

LESS IS MORE

EXPLORING THE IMPACT OF COMPETITION ON PROFITABILITY

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Less Is More: Exploring the Impact of Competition on Profitability

Abstract

This thesis aims to explore how competition affects profitability. This is done by studying the relationship between competition and profitability across all industries in the U.S. between 2002-2021, focusing on public firms. This thesis is a quantitative study, where multiple linear regressions are used to identify the relationship. Moreover, fixed effects are applied to isolate the effect of competition on profitability. This thesis finds that increased competition in a market leads to lower profits on average for the companies operating within that market. The relationship is examined both by measuring competition as market concentration, using the Herfindahl-Hirschman Index, as well as measuring competition as market position and the consequence of being a market leader. It can be identified that the relationship between competition and profitability is non-linear, where being in a moderately competitive industry yields the highest contribution to profitability on average. This thesis contributes to both academia and practitioners. It adds to the literature on competition's impact on firm profitability. While previous research has mainly addressed specific industries, this study focuses on competition and its effect across industries. Moreover, it contributes to existing literature by using recent data, re-examining competition's potential impact. Further, this study provides a foundation for practitioners both on how to invest and how to regulate in order to ensure an efficient market from the point of view of consumer welfare.

Keywords:

Competition, Herfindahl-Hirschman Index, Market Share, Market Structure, Profitability

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1. Introduction

Market competition is necessary for efficient allocation of resources in an economy. Competition fosters innovation, efficiency, and secures consumer preferences (Vives, 2008). The level of competition within an industry has large consequences for the market dynamics and potentially the profitability of the industry. The relationship between competition and profitability has been studied in the industrial organization literature for more than a century. Industry competitiveness is in theory said to both boost and limit profits. From a consumer welfare perspective, it is important to have well-functioning and competitive markets to maintain competitive prices and avoid potential welfare loss. From an investor perspective, high returns are desired. It is important to acknowledge what industry characteristics that are likely to infer higher returns. Hence, how does competition relate to firm profitability?

An increasing body of research suggests that market concentration in the U.S. has increased over time, and that corporate profits has increased during that same period (Cavalleri, et al., 2019). Since the late 1990s, market concentration levels have increased in more than 75% of the industries in the U.S. (Grullon, Larkin, & Michaely, 2019), implying that competition has decreased in these industries. In the late 20th century, the idea that competition leads to efficient allocation of resources prompted governments worldwide to implement policy reforms, such as tariff reductions, deregulations, and antitrust enforcement to ensure more competitive markets. Such changes in industrial conditions across markets resulted in increased competition (Irvine & Pontiff, 2009; Rajan & Zingales, 2001). Existing markets and players continuously change, and new markets and players emerge. This calls for relevant and new data and research to understand the nature of the relationship between competition and profitability today.

Increasing concentration in a market, inferring that fewer firms are competing in that market, is equivalent to a decrease in competition. This implies an increase in market power of the remaining firms. Market power is the ability of individual firms to influence prices at which goods or services are sold. Similarly, the market share of firms is an indicator of the competition that the firm is facing and its market power. The business community and government antitrust authorities such as the U.S. Department of Justice and the Federal Trade Commission monitor such market trends. As governments and antitrust authorities base their regulations on measurements of competitive intensity, with the welfare of the consumer in mind it is of interest to examine the relationship between competition and profitability. It is also of interest how competition and profitability relate from an investor perspective. As an investor, the different drivers of profitability are important to understand. To efficiently allocate capital it is of interest to understand the effect competition has on returns. For example, on the stock market the investor can short

sell the industry where there are negative trends for future returns and invest in markets where there are positive drivers of profitability.

1.1. The Research Purpose and Research Question

The aim of this thesis is to contribute to the research on competition and how it relates to profitability across industries. This is done by studying public firms in the U.S. over the past 20 years. Previous empirical research on the competition and profitability relationship, focuses mostly on specific sectors or industries. This paper examines the relationship across industries with regard to the market structure that the firm operates within on profitability. In addition, it examines the role of the firm's market share on profitability. Hence, this study focuses on the empirics with recent data across all industries.

To fulfil this aim, the research question of this empirical study is:

What is the nature of the relationship between competition and profitability?

The purpose of this thesis is to provide an understanding for the relationship between competition and profitability. As described, examining the relationship is important for policy decisions and investor preference. Moreover, it contributes to the economic literature to understand how competition drives profitability. To analyze the relationship and fulfill the purpose, an OLS method of multiple linear regression with fixed effects is used. Competition is defined using two measurements, market concentration using the Herfindahl-Hirschman Index (HHI), and market position using the firm's market share. Profitability is measured using a book value, Return on Assets (ROA). This thesis finds that increased competition on average leads to lower profits measuring across industries. This holds for competition measured both as market structure and market share, and it is found that the nature of the relationship is non-linear.

1.2. Delimitations

The delimitations of this empirical study are defined by the choice of case country studied, as well as the time period and the type of industries and the firms that operate in those industries. The focus is U.S. listed firms on AMEX, NYSE, and NASDAQ, as information is extensive and publicly available. Moreover, for studying differences across all industries, choosing the U.S. as the case country is relevant as it is the world's largest economy (IMF, 2023) with relatively unregulated markets with high competition levels.¹

¹ Measured as GDP, interpreted with respect for that it is an incomplete measurement. However, for the purpose of its use it is still considered relevant.

The time period chosen is the past 20 years, 2002-2021, as this provides a relevant and robust indication of how competition affects profitability.

1.3. Structure of Thesis

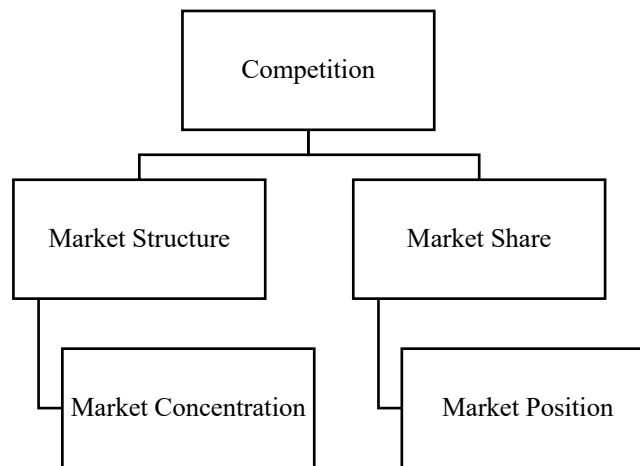
This thesis consists of eight sections. The next section, Section 2 presents a literature review of previous research. It describes the current state of knowledge concerning the relationship between competition and profitability, as well as the research gap and this thesis' contribution. Section 3 provides an outlay of the data, introduces the constructed variables, and explains the data limitations. In turn, Section 4 describes the empirical framework and the methodological limitations, and Section 5 presents the empirical results. Section 6 consists of robustness checks, controlling for subperiods, using a balanced data set, and imposing other restrictions on the data set. Section 7 provides a discussion of the results and its wider applicability. This is followed by a discussion on the limitations of the findings and suggested areas for future research. The last section, Section 8, concludes and presents a summary of the paper.

2. Literature Review

How competition and profitability relate within, and across, different industries have drawn great interest in previous research. This section presents the relevant literature concerning competition and profitability and its relationship. It also explains two distinct proxies for competition, namely market structure and market share, that both will be examined in this thesis when exploring the role of competition. Furthermore, this section investigates the potential gap in the current state of knowledge that initiates this thesis' research focus.

The literature on competition and profitability is extensive and builds on literature concerning early economic theory on competition and in particular market structure's role in how the market works. Competition is a broad term and difficult to measure in practice. One way to analyze competition is to study the market structure and to understand the concentration of market power (Kastratović, Lončar, & Milošević, 2019; Gal & Cheng, 2016). Another way to analyze competition in practice is to observe the market shares and examine the market position of a firm within an industry (Chu, Chen, & Wang, 2008). Hence, competition can be divided into different components more accessible to measure, illustrated in Figure 1.

Figure 1: Competition and Its Components



Note: Figure of competition and its component. Source: Own.

For the research purpose, competition is divided into two main areas, market structure and market share, which is measured as market concentration and market position respectively. Market structure includes the different characteristics of a market, as the number and size of firms, types of products and services, level of competition, degree of market power, and entry barriers. Different market structures have various implications for how firms behave, the pricing of goods and services, and the consumer welfare.

Market structure can be measured by market concentration. Market concentration shows the degree to which few firms control a substantial share of the total market for a given product or service. High market concentration suggests that few large firms dominate the market, while low market concentration indicates a more competitive market with many smaller firms. Thus, there are different types of market structures such as perfect competition, monopolistic competition, oligopoly, and monopoly.

Another way to measure competition is to analyze the market share of a firm which can be used to measure a company's competitive position in an industry. Market share refers to the percentage of total revenue or sales in a market that is captured by a specific firm. Market share can in turn be indicated by the market position of companies in an industry. The market position is the rank or standing of the company in relation to its competitors. A strong market position indicates that the company is competitive in its market, while a weak market position suggest that the firm is struggling to gain market share and compete.

The two ways to measure competition give rise to two strands of literature. The first one, the relationship between market structure and profitability builds on the market power hypothesis, introduced by Bain (1951) building on the work of Mason (1939). The market power hypothesis postulates that more concentrated markets, markets with fewer players, allow the exercise of market power, this primarily by large firms. The second strand of literature investigates the relationship between profitability and market share. Market share is considered one of the most important sources of competitiveness and profitability for firms (Laverty, 2001). Many empirical studies, as shown in Table 1 and Table 2, have been conducted building on these foundations, finding both positive and negative relationships within the two strands of literature.

As the research purpose is to analyze the relationship between competition and profitability, this thesis mostly gains inspiration from the literature studying the empirical relationship between profitability and the two proxies for competition, namely market concentration and market position. However, it is important to keep the underlying economic theory in mind to build a solid foundation. Hence, the literature review first provides a solid review of the underlying economic mechanisms, to then explain the previous empirical literature further.

2.1. Perfect Competition, Monopolistic Competition, and Industrial Organization

Industrial organization as a field of research has existed for as long as economics has existed (Peltzman, 1991). It was brought up and discussed as early as in Adam Smith's famous "Wealth of Nations" (1791) regarding the effects that monopoly and collusion can have, and the determinants of firm structure and firm size.

The theory of perfect competition and a perfect market stem from the work of Walras in the late 19th century. Walras' law or the Walrasian equilibria, models that a market reaches its equilibrium as the quantity supplied equals the quantity demanded for all products and services, including labor - implicating that there is perfect competition. This implies that in the short run, average cost equals the marginal cost, and in the long run this also equals the price of the product or service, thus clearing all markets implying that demand and supply are met. In extension, when market price equals marginal cost, there is perfect competition. However, in practice this is rarely the case. An industry that is typically mentioned as an example of being close to perfect competition is the coal industry, albeit not being perfect competition it is an industry where there are many buyers and sellers that have almost identical products (Trüby & Paulus, 2012). Moreover, when there is monopoly, the price is no longer to be set at marginal cost, but rather above the marginal cost implying that the firm will earn a positive profit. It can be noted that most industries and firms are somewhere on the scale between perfect competition and monopoly operating at different levels of economic profitability.

Although being a topic that since long has been researched and discussed, it was in the 1930s, likely to have been spurred by the dissatisfaction with the performance of the economy at the time, when the field started to flourish. This included the work of Chamberlin (1933) introducing the concept of monopolistic competition. Chamberlin raised the point that monopolistic competition leads to less efficient outcomes than perfect competition does as firms have a certain degree of market power which allows them to charge a markup over marginal cost. Monopolistic competition is defined as imperfect competition where several producers compete selling differentiated products that are not perfect substitutes. This implies that the competition is less intense compared to perfect competition. Chamberlin therefore argued that monopolistic competition leads to greater product differentiation and innovation than perfect competition. Chamberlin's work on monopolistic competition helped lay the foundation for the study of industrial organization and has been a major influence on subsequent research in the field. It has also had a significant impact on antitrust policy, as it emphasizes the importance of considering market power and product differentiation in determining whether a market is competitive.

Building on Chamberlin's work, Chamberlin and Robinson published *The Structure-Conduct-Performance (SCP) paradigm* which Bain (1959) later developed (Faccarello & Kurz, 2016). The SCP paradigm highlights the importance of competition and market structure in shaping behavior and outcomes of firms in the market, suggesting that the structure of a market influences conduct of firms, which in turn affects their performance. This implies that characteristics such as number of firms, size of firms, and entry barriers influence firms' pricing, innovation strategies, and advertising, which then affects the

profit and market share of the firm. It predicts a causal relationship between industry concentration and firm profitability, and that the existence of high profits is a signal of monopoly power. The SCP paradigm dominated the market until the early 1980s. Typically, cross-sectional data was used using Standard Industrial Classification codes (SICs) to separate industries and regressions were run on average profit rate on variables such as concentration, entry barriers, R&D spending, and other market structural measurements. However, since then it has faced criticism as it has been argued that all variables were endogenous, implying that no causal relationship could be found (Slade, 2004).

Stigler (1964) demonstrated with the theory of oligopoly that when firms collude, uncertainty hinders the detection of secret price reductions and leads to cartel instability. This means that uncertainty surrounding the percentage increase in sales from undetected price cuts increases with number of firms in the industry and in turn decreases as inequality of firms' market shares increases. Furthermore, Stigler (1964) illustrated that aggregating the variances of firms' sales shares results in a variable that is proportional to the Herfindahl-Hirschman index (HHI) measuring the concentration in industries (Slade, 2004). HHI is commonly used as a measure of market concentration.²

Other models have since been formulated which do not predict the same relationship as the SCP paradigm. One that has received attention is the explanation of firm market share or size. This was proposed by the "Chicago-school" economists as they criticized the SCP paradigm (Faccarello & Kurz, 2016). This strand of theory presents that although markets are competitive, firms vary in productivity. Because efficient firms expand and dominate their markets, inefficient firms decline and eventually leave resulting in that industries with the largest efficiency differences have the most uneven market structures and the highest level of horizontal concentration. In turn, it is possible to identify that the dominant and highly profitable firms have a positive correlation between concentration and profitability, however not as a result of market structure itself.

Given these opposing views, there are proposedly two ends of the spectrum. There is the one side which represents market structure, arguing that market share itself should not matter and that it is the horizontal concentration that is the determinator of the profitability of the firm in the industry. Then there is the other side, which is conditional on the share that a firm has of the market and the profitability should be determined by its position rather than the horizontal concentration.

