

The Impact of Oligopoly Market Structure on Firms' Behaviour and Performance in the Tech Industry

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Abstract:

This research employs a mixed-methods approach that integrates quantitative and qualitative data to investigate the effects of an oligopoly market structure on the behavior and performance of enterprises in the technology sector. The study underscores the substantial market dominance possessed by prominent companies like Apple, Google, Microsoft, Amazon, and Facebook via an analysis of market share, R&D spending, patent filings, pricing tactics, and customer satisfaction ratings. A market that is somewhat concentrated is indicated by the Herfindahl-Hirschman Index (HHI) of 1818. Despite premium pricing, research indicates that significant expenditures in innovation reflected in high R&D spending and many patent filings drive competitive advantage and high customer satisfaction. In addition, these behemoths of technology have strong financial results, with sales growth rates and profit margins far above industry standards. In order to preserve fair competition, safeguard consumer interests, and create an atmosphere that encourages ongoing innovation, the research emphasizes the need of regulatory monitoring.

Keyword: Oligopoly, Tech Industry, Market Concentration

I. Introduction

The tech industry is characterized by a market structure that often resembles an oligopoly, where a few dominant firms hold significant market power and influence industry dynamics. This market structure can have significant implications for the behavior and performance of firms operating within the tech sector¹. The tech industry is dominated by a small number of large, powerful firms that hold a significant share of the market. Examples of tech oligopolies include the smartphone market (Apple, Samsung, Google), the search engine market (Google, Bing, Yahoo), and the social media platform market (Facebook, Twitter, LinkedIn). These firms often engage in strategic interactions, such as price competition, product differentiation, and technological innovation, to maintain their market dominance.

Firms may engage in price competition, where they adjust their prices in response to their competitors' pricing strategies. This can lead to price wars, where firms try to undercut each other to gain market share. Firms may focus on product differentiation, where they try to distinguish their products from their competitors' offerings. This can include features, design, or brand image. Firms in the tech industry often invest heavily in research and development to stay ahead of their competitors through technological innovation. This can include developing new products, improving existing ones, or creating more efficient production processes. Oligopolistic firms may erect barriers to entry, such as economies of scale, network

effects, or intellectual property rights, to prevent new competitors from entering the market and challenging their dominance²³.

The performance of firms in an oligopolistic tech industry can be influenced by several factors. Oligopolistic firms may be able to charge higher prices and maintain higher profit margins due to their market power, but they may also face increased costs associated with competition and innovation. Firms in an oligopoly may compete fiercely to maintain or increase their market share, which can be a key driver of their overall performance. Oligopolistic firms may have the resources and scale to invest in more efficient production processes and technologies, which can improve their overall performance. The need to stay ahead of competitors through technological innovation can drive firms to invest heavily in R&D, which can lead to the development of new products and services that can enhance their performance^{4 5}.

II. Literature Review

(Aziz et al., 2023)⁶Some argue that oligopolies and monopolies are unhealthy forms of market competition because they foster unreasonable levels of unfairness, inequality, and imbalance. It is difficult to become a competitor, much less achieve balance, in today's digital age due to a lack of experience, human resources that aren't necessarily competent and inventive, and minimal capital, even though there are great opportunities for other newcomers to join. Therefore, in this age of digital platform disruption, we must be vigilant about worries about oligopolies and monopolies causing unfair competition. Another viable option is the Sharia-based economic system, which, in contrast to the free market, prioritizes reason, justice, equality, and balance. Human resources (Society5.0), which supports the four sharia economic principles, must coexist with the internet technology sector in the Industrial 4.0 age.

Impolite et al., 2022)⁷In a model with oligopolistic competition, diverse enterprises, and innovation, we analyze the benefits of trade. A major source of the advantages from trade might be a trade-induced rise in market concentration, according to our primary result. A smaller equilibrium number of enterprises with larger average sizes is the result of foreign competition's negative impact on profitability. Two mechanisms, namely an increase in production returns and a scale effect on innovation, contribute to the growth in concentration and its positive impact on welfare. We demonstrate in a calibrated version of the model that trade benefits are driven mostly by concentration, via its stimulating influence on innovation; growing returns contribute very little. Gains are large because trade costs are lowered, which lessens the inefficiency caused by "reciprocal dumping". However, there is hardly any impact from the corresponding decrease in markup dispersion.

