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경제학석사 학위논문

**The impacts of value chain
digitalization on firm performance in
the video game and apparel industry**

비디오 게임 및 의류 산업에서
가치사슬 디지털화가 기업 성과에
미치는 영향

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경제학부 경제학전공

뷰푸트리 (Vu Phu Tri)

Abstract

The impacts of value chain digitalization on firm performance in the video game and apparel industry

Vu Phu Tri

Department of Economics

The Graduate School

Seoul National University

The research examines how digitalization affects the global value chain (GVC). By using firm-level empirical evidence, the study elaborates on the value chain digitalization process in the video game and apparel industries. In both sectors, it is found that the digitalization of value chain is usually originated in downstream stages where platforms emerge, disrupt and replace traditional retailers (platform digitalization). At this level, regarding manufacturers' positions, two opposite impacts are identified. On the positive side, the platforms' incorporation lowers customer acquisition costs and enhances firms' productivity. On the negative side, firms have to pay a significant amount of money to platform owners through platform provider fees. Intriguingly, as is being revealed in the video game industry, there are asymmetric impacts of GVC digitalization on small and medium-sized enterprises (SMEs) and incumbent firms. With regard to SMEs, the GVC digitalization is generally beneficial as it lowers entry barriers and facilitates upgrading, especially end market upgrading. Meanwhile, it is more likely that incumbent firms have to trade-off between revenue (and customer) growth and profitability. A higher sophisticated level of value chain digitalization with the involvement of platforms and the emergence of data-driven characteristics is also identified in the apparel industry (full digitalization). At this level, apparel platforms

are trying to go beyond the primary role of a two-sided marketplace to penetrate deeper into higher value-added stages. These efforts lead to the emergence of new original design manufacturers (ODMs), specifically in the “Individual ODM” and “Platform ODM” classes which have profound economic consequences.

Keywords: Digitalization, platform provider fee, value chain, upgrading, video game, apparel.

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Chapter 1: Introduction

Global value chain (GVC) is a dominant feature of the global economy and it is one of the topics that is widely discussed in literature. Investigating GVCs unveils the picture of global production networks and sheds light on the value creation process. Participation in GVC has been proven to promote economic growth, support job creation and enhance firms' performance (UNCTAD, 2013; OECD, 2013; WTO, 2019). Therefore, understanding the dynamics of GVC and enhancing the readiness level to cope with changes within it are critical for any country and organization. This research aims to improve our understanding of the digitalization process in GVC, one of four major trends that are reshaping the global value chain (Brun *et al.*, 2017).

Digitalization is a concept that is closely related to currently well-known terms such as 'digital economy', 'industry 4.0' or 'the fourth industrialization revolution' (4IR). There is no clear definition of what industry 4.0 or 4IR is. Different organizations and scholars have different definitions and understandings of the term. The notion of "The 4th Industrial Revolution" was first used by Schwab at the 2016 World Economic Forum in Geneva. According to him, 4IR is powered by the newest technologies such as 3D-printing, big data or artificial intelligence (AI). It differs from the first three industrial revolutions in which mechanization, electricity, and information and communications technology (ICT) were the main drivers of industrial changes (Davis, 2016; Schwab, 2016). Rießmann *et al.* (2015) identify nine key technologies that power the industry 4.0, including autonomous robots, simulations, horizontal and vertical system integration, the industrial Internet of Things, cybersecurity, the cloud, additive manufacturing, augmented reality and big data, and analytics.

The United Nations Conference on Trade and Development defines industry 4.0 as a "platform-based ecosystem of ICT-based products and services" (UNCTAD,

2017b). Platforms in UNCTAD's definition can be understood, according to Gawer and Cusumano (2013), as occurring in two forms: internal and external platforms. Internal platforms (company or product platforms) are defined as "a set of assets organized in a common structure from which a company can efficiently develop and produce a stream of derivative products". On the other hand, external platforms (or industry platforms) are products, services or technologies that provide the foundation for external innovators to develop their own products, services or technologies. Examples of typical external platforms are Amazon, Apple App Store, Google Cloud, Uber, and WeWork.

In this research, the concept of GVC digitalization echoes that of Mussomeli *et al.* (2016) which states "the use of advanced data analytical tools and physical technologies to improve the digital connectivity and technological capabilities of supply chains". Following this definition, a digitalized GVC is primarily differentiated from the conventional one in three aspects. First, parts of the value chain are now digitally conducted. Examples include online shopping in downstream stages, E-auctions among suppliers in upstream stages and the digital automation of plant operations in internal production stages (UNCTAD, 2017b).

