

Harm of Giants in Cloud computing Market

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Abstract—In the realm of traditional IT, dominance was primarily held by IT service providers. However, the landscape has drastically changed in the artificial intelligence sector, with market power shifting towards global behemoths such as Google, Apple, and Amazon. These industry giants have solidified their dominance by capitalizing on electronic data, presenting a challenge in terms of regulating their growing market control. This article aims to explore the consolidation of monopolistic power among a handful of cloud service providers and the resulting ramifications on the market. Additionally, it delves into the comprehensive inquiry conducted by the U.S. Judiciary Committee in 2019. This investigation scrutinized the market influence and business practices of tech titans including Amazon, Apple, Facebook, and Google. The insights gleaned from this investigation are analyzed to shed light on the issue at hand. Furthermore, this article puts forth strategies for the regulation of business activities within the cloud market ecosystem. It suggests potential enhancements to antitrust regulations that can effectively address the emerging concerns. The goal is to strike a balance between fostering innovation and competition while preventing unchecked monopolistic control.

Keywords—Cloud computing, Monopoly law, Significant market power, Amazon, Google, Big Data

I. INTRODUCTION

Since “4th Industrial Revolution”, the elements of capital have undergone transformation, spanning industries such as machinery, real estate, and finance. However, a portion of this capital is transitioning from physical spaces to virtual realms. Enterprises and individuals can now circulate their capital within virtual spaces, even borrowing others' resources. Cloud services, enabled by virtualization technology and advanced cloud computing, facilitate this transition. They offer integrated IT resources that can be leveraged across various industries, such as finance and manufacturing. In practice, global IT giants like Apple, Amazon, and Google are entering the domestic cloud computing market, bolstering their market dominance. Given this situation, potential disputes may arise involving fair trade practices, domestic information security, and personal data protection. Thus, it is imperative to conduct legal and regulatory research to address these issues.

In the context of the core infrastructure of the artificial intelligence (AI) industry, within the cloud market environment, certain companies are leveraging electronic information-based IT innovations that go beyond traditional capital boundaries such as land, facilities, and finance. Through these innovations, they are establishing dominant positions in the cloud computing market. The services these companies provide, based on electronic information,

strengthen their monopolistic position in the market. Moreover, they create incentives for the development of new services by integrating their offerings, thereby enabling them to maintain their monopolistic power in the cloud computing market. Over the past decade, Microsoft, a prominent micro software company, has secured a market share of over 87% in the operating system market. During the period between 2019 and 20, Apple has consistently maintained a profit margin of over 23.7%. Additionally, Google holds a dominant position in the search market, with a market share exceeding 90%.¹

Having a high market share does not necessarily imply distorting the market, excluding market entrants, or maintaining monopolistic power through bundled sales. However, in the case of the cloud market, due to the high path dependency on preceding services, switching costs, and significant economic externalities, it is observed that leading companies can dominate the market. Therefore, instead of applying traditional methods of regulation, it seems necessary to implement monopolistic regulations that reflect the characteristics of the cloud market, as it is essential to address the dominance of key players in this unique market environment.

In this paper, aim to firstly elucidate the criteria for assessing the market dominance of companies such as Apple, Google, and Amazon, which have secured dominant positions as the telecommunications landscape transitions to the cloud computing environment. Additionally, we seek to analyze recent precedents from antitrust regulation lawsuits in the United States to derive insights. Next, we intend to propose institutional improvements aimed at fostering the growth of the cloud computing industry. Lastly, we endeavor to present strategies for mitigating the market dominance entrenched in a few companies through technological innovation in cloud computing, along with suggestions for enhancing antitrust regulations.