Nevertheless, most antitrust agencies in Western countries assume that the market structure concentration-profitability relationship exists when forming policy (Shughart, 2022). European antitrust laws have to a large extent been built upon the U.S. antitrust

² A further explanation of HHI is provided in Section 3.3.

laws as the U.S. introduced the competitive culture to Europe (Monti, 2001). With time the U.S. and Europe now share the same views on antitrust law and share the same goals with their antitrust law implementation. The U.S. antitrust agency, the Federal Trade Commission, and the Department of Justice, oversee implementation of the three main antitrust acts which are the Sherman Act, the Federal Trade Commission Act, and the Clayton Act. The U.S. antitrust law is constructed to ensure and maximize consumer welfare, having trust in that a close to perfect competitive market will ensure this (Investopedia, 2022). The antitrust acts are in place to protect firms and consumers from manipulation taking place in the market and to ensure that there is no rigging, monopolization, or mergers and acquisitions that are anti-competitive which are allowed. A famous example of where the Supreme Court of the United States decided to dissolve a company due to it having a monopoly position in the market is the Standard Oil Co. of New Jersey v. United States (1911) case. This was decided on the grounds of the Sherman Act, where Standard Oil, which was an oil conglomerate, had a market share of 64%. Standard Oil was ordered to geographically split and instead formed 34 new companies, this against the backdrop of wanting increased competition.

2.2. Market Power, Efficiency, and Superstar Firm Hypotheses

As discussed, the relationship between market structure and market share on profitability has been quite researched without a consensus being found. Traditionally, the positive relationship is explained by either the market power hypothesis or the efficiency hypothesis (Kastratović, Lončar, & Milošević, 2019). In short, the difference between the two hypotheses is that the market power hypothesis claims that the reason as to why there is a positive relationship between market concentration and profitability is due to collusion and that firms in these dominant positions are able to abuse their market power (Bain, 1951). The efficiency hypothesis argues that the relationship between market concentration and profitability itself is false, and that it instead is efficiency of dominating companies that is the originator to both market concentration and profitability (Demsetz, 1973). Building on the Structure-Conduct-Performance paradigm (Chamberlin, 1933; Bain, 1951) Rhodes (1983a) introduced the relative market power hypothesis which instead of firm concentration predicts a positive relationship in regard to the market share of a firm and the firm's performance. More specifically, the relative market power hypothesis focused on the role of market share in level of profit and prices (González, Búa, Razia, & Sestayo, 2019).

More recently, the development of the superstar firm hypothesis has also gained influence (Autor, Dorn, Katz, Patterson, & Van Reenen, 2020; Stiebale, Südekum, & Woessner, 2020). The superstar firm hypothesis focuses on explaining the relationship between market share and profit, and claims that the reason why profits increase with market

concentration is due to it being the more productive firms that gains market share. Thus, it is not the structure of the market, but rather the firms that are able to gain market share that positively correlates with profit.

2.3. Early Empirical Research on the Profitability-Competition Relationship

Previous research has extensively studied the effect of market structure on the behavior of market participants. Mason (1939) was among the earliest researchers to examine the link between market structure and market performance, proposing a positive correlation based on the profit maximization goal of individual companies. Building on Mason's work, Bain (1951) expanded the analysis to industry level. It is one of the first empirical studies on the relationship between concentration and profitability in the manufacturing sector. Bain studied the relationship between the market share of the largest firm in an industry, concentration ratio, and profit rate. Where the profit rate chosen is the ratio of annual net profit after income taxes to net worth as of the beginning of the year. Where net worth is the book value of equity. The study found that there is a positive relationship between concentration and profit rate, with more concentrated industries having higher profit rates. It also found that the relationship was stronger for industries with a high degree of product differentiation, and weaker for industries with a low degree of product differentiation. The study is considered a classic in the field of industrial organization, it has been widely cited and the findings have been used as a foundation for further research on the topic. Bain has also done work on how a firm's profit rate can serve as an indicator of its degree of monopoly power (Bain, 1941), arguing that a higher profit rate can indicate a greater concentration of market power and a corresponding ability to control prices and restrict competition.

Following the research by Bain and scholars, numerous conceptual and empirical studies have been conducted on the subject of competition as market share. They suggest that a high market share indicates a strong competitive position in the market and that firms with higher market shares are better able to meet customer needs, resulting in a competitive advantage over smaller competitors (Demsetz, 1973; Buzzell & Gale, 1987; Schwalbach, 1991). Since the first published studies reporting a positive market share–profitability association (Gale, 1972; Shepherd, 1972), the nature of the relationship between market share and profitability continues to be an important subject to research in many fields, especially economics (Rhoades, 1983b; Kurtz & Rhoades, 1992; Frame & Kamerschen, 1997; Goddard, Tavakoli, & Wilson, 2005).

2.4. The Relationship Between Profit and Competition

Bain's early findings have been challenged by subsequent studies, which have found that there is no definitive relationship between competition and profitability. Empirically, several previous studies report a positive relationship (as shown in Table 1), while others find a negative relationship (as shown in Table 2). There have also been empirical studies that find no systematic relationship.

The industrial organization literature includes numerous empirical papers of supposed connections between elements of industry structure and performance. Empirical research on the impact of competition on profitability has been conducted on various countries, such as the U.S., Australia, and Serbia. The research has often built on the framework of the SCP paradigm, using a cross-sectional approach with an ordinary least squares (OLS) methodology. Although competition can be measured in various ways, focus is on competition measured as market concentration and a firm's competitive position.

2.4.1. A Positive Relationship

Several empirical studies have built on the seminal work of Bain (1951). Selected studies are presented in the table below (Table 1). These studies empirically test the relationship between profitability and competition and have reported a statistically significant positive relationship.

Table 1: Summary of Positive Profitability-Competition Relationship Articles

Article	Period	Country	Industry	Profit measure	Competition measure
Collins & Preston (1969)	1958-1963	US	Multiple	Price-cost margin (Operating margin)	CR4
Strickland & Weiss (1976)	1963	US	Manufacturing	Price-cost margin (Operating margin)	PMES
Neumann et al. (1979)	1965-1973	Germany	Multiple	Return on Equity	CR3
Kurtz & Phoades (1992)	1986	Multiple	Banking	Return on Assets	HHI, CR3, MS
Bhattacharya & Bloch (1997)	1984-1985	Australia	Manufacturing	Price-cost margin (Operating margin)	HHI
McDonald (1999)	1984-1993	Australia	Manufacturing	Profit-cost margin (Operating margin)	CR4
Goddard et al. (2005)	1993-2001	European	Manufacturing	Return on Assets	MS
Chu, Chen & Wang (2008)	2003-2005	Taiwan	Securities	Return on Assets	MS
Stiegert et al. (2009)	1972-1992	US	Food and Tobacco Processing	Price-cost margin (Operating margin)	CR4
Bhandari (2010)	1993-2005	India	Multiple	Rate of Return	HHI, CR4
Pervan & Mlikota (2013)	1999-2009	Croatia	Food and Beverage	EBITDA ratio	HHI, CR3
Gallagher et al. (2015).	1993-2007	Australia	Multiple	Stock return	HHI
Gu (2016)	1963-2013	US	R&D intensive	Stock return	HHI, THHI
Setiawan & Efendi (2016)	1980-2011	Indonesia	Manufacturing	Average price-cost margin	HHI, CR4, MS
Blažková & Dvouletý (2017)	2003-2014	Czech Republic	Food and Beverage	Price-cost margin (Operating margin)	HHI, CR4
Skuflić et al. (2018)	2003-2014	Croatia	Construction	Net profit after tax	HHI
González et al. (2019)	2005–2012	MENA	Banking	Return on Average Assets	HHI, MS
Grullon et al. (2019)	1972-2014	US	Multiple	Return on Assets	HHI, CR4
Kastratović et al. (2019)	2015-2017	Serbia	Manufacturing	Market-level net profit margin	HHI
Eide (2021)	2000-2018	Norway	Multiple	EBIT & EBITDA margin, ROA, markup	HHI

Note: A non-exhaustive list of studies reporting a positive relationship between profitability and competition. HHI is the Herfindahl-Hirschman Index, CRN is the N-firm concentration ratio, MS is the Market Share, PMES is plant minimum efficient scale, and THHI is the Text-Based HHI. As studies within the fields of accounting and economics refer to accounting measurements differently, an interpretation of the measurement used is found in parenthesis. Source: Own.

Numerous studies have been conducted over the last 70 years where several different countries and industries with different characteristics have been of research interest. Mostly similar methodology is used, regressions are used where profitability is the dependent variable and a competition measure is the independent variable of interest, all with the same result, a positive relationship. Hence, the studies support the theoretical literature of the traditional market power hypothesis and the SCP paradigm. The literature also appears to be in favor of the superstar firm hypothesis, efficiency hypothesis, and the relative market power hypothesis about market position and share having a positive relationship with firm profitability.

2.4.2. A Negative Relationship

However, multiple empirical studies have found a statistically significant negative relationship between competition and profitability. Selected studies are presented in the table below (Table 2).

Table 2: Summary of Negative Profitability-Competition Relationship Articles

Article	Period	Country	Industry	Profit measure	Competition measure
Porter (1974)	n/a	US	Consumer Goods	Profit Rate	CR8
Nickell & Metcalf (1978)	1974-1976	UK	Manufacturing	Cost Margin	CR5
Connolly & Hirschey (1984)	1977	US	n/a	Market Value	CR4
Anderson et al. (2000)	1996	Mongolia	7 sectors	Sales, Capital	MS
Hou & Robinson (2006)	1963-2001	US	n/a	Stock Return	HHI
Giroud & Mueller (2011)	1990-2006	US	48 sectors	Excess Return	HHI, CR4
Gschwandtner (2012)	1950-2000	US	Manufacturing	Profit Persistence Rate	CR4
Alhassan et al. (2015)	2007-2011	Ghana	Insurance	ROA	HHI
Mukhopadhyay & Chakraborty (2017)	2001-2013	India	Manufacturing	ROA, Tobin's Q	HHI, CR, ER
Shanko, Timbula & Mengesha (2019)	2010-2017	Ethiopia	Banking	ROA	HHI

Note: A non-exhaustive list of studies reporting a negative relationship between profitability and competition. HHI is the Herfindahl-Hirschman Index, CRN is the N-firm concentration ratio, and MS is the Market Share. As studies within the fields of accounting and economics refer to accounting measurements differently, an interpretation of the measurement used is found in parenthesis. Source: Own.

These studies, as the studies finding a positive relationship, span across different countries, industries, and time periods. A similar methodology is used, but instead of finding a positive relationship between concentration and market position on profitability, these studies find a negative one. They find that businesses in industries with a higher market concentration or firms with a high market share earn lower profit. They conclude that the SCP paradigm is not always accurate, and that the most conventional economic theory does not hold in practice.

Another study by Keil (2017), discusses that a significant negative relationship between market share concentration and profitability can occur when there is a negative correlation between market share and costs. However, Keil does not conduct an empirical study himself.

2.4.3. A Complex Relationship

Even though there is an extensive list of studies that have found a positive, or a negative, relationship between competition and profitability, some researchers do not find any statistically significant relationship between competition and profitability (Clarke; 1984; Mishra, 2008; Keil, 2018; Khan & Hanif, 2018). This would suggest that there is no systematic variation between the two.

There are also studies that find a positive relationship between competition and profitability regarding market share but not when testing for concentration. Outreville (2015) study the Canadian wine industry between 2010-2012. Outreville investigates the SCP paradigm, the relative market power hypothesis, and the efficiency structure hypothesis. Outreville finds support for the efficiency structure hypothesis, that there is a positive relationship between market share and profitability. However, Outreville does not find a significant positive relationship between concentration, measured as HHI, and profitability. Going back in time, another article by Branch and Gale (1982) also suggests that there is a significant positive relationship between market share and profitability, but not concentration. Thus, both authors suggest that market share is the primary determinant of profitability. They determine that scale economy is more efficient in generating profits than oligopoly power driven by concentration.

Clarke (1984) examines the link between market concentration and different profit margins in the UK manufacturing industry between 1970-1976 but finds no significant linear relationship between concentration and profitability in this period. On average, Clarke could rather see a negative relationship between the two. He finds a positive correlation between variability in the two measurements over time. In line with the complex relationship found by Clarke (1984) but with more recent data of India between the period 1992-1999, Mishra (2008) finds that the traditional positive relationship between concentration and profitability does not hold in a dynamic context. Mishra offers an explanation that this is due to the entry of new firms, inefficiency, or changes in industrial production.

Also studying an Asian country, Khan and Hanif (2018) empirically evaluate the SCP paradigm of the banking sector in Pakistan between 1996-2015. They find a weak linkage between market structure and firm performance but reject the SCP paradigm as the relationship is proven unclear. Leaving India and Pakistan, Li, Nie, & Zhao (2017) study the solar cell industry in China between 2008-2014. They find that market concentration and market share are not significantly related to corporate performance.

Keil (2018) studies business segments in the U.S. during 1976-2015 and concludes that there is no evidence from the regression that concentration has a statistically, or economically, significant positive impact on persistent profit rate differentials. Instead,

there is weak evidence for a statistically and economically significant negative causal effect of concentration on profitability. Hence, positive, negative, and uncertain relationships between competition and profitability have all been found in previous research.

2.4.4. Measurement of Competition and Profitability

To analyze how competitive a market is, it is important to specify the degree of competition between companies in an industry. Regarding the measurement of competition, there are two measurements of industrial concentration that stands out to be the most frequently used by economists. These are the Herfindahl-Hirschman Index (HHI) and the concentration ratio of the four firm (CR4). HHI quantifies how an industry's market share is distributed and CR4 measures the four biggest firms' market share of the industry.³ These measurements are often used as proxies for the market structure. A majority of the previous research has used HHI, adding up the square of the contribution of each firm in a decimal structure in the industry, to measure the level of competition of the industry (Bhattacharya & Bloch, 1997; Hou & Robinson, 2006; Giroud & Mueller, 2011; Gu, 2016; Amini Moghadam, 2018). However, in previous research, HHI is often substituted with the a concentration ratio measure as well to fully study the effect on market concentration on profitability (Kurtz & Rhoades, 1992; Bhandari, 2010; Giroud & Mueller, 2011; Pervan & Mlikota, 2013; Alhassan, Addisson, & Asamoah, 2015; Setiwan & Effendi, 2016; Blažková & Dvouletý, 2017; Grullon, Larkin, & Michaely, 2019).

Moreover, while HHI and CR4 are considered structural measurements of concentration, there is also a non-structural measurement called Lerner Index. The Lerner Index is a measurement of market power and the markup that a firm is able to charge. Although it has its limitations, for example regarding how it is measured, Lerner Index is by many scholars known as the best measurement for measuring monopoly power (Mills & Elzinga, 2011; Yuanita, 2019).

Another way to measure competition is to study the market share to understand a firm's position within an industry (Anderson, Lee, & Murrell, 2000; Chu, Chen, & Wang, 2008). Market share appeals to the second strand of literature, where HHI, CR4, and Lerner Index are measures of concentration relating to market structure, market share relates to competition in form of market position of firms within an industry. González, Búa, Razia, & Sestayo (2019) use both HHI and market share as competition measurements and suggests that higher market share relates to higher profits. This since high market share companies can set higher prices without being challenged.