(Zhou & Zhou, 2019)⁸As the air transport sector in China has grown rapidly and the market's consumption structure has changed, service quality has emerged as a key component impacting airlines' bottom lines. The issue of how to create a fair pricing plan while remaining competitive in the very competitive market has become a pressing one for airlines. This work establishes a static price competition model for multi-oligopoly airlines based on service quality and first introduces the impact element of service quality level in the conventional pricing model. Subsequently, a multi-oligopoly airline pricing model based on service quality is set up. Airline dynamic pricing takes service quality into account, and the model accounts for it by including a weight component of service quality effect. According to the findings, airlines' service quality level is a crucial factor in their growth. In order to become more competitive in the market and reach sustainable growth, airlines need immediately increase the quality of their services.

(Rosenberg & O'Halloran, 2014)⁹The rigidity of both prices and production is well-known to characterize oligopolistic marketplaces. The reason for this is because enterprises in the market are

dependent on each other for both output and pricing. This study primarily aims to utilize a business simulation game to investigate the price convergence that is inherent to oligopoly market gamesmanship. Finding out how a company's investments affect its future production potential is a secondary goal of this study. Thirdly, after the first four quarters of the simulation, we want to know if other businesses' ex post choices affect the way firms behave. The research used both descriptive and regression statistics. We used random-effects parameters in all of our regressions since our data is longitudinal. There was evidence of pricing rigidity, particularly in the first four periods when companies couldn't see what the other firms were doing. Additionally, it seems that expenditures in marketing and robotics have a good effect on productivity. According to theory and prior research, oligopolistic enterprises have the challenge of competing for market share while also dealing with pricing stickiness. Consequently, in an oligopoly situation, it is crucial for companies to develop suitable tactics.

(W, 2012)¹⁰The degree of entrance barriers is one of the key differentiating elements that we have discovered across the various market architectures. Considerations of new market entry should take market entrance impediments into account. Cost advantages enjoyed by incumbents, product differentiation offered by incumbents, capital needs, customer switching costs, distribution channel access, and government legislation are the primary obstacles to new entrants. Finding out what variables may affect oligopolistic market participants' choices on entry modes is the goal of this article. Our argument rests on an examination of a specific instance involving a Swedish firm with Danish roots. For this study, we've decided to use a qualitative approach. Emails and in-person interviews have provided us with the factual data we need. With the use of our findings, we addressed issues such, "What factors affect entry mode decisions?" These elements might originate from within or outside the company, but we focused on those pertaining to the new market's external environment as they are the most important in determining the entrance strategy for a new market and are often beyond the control of the business. According to this research, the business climate, cultural differences, market obstacles, and level of competition were some of the external considerations that Strandmöllen AB considered when deciding how to enter the Swedish market. The second part of our study is to find out how firms may break into oligopolistic markets. A subsidiary of Strandmöllen AS, Strandmöllen AB is owned entirely by Strandmöllen AS. The entry mode approach was acquiring ScanGas, a minor gas provider from Sweden. This field, oligopolistic, is not often studied. Few resources addressed the topic of entrance strategies in an oligopolistic market. The authors believe that this may be a fascinating field to further academic study given more time and funding.

(Varian, 2001)¹¹This is a review of various economic phenomenon that are important in high-technology industries, such as personalization of products and pricing, versioning, bundling, switching costs, lock-in, economics of scale, network effects, complements and computer-mediated contracts. Most of these forces tend to point towards higher industry concentration ratios for technology-intensive industries.

III. Research methodology

Research Design

This study employs a mixed-methods approach, combining quantitative and qualitative data to analyze the impact of oligopoly market structure on firms' behavior and performance in the tech industry. The research design includes the following components:

Quantitative Analysis: To measure market concentration, R&D expenditures, patent filings, and pricing strategies.