II. EXPANDING MARKET DOMINANCE THROUGH CLOUD COMPUTING

A. Expansion of Capital through Cloud Computing

Capital has transitioned from land to machinery, finance, and recently, electronic information has become a significant component of capital. In other words, electronic information can be invested in traditional capital to generate surplus profits and enhance the competitiveness of capital itself. According to Joseph A. Schumpeter's theory of economic development, capital is a lever that allows entrepreneurs to control specific goods, a means to dispose of goods for new purposes, a tool

¹ <https://alphametic.com/global-search-engine-market-share>

for converting production factors for new uses, or a means of directing production in new directions.²

So, what is this "lever" or means of control? It certainly does not arise from a fixed category of goods nor does it originate from a limited portion of existing goods. It is generally understood that we encounter capital in the course of production and that it is useful in some way in the production process. Therefore, in the context of the IT industry, electronic information has become a pivotal means for companies to achieve surplus profits, functioning as a lever for their success. Over the past 5 years, as exemplified by Amazon in the U.S., where a significant 55% of their key revenue is derived, cloud services based on electronic information have become a central asset for cloud companies. In 2021, the global volume of electronic information was approximately 79 ZB (zettabytes), and it is projected to increase by over 50 times by the year 2030.³ Given that electronic information serves as a critical capital driving the information society, the evolving landscape of electronic information is poised to shape the paradigm of industrial society. In essence, electronic information enables situational awareness, problem-solving, and future insights through processing and analysis. It serves as an economic asset and a measure of competitiveness.

B. Meaning of Cloud Computing dominance

When assessing whether cloud service providers engage in anti-competitive practices, such as the abuse of market dominance, a key determinant will be whether the company holds substantial market power in a specific market. Market delineation focuses on demand-side substitution factors, and supply-side substitution factors are only considered when analyzing the presence of participating companies in related markets and their potential for entry. A market-dominant operator is defined as one that can attempt "small but significant and non-transitory price decreases" in a single product (service) or bundle service.

Market-dominant businesses often engage in strategic practices such as exclusive dealings and predatory pricing to maintain and strengthen their market dominance, aiming to maximize long-term supernormal profits by setting prices above competitive levels, thereby compromising consumer interests. These unfair trading practices can hinder the entry of potential competitors and force out competing firms, contributing to the perpetuation of their dominance.

Traditionally, dominant players used essential infrastructure to expand their market power, but nowadays, companies equipped with platforms (operating systems, middleware, services) are exercising market dominance through bundled products (services) over an extended period. This dominance allows them to monopolize the market by either substituting service demand or replacing supply, thus reinforcing their dominant market position. For example, in the case of smartphones, while the platform itself remains unchanged, application providers (e.g., games, utility apps) and service providers without bargaining power can naturally

fade away, except for self-upgrades. This issue is further explored in the context of the Google lawsuit.⁴

III. A COMPETITIVE ANALYSIS IN DIGITAL MARKET

A. Assessment Methods for Market Dominance in the Cloud Market

The new regulatory framework for information and communication services in the EU defines markets subject to regulation in accordance with the principles of EU competition law for market delineation. The assessment of market dominance incorporates analyses of past market behavior and applies dynamic changes based on relevant developments. Key criteria for evaluation include demand substitutability, supply substitutability, and potential competitive threats. One of the criteria for assessing demand/supply substitutability involves conducting a 'hypothetical monopolist test'. However, recognizing the continuous technological innovation and convergence, there is an acknowledgment that current market delineation may become inadequate in the near future.⁵

The Herfindahl-Hirschman Index (HHI) for the top k (3) firms is calculated by summing the market shares of the three leading companies, Amazon, Microsoft, and Google, among the total of 11 firms. It serves as a cumulative concentration measure and is determined by the size of market shares of the three firms. The cumulative market share of the top k (3) firms is defined as the concentration ratio of the top k (3) firms.

$$CR_k = \sum_{i=1}^k S_i$$

In the case of three companies, K is equal to 3. Represented as K = 3, it is referred to as the concentration ratio of the top three companies.

$$H = \sum_{i=1}^N S_i^2$$

The Herfindahl-Hirschman Index is calculated by squaring the market shares of all companies within the industry and summing them up. It can be expressed as follows.

$$H = \sum_{i=1}^N S_i^2$$

In the case of three companies, K is equal to 3. Represented as K = 3, it is referred to as the concentration ratio of the top three companies.

When the market shares of overseas cloud computing companies in the domestic market - Amazon with 45.4%, Google with 3.1%, and Microsoft with 10.3% - are squared and summed using the Herfindahl-Hirschman Index formula

with $H = \sum_{i=1}^N S_i^2$, the result is 3,457.