³ For formulas estimating HHI and CR4, go to Section 3.3.1 (Equation 3.2 and Equation 3.3).

Previous research also differs in how profitability is measured. From previous research it can be concluded that research has mostly been testing profitability in form of a book value, as for example ROA (Kurtz & Rhoades, 1992; Goddard, Tavakoli, & Wilson, 2005; Chu, Chen, & Wang, 2008; Grullon, Larkin, & Michaely, 2019). However, there has also been research testing profitability in form of a market value, for example stock return (Gallagher, Ignatieva, & McCulloch, 2015; Gu, 2016). Multiple studies also use some sort of a profit margin (Clarke, 1984; McDonald, 1999; Pervan & Mlikota, 2013; Kastratović, Lončar, & Milošević, 2019).

2.4.5. Previous Delimitations

Previous literature has studied different cases. There are big variations in case company, case industry, and case period. Focusing on the U.S. as the case country, various research has been conducted. One important study is the work of Grullon, Larkin, & Michaely (2019) as they investigate the profitability-competition relationship over a longer period than most other articles. They present a positive significant correlation between market concentration, as measured by HHI, and profit margins, as measured by return on assets and operating margins, for firms in the U.S. between 1972-2014. Studying multiple industries, the authors propose that the relationship has become stronger over time, especially after the year 2000.

When studying multiple industries, industry belonging needs to be defined. Many researchers use the Standard Industrial Classification (SIC) codes to define the industry of interest (Collins & Preston, 1969; Strickland & Weiss, 1976; Hou & Robinson, 2006; Stiegert, Wang, & Rogers, 2009; Gu, 2016). Hou and Robinson (2006) find a balance using a three-digit level SIC classifications based on two reasons. First, firms in unrelated business operations should not be grouped together and second, using an industry classification on a finer level will result in groups that are statistically arbitrary. Replicating the results using two- and four- digit level results in qualitative identical results.

2.5. The Research Gap and Contribution

To give a summary of previous research, the empirical studies above demonstrate that the relationship between competition and profitability can vary and is often complex. It varies depending on method, measurement, industry, and country being studied, and it highlights the need for further research in this area. Many factors, such as market structure, regulatory environment, and technological innovation, shape the relationship. In some cases, in line with economic theory, lower competition results in higher

profitability. In other cases, lower competition leads to lower profits as higher competition can result in improved offerings for consumers, and a higher profit.

Previous literature shows a gap with regard to studying several industries over time. Earlier studies have mostly been concentrated to few sectors, such as manufacturing or financial services and have thus not been based on a broad range of SICs. This makes it difficult to generalize any obtained result to the total economy. Furthermore, although the topic of competition as a determinant of profitability has been studied for a long time, it will always be of interest both from a consumer and investor perspective. The field is always changing and in need of more recent studies to make relevant decisions.

The contributions of the findings of this thesis are multiple. First, the findings expand to earlier findings within the field of industrial organization related to profit determinants by investigating competition, in the case of market structure and firm size. Second, differing from previous research this thesis adds to the literature in its attempt to explore differences across many industries, hence not limiting the research to only the manufacturing sector or banking sector. Third, adding to the research examining the U.S. as the case country, this thesis employs recent data re-examining the topic and contributing to new findings in the constantly changing landscape of competition. Lastly, this thesis contributes by clarifying the relationship between competition, in the form of market concentration and market position, and profitability.

3. Data

This section outlines the data used in this empirical study. To answer the research question, data on market structure, market position, and firm characteristics is needed. First, the data set used in the analysis is presented. Second, the created dependent variable of profitability is described. Third, the independent variables of market structure and market share are explained. Fourth, the control variables are presented where firm age, innovation, leverage, and product differentiation are included. Fifth, variables that are unaccounted for are discussed as well as their implication for the result. Moreover, an overview is provided of the limitations that the choice of data implies. Lastly, descriptive statistics are presented.

3.1. Data Collection

The data used in the analysis is collected from Compustat. This as Compustat is an extensive and comprehensive data base, allowing for a large and relevant sample. The sample consist of U.S. firms listed on NYSE, AMEX, or NASDAQ (Compustat item EXCHG) in accordance with previous literature (Hou & Robinson, 2006; Amini Moghadam, 2018). As the data is on U.S. listed companies, the accounting standard is US GAAP. The data is collected between 2002-2021, a period of 20 years. A large interval is chosen to be able to draw general conclusions, but a robustness check will also be conducted comparing the relationship within the data over time and see if it differs during different subperiods. During the 20-year period there is a total of 10,325 firms operating on the exchanges. Industries are classified using SIC codes at a three-digit level in accordance with previous literature (Hou & Robinson, 2006; Gu, 2016). Using a three-digit classification increases the probability that larger firms are grouped as competitors in the same industry. Firms that do not have a SIC code are excluded from the data set. As there are companies that throughout this 20-year period has changed their fiscal year end, the last record in the calendar year is chosen.

The data from the financial statements that can be retrieved from the data base Compustat covers the needs for this thesis regarding all metrics used. It provides identifying information like the SIC, company descriptives, supplemental data items, income statements, balance sheets, cash flow statements, and miscellaneous items. The data set used is an unbalanced panel data set as companies have both entered and exited the market during the 20 years studied. All companies, both active and inactive, are included as they have affected the market when active. In section 6, a robustness check using balanced panel data is conducted to verify that this does not bias the results in any direction.

3.2. Profitability as the Dependent Variable

The dependent variable is a measurement of profitability. It is represented by book value Return on Assets (ROA). A book value is chosen over a market value as it better captures that actual performance of the company in relation to the effect that competition potentially can have. Using a market value, for example stock return would imply the risk of the effect already being included in the share price. In this subsection the construction of this dependent variable is explained. Firms commonly use ROA as a performance measurement and continuously set target ratios of for example ROA which is evaluated regularly. Moreover, ROA is considered by investors when understanding and evaluating the profitability of the firm.

3.2.1. Return on Assets

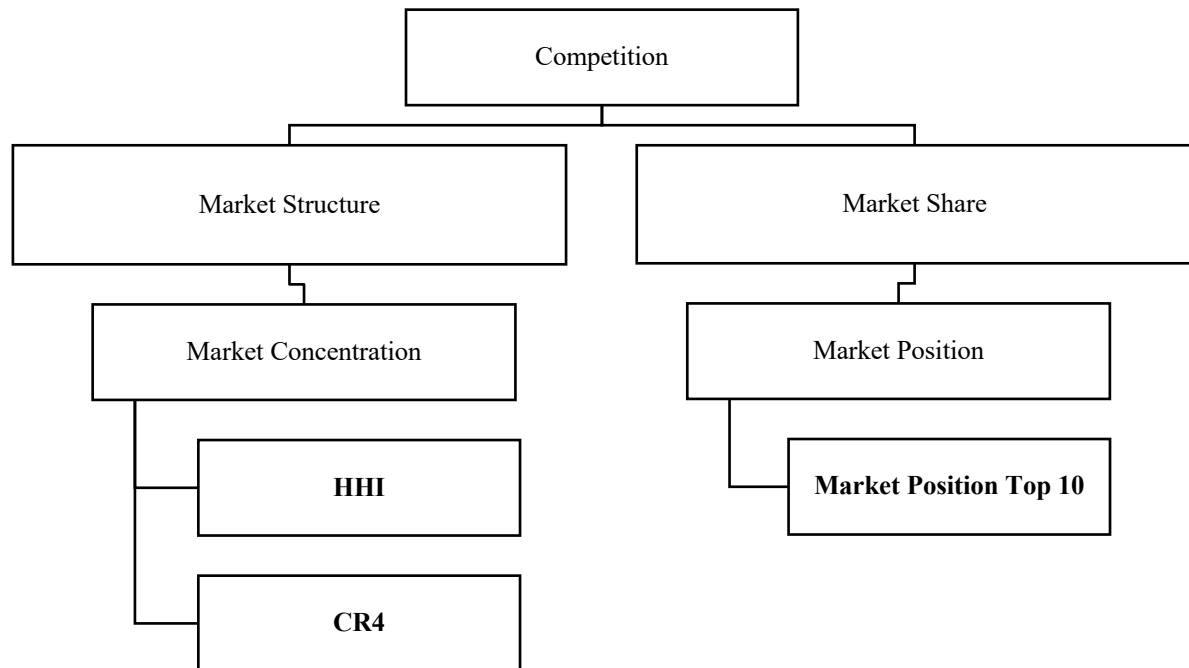
Following previous literature, ROA is commonly used as a profitability measure when calculating profitability in relation to competition measurements (Kurtz & Rhoades, 1992; Goddard, Tavakoli, & Wilson, 2005; Chu, Chen, & Wang, 2008; Alhassan, Addisson, & Asamoah, 2015; Mukhopadyay & Chakraborty, 2017; Grullon, Larkin, & Michaely, 2019; Shanko, Timbula, & Mengesha, 2019). ROA is used as the ratio is independent of changes in capital structure and by nonrecurring items. It is calculated as EBIT divided by the prior year end total assets (item EBIT and TA), as expressed in Equation (3.1). Where $EBIT_{it}(CB)$ is the earnings before interest and tax of firm i at year t , and $Total Assets_{it-1}(OB)$ is the total assets of firm i at year $t - 1$. ROA is winsorized at 11% to mitigate the effect of extreme outliers in the sample.

$$ROA_{it} = \frac{EBIT_{it}(CB)}{Total Assets_{it-1}(OB)} \quad (3.1)$$

3.3. Competition as the Independent Variables of Interest

Competition is measured in several fashions to capture its implications at full scale. The independent variables of interest are two different proxies of competition, namely Herfindahl-Hirschman Index (HHI) and Market Position. Moreover, an additional measurement for market concentration is included as an alternative measurement: CR4. In this subsection the construction of these variables is explained.

Figure 2: Variables Estimating Competition



Note: Figure of competition and its component. Source: Own.

In the literature there is third measurement of concentration that is used on some occasions which is called Lerner Index (Grullon, Larkin, & Michaely, 2019). The Lerner Index is a measurement of monopoly power. The Lerner Index is mostly confined to theoretical studies due to the challenge of accurately measuring costs in practice. It measures the extent to which prices exceed marginal costs (price-cost margins). Other measurements, such as the HHI, are more frequently employed to estimate monopoly power using real industry data. Moreover, as the Lerner Index often is calculated as an operating margin, EBIT over sales, it is dependent on capital turnover rate and works poorly when using ROA as the profitability measurement. Hence, the Lerner Index will not be employed as a measurement of competition in this thesis.

3.3.1. Herfindahl-Hirschman Index

Considering the consistence of prior studies, HHI is the first key independent variable to measure competition, more accurately market concentration, at the three-digit SIC code industry level. The HHI is calculated by adding up the square of the contribution of each firm in a decimal structure of each firm within the industry, as demonstrated in Equation (3.2).

$$HHI_{jt} = \sum_{i=1}^{n_j} s_{ijt}^2 = \sum_{i=1}^{n_j} \left(\frac{R_{ijt}}{\sum_{i=1}^n R_{ijt}} \right)^2 \quad (3.2)$$

Where s_{ijt} is the market share of firm i in industry j at year t , and R_{ijt} is the revenue of firm i in industry j at year t . To compute the market shares, Compustat's data on revenue is used (item REVT). Firms that have a negative revenue are excluded from the data set to correctly calculate the HHI.

Table 3: Herfindahl-Hirschman Index Classification

Value of HHI (%)	Category of Market	Interpretation of Market Structure
$HHI < 0.15$	Unconcentrated (Low)	Effective competition
$0.15 \leq HHI \leq 0.25$	Moderately Concentrated (Medium)	Monopolistic competition
$HHI > 0.25$	Highly Concentrated (High)	Oligopoly, dominant firm with competitive fringe or monopoly

Note: A description of the HHI variable in classifying industries. Source: United States Department of Justice (2018).

HHI is used as logarithmic in the regressions as it provides the best fit for describing the relationship within the data. Moreover, three dummy variables are created categorizing low, medium, and high industry concentration as shown in Table 3. These are the following, HHI_H which is 1 when $HHI > 0.25$ and 0 otherwise, indicating that the industry concentration is high. HHI_M which is 1 when $0.15 \leq HHI \leq 0.25$ and 0 otherwise, indicating that the industry concentration is moderate. Lastly, HHI_L which is 1 when $HHI < 0.15$ and 0 otherwise, indicating that the industry is unconcentrated. The reason for including the HHI dummies is that they alleviate measurement errors in nuances that otherwise potentially would affect the results. By not interpreting small nuances in the data, but rather categorizing HHI, it is possible to compare competitive and monopolistic industries regarding their respective effect on profitability.

HHI is known for understating the level of competition in industries that are exposed to foreign competition and where imports consist of a significant share of the market (Amini

Moghadam, 2018). This reduces the probability of identifying a significant relationship between market concentration and profitability. Nevertheless, this makes the result slightly more conservative which implies that if a relationship is found it is more robust.

There is some research which suggests that the commonly used SIC-based HHI does not align as well with industry price cost margin and firm size measures as the HHI measurement provided by the U.S. Census Bureau (Ali, Klasa, & Yeung, 2009). Nevertheless, there are drawbacks with the U.S. Census measurement of HHI as well. Firstly, it only measures the competition index for manufacturing industries, and secondly, it is only calculated and published every five years. Against this backdrop, Hoberg & Phillips (2010; 2014; 2016) developed and introduced the THHI which is a text-based network industry classification index. It is derived using descriptions from firms' annual firm 10-Ks and by identifying each firms' competitors. When THHI and HHI has been used as alternative measures in previous research they have provided the same results and been equally powerful in explaining industry concentration (Amini Moghadam, 2018). Thus, in this paper HHI will be used as the main proxy for industry concentration.

3.3.2. Alternative Concentration Measurement: CR4

Following previous research, a second measure of market concentration is used, namely CR4. It is used as an alternative measure to verify the results found when measuring competition as HHI. It is calculated as the market share of the four largest firms towards the estimated turnover of the total industry, as demonstrated in Equation (3.3).

$$CR4_{jt} = \sum_{i=1}^{4_j} s_{ijt} = \sum_{i=1}^{4_j} \frac{R_{ijt}}{\sum_{i=1}^n R_{ijt}} \quad (3.3)$$

Where s_{ijt} is the market share of firm i in industry j at year t , and R_{ijt} is the revenue of firm i in industry j at year t . To compute the market shares, Compustat's data on revenue is used (item REVT).

Table 4: CR4 Classification

Value of CR4 (%)	Category of Market	Interpretation of Market Structure
$CR4 < 0.50$	Low	Perfect Competition, Effective Competition, or Monopolistic Competition
$0.50 \leq CR4 \leq 0.75$	Medium	Monopolistic Competition or Loose Oligopoly, Tight Oligopoly, or Dominant Firm with a Competitive Fringe
$CR4 > 0.75$	High	Perfect Monopoly, The Dominant Firm with Competitive Fringe, or Effective Monopoly

Note: A description of the CR4 variable in classifying industries. Source: Bain (1959).

When regressing CR4 on profitability, it is included both as it is and as three dummy variables categorizing low, medium, and high industry concentration as shown in Table 4 in accordance with Bain (1959). CR4_H is created which is 1 when $CR4 > 0.75$ and 0 otherwise, indicating that the industry concentration is high. CR4_M is 1 when $0.50 \leq CR4 \leq 0.75$ and 0 otherwise, indicating that the industry concentration is moderate. Lastly CR4_L is 1 when $CR4 < 0.50$ and 0 otherwise, indicating that the industry concentration is low. CR4 are included as dummies to alleviate measurement error, and as categorizing CR4 allows for comparison of competitive and monopolistic industries' effect on profitability.

3.3.3. Market Position

As this thesis also study market share's effect on profitability in addition to market structure, it includes firm size and investigate more particularly the market position of a firm within an industry. A market position variable is constructed to determine the effect of market position in terms of revenue within an industry each year (item REVT). The market positions that are included is the market leading position, the firm that has the 5th largest position, as well as the firm that has the 10th largest position within each industry, named M1, M5, and M10 respectively. These are chosen as they represent a dispersed sample among the largest firms and thus potential differences among the role of market position can be examined. The firm that has the leading market position corresponds to market position 1 and is named M1, the firm having the fifth largest position has market position 5, M5, and the firm that has the tenth position in the market has market position 10, M10. Three different dummies are constructed. M1 that takes on the value 1 if the firm has market position 1, and 0 otherwise. M5 that takes on the value 1 if the firm has market position 5, and 0 otherwise. The last one, M10 takes on the value 1 if the firm has a market position 10, and 0 otherwise.

3.4. Control Variables

Regarding control variables, it is necessary to control for additional factors that could influence profitability of a firm, that otherwise risk biasing the variables of interest. These profitability determinants include firm characteristics, market conditions, and time trends. Four control variables are included. These are leverage, innovation, product differentiation, and firm age. In this subsection the construction of these variables is presented, as well as the reason to why they are included. The control variables that are included also diminish a potential source of omitted variable bias – and although they likely do not adjust for it completely, they are important to include when estimating our models. Fixed effects regressions are moreover used to control for time trends and industry trends – which will be discussed in the Empirical Framework, Section 4. Following previous research (Giroud & Mueller, 2011; Hoberg, Phillips, & Prabhala, 2014; Amini Moghadam, 2018) all control variables are lagged as their effect is not believed to be realized right away and to mitigate the risk of including bad controls which are an output of the variable of interest. All control variables except firm age are winsorized at a 5% level to mitigate the effect of extreme outliers.

Leverage

Leverage is included to control for more profitable companies. More profitable companies are less risk-averse to leverage which implies that these firms can bear more debt, hence profitable firms have a higher debt capacity. This is proxied by adding long-term debt (item DLTT) and short-term debt (item DLC) and scaling it by total assets (item AT).

Innovation

R&D spending, as a proxy for innovation, is of interest to control for as it is likely to impact profitability (Mukhopadhyay & Chakraborty, 2017; Kastratović, Lončar, & Milošević, 2019). This is incorporated in the model by using R&D spending (item XRD) and by following previous literature, the spending is set to zero when it is missing in the data set as this is how Compustat treats non-existing spending (Amini Moghadam, 2018).

Product Differentiation

Product Differentiation is included as a control variable as it is a characteristic that may affect firm profitability (Bain, 1951). As a proxy for product differentiation, firms' advertisement expenses are used (item XAD) and whenever a value is missing in the Compustat database, standard practice in literature is used, and advertising expenses are set to zero (Bhandari, 2010; Amini Moghadam, 2018; Kastratović, Lončar, & Milošević, 2019).

Firm Age

It is important to control for at which stage the firm is at in its journey as this is likely to have an important effect on the profitability of the firm, following previous literature (Chu, Chen, & Wang, 2008). This is done by estimating the age of the firm (item DATADATE), which is done by calculating the number of years that the firm has been in the data set. For the firms that has been in the data set during the entire period (since 1951), the age is likely to be higher than estimated by the data set. However, this is only applicable to a few observations and thus not considered to be a problem. Moreover, whether a firm is 71 or 75 years old is not likely to constitute any large biases. The reason as to why firm age is important to include is that on the one hand, if a firm is in the start-up phase, it is likely that its profitability is affected by the process of actively working to gain market share by large investments which can create a misleading return on assets for the firm. On the other hand, more mature firms are likely to not have as high returns as they are more likely to having entered a steady stage where returns on average are lower and steadier.

3.5. Data Limitations

The data set used is extensive and thoroughly created, however there are limitations to it and with the collection of data. To fully understand the findings of this thesis and its wider applicability, attention needs to be drawn to these limitations as they could potentially affect the relationship studied between competition and profitability. Moreover, there are unaccounted variables which create an omitted variable bias that must be considered when examining the robustness of the results.

As Compustat only collects information on public firms, our models will only be estimated on these. Therefore, smaller firms are to a certain extent not included in the data set and can thus not be accounted for when calculating the market concentration or market share. Moreover, as it is only companies listed on the U.S. stock exchanges that are included in the data set, competition may be larger in some industries than estimated by the data. This as foreign competition is not perfectly accounted for. Furthermore, Compustat uses data from financial statements that the companies themselves provide which can create a bias in the accounting. There is the risk of companies having an agenda to use the accounting in favor of the result of the company, such as earnings manipulation.

Although Compustat provides data suitable for the research purpose there are several other factors that potentially affect profitability that this research cannot account for, unaccounted variables. The effect of these is important to keep in mind when interpreting the results. One example of such a variable is the barriers to entry of a market (Porter, 1974). Barriers to entry is hard to separate from competition intensity in

the measurements for competition (Kastratović, Lončar, & Milošević, 2019). A part of the result could rather be explained by the effect of barriers to entry and not market concentration. However, barriers to entry are and should be a large part of competition and thus perhaps not suitable to separate when trying to understand competition's effect on profitability. Another unaccounted-for variable could be employee behavior and labor productivity (Blažková & Dvouletý, 2017). As this thesis uses company data, the employees' characteristics are not accounted for. For example, CEO age, CFO gender, or board characteristics that in previous research is shown to affect profitability of a company (Belenzon, Shamshur, & Zarutski, 2019; Nadeem, Suleman, & Ahmed, 2019). Another unaccounted-for variable is the ownership structure (Anderson, Lee, & Murrell, 2000). Depending on a company's ownership structure there can be systematic differences in strategies which affect profitability.

3.6. Description of Data

In this subsection the key characteristics from the constructed data set are outlined. The data descriptives present how the data is distributed and how it is used to fulfil the aim of this thesis.

Table 5: Summary Statistics for Aggregate Sample

	N	Mean	Q1	Median	Q3	Std.
HHI	95,557	0.16	0.05	0.10	0.21	0.17
CR4	95,557	0.57	0.35	0.53	0.78	0.25
M1 (%)	4,974	54.07	32.49	49.01	75.95	26.96
M5 (%)	3,103	5.05	2.96	4.98	6.95	2.86
M10 (%)	1,996	1.67	0.70	1.53	2.46	1.16
ROA (%)	95,557	2.30	-0.36	4.54	10.74	12.73
EBIT (\$Millions)	95,557	544.61	-0.445	31.03	201.59	2,751
Total Assets (\$Millions)	95,557	13,950	155.33	771.06	3,343	109,345
Revenue (\$Millions)	95,557	3,870	60.36	335.16	1,685	16,851
Leverage (%)	95,557	22.47	2.68	16.98	36.32	21.59
Innovation (\$Millions)	95,557	20.83	0	0	12.36	47.95
Product Differentiation (%)	95,557	0.83	0	0	0.95	1.58
Firm Age (Years)	95,557	18.04	6	13	25	15.71

Note: M1, M5, M10 are market share of total revenue, ROA is winsorized at 11%, and Leverage, Innovation, and Product Differentiation are winsorized at 5%.

The summary statistics in Table 5 shows that HHI has a relatively low mean of 0.16, which is almost right on the lower threshold for medium competition (0.15 as shown in Table 3). The mean of CR4 at 0.57 indicates that as CR4 is used as the measure of market concentration, the average is also close to the lower threshold for medium competition, and with a similar same distribution as the HHI measure (as shown in Table 6).

Investigating the market position variables, M1, M5, and M10, the mean corresponds to the average market share, calculated as revenue divided by total revenue of the industry, of the market position the company has. There is quite a large difference between the

means of the three ranks. Market leaders have on average a market share of 54.07%, companies retaining a 5th place has on average a market share of 5.05% and 10th place has on average a market share of 1.67%. The average ROA of the sample is 2.30% which corresponds fairly well to the average ROA in the U.S. during the last 20 years.

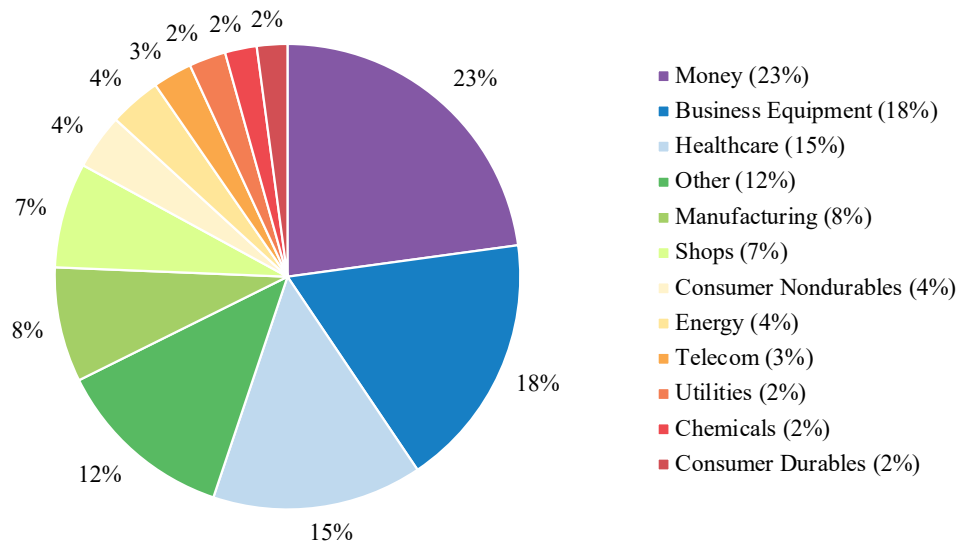
Table 6: Distribution of Concentration Dummies

	Concentration		
	Low	Medium	High
HHI	63%	17%	20%
CR4	52%	28%	30%

Note: Distribution of the competition intensity dummies.

To understand the distribution among the two concentration measures and to ensure the comparability of the two, Table 6 presents the division of the two concentration dummies. When examining the distribution, it shows a relative equal allocation of how the industry concentration is classified. For HHI there is 63% of the data that is classified as low concentration industries, hence industries with high competition, while for CR4 this corresponds to 52%. The difference needs to be considered when comparing the results of the two measurements, and more specifically when interpreting the results of the dummies. However, the differences are relatively small.

Chart 1: Summary Statistics for Industry Distribution



Note: Industries classified by the Fama-French 12 industry classification, later used in the fixed effects regression. ⁴

⁴ **Consumer Nondurables:** Food, Tobacco, Textiles, Apparel, Leather, Toys, **Consumer Durables:** Cars, TVs, Furniture, Household Appliances, **Manufacturing:** Machinery, Trucks, Planes, Off Furn, Paper, Com Printing, **Energy:** Oil, Gas, and Coal Extraction and Products, **Chemicals:** Chemicals and Allied Products, **Business Equipment:** Computers, Software, and Electronic Equipment, **Telecom:** Telephone and Television Transmission, **Utilities:** Utilities, **Shops:** Wholesale, Retail, and Some Services (Laundries, Repair Shops), **Healthcare:** Healthcare, Medical Equipment, and Drugs, **Money:** Finance, and **Other:** Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment.

The data sample used consists of 263 unique values of SIC (three-digit), hence 263 different industries. These industries are used to calculate the competition measurements. In addition to this, the model estimates effects within the Fama-French 12 industry classification, thus this provide groups of the industries that the data is constructed upon. The chart presents the distribution of industry classifications in the sample. The largest industry is Money (23%), followed by Business Equipment (18%) and Healthcare (15%).

An overview of all the industries, at the three-digit SIC code industry level, and their average ROA and HHI during the period 2002-2021 is found in Appendix A, Table A1. There are large differences in the average values between industries.

4. Empirical Framework

The empirical framework applied allows for testing the influence that competition has on firm profitability. A multiple linear regression model is applied to test the nature of the relationship. To isolate the effect of the independent variables of interest, fixed effects are applied to control for time varying trends and constant industry differences. Profitability, measured as Return on Assets, is estimated as a function of competition, measured as market concentration and market position. This presents the possibility to study the independent effect of competition on profitability. Throughout this thesis, the significance level chosen and referred to is a significance level of 5%. This section outlines the regressions used, followed by the limitations of the chosen methodology, and lastly this thesis' hypotheses.

4.1. Multiple Linear Regressions

4.1.1. Basic Multiple Linear Regression

To examine competitions' role on profitability, multiple linear regressions is used to estimate the effect.⁵ The regressions are first estimated by ordinary least squares (OLS) regressions, where standard errors are clustered heteroscedasticity consistent, by clustering at firm level. The regressions are presented below.

Regression 1:

$$ROA_{it} = \alpha + \beta_1 \log(HHI)_{jt} + \beta_2 M1_{ijt} + \beta_3 M5_{ijt} + \beta_4 M10_{ijt} + \beta_5 \mathbf{X} + \varepsilon_{it} \quad (4.1)$$

Regression 2:

$$ROA_{it} = \alpha + \beta_1 HHI_H_{jt} + \beta_2 HHI_M_{jt} + \beta_3 M1_{ijt} + \beta_4 M5_{ijt} + \beta_5 M10_{ijt} + \beta_6 \mathbf{X} + \varepsilon_{it} \quad (4.2)$$

Where ROA is the Return on Assets for firm i at time t . In Regression 1, HHI is logarithmic as it provides the best fit of data. While in Regression 2, HHI is included as dummies. The inclusion of HHI as dummies allows to measure the effect that different competition intensities have on ROA, while HHI as logarithmic allows to measure an overall relationship. In addition, Market Position is included by three dummies, where M1 is 1 if the firm is the market leader within its industry, based on revenue. M5 is 1 if

⁵ In Appendix B, the basic regressions with no control variables are presented. These indicate that HHI has explanative purpose. Hence, HHI is an appropriate measurement for competition. Market Position also has explanative purpose. Comparing the regression where both HHI and Market Position are included to the regressions where they are included separately, it is shown that HHI and Market Position correlate and work best when included together.

the firm is the 5th largest within its industry and M10 is 1 if the firm is the 10th largest within its industry. Moreover, a vector of control variables is included in the model where leverage, innovation, product differentiation, and firm age are controlled for.