The second distinction of the digitalized GVC is the involvement of platforms in the value chain. Platforms like Apple App Store, Amazon, and Alibaba, with superiority in technological capabilities, are penetrating into the value chain and disrupting traditional business models. It is not surprising that platforms are increasingly capturing more value from the global value chain. For instance, in the video game industry, despite the fact that gaming is not Apple and Google's core business, the two companies ranked 4th and 6th, respectively, in the top 25 largest public companies by game revenues in 2018 (Newzoo, 2018b). Similarly, in the apparel industry, Morgan Stanley Research estimated that Amazon will soon become the number one retailer in the U.S market (CNBC, 2018). Summarizing the power of platforms in the world economy, Kenney and Zysman (2016) simply stated that "we are in the midst of a reorganization of our economy in which the platform owners

are seemingly developing power that may be even more formidable than was that of the factory owners in the early industrial revolution”.

The final characteristic of a digitalized GVC is the data-driven value chain: information from different sources and locations are incorporated to derive production decisions. A typical example of a data-driven value chain can be found in the Indonesian aquaculture sector and illustrated in the case of eFishery. eFishery is a successful startup that was founded in 2013. It develops sensors-based IoT applications that track fish behavior data which is utilized to analyze fish behavior and improve feeding performance¹. The booming of these similar IoT platforms and startups that focus on data collection is the key to the evolution of the digitalized GVC (UNCTAD, 2017b).

Currently, the shift to digitalization has been adopted in many countries, industries, and organizations. Taking the United State as an example, the Bureau of Economic Analysis (BEA) estimated that the digital economy accounted for 6.9% (\$1351.3 billion) of the United States gross domestic product in 2017. Digital transformation also added billions of value to many US industries in 2018, with \$424.4 billion in broadcasting and telecommunications and \$328.2 billion in computer systems design and related services. As a result, the value chain is increasingly digitalized and this phenomenon raises the fundamental question of the worth of such a transformation: is the digitalization of GVC good or bad?

One of the first studies that looked at the impacts of GVC digitalization is the research of Mussomeli, Gish, and Laaper (2016). In their research, Mussomeli *et al.* elaborate on the ways that usage of the latest technologies could transform the traditional linear GVCs to a more open and interconnected system. They also emphasize the positive impact of a digitalized GVC, as the collection of information from different sources and locations could be utilized to derive better production decisions. UNCTAD (2017a) points out that digitalization can have massive and

¹ From eFishery’s website at <https://efishery.com/en/home/>. Accessed June 10th, 2019

positive impacts on all stages of the value chain. Regarding the economic impact of E-commerce and online trading, a special form of value chain digitalization, there is strong evidences that engagement in online business can increase the amount of value-added to retail companies (Xia and Zhang, 2010), enhance the efficiency of manufacturing firms (Quiros Romero and Rodriguez, 2010) and boot firms' productivity (Liu *et al.*, 2013; UNCTAD, 2015).

Besides the positive impacts of GVC digitalization, some scholars have pointed out that negative aspects are present as well. For instance, Kenney and Zysman (2016) raise several concerns about the dependence on platforms and the economics relation between platforms and their partners (gig employment). Foster and Graham (2015) express concerns that SMEs might find digital transformation to be difficult and challenging as many of them lack the sufficient capabilities to adopt sophisticated technologies and other necessary requirements.

This research, by using firm-level empirical evidence, takes the manufacturers' position and tries to shed some light on the value chain digitalization process on the video game industry and apparel industry. The main research question in the study is: Is the digitalization of GVC is good or bad for manufacturers? As digitalization can have impacts on all stages of the value chain (UNCTAD, 2017a), this research narrows down its focus on the internal production and downstream stages only.

To address the question, two dimensions of analysis are presented. First, the research elaborates on the economic consequences of GVC digitalization with impartial focus on both the beneficial and disadvantageous impacts. Regarding the positive aspects, the research seeks to measure how a partnership with platforms can enhance firms' productivity by lowering customer acquisition costs. While on the negative side, the research quantifies the magnitude of the platform provider fee, a fee that manufacturers have to pay to platform providers to be included and appeared in their platforms. Next, the research draws a comparison of companies' growth and profitability between a digitalized value chain and the traditional one to reveal the

overall impacts of GVC digitalization. The research also takes a closer look at platform provider fees, the very new component in the digitalized GVC.

Second, by employing a GVC perspective, the research tries to determine whether the digitalization of GVC has any implications on governance issues and upgrading possibilities, the two fundamental problems in any GVC research (Gereffi, 2019). Regarding governance issues, the research infers the bargaining power between manufacturers and platform owners primarily through the ability to negotiate favorable partnership contracts, especially, the platform provider fees. In relation to the possibility of upgrading, the critical question which is addressed in the research is whether digitalization becomes an additional barrier or whether it will serve as a window of opportunity for companies in the process of moving up the value chain.