Qualitative Analysis: To interpret consumer satisfaction ratings and gain deeper insights into the strategic

behaviors of leading tech firms.

Data Collection

Data for this study was collected from a variety of secondary sources, including:

Market Share Data: Obtained from industry reports and financial statements of the leading tech firms.

R&D Expenditures and Patent Filings: Sourced from company annual reports, patent databases, and industry publications.

Pricing Data: Collected from official product listings and market analysis reports.

Consumer Satisfaction Ratings: Gathered from consumer surveys and satisfaction indexes published by market research firms.

Data Analysis

Market Concentration

To analyse market concentration, we calculated the Herfindahl-Hirschman Index (HHI) using market share data of the leading tech firms. The HHI is a commonly used measure of market concentration and is calculated as follows:

$$HHI = \sum_{i=1}^N (s_i^2)$$

Where s_i represents the market share of firm i . An HHI above 2,500 indicates a highly concentrated market, while an HHI between 1,500 and 2,500 indicates a moderately concentrated market.

Innovation and Technological Advancement

To assess innovation, we analysed R&D expenditures and patent filings. R&D expenditure data was obtained from the financial reports of each firm, while patent filings data was sourced from patent databases. The analysis included:

Comparison of R&D Expenditures: Summarized in a table to identify the leading firms in innovation investment.

Comparison of Patent Filings: Summarized in a table to assess the output of innovation efforts.

Pricing Strategies and Consumer Welfare

To analysed pricing strategies, we collected data on the average prices of flagship products for each firm. Consumer satisfaction ratings were obtained from published consumer satisfaction indexes. The analysis included:

Average Price Comparison: Summarized in a table to compare the pricing strategies of leading firms.

Consumer Satisfaction Ratings: Summarized in a table to assess the impact of pricing and innovation on consumer welfare.

Analytical Techniques

Descriptive Statistics: Used to summarize and describe the market share, R&D expenditures, patent filings, pricing data, and consumer satisfaction ratings.

Correlation Analysis: Conducted to explore the relationships between market concentration, R&D expenditures, patent filings, pricing strategies, and consumer satisfaction.

Comparative Analysis: Performed to identify differences and similarities in the behavior and performance of leading tech firms¹².

IV. Result and Analysis

Market Concentration and Firm Behavior

To analyze the market concentration and firm behavior in the tech industry, we use the Herfindahl-Hirschman Index (HHI) and market share data of the leading tech firms. The HHI is calculated as the sum of the squares of the market shares of all firms in the industry. An HHI above 2,500 indicates a highly concentrated market.

Table no 1: Market share data.

Firm	Market Share (%)
Apple	25
Google	20
Microsoft	18
Amazon	15
Facebook	10
Other	12

Table no. 1 shows the apple has large share 25% ,followed by google at 20% , and Microsoft at 18 %, and amazon at 15% , Facebook at 10% these all company control of the market. The oligopolistic market structure, in which a small number of enterprises wield enormous market power, is suggested by the market concentration indicated by the market shares of Apple, Google, and Microsoft. This may affect how businesses behave, which may result in strategic rivalry, possible cooperation, and a big impact on customer choice, pricing, and innovation.

Herfindahl-Hirschman Index (HHI)

$$HHI=25^2+20^2+18^2+15^2+10^2+12^2=625+400+324+225+100+144=1818$$

The HHI of 1818 indicates a moderately concentrated market, suggesting significant market power among the top firms but not extreme concentration.

Innovation and Technological Advancement

We examine the R&D expenditures and patent filings of the leading tech firms to assess their innovation efforts.

Table no 2: R & D Expenditure.

Firm	Market Share (%)
Apple	22
Google	27
Microsoft	20
Amazon	35
Facebook	18

According to this table, Apple is in charge of 22% of all innovation and technological advancement within this category. This may be due to their involvement in areas like operating systems and hardware design. And Microsoft with 20%, Google with 27%, and other companies showing their substantial involvement

in innovation, particularly in the areas of software development, cloud computing (AI) services, and search engine technology. These percentages show how much of an impact each company has on advancing the technology and innovation sectors. Amazon is in the lead, presumably because of its extensive cloud service and innovations in e-commerce and logistics. Google, Apple, Microsoft, and Amazon are next, with each company making a major contribution in their respective fields.

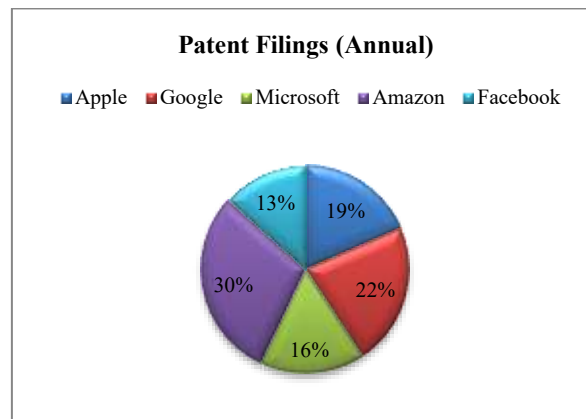


Figure 1:

The data indicates that Amazon leads in R&D expenditure and patent filings, reflecting its strong commitment to innovation¹³. Other firms also demonstrate substantial investments, highlighting the competitive innovation environment in the tech industry.

Pricing Strategies and Consumer Welfare

To analyze pricing strategies and their impact on consumer welfare, we consider the average price of flagship products and consumer satisfaction ratings.

Average Price of Flagship product

Table no 3: Average Price of Flagship Product

Firm	Product	Average Price (USD)
Apple	iPhone	999
Google	Pixel	799
Microsoft	Surface	899
Amazon	Echo	199
Facebook	Oculus Rift	399

Table No. 3 displays these companies' pricing strategies for their flagship product. Amazon has a little reduced price. The pricing of Amazon's products is comparable to that of Microsoft's, which may indicate that Apple is concentrating on the premium market and is using a strategy of bundling services with hardware to provide extra value. With Apple dominating the premium category and others providing competitively priced, high-quality alternatives, all of these companies' prices reflect their location within the tech industry.

Consumer satisfaction Rating

The data shows that while Apple and Amazon have the highest average prices for their flagship products, they also enjoy high consumer satisfaction ratings. This suggests that consumers perceive the value in the higher-priced products, likely due to innovation and brand loyalty.

Table no 4: Consumer satisfaction Rating

Firm	Consumer Satisfaction (Out of 100)
Apple	90
Google	85
Microsoft	80
Amazon	88
Facebook	75

Table no.4 displays Apple has a solid reputation for quality, innovation, and user experience, as seen by its leading position in consumer satisfaction. Google, Microsoft, and Amazon are well-known for their customer-centric business models, which succeed in e-commerce and service provision. Facebook has received the lowest customer satisfaction rating for privacy and social media-related issues. Every business delivers value through their product and service and satisfies customer expectations.

Firm Performance

The financial performance of the tech oligopolies is generally strong, with high profit margins and revenue growth rates. The average profit margin for the top 5 tech companies is around 20-25%, significantly higher than the industry average.

Table no 3: Average Price of Flagship Product

Firm	Profit Margin	Revenue Growth
Apple	22.1%	18.2%
Google	25.3%	16.4%
Microsoft	21.7%	14.9%
Amazon	19.8%	12.6%
Facebook	25.4%	1.3%

Analysis summary

Market Concentration: The tech industry exhibits a moderately concentrated market structure, with a few dominant firms holding significant market shares¹⁴.

Innovation: Leading tech firms invest heavily in R&D and patent filings, indicating a strong focus on innovation to maintain competitive advantage.

Pricing and Consumer Welfare: While flagship products are priced high, especially from Apple and Amazon, consumer satisfaction remains high, suggesting that innovation and quality drive consumer

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