Generally, within industries, if a calculated value is below 100, it signifies intense competition, between 100 and 1,500 indicates a less concentrated market, between 1,500 and 2,500 suggests a slightly concentrated market, and if the value

² Thomas Pikety, "Capital in the Twenty-First Century" 215. 56page

³ <https://firstsiteguide.com/big-data-stats/>

⁴ Subcommittee on Antitrust, Commercial and Administrative Law of the Committee on the Judiciary "Investigation of Competition in Digital Markets", 2020.

exceeds 2,500, it signifies a highly concentrated market. According to the Herfindahl-Hirschman Index (HHI), the cloud computing market can be considered highly concentrated, with a significant concentration of companies. Due to competition with other companies in the cloud computing market, this highly concentrated market structure directly affects companies aiming to enter the cloud computing market.

B. Harm of Giants in Cloud Computing Market

According to Herfindahl-Hirschman Index, in an environment where a giant businesses dominate the market, it can be difficult for small cloud operators to enter or participate in the cloud market. This situation can have a negative impact on the cloud market.

This phenomenon can arise for various reasons. When a giant businesses dominate the market, they often possess strong market positioning and a competitive advantage. Consequently, smaller cloud operators might find it challenging to enter the market, establish competitiveness, and increase their market share. Such a scenario can hinder the growth of new entrants and small-scale enterprises.

Moreover, market dominance by a few players can result in higher entry barriers. Larger companies have advantages in terms of capital, technology, and brand value, making it difficult for smaller firms to overcome these entry barriers. As a result, opportunities for various participants in the cloud market to compete and innovate might become limited.

To address this situation, various efforts such as government regulations, support policies, or fostering a competitive environment in the cloud market might be necessary. By promoting competition in the cloud market and expanding opportunities for diverse companies to participate, innovation and competition can be encouraged. This, in turn, can contribute to maintaining a healthy overall market ecosystem.

IV. CASE STUDY OF MONOPOLY LAW SUIT

While the exact interpretation of terms like "restraint of trade" and "monopolization" may not be clear under U.S. federal antitrust law, one definite fact is that antitrust laws are closely related to economic phenomena.

Existing monopolistic firms can increase prices in their favor or expand market share through the acquisition of monopolistic facilities. Furthermore, high market share and revenue allow for price adjustments of products, which can serve as criteria for identifying monopolistic entities capable of deterring market entry by excluding potential competitors. The evaluation criteria for new monopolistic firms include their ability to dominate a market without raising prices, while experiencing cost reductions as external benefits increase for users.

In examining the abuse of dominance by Google, Apple, and Amazon, to identify areas for improvement and suggest remedies.

A. Google, competitive analysis within the cloud market

According to the United States House Investigative Committee, recent findings align with the assessments of countries such as Europe regarding Google's market dominance. For instance, the UK's Competition and Market Authority determined that Google holds significant market dominance in the search market. Google argued that it can exclude new entrants from the digital market through achieving economies of scale, access to large-scale data, management, utilization, and securing a broad competitive advantage within the digital market.⁶

According to internal documents from Google in 2005, the company's management recognized the potential long-term threat posed by its search engine service to the market. Google's search engine is utilized as a means to maintain dominance in the market by integrating with other services and acting as a core service. Additionally, Google's integrated services can exclude competitors from the market and exploit the search content of other businesses. Through these processes, Google weakens potential rivals, further expanding its market dominance.

For instance, Google recognized the importance of the local search market and actively entered it, securing licenses for the use of local content and providing such services. In response, Yelp.com⁷ requested Google to cease using Yelp.com's content, but Google declined, citing reasons such as system complexity. In this manner, Google can wield its search engine as a weapon to exclude competitors, and Yelp.com is left with no choice but to relinquish valuable content. Furthermore, Google forcibly aggregates third-party content through its dominance and facilitates easy user access by directly linking to its own website.⁸

B. Apple, competitive analysis within the cloud market

The U.S. Department of Justice alleges that Apple is abusing its dominant position over the App Store to push out competing content and impose excessive fees. In particular, Apple's profit margin is transitioning from profits generated from games, videos, and music content through iTunes to new industries like cloud services.⁹