Overall, contributions of the research are as follows. Firstly, to the best of our knowledge, this is the first research that quantifies the platform provider fees. The data in this research consists of the fees charged by the 26 leading retailer platforms coming from 12 countries. Secondly, the research shows the asymmetric impacts of value chain digitalization on SMEs and incumbent firms. Although having to pay a significant platform provider fee, the value chain digitalization is generally beneficial for SMEs as it lowers entry barriers and facilitates upgrading, especially end market upgrading. Meanwhile, the value chain digitalization can hurt incumbent firms. Indeed, in the video game industry, it is found that incumbent firms are more likely to have to trade-off between revenue (and customer growth) and profitability. In the apparel industry, the value chain digitalization can create potential competitors who directly compete with leading apparel brands and manufacturers.

The remaining parts of the research are organized as follows. Chapter 2 provides three modes of GVC digitalization and their possible economic consequences. Chapter 3 mentions the data and methodology. Chapter 4 and Chapter 5 examine the process of GVC digitalization in the video game and apparel industry, respectively. Chapter 6 concludes and makes recommendations on policy implications.

Chapter 2: Modes of GVC digitalization and their economic consequences

UNCTAD (2017a) classifies three kinds of digitalization in GVCs: thin integration, platform digitalization, and full digitalization. Although UNCTAD classification is only applied to micro, small and medium enterprises (MSMEs), this classification can also be expanded to any firm size.

Thin integration

The first mode of GVC digitalization is “thin integration” (Murphy and Carmody, 2015). It is the simplest level of value chain digitalization and mostly used by MSMEs. In this form, small firms start incorporating ICT technologies into their businesses. Using digital technologies helps to improve cooperation effectiveness in the chain. However, it does not affect the fundamental structure of the chain. Indeed, there are no significant changes in both the role of firms in the chain and the amount of value captured by these firms.

This level is prevalent in low and middle-income countries where the development of advanced ICTs is quite limited² and MSMEs are resource-constrained³. The ICT technologies used in this level are usually cheap and simple such as the usage of emails, mobile phones and telephones, broadband, fax machines, intranet, LAN, post boxes, computers, and information websites (McNamara, 2008; Apulu *et al.*, 2011; Esselaar *et al.*, 2007).

Even at its simplest level, the GVC digitalization is proved to enhance the business performance of MSMEs. Ongori and Migiro (2010) summarizes five main benefits of the ICTs adoption on SME and MSMEs as (i) access to market and customers; (ii)

² See Ihua (2009), Terero and von Braun (2005), Weiner and Rumiany (2007).

³ Computer is too expensive is the reason that 45% of SMEs state that they do not have a computer (Esselaar *et al.*, 2007). Ashrafi & Murtaza (2008) found that more than 70% of 51 Oman SMEs considered in their research spend less than 10% of budget for ICTs.

access to robust information; (iii) knowledge management; (iv) efficient, admiration, control, and accountability; and (v) managing resources efficiently. The first advantage of value chain digitalization is exemplified in the work of Raymond *et al.* (2005) and that of Esselaar *et al.* (2007). In these studies, it is explained that the adoption of ICTs has a positive correlation to revenue generation. The second impact of “thin integration” is stressed by Irani (2002, p.12) as ICTs enable SMEs to gain access to robust information, which is a critical factor that improves the competitiveness of SMEs (Kohli and Devaraj, 2004, p. 56). The remaining three are more or less related to the positive effect of adopting ICTs in firms. Several studies already tackled this issue by pointing out that the usage of ICTs enhances efficiency, effectiveness and competitiveness (Hamilton & Asundi, 2008; Mahmood & Mann, 2000); boosts labor productivity (Black & Lynch, 2001; Esselaar *et al.*, 2007) and improves the efficient administration of SMEs (Schware, 2003; Mutula and Brakel, 2006, p.409).

Platform digitalization

The second mode in GVC digitalization is platform digitalization. It refers to the involvement of platforms into the value chain. Recent years have witnessed the proliferation of platforms. Eisenmann *et al.* (2011) note that platform markets “comprise a large and rapidly growing share of the global economy”. Examples of the largest platforms are Facebook and Twitter (social network); Alibaba and Amazon (E-commerce); Apple App Store and Google Play Store (app stores); Uber and Grab (ride-hailing); Airbnb and Booking (hospitality).

As pointed out by Katz and Shapiro (1985) and Gawer and Cusumano (2013), one of the most intriguing characteristics of the platform is the possibility to create a network effect. That is, the value of platform adoption for any users is positively correlated with the number of interactions with other users they can make. Thus, the more users who affiliate to the platform, the more valuable platform becomes in users’ and firms’ eyes. In other words, the ecosystem created based on platform lures

more firms and users to join the platform as more users, counterparts and competitors do so. It makes leading platforms hard to compete with.

Many SMEs are now starting to incorporate platforms into their businesses. Agriculture exporters in Ethiopia and Nairobi are using various exchanges based