Nonetheless, in the OLS regressions presented above there are many unaccounted-for variables and the difficulty of endogeneity of the independent variables is present. This commonly occurs especially within financial accounting and corporate finance fields. Conducting a Durbin-Wu-Hausman Test it is concluded that fixed effects are suitable to mitigate this problem of endogeneity in estimating the model better. This as it is possible to reject that differences in coefficients are not systematic at a <1% significance level.

By including control variables, it is partially possible to eliminate the endogeneity problem and the omitted variable bias. However, the inclusion of control variables cannot solve the problem altogether and therefore fixed effects by both industry and year are included. This allows to control for changes over time, excluding the potential bias of macroeconomic shocks, and to level the industries and make them comparable taking industry specific differences into account. Controlling for both between and within variation. The results are reported first by only including time invariant industry fixed effects and time varying year fixed effects separately. Moreover, it is modeled for when both are included simultaneously which is the main method used for this paper.

4.1.2. Industry Fixed Effects

It is likely that one source of endogeneity is that industry level characteristics are omitted which can bias the results or provide inconsistent estimates. There are systematic differences in characteristics within industries and for the circumstances that the firms operate within. By eliminating within variation, the initial levels are controlled for and considered, making the companies across industries more comparable. There is the possibility that there are factors on the industry level which significantly can affect profitability, for example asset intensity of the industry. The industry fixed effects will then be able to capture time-invariant differences and allows the independent variables of interest, HHI and Market Position, to better capture the effect of profitability on competition. This is done by having the industry fixed effects included as the Fama-French 12 industries (French, 2023). The Fama-French 12 industries are chosen to avoid multicollinearity between HHI and the industry fixed effects. Since the concentration measurement is measured at industry level using a 3-digit SIC code, the Fama-French allows for variation within similar industries mitigating the multicollinearity issue. Moreover, ensuring that there is variation left to regress.

4.1.3. Year Fixed Effects

By including year fixed effects, the estimated effect is controlled for time trends, seasonality, life-cycle variables, and macroeconomic shocks that occur between years which otherwise might cause concerns for endogeneity. This is important as there in addition to the industry level specific omitted factors might be factors that are dynamic and that evolves with time that are important to control for. The year fixed effects capture time-variant differences, for example changes in technology that can increase productivity with time, so that the variables of interest, HHI and Market Position, can capture the effect of profitability on competition comparatively over time.

4.1.4. Multiple Linear Regression with Fixed Effects

The regressions including the fixed effects are presented below.

Regression 3:

$$ROA_{it} = \alpha + \beta_1 \log(HHI)_{jt} + \beta_2 M1_{ijt} + \beta_3 M5_{ijt} + \beta_4 M10_{ijt} + \beta_5 X + \tau_t + I_j + \varepsilon_{it} \quad (4.3)$$

Regression 4:

$$ROA_{it} = \alpha + \beta_1 HHI_H_{jt} + \beta_2 HHI_M_{jt} + \beta_3 M1_{ijt} + \beta_4 M5_{ijt} + \beta_5 M10_{ijt} + \beta_6 X + \tau_t + I_j + \varepsilon_{it} \quad (4.4)$$

Regression 3 and 4 show updated regression models where fixed effects by Fama-French 12 industries is included as state fixed effects, I_j , and year is included as time fixed effects, τ_t . In the results there are several versions included where multi-way fixed effects are included as well as results on regressions run using industry fixed effects and year fixed effects respectively.⁶

4.2. Methodology Limitations

Using the OLS regression method can be a methodological limitation in finding causality due to the potential violation of the zero conditional mean assumption. The Gauss-Markov Theorem developed by Carl Friedrich Gauss and Andrey Markov identifies the requirements of the sample to justify the use of the OLS method to find unbiased and consistent estimates. The main assumption that must hold to find causality is the fourth assumption, namely the zero conditional mean assumption. This implies that there cannot be any correlation between the independent variables and the error term, thus that the

⁶ A regression is also run controlling the results by including an interaction between industry concentration and time trends allowing for differences in trends over time. However, no significant differences for the results are found.

error term is not conditional on the explanatory variables. The failure of this assumption is what is most likely to cause inference problems and create biased estimates.

To mitigate the effect of this problem control variables are included as well as fixed effects. This allows to level industries and level time trends to control for potential other causes of explanations of the explanatory variable than the variables of interest. Moreover, lagged control variables are included to remove further variation in the data that is not captured by the fixed effects. It is not possible to completely solve the endogeneity problem and industry specific time trends are still unaccounted for. Nevertheless, for the scope of this paper it is still possible to draw interesting conclusions while keeping in mind the potential bias when interpreting the estimated results.

4.3. Hypotheses

The hypotheses tested regards how the market competition influences the profitability of a firm:

H0: The profitability for firms that face intense competition does not differ from firms facing a less competitive market.

H1: The profitability for firms that face intense competition does differ from firms facing a less competitive market.

If the null hypothesis is rejected, the paper will aim to find whether the difference is positive (competitive firms perform better) or negative (monopoly firms perform better).

As stated in the literature review a negative relationship between competition and profitability is indicated to be found. Hence, the hypothesis is that it will be a negative relationship between competition and profitability. This implies that there is a positive relationship between market concentration and profitability, as well as a positive relationship between market position and profitability. This as with higher competition, price pressure can drive down profits.

5. Empirical Results

This section presents the empirical findings from the multiple linear regression models applied to analyze the relationship between profitability and competition. The first subsection provides the results from the model using Return on Assets as the dependent variable measuring profitability. This is followed by a subsection that presents the results using an alternative measure of concentration, CR4.

5.1. Return on Assets

In Table 7 the results from Regression 1 and 2, as well as Regression 3 and 4 are presented. The first two columns (1)-(2) test for the OLS model without fixed effects when profitability is measured by the book value ROA and where HHI is first, logarithmic and second, categorized as dummy variables. The last six columns (3)-(8) are estimates of the regressions that include different fixed effects, allowing to compare the model when within and/or between variation is adjusted for.

In Table 7 below, overall, a significant positive relationship can be identified between market concentration and profitability, as well as market position and profitability. Examining market concentration, HHI, there are differences in the model when using dummy variables or as logarithmic. Both ways of measuring market concentration show that the relationship between increased market concentration and profitability is positive. It is possible to identify that the relationship between concentration and profitability is non-linear as indicated by the dummy variables. It appears that firms operating in industries where competition is moderate are more profitable on average than are firms operating in high concentrated industries, and low concentrated industries respectively.

Moreover, examining Market Position's effect on profitability, the results show that being one of the bigger competitors in the market implies larger profitability on average. By examining the results and comparing the coefficients on the M1, M5, and M10 variables across all model estimations it is clear that there is a non-linear relationship where having the 5th place implies a higher ROA on average compared to being the market leader or in 10th place. It is also possible to make the distinction that it is preferred to be the market leader compared to being in 10th place.

Table 7: Return on Assets, HHI, and Market Position Regression

Dependent variable: Return on Assets								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(HHI)	0.015*** (0.001)		0.009*** (0.001)		0.013*** (0.001)		0.008*** (0.001)	
HHI_H		0.034*** (0.003)		0.016*** (0.003)		0.034*** (0.003)		0.015*** (0.003)
HHI_M		0.041*** (0.002)		0.026*** (0.002)		0.037*** (0.002)		0.022*** (0.002)
M1	0.026*** (0.003)	0.027*** (0.003)	0.014*** (0.003)	0.017*** (0.003)	0.025*** (0.003)	0.024*** (0.003)	0.013*** (0.003)	0.015*** (0.003)
M5	0.031*** (0.003)	0.028*** (0.003)	0.020*** (0.003)	0.020*** (0.003)	0.031*** (0.003)	0.027*** (0.003)	0.020*** (0.003)	0.019*** (0.003)
M10	0.021*** (0.003)	0.018*** (0.004)	0.010*** (0.003)	0.009*** (0.004)	0.021*** (0.003)	0.018*** (0.003)	0.011*** (0.003)	0.009*** (0.003)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES	YES	YES	YES
N	91,352	91,352	91,352	91,352	91,352	91,352	91,352	91,352
R ²	0.079	0.087	0.188	0.190	0.108	0.116	0.213	0.215

*Note: Regression output for multiple linear regression. Standard errors are clustered at firm level in parentheses. The control variables, leverage, innovation, product differentiation, and firm age are included. Significance level denoted *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

The results are statistically significant across all estimations. There is a slight positive relationship across all market positions and market concentration on profitability. It can be noted that the average ROA in the sample is 2.30% (see Table 5). The economic interpretation of the findings is rather small. On average the economic interpretation is that HHI explains 0.03-0.19% of ROA.⁷ For market position the economic interpretation corresponds to approximately 0.11-0.26% of ROA. Furthermore, the R^2 is relatively low, indicating that the model has relatively low explanatory value of profitability. It is interesting to note that quite a big jump in explanatory value of the model occurs as industry fixed effects are included. This indicates that there exists systematic difference between industries which explain a great deal of ROA and thus that the industry itself that a firm operates within affects the ROA on average. This can be explained by that there

⁷ The economic interpretation is calculated using the mean of the dependent variable, and for the regression estimation which includes both industry and year fixed effects – chosen as a conservative choice.

are industries which on average has a higher ROA as the baseline, which is why it is necessary to include the fixed effects to ensure that the industries are comparable. These differences can be further examined in Appendix A.

When including fixed effects, both by industry and year, the model's results appear robust. No large differences in the coefficients can be seen across the estimations, indicating that the relationship found is robust to controlling for between and within variation. The individual effects decrease as fixed effects are included, which is explained by that the variation controlled for by the fixed effects have explanatory value. However, the positive relationship between the variables remains. It can thus be concluded that market structure and market share have a positive effect on profitability measured as ROA, which means that competition has a negative effect on profitability.

5.2. Alternative Concentration Measure: CR4

In Table 8, the results from the regressions using CR4 as an alternative measure for market concentration are presented. CR4 stands for the concentration ratio for the four largest firms within each industry. The value of CR4 is the four largest firms' share of the total market. The first two columns (1)-(2) test for the OLS model without fixed effects where CR4 is first measured as a ratio and second, categorized as dummy variables. The last six columns (3)-(8) are estimates of the regressions that include different fixed effects, allowing to compare the model when within and/or between variation is adjusted for.

CR4 shows almost the same result as the HHI (Table 7). The main difference when comparing the regressions is that CR4 shows a larger positive significant effect on ROA than HHI does. The economic interpretation estimates that 0.39-0.89% of ROA is explained by CR4. When interpreting the coefficients on market position and comparing it to when HHI is used there does not appear to be any differences and it can be concluded that having a top market position on average contributes to a larger ROA, and that the relationship here as well is non-linear. Being in 5th place implies on average a larger ROA than being the market leader or in 10th place.

Table 8: Return on Assets, CR4, and Market Position Regression

Dependent variable: Return on Assets								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CR4	0.071*** (0.004)		0.046*** (0.005)		0.066*** (0.004)		0.041*** (0.005)	
CR4_H		0.048*** (0.002)		0.032*** (0.003)		0.046*** (0.002)		0.030*** (0.003)
CR4_M		0.046*** (0.002)		0.036*** (0.003)		0.041*** (0.002)		0.031*** (0.003)
M1	0.023*** (0.003)	0.025*** (0.003)	0.013*** (0.003)	0.017*** (0.003)	0.021*** (0.003)	0.022*** (0.003)	0.011*** (0.003)	0.014*** (0.003)
M5	0.026*** (0.003)	0.024*** (0.003)	0.018*** (0.003)	0.019*** (0.003)	0.026*** (0.003)	0.024*** (0.003)	0.018*** (0.003)	0.018*** (0.003)
M10	0.018*** (0.003)	0.013*** (0.003)	0.010*** (0.004)	0.007* (0.003)	0.018*** (0.003)	0.013*** (0.003)	0.010*** (0.003)	0.007** (0.003)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES	YES	YES	YES
N	91,352	91,352	91,352	91,352	91,352	91,352	91,352	91,352
R ²	0.085	0.101	0.190	0.197	0.114	0.128	0.214	0.220

*Note: Regression output for multiple linear regression. Standard errors are clustered at firm level in parentheses. The control variables, leverage, innovation, product differentiation, and firm age are included. Significance level denoted *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

The explanatory value of the two competition measurements is similar, and it is concluded that HHI can be used as an appropriate proxy for market concentration as CR4 and HHI show similar results. HHI is the main measure, and a conservative choice since it shows a lower effect on profitability than CR4 does.

6. Robustness Checks

Several robustness checks are conducted to ensure that the results found are not sensitive to the choices made when constructing the data set. The first robustness check is conducted on subperiods, where the data is estimated across four subperiods. The second robustness check is conducted by restructuring the data set as balanced panel data. The third robustness check is conducted by restricting the firms included in the data set based on the market-to-book ratio of the firm where both small and large market-to-book ratios are excluded. The fourth robustness check is conducted by restricting the sample to not include firms that have a small asset base as this could potentially bias the measure of profitability measured as ROA. The tests reveal that overall, there is no difference in the results when examining the relationship between competition and profitability during different time periods, using a balanced data set, excluding growth and loss-making market-to-book ratios, and excluding small asset-based companies. As such, the previous results appear reliable.

6.1. Subperiods

In the first robustness check the sample is restricted to four time periods between 2002-2021 with a five-year span. The goal of dividing the sample into four subperiods is to verify that the results not only hold for a longer period of time, but to also see that the results obtained hold for shorter periods. Table 9 shows the results for the four subperiods using the OLS regression both without fixed effects and with fixed effects.

The results in Table 9 indicate that there across all time periods is a positive relationship between market concentration and market share on profitability. When including fixed effects there are a couple of results that are insignificant, thus that there is no systematic variation within the data set for those coefficients at that time period. It can be noted that the result both for market concentration and market position indicates that the relationship is non-linear. The coefficients on the HHI dummies suggest that being in a moderately competitive industry is preferred to being in a low or highly competitive industry. In addition to this, the market position variables indicate that being the 5th in the market is preferred both to being the market leader and to being the 10th in the market.

Conclusively, it is noted that the results found when testing for the separate subperiods overall are in line with the results found when estimating the relationship using data over the 20-year period.

Table 9: Return on Assets, HHI, and Market Position Over Time

Dependent variable: Return on Assets																
	2002-2006				2007-2011				2012-2016				2017-2021			
	2002-2006				2007-2011				2012-2016				2017-2021			
Log(HHI)	0.016*** (0.001)				0.013*** (0.001)				0.013*** (0.001)				0.014*** (0.002)			
HHI_H		0.041*** (0.003)				0.028*** (0.003)				0.036*** (0.004)				0.044*** (0.005)		
HHI_M		0.035*** (0.003)				0.027*** (0.002)				0.044*** (0.003)				0.056*** (0.005)		
M1	0.023*** (0.004)	0.021*** (0.004)	0.016*** (0.004)	0.018*** (0.004)	0.030*** (0.004)	0.027*** (0.004)	0.032*** (0.006)	0.027*** (0.005)	0.010** (0.004)	0.011** (0.004)	0.014*** (0.004)	0.013*** (0.004)	0.016*** (0.004)	0.018*** (0.004)	0.011* (0.006)	0.014** (0.006)
M5	0.032*** (0.004)	0.028*** (0.004)	0.019*** (0.004)	0.018*** (0.004)	0.039*** (0.004)	0.033*** (0.004)	0.044*** (0.007)	0.036*** (0.007)	0.021*** (0.004)	0.019*** (0.004)	0.015*** (0.004)	0.013*** (0.004)	0.026*** (0.005)	0.026*** (0.005)	0.022*** (0.007)	0.023*** (0.007)
M10	0.024*** (0.005)	0.021*** (0.005)	0.014*** (0.005)	0.013*** (0.005)	0.026*** (0.006)	0.022*** (0.006)	0.035*** (0.008)	0.027*** (0.008)	0.014*** (0.005)	0.013** (0.005)	0.009* (0.005)	0.008* (0.005)	0.014*** (0.005)	0.014** (0.006)	0.009 (0.008)	0.008 (0.008)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES
N	23,997	23,997	21,996	21,996	22,506	22,506	22,853	22,853	23,997	23,997	21,996	21,996	22,506	22,506	22,853	22,853
R ²	0.065	0.076	0.057	0.062	0.095	0.106	0.129	0.137	0.149	0.153	0.106	0.108	0.254	0.254	0.337	0.337

Note: Regression output for multiple linear regression. Standard errors are clustered at firm level in parentheses. The control variables, leverage, innovation, product differentiation, and firm age are included. Significance level denoted *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

6.2. Balanced Panel Data

As the data set used in this paper is unbalanced panel data, a robustness check is conducted transforming the panel data into a balanced panel data set. This is done by excluding all companies that have been inactive at some point during the 20-year period. Thus, the data set only includes the firms that have been present and have data reported during all 20 years.

The results from running the regressions on this balanced panel data set are presented in Appendix C, Table C1. Interpreting the results from this robustness check and comparing them to the regressions run on the complete data set, there are no major differences identified. Thus, it is concluded that there is no problem or systematic bias associated by using the unbalanced panel data.

6.3. Adjusted Sample Selection

To lower the noise of the data, two robustness checks are performed with adjusted data to evaluate if a stronger relationship between competition and profitability is visible. When using ROA as the dependent variable, the value of profitability is affected by companies' assets, not only EBIT itself. Hence, noise can be present from the fact that firms have different market-to-book value. Industries differ in the amount of required assets; naturally different ROA benchmarks are good indicator for different industries. Growth companies, with a M/B-ratio above 4, and loss-making companies, with an M/B-ratio below 0.8 are therefore excluded. The results (as shown in Appendix D, Table D1) show that excluding these firms does not have a significantly different impact on the results. There is no larger effect of competition on profitability and the explanatory value does not alter meaningfully.

An additional approach to lower the noise of the data is to further control for firm size. Smaller companies can be more productive due to having a higher flexibility, while larger companies can have greater economies of scale. Furthermore, firms with a small asset base might naturally also report a higher ROA than larger companies, but they might not be more profitable. Hence, smaller companies, with assets below the 25th percentile in the original sample are excluded. The results (as shown in Appendix D, Table D2) show that the exclusion of small firms does not have a large impact on the results.

By performing the above two robustness checks, controlling for the market-to-book ratio and firm size, it is concluded that the panel data used in this thesis is relevant and can be used to draw conclusions regarding competition and profitability.

7. Discussion

This section provides a discussion of the findings. First, an interpretation and general discussion of the results are presented, namely discussing the observed relationship between profitability and competition, and its implications. Second, this thesis' research question is answered. Third, the wider applicability of the result and result limitations are elaborated upon. Lastly, areas that can be subject for future research are presented.

7.1. General Results Discussion

The findings of the previous sections indicate that the impact of competition on profitability is negative. The findings have multiple areas of relevance. It provides further knowledge to several strands of the previous work done in the literature as well as insights to both policymakers, firms, and investors. From the results there are three general findings which enhance the existing research about the relationship identified between market structure and market share on profitability. First, the differences between market concentration and market position on profitability are discussed. Second, a discussion on analyzing one industry, compared to when analyzing multiple industries is provided. Third, the measurement of competition is evaluated. Fourth, the results in relation to the hypotheses presented in the literature review is examined.

7.1.1. Market Concentration versus Market Position

Investigating the effect of competition on profitability, the results are robust and show that there is a negative effect of competition on profitability. Competition is measured using both a market concentration measurement, Herfindahl-Hirschman Index (HHI), and a market position measurement which compares the firms that are in a market leading position, in the 5th position, and the 10th position to all other firms.

The overall relationship that can be concluded based on the findings is that the relationship between competition and profitability is of a negative, non-linear, nature. For a firm, being in a moderately competitive industry indicates that the firm on average will have higher profitability compared to firms operating in industries where competition is either high or low. It can moreover be concluded that profitability on average is higher in industries that are highly concentrated than in industries that have low concentration. The same can be concluded regarding the position of the firm on the market. The results significantly show that firms that are in the 5th position in the market on average have higher profitability than firms that are the market leader or in the 10th position. It can also be concluded that it is preferred to be the market leader compared to being 10th in position.

The findings remain robust when including and controlling for industry as well as year fixed effects. This implies that the effects of the result cannot be accounted to the factors captured by this such as macroeconomic shocks or industry specific differences. Comparing the estimated regressions regarding the explanatory value the differences in R^2 is quite large when including industry fixed effects. This implies that apart from competition per se, industry differences account for a large part of the average ROA.

7.1.2. All Industries versus One Industry

The results indicate that when analyzing a wide range of industries, namely 263 industries across all sectors, a positive relationship between market concentration and market position on profitability is found. Taking these results into account in comparison to previous research, which has examined individual industries and found both positive and negative relationships between competition and profitability, suggests that industries need to be considered individually regarding what effect that market structure and market share has on profitability and other firms in that industry. As in some industries, for example mining, competition can be good to raise innovation, and hence, profits are likely to rise. When comparing the estimations with regard to the industry fixed effects it is noted that there is a jump in the explanatory value when including the industry fixed effects. This can be explained by that the industries themselves have an effect on ROA and that there are baseline differences depending on what industry the firm operates within. This thesis' results are important for antitrust authorities as general large conclusions regarding competition and profitability cannot be determined and emphasizes the importance of carefully considering the implication of specific mergers and acquisitions.

7.1.3. The Result in Relation to Hypotheses

The result of this paper is in line with the hypotheses presented in the literature review. Both the market power hypothesis and efficiency hypothesis indicate that there should be a positive relationship between market structure and profitability which is in line with the results found in this paper. Nevertheless, this thesis is not able to make a distinction as to whether it is the market power or efficiency hypothesis that is the driver of profitability. In line with the relative market power hypothesis and the superstar firm hypothesis, market share appears to positively affect profitability. This provides an indication that the underlying driver of this relationship is that more productive firms can have higher market shares. Overall, support is found for all hypotheses presented.

7.1.4. Competition Measurements

The effectiveness of the measurements used to estimate the results can be evaluated. Market concentration, measured as HHI, and market share, measured as market position,

explain only a small part of profitability, ROA. Both the explanatory value of the model is low as well as the economic interpretation estimates which is between 0.03-0.26% of ROA. Taking this into account, the measurements for competition are likely not able to capture the whole reality of the situation on the market within each industry. For example, price competition is likely not captured to its full extent. Therefore, it can be expected that by using market concentration and market share as measurements for competition, only a portion of competition can be examined and that there in fact are more to competition than captured. This could thus potentially bias the result so that the effect of competition on profitability is underestimated.

7.2. Research Question

The research question of the thesis can now be answered.

What is the nature of the relationship between competition and profitability?

This thesis finds that a weak positive relationship between market concentration and profitability, and market position and profitability, can be determined. Answering the research question with that a negative relationship between competition and profitability is found. The results suggest that profitability for firms that face intense competition does differ from firms facing a less competitive market.

The findings successfully answer the research question and fulfill the purpose of investigating the relationship of profitability and competition. Aligned with previous research the relationship found is weak, which suggests that market concentration and market share as proxies for competition are not the main drivers of profitability. These results are robust to the four subperiods tested, when using balanced panel data, and to when adjusting the sample selection by excluding both growth and loss-making companies as well as when excluding companies with small assets.

7.3. Wider Implications

The findings provide a foundation for both wider applicability and future implications. The key take-away is that competition is estimated to have a positive influence on profitability. As presented, measuring market structure, market concentration gives significant positive results on profitability. Measuring market share, market position has a significant positive result on profitability. Nevertheless, the statistical effect and economic interpretation is small, indicating that market structure and market share just slightly influence profitability positively. The economic significance of the findings is nevertheless important as it shows that competition does not explain large part of the

variation in profitability. In order to understand what drives high levels of profitability there are other factors that must be considered.

Comparing the results to previous literature it can be concluded that generalizing the effect of competition on profitability across all industries can posit problems as the implications may differ depending on industry. Nevertheless, it is important to understand the overall relationship of market structure and market share on profitability as the policies and interventions in the market by authorities can influence the structure and role of firms on the market. However, it must still be considered that the realized effect can be different for individual industries.

This highlights the crucial role that antitrust agencies have when enforcing competitive regulation, such as preventing excessive market concentration. An example of the power that the antitrust agencies have is how in 2022 the U.S. Federal Trade Commission (FTC) blocked the merger acquisition that Meta was to do of the virtual reality company Within Unlimited. The reason as to why this acquisition was blocked by the FTC was that FTC argued Meta to be "... trying to buy its way to the top" rather than competing competitively (Federal Trade Commission, 2022). A further takeaway for antitrust authorities and agencies is that the effect of competition on profitability is not very large. Thus, there are several other factors that also must be considered to reach healthy competition which is the ambition of the antitrust agencies. This is important to consider as policies on the regulation of competition itself might not be the key to keeping excess profit at low levels.

As a firm the results indicate that firms can work towards enlarging their market share to gain profitability, this is in line with the results of Chu, Chen, & Wang (2008) who studied the securities industry. The results of this thesis indicate that operating in a moderately competitive industry on average generates the highest return on assets compared to low and highly competitive industries. In addition to this it is clear that being the market leader on average is not something that necessarily is desirable compared to being in a runner-up spot, suggesting that bigger is not always better.

Overall, the finding that companies facing less competition and with higher standings in the market on average also earn a higher return is from a societal perspective not believed to promote effective competition or boost innovation. This as economic theory points to that it is in the perfectly competitive markets that competition leads to efficient markets and has inherent drives for renewal and adaptation. This means that there is an inherent power in competitive markets to adapt to changes in consumer preferences and changes in society, suggesting that the markets in the U.S. today are not at their optimal levels from a societal point of view.

7.3.1. Result Limitations

The results are subject to limitations as only listed firms in the U.S. are included. As a result of this, the full size of the U.S. market will not be captured which may affect the results if the non-listed firms constitute to an important portion of the competition. This is likely to be the case in certain industries but not in general and thus it is not believed to have an unproportionate bias on the results. Moreover, the results are not applicable globally, conclusions can only be drawn regarding publicly listed firms operating in relatively unregulated markets. However, important insights can be drawn regarding that competition does have a positive impact on profitability across industries.

7.4. Future Research

In this subsection, areas that can be subject for future research are presented. The suggestions for future research can be divided into four main areas. The first area concerns the use of dependent variable. Profitability can be measured using different ratios, further research can explore the applicability of different profit and return measurements. Perhaps include obligations and capital structure in different ways. The second area concerns the explanatory variables. Future research can benefit from using data on behavioral aspects concerning a company, such as characteristics of the board or the CEO. Furthermore, investigating the goals of the company and the strategies. The third area concerns the sample. Further research can benefit from including both private and listed firms and using a global approach to the country selection, as well as attempting to include and account for foreign competition.

The last area for future research concerns the method. Approaching the relationship of competition and profitability in a different manner than most previous research, it would be interesting to use alternative methods to ensure causality. One alternative method could be to use an IV (Instrumental Variable), measuring competition through an IV to find a solution to the endogeneity problem. Another way is applying a differences-in-differences approach using potential reductions in import tariffs as the treatment. This could potentially also mitigate the endogeneity problem and allow for unbiased estimates of competition on profitability. Altogether, the effect of competition on profitability it is a widely researched topic and future researchers will hopefully continue investigating the relationship as this has significant impact on regulations, social welfare, and investor decisions.

8. Conclusion

This research examines the impact of market concentration and market position on profitability in the case of U.S. industries. This is empirically tested using panel data with year and industry fixed effects using U.S. data from 263 industries in the period 2002-2021. An OLS method of multiple linear regression is conducted to answer the following research question:

What is the nature of the relationship between competition and profitability?

The result suggests that the impact of competition on profitability is statistically significant and negative, which supports the initial hypothesis. Hence, increased competition leads to lower profitability. More specifically, market concentration and market position have a positive significant relationship with ROA. Additionally, the empirical results support the traditional market power hypothesis.

This thesis contributes to the current literature by widening the understanding of competitions' effect on profitability. Further insights are provided regarding the difference between market concentration and market position. Moreover, this thesis contributes by adding to existing findings using recent data from the U.S. over a long period of time. The paper studies the relationship across multiple industries contributing to the literature which focuses on specific industries and allows for comparisons between what the relationship for the individual industries are and the overall relationship across industries.

To summarize, for antitrust authorities it is important to acknowledge the findings. Overall, the relationship between competition and profitability is negative but not very strong. Comparing the results in relation to previous literature it can be noted that the relationship may differ from the overall result in particular industries. Thus, it must be recognized that industries can diverge and that specific measurements must be considered by antitrust authorities to ensure social welfare. Even though the relationship is weak, the economic significance of the finding is important. The finding that competition's effect on profitability is small is important to consider both from the perspective of the companies and the perspective of the consumers as well as society in general. Hopefully, this thesis can inspire more research on how competition and profitability are related to further understand how to best regulate the competitive landscape. On average, less competition means more in profit. Less is more.

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Appendices

Appendix A: Overview of Industries (Three-Digit SIC Code)

Table A1: All Industries with ROA and HHI Averages

Classification	SIC	Average ROA				20 Year Average	
		2002-2006	2007-2011	2012-2016	2017-2021	ROA	HHI
Agriculture, Forestry, and Fishing							
Agricultural Production-Crops	10	7%	5%	3%	2%	3.89%	0.41
Agricultural Prod-Livestock & Animal Specialties	20	9%	14%	11%	6%	10.01%	0.99
Agricultural Services	70	10%	10%	13%	-2%	6.68%	0.94
Forestry	80	14%	2%	2%	3%	4.73%	0.87
Mining							
Metal Mining	100	-4%	-1%	-3%	-1%	-2.45%	0.26
Gold and Silver Ores	104	-2%	2%	-3%	0%	-0.72%	0.11
Miscellaneous Metal Ores	109	-9%	-14%	-10%	-6%	-9.58%	0.74
Bituminous Coal and Lignite Mining	122	3%	9%	5%	2%	4.55%	0.19
Crude Petroleum and Natural Gas	131	3%	9%	5%	2%	2.57%	0.12
Oil and Gas Field Services	138	9%	10%	5%	-1%	5.67%	0.12
Mining & Quarrying of Nonmetallic Minerals (No Fuels)	140	9%	10%	7%	2%	6.56%	0.20
Construction							
Residential Building Construction	152	n/a	n/a	n/a	17%	17.02%	0.90
Operative Builders	153	15%	-7%	7%	11%	6.55%	0.09
Nonresidential Building Construction	154	8%	9%	5%	4%	6.44%	1.00
Heavy Construction Other Than Bldg Const - Contractors	160	8%	10%	4%	4%	6.20%	0.38
Heavy Construction, Except Highway	162	6%	6%	7%	3%	5.71%	0.20
Construction - Special Trade Contractors	170	6%	9%	8%	8%	7.95%	0.39
Electrical Work	173	4%	3%	3%	10%	4.43%	0.42
Manufacturing							
Food and Kindred Products	200	10%	9%	9%	5%	8.24%	0.41
Meat Products	201	9%	9%	12%	11%	10.11%	0.30
Dairy Products	202	12%	9%	11%	-3%	9.37%	0.51
Preserved Fruits and Vegetables	203	12%	12%	8%	7%	9.38%	0.24
Grain Mill Products	204	9%	10%	6%	0%	5.94%	0.38
Bakery Products	205	9%	10%	11%	8%	9.37%	0.76
Sugar and Confectionery Products	206	14%	8%	12%	11%	11.24%	0.50
Fats and Oils	207	8%	12%	9%	4%	8.86%	0.95
Beverages	208	9%	7%	6%	5%	6.65%	0.12

Miscellaneous Food and Kindred Products	209	9%	7%	6%	-3%	4.78%	0.38
Tobacco Products	210	18%	18%	18%	17%	17.48%	1.00
Cigarettes	211	15%	16%	17%	13%	15.31%	0.32
Textile Mill Products	220	0%	2%	7%	5%	3.24%	1.00
Broadwoven Fabric Mills, Cotton	221	6%	13%	16%	10%	11.31%	0.62
Broadwoven Fabric Mills, Manmade	222	8%	9%	6%	11%	8.08%	0.83
Knitting Mills	225	8%	n/a	n/a	n/a	8.04%	0.80
Carpets and Rugs	227	10%	6%	8%	7%	7.96%	0.72
Apparel & Other Finished Prods of Fabrics & Similar Matl	230	13%	13%	11%	9%	11.52%	0.10
Men's and Boys' Furnishings	232	10%	6%	5%	6%	8.80%	0.60
Women's and Misses' Outerwear	233	7%	11%	3%	2%	6.88%	0.55
Women's and Children's Undergarments	234	7%	17%	10%	2%	11.00%	0.86
Lumber & Wood Products (No Furniture)	240	9%	0%	9%	12%	7.37%	0.47
Sawmills and Planing Mills	242	8%	5%	9%	14%	8.80%	0.59
Millwork, Plywood and Structural Members	243	12%	1%	9%	10%	8.60%	0.37
Wood Buildings and Mobile Homes	245	7%	-7%	3%	14%	4.44%	0.56
Household Furniture	251	12%	6%	11%	5%	8.42%	0.19
Office Furniture	252	11%	9%	12%	9%	10.49%	0.24
Public Building and Related Furniture	253	5%	7%	9%	5%	6.78%	0.62
Partitions and Fixtures	254	7%	n/a	n/a	-26%	0.71%	1.00
Miscellaneous Furniture and Fixtures	259	9%	12%	12%	9%	10.40%	1.00
Papers & Allied Products	260	6%	n/a	n/a	n/a	5.61%	1.00
Pulp Mills	261	6%	6%	8%	10%	7.17%	0.43
Paper Mills	262	6%	7%	7%	7%	6.94%	0.38
Paperboard Mills	263	4%	6%	8%	7%	5.77%	0.50
Paperboard Containers and Boxes	265	7%	11%	9%	10%	9.01%	0.21
Miscellaneous Converted Paper Products	267	11%	9%	10%	9%	9.89%	0.37
Newspapers	271	10%	3%	6%	5%	6.26%	0.35
Periodicals	272	13%	14%	12%	4%	11.17%	0.30
Books	273	13%	9%	3%	1%	6.75%	0.49
Miscellaneous Publishing	274	7%	9%	4%	10%	8.34%	0.88
Commercial Printing	275	9%	9%	8%	7%	8.44%	0.43
Manifold Business Forms	276	15%	14%	11%	13%	13.41%	0.85
Greeting Cards	277	6%	9%	8%	n/a	7.49%	1.00
Blankbooks and Bookbinding	278	14%	13%	14%	11%	12.93%	0.41
Printing Trade Services	279	17%	12%	8%	5%	11.28%	0.66
Blankbooks, Looseleaf Binders & Bookbinding & Related Work	280	7%	10%	12%	12%	10.11%	0.58
Industrial Inorganic Chemicals	281	5%	9%	8%	7%	7.14%	0.15
Plastics Materials and Synthetics	282	5%	8%	8%	2%	5.59%	0.28

Drugs	283	-12%	-11%	-16%	-19%	-15.77%	0.06
Soap, Cleaners and Toilet Goods	284	13%	13%	12%	9%	11.52%	0.23
Paints and Allied Products	285	11%	11%	13%	10%	11.28%	0.35
Industrial Organic Chemicals	286	6%	1%	6%	4%	3.92%	0.27
Agricultural Chemicals	287	6%	15%	8%	1%	7.45%	0.17
Miscellaneous Chemical Products	289	7%	7%	7%	4%	6.18%	0.24
Petroleum Refining	291	12%	9%	7%	4%	8.05%	0.11
Asphalt Paving and Roofing Materials	295	13%	12%	13%	11%	12.42%	0.86
Miscellaneous Petroleum and Coal Products	299	10%	7%	12%	13%	10.28%	0.57
Tires and Inner Tubes	301	6%	5%	11%	7%	7.16%	0.73
Rubber and Plastics Footwear	302	12%	13%	11%	11%	11.68%	0.85
Hose and Belting and Gaskets and Packing	305	8%	8%	6%	6%	6.89%	1.00
Fabricated Rubber Products, NEC	306	-2%	11%	11%	0%	4.93%	0.89
Miscellaneous Plastic Products, NEC	308	10%	10%	8%	8%	9.12%	0.17
Leather & Leather Products	310	16%	11%	13%	9%	11.85%	0.56
Footwear, Except Rubber	314	13%	8%	11%	9%	10.68%	0.22
Glass and Glassware, Pressed or Blown	322	8%	10%	8%	6%	8.13%	0.98
Products of Purchased Glass	323	n/a	18%	11%	11%	13.42%	1.00
Cement, Hydraulic	324	9%	5%	6%	9%	7.40%	0.50
Structural Clay Products	325	8%	13%	4%	-18%	0.52%	0.94
Concrete, Gypsum and Plaster Products	327	10%	5%	9%	11%	8.79%	0.26
Cut Stone and Stone Products	328	n/a	18%	18%	6%	12.65%	1.00
Miscellaneous Nonmetallic Mineral Products	329	8%	6%	2%	4%	5.03%	0.59
Blast Furnace and Basic Steel Products	331	11%	9%	5%	8%	8.35%	0.14
Primary Nonferrous Metals	333	-2%	7%	2%	3%	2.89%	0.54
Secondary Nonferrous Metals	334	10%	10%	1%	n/a	7.97%	0.66
Nonferrous Rolling and Drawing	335	7%	9%	7%	6%	7.48%	0.19
Miscellaneous Nonmetallic Mineral Products	339	10%	8%	5%	7%	7.73%	1.00
Metal Cans and Shipping Containers	341	11%	12%	11%	8%	10.35%	0.33
Cutlery, Hand Tools and Hardware	342	11%	9%	9%	7%	9.13%	0.22
Plumbing and Heating, Except Electric	343	13%	6%	10%	13%	10.38%	0.76
Fabricated Structural Metal Products	344	6%	8%	7%	5%	6.32%	0.17
Screw Machine Products, Bolts, Etc.	345	4%	0%	11%	4%	5.23%	0.91
Metal Forgings and Stampings	346	4%	0%	11%	4%	5.12%	0.56
Metal Services, NEC	347	4%	-2%	7%	n/a	1.47%	1.00
Ordnance and Accessories, NEC	348	9%	12%	15%	6%	10.37%	0.48
Miscellaneous Fabricated Metal Products	349	9%	9%	10%	10%	9.43%	0.37
Engines and Turbines	351	-2%	0%	2%	0%	0.27%	0.45
Farm and Garden Machinery	352	9%	10%	9%	4%	7.90%	0.35
Construction and Related Machinery	353	10%	12%	7%	3%	8.38%	0.28

Metalworking Machinery	354	10%	8%	9%	8%	8.94%	0.39
Special Industry Machinery	355	1%	3%	1%	4%	2.35%	0.18
General Industrial Machinery	356	9%	10%	9%	7%	8.72%	0.14
Computer and Office Equipment	357	2%	2%	1%	3%	1.69%	0.14
Refrigeration and Service Machinery	358	8%	8%	7%	7%	7.62%	0.26
Industrial Machinery, NEC	359	5%	-1%	-10%	-11%	-2.99%	0.71
Electronic & Other Electrical Equipment (No Computer Equip)	360	3%	3%	4%	0%	2.19%	0.96
Electric Distribution Equipment	361	1%	3%	-1%	-8%	-0.74%	0.90
Electrical Industrial Apparatus	362	0%	1%	-2%	-2%	-0.73%	0.35
Household Appliances	363	7%	7%	9%	6%	7.20%	0.52
Electric Lighting and Wiring Equipment	364	9%	9%	6%	4%	7.30%	0.24
Household Audio and Video Equipment	365	2%	3%	-1%	-3%	0.12%	0.33
Communications Equipment	366	1%	1%	1%	-1%	0.72%	0.29
Electronic Components and Accessories	367	1%	4%	2%	2%	2.43%	0.05
Miscellaneous Electrical Equipment and Supplies	369	2%	2%	0%	-5%	-0.24%	0.15
Motor Vehicles and Equipment	371	8%	5%	7%	3%	5.56%	0.14
Aircraft and Parts	372	9%	12%	8%	4%	8.30%	0.20
Ship and Boat Building and Repairing	373	12%	6%	11%	9%	9.80%	0.66
Railroad Equipment	374	9%	8%	11%	0%	7.37%	0.33
Motorcycles, Bicycles and Parts	375	18%	14%	16%	4%	9.93%	0.81
Guided Missiles, Space Vehicles, Parts	376	9%	10%	9%	7%	9.01%	0.92
Miscellaneous Transportation Equipment	379	15%	9%	14%	15%	13.01%	0.32
Search and Navigation Equipment	381	9%	7%	7%	5%	7.43%	0.28
Measuring and Controlling Devices	382	4%	4%	4%	3%	3.62%	0.11
Medical Instruments and Supplies	384	1%	0%	-5%	-10%	-3.69%	0.10
Ophthalmic Goods	385	8%	8%	2%	1%	5.47%	0.57
Photographic Equipment and Supplies	386	3%	2%	7%	-5%	1.84%	0.32
Watches, Clocks, Watchcases and Parts	387	13%	10%	13%	6%	10.67%	0.66
Jewelry, Silverware and Plated Ware	391	7%	6%	0%	-26%	2.63%	0.91
Musical Instruments	393	7%	6%	7%	n/a	6.78%	0.89
Toys and Sporting Goods	394	10%	5%	8%	7%	7.32%	0.25
Pens, Pencils, Office and Art Supplies	395	5%	7%	9%	n/a	5.70%	0.79
Miscellaneous Manufactures	399	6%	5%	7%	7%	6.18%	0.39

Transportation, Communications, Electric, Gas, and Sanitary Service

Railroads	401	6%	8%	10%	11%	8.21%	0.31
Local & Suburban Transit & Interurban Hwy Passenger Trans	410	12%	11%	5%	-9%	4.31%	0.57
Trucking and Courier Services, Except Air	421	11%	8%	10%	8%	9.03%	0.27
Public Warehousing and Storage	422	8%	n/a	n/a	n/a	7.90%	1.00
Water Transportation	440	8%	5%	3%	1%	4.28%	0.24

Deep Sea Foreign Transportation of Freight	441	11%	7%	3%	4%	5.12%	0.07
Air Transportation, Scheduled	451	5%	6%	10%	3%	6.21%	0.15
Air Transportation, Nonscheduled	452	10%	8%	7%	-1%	4.97%	0.40
Airports, Flying Fields and Services	458	9%	7%	11%	10%	9.03%	0.30
Pipelines, Except Natural Gas	461	8%	7%	8%	11%	8.80%	0.35
Transportation Services	470	6%	4%	-7%	-8%	-2.68%	0.36
Freight Transportation Arrangement	473	10%	9%	7%	6%	8.05%	0.26
Telephone Communications	481	6%	9%	5%	4%	6.27%	0.07
Telegraph and Other Communications	483	5%	7%	10%	8%	7.17%	0.13
Radio and Television Broadcasting	484	-2%	6%	8%	7%	4.23%	0.20
Cable and Other Pay TV Services	488	6%	8%	10%	9%	8.22%	0.29
Communications Services, NEC	489	-4%	4%	2%	-6%	-0.21%	0.13
Electric, Gas & Sanitary Services	490	n/a	n/a	n/a	-26%	-25.61%	1.00
Electric Services	491	6%	6%	4%	5%	5.35%	0.06
Gas Production and Distribution	492	8%	7%	6%	5%	6.60%	0.09
Combination Utility Services	493	5%	6%	6%	6%	5.81%	0.06
Water Supply	494	6%	4%	4%	3%	4.29%	0.29
Sanitary Services	495	7%	8%	2%	1%	4.71%	0.25
Irrigation Systems	499	3%	-3%	1%	2%	0.73%	0.72

Wholesale Trade

Wholesale-Durable Goods	500	17%	18%	16%	12%	15.33%	0.51
Motor Vehicles, Parts and Supplies	501	14%	12%	13%	12%	13.14%	0.59
Lumber and Construction Materials	503	10%	1%	5%	5%	5.13%	0.30
Professional and Commercial Equipment	504	6%	7%	7%	5%	6.21%	0.16
Metals and Minerals, Except Petroleum	505	10%	9%	4%	4%	6.65%	0.23
Electrical Goods	506	6%	7%	5%	4%	5.53%	0.26
Hardware, Plumbing and Heating Equipment	507	9%	9%	10%	10%	9.29%	0.61
Machinery, Equipment and Supplies	508	8%	11%	11%	9%	9.52%	0.16
Miscellaneous Durable Goods	509	12%	12%	7%	7%	9.70%	0.33
Paper and Paper Products	511	11%	9%	7%	6%	9.20%	0.53
Drugs, Proprietarys and Sundries	512	9%	7%	9%	5%	7.51%	0.33
Apparel, Piece Goods and Notions	513	15%	12%	10%	7%	11.51%	0.88
Groceries and Related Products	514	9%	9%	9%	7%	8.71%	0.30
Farm-Product Raw Materials	515	8%	8%	6%	5%	6.73%	0.55
Chemicals and Allied Products	516	9%	13%	9%	7%	8.54%	0.59
Petroleum and Petroleum Products	517	8%	8%	7%	6%	7.01%	0.17
Miscellaneous Nondurable Goods	519	7%	7%	4%	7%	6.60%	0.72

Retail Trade

Retail-Building Materials, Hardware, Garden Supply	520	18%	16%	18%	6%	12.80%	0.99
Lumber and Other Building Materials	521	16%	12%	13%	13%	13.21%	0.51

Department Stores	531	8%	7%	11%	7%	8.38%	0.35
Variety Stores	533	11%	14%	15%	13%	13.01%	0.65
Miscellaneous General Merchandise Stores	539	6%	6%	14%	4%	9.56%	0.74
Retail-Food Stores	540	6%	6%	14%	4%	9.65%	0.51
Grocery Stores	541	8%	11%	10%	5%	8.69%	0.26
Retail-Auto Dealers & Gasoline Stations	550	10%	5%	7%	8%	7.21%	0.11
Auto and Home Supply Stores	553	12%	13%	14%	15%	13.22%	0.28
Retail-Apparel & Accessory Stores	560	16%	12%	12%	9%	12.32%	0.26
Women's Clothing Stores	562	12%	7%	14%	3%	9.41%	0.25
Family Clothing Stores	565	15%	14%	12%	10%	13.03%	0.24
Shoe Stores	566	12%	9%	13%	9%	10.66%	0.21
Retail-Home Furniture, Furnishings & Equipment Stores	570	13%	1%	4%	6%	6.68%	0.54
Furniture and Homefurnishing Stores	571	4%	1%	12%	12%	8.23%	0.47
Radio, Television and Computer Stores	573	12%	10%	10%	7%	9.90%	0.72
Eating and Drinking Places	581	11%	9%	9%	5%	8.47%	0.10
Retail-Miscellaneous Retail	590	11%	14%	9%	6%	10.29%	0.28
Drug Stores and Proprietary Stores	591	9%	10%	7%	1%	7.63%	0.33
Miscellaneous Shopping Goods Stores	594	11%	6%	9%	8%	8.52%	0.14
Nonstore Retailers	596	3%	3%	2%	-6%	-0.72%	0.34
Retail Stores, NEC	599	11%	11%	12%	9%	10.79%	0.31

Finance, Insurance, and Real Estate

Commercial Banks	602	3%	2%	2%	2%	2.20%	0.04
Savings Institutions	603	2%	1%	2%	2%	1.80%	0.06
Functions Closely Related to Banking	609	3%	9%	9%	8%	7.07%	0.26
Federal and Federally-Sponsored Credit Agencies	611	5%	4%	2%	3%	3.66%	0.78
Personal Credit Institutions	614	9%	8%	7%	7%	7.75%	0.24
Business Credit Institutions	615	7%	7%	7%	0%	5.03%	0.18
Mortgage Bankers and Brokers	616	7%	5%	7%	8%	7.04%	0.36
Finance Lessors	617	4%	6%	4%	3%	4.38%	0.58
Finance Services	619	5%	4%	5%	5%	4.92%	0.58
Security & Commodity Brokers, Dealers, Exchanges & Services	620	11%	9%	6%	8%	8.69%	0.34
Security Brokers and Dealers	621	4%	2%	3%	5%	3.42%	0.19
Security and Commodity Services	628	9%	8%	10%	10%	9.25%	0.21
Life Insurance	631	2%	1%	1%	1%	1.41%	0.17
Medical Service and Health Insurance	632	9%	7%	5%	3%	6.44%	0.15
Fire, Marine, and Casualty Insurance	633	5%	4%	4%	2%	3.84%	0.09
Surety Insurance	635	4%	1%	3%	6%	3.58%	0.24
Title Insurance	636	16%	1%	8%	11%	9.19%	0.43
Insurance Carriers, NEC	639	18%	18%	n/a	18%	17.84%	1.00

Insurance Agents, Brokers, and Service	641	9%	10%	8%	8%	8.70%	0.19
Real Estate	650	12%	-1%	2%	-1%	3.31%	0.90
Real Estate Operators and Lessors	651	1%	2%	4%	-3%	0.50%	0.28
Real Estate Agents and Managers	653	6%	6%	7%	3%	5.18%	0.17
Subdividers and Developers	655	7%	2%	3%	1%	2.80%	0.27
Miscellaneous Investing	679	7%	6%	5%	5%	5.38%	0.01

Services

Hotels, Rooming Houses, Camps & Other Lodging Places	700	8%	n/a	n/a	-14%	-8.16%	0.87
Hotels and Motels	701	5%	4%	7%	6%	5.56%	0.21
Services-Personal Services	720	9%	8%	9%	6%	7.89%	0.18
Advertising	731	6%	6%	0%	-2%	1.81%	0.25
Credit Reporting and Collection	732	18%	15%	12%	9%	12.87%	0.29
Mailing, Reproduction, Stenographic	733	13%	11%	4%	-3%	8.62%	0.61
Services to Buildings	734	11%	14%	13%	11%	12.13%	0.42
Misc. Equipment Rental and Leasing	735	9%	8%	6%	5%	6.84%	0.16
Personnel Supply Services	736	6%	7%	7%	6%	6.24%	0.20
Computer and Data Processing Services	737	2%	4%	0%	-3%	0.65%	0.05
Miscellaneous Business Services	738	5%	7%	7%	3%	5.64%	0.09
Services-Automotive Repair, Services & Parking	750	9%	13%	11%	4%	8.24%	0.37
Automotive Rentals, No Drivers	751	6%	4%	5%	5%	4.86%	0.29
Services-Miscellaneous Repair Services	760	n/a	n/a	n/a	18%	17.84%	1.00
Motion Picture Production and Services	781	3%	9%	-2%	-3%	1.32%	0.42
Motion Picture Distribution and Services	782	7%	6%	7%	1%	-3.49%	0.61
Motion Picture Theaters	783	7%	6%	7%	1%	5.32%	0.35
Video Tape Rental	784	8%	16%	5%	6%	7.27%	0.93
Services-Amusement & Recreation Services	790	4%	2%	3%	-2%	0.54%	0.61
Commercial Sports	794	11%	8%	6%	2%	6.95%	0.50
Miscellaneous Amusement, Recreation Services	799	7%	6%	5%	3%	5.48%	0.10
Services-Health Services	800	8%	12%	15%	5%	9.02%	0.99
Offices and Clinics of Medical Doctors	801	13%	15%	16%	3%	12.01%	0.35
Nursing and Personal Care Facilities	805	6%	7%	6%	4%	6.12%	0.21
Hospitals	806	8%	7%	7%	3%	6.33%	0.24
Medical and Dental Laboratories	807	-1%	0%	-2%	-4%	-1.59%	0.37
Home Health Care Services	808	10%	12%	9%	12%	10.34%	0.19
Health and Allied Services, NEC	809	10%	8%	4%	2%	6.03%	0.29
Legal Services	811	15%	7%	6%	6%	8.09%	0.89
Services-Educational Services	820	8%	12%	6%	1%	5.39%	0.15
Services-Social Services	830	4%	3%	3%	-1%	3.24%	0.50
Child Day Care Services	835	13%	11%	7%	6%	9.22%	0.88
Services-Engineering, Accounting, Research, Management	870	6%	8%	8%	2%	5.95%	0.39

Engineering and Architectural Services	871	7%	8%	7%	2%	6.11%	0.31
Accounting, Auditing and Bookkeeping	872	11%	12%	8%	11%	10.39%	0.36
Business Consulting Services, Not Elsewhere Classified	873	0%	3%	3%	-1%	0.94%	0.14
Management and Public Relations	874	10%	9%	7%	6%	8.20%	0.44
Services-Services, NEC	890	-26%	n/a	n/a	n/a	-25.61%	1.00
Nonclassifiable							
Non-Operating Establishments	999	3%	-2%	-2%	-8%	-5.43%	0.40

Appendix B: Basic regression

Table B1: Simple Regression with Return on Assets, HHI, and Market Position

Dependent Variable: Return on Assets			
	(1)	(2)	(3)
HHI	0.129*** (0.006)		0.100*** (0.007)
M1		0.078*** (0.003)	0.049*** (0.003)
M5		0.060*** (0.003)	0.048*** (0.003)
M10		0.044*** (0.004)	0.038*** (0.004)
Constant	0.002 (0.002)	0.016*** (0.001)	0.002 (0.002)
N	95,557	95,557	95,557
R ²	0.031	0.026	0.042

*Note: Regression output for multiple linear regressions. Standard errors are clustered at firm level in parentheses. Significance level denoted *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Appendix C: Balanced Panel Data Regression Results

Table C1: Regression Balanced Panel Data with Return on Assets

Dependent Variable: Return on Assets								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(HHI)	0.014*** (0.001)		0.002 (0.002)		0.014*** (0.001)		0.002 (0.002)	
HHI_H		0.033*** (0.003)		0.014*** (0.003)		0.032*** (0.003)		0.012*** (0.003)
HHI_M		0.026*** (0.003)		0.012*** (0.003)		0.024*** (0.003)		0.010*** (0.003)
M1	0.009*** (0.003)	0.010*** (0.003)	0.010*** (0.003)	0.008*** (0.003)	0.008** (0.003)	0.009*** (0.003)	0.009*** (0.003)	0.007** (0.003)
M5	0.012*** (0.004)	0.010*** (0.004)	0.008** (0.003)	0.007* (0.003)	0.012*** (0.004)	0.010*** (0.004)	0.008** (0.003)	0.007** (0.003)
M10	0.002 (0.005)	0.001 (0.005)	-0.001 (0.005)	-0.001 (0.005)	0.002 (0.005)	0.001 (0.005)	-0.001 (0.005)	-0.001 (0.005)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES	YES	YES	YES
N	41,591	41,593	41,591	41,593	41,591	41,593	41,591	41,593
R ²	0.075	0.085	0.121	0.125	0.092	0.100	0.137	0.140

*Note: Regression output for multiple linear regression. Standard errors are clustered at firm level in parentheses. The control variables, leverage, innovation, product differentiation, and firm age are included. Significance level denoted *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Appendix D: Adjusted Sample

Table D1: Market-to-Book Ratio of >0.8 and <4

Dependent Variable: Return on Assets								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(HHI)	0.016*** (0.001)		0.010*** (0.001)		0.014*** (0.001)		0.009*** (0.001)	
HHI_H		0.030*** (0.002)		0.014*** (0.003)		0.030*** (0.002)		0.014*** (0.003)
HHI_M		0.038*** (0.002)		0.025*** (0.002)		0.035*** (0.002)		0.022*** (0.002)
M1	0.016*** (0.003)	0.020*** (0.003)	0.009*** (0.003)	0.013*** (0.003)	0.015*** (0.003)	0.018*** (0.003)	0.008** (0.003)	0.011*** (0.003)
M5	0.020*** (0.003)	0.019*** (0.003)	0.014*** (0.003)	0.014*** (0.003)	0.021*** (0.003)	0.019*** (0.003)	0.015*** (0.003)	0.014*** (0.003)
M10	0.014*** (0.004)	0.012*** (0.004)	0.007* (0.004)	0.006 (0.004)	0.014*** (0.003)	0.012*** (0.004)	0.007* (0.003)	0.006 (0.003)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES	YES	YES	YES
N	61,713	61,713	61,713	61,713	61,713	61,713	61,713	61,713
R ²	0.082	0.087	0.150	0.152	0.112	0.117	0.177	0.179

*Note: Regression output for multiple linear regression. Standard errors are clustered at firm level in parentheses. The control variables, leverage, innovation, product differentiation, and firm age are included. Same results when testing M/B-ratio and changing 4 to 3 or 5. Significance level denoted *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Table D2: Regression Firms with Few Assets Excluded

Dependent Variable: Return on Assets								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(HHI)	0.016*** (0.001)		0.009*** (0.001)		0.015*** (0.001)		0.008*** (0.001)	
HHI_H		0.030*** (0.002)		0.013*** (0.002)		0.029*** (0.002)		0.013*** (0.002)
HHI_M		0.032*** (0.002)		0.021*** (0.002)		0.030*** (0.002)		0.018*** (0.002)
M1	0.013*** (0.003)	0.018*** (0.003)	0.011*** (0.003)	0.014*** (0.003)	0.012*** (0.003)	0.015*** (0.003)	0.010*** (0.003)	0.012*** (0.003)
M5	0.015*** (0.002)	0.015*** (0.002)	0.012*** (0.002)	0.011*** (0.002)	0.014*** (0.002)	0.014*** (0.002)	0.011*** (0.002)	0.011*** (0.002)
M10	0.012*** (0.003)	0.013*** (0.003)	0.010*** (0.003)	0.009*** (0.003)	0.012*** (0.003)	0.013*** (0.003)	0.010*** (0.003)	0.009*** (0.003)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	NO	NO	YES	YES	NO	NO	YES	YES
Year FE	NO	NO	NO	NO	YES	YES	YES	YES
N	70,384	70,384	70,384	70,384	70,384	70,384	70,384	70,384
R ²	0.072	0.070	0.105	0.106	0.107	0.105	0.136	0.138

*Note: Regression output for multiple linear regression. Standard errors are clustered at firm level in parentheses. The control variables, leverage, innovation, product differentiation, and firm age are included. Significance level denoted *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*