A federal court ruling has determined that AT&T, the exclusive distributor of the iPhone in the United States, could become subject to antitrust regulation. Particularly, iPhone users raised objections against Apple's practices of establishing defensive barriers that restricted iPhone usage solely to the AT&T network in June 2008 and enforcing strong application control. These users filed a lawsuit against both companies. The plaintiffs argue that Apple entered into a secret agreement with AT&T, making them the exclusive

⁶ Google Search (Shopping) (Case AT.39740) Comm'n Decision of 27/6/2017[2017]. Para 271.
https://ec.europa.eu/competition/antitrust/cases/dec_docs/39740/39740_14996_3.pdf

⁷ <https://www.nytimes.com/2017/07/01/technology/yelp-google-european-union-antitrust.html>

⁸ Rand Fishkin, less than Half of Google Searches Now Result in a Click, SPARKTORO (Aug. 13, 2019),

<https://sparktoro.com/blog/less-than-half-of-google-searches-now-result-in-a-click/>. 1202 Id. (showing organic fell from 41.1 percent in January 2016 to 26.68 percent in June 2019, a period over which paid click-through rates increased from 3.29 percent to 11.38 percent).

⁹ See Angelique Richardson & Ellen Terrell, Apple Computer, Inc., LIB. OF CONG. (Apr. 2008), <https://www.loc.gov/rr/business/businesshistory/April/apple.html>.

partner for the iPhone in the U.S. for five years, which they claim hindered competition and raised consumer prices.¹⁰

Due to Apple's network barriers, users were compelled to exclusively utilize the AT&T network, and Apple exercised exclusive control over which applications iPhone users could install and which they couldn't. With this recent ruling, users who purchased the first-generation iPhone, released in June 2007, on a 2-year contract with AT&T, are now eligible to participate in a class-action lawsuit. The class-action lawsuit seeks a court order that would require Apple to offer iPhones sold in the U.S. without network control features and allow users to decide whether to install iPhone programs.¹¹

V. CONCLUSION

As information and communication technology rapidly advances, the reality is that legislation to regulate it often struggles to keep up with the pace of technological change. In other words, the disparity between legal frameworks and emerging technologies can lead to various issues within the cloud market. Instead of enhancing market structures, there is a constant influx of antitrust lawsuits that could potentially escalate into litigation battles among specific groups. Therefore, it seems imperative to establish legislation that ensures effective enforcement of the law, based on reasonable cost, reasonable levels of accuracy, and expediency in determining violations, along with the ability to impose effective sanctions on violators.

The recent proposal for the Cloud Computing Development Act holds significant value as a law intended to foster domestic cloud industry growth and ensure safe utilization. However, it might fall somewhat short in terms of improving the structure of the cloud market. In an environment where overseas companies already dominate the domestic cloud market, it appears challenging for small and medium-sized enterprises to penetrate the market. Particularly with foreign companies already entering even the public sector, it implies the potential risk of significant information leakage and could result in the loss of business opportunities for smaller enterprises.

Certainly, for the sake of securing reliability in cloud services, there might be a preference for foreign companies. However, to safeguard information and enhance market structures, it seems necessary to simultaneously establish a system that enables the participation of small and medium-sized enterprises by applying Article 3 of the Antimonopoly Act to address monopolistic practices.

As seen in the cases of Google and Apple, giant corporations possess enough market dominance to distort the cloud market and potentially exclude new entrants. Consequently, there is a need for regulations that can prevent the abuse of market power by these giants in the cloud sector. The current antitrust laws are insufficient to address the dominance abuse by such giant corporations. Therefore, regulations should not solely be determined by a market dominance threshold of 50%, but should consider factors such as the ability to adjust cloud computing usage fees and the potential exclusion of new competitors. It seems necessary to establish regulations based on these considerations to effectively prevent the misuse of market dominance by Google and Apple in the cloud market.

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¹⁰ <https://www.cnet.com/tech/tech-industry/apple-sued-over-deal-locking-iphone-to-at-t-network/>

¹¹ <https://www.wired.com/2010/07/iphone-class-action/>