J. (2010). Employee Well-being, Firm Leverage, and Bankruptcy Risk. *Journal of Banking & Finance*, Vol.34, No.5, pp. 956-964.
- Vilasuso, J., & Minkler, A. (2001). Agency Costs, Asset Specificity, and the Capital Structure of the Firm. *Journal of Economic Behavior & Organization*, Vol.44, No.1, pp. 55-69.

Appendix 1. The major industry sectors classified by BvD

01. Primary sector
02. Food, beverages, tobacco
03. Textiles, wearing apparel, leather
04. Wood, cork, paper
05. Publishing, printing
06. Chemicals, rubber, plastics, non-metallic products
07. Metals & metal products
08. Machinery, equipment, furniture, recycling
09. Gas, Water, Electricity
10. Construction
11. Wholesale & retail trade
12. Hotels & restaurants
13. Transport
14. Post & telecommunications
15. Banks
16. Insurance companies
17. Other services
18. Public administration & defence
19. Education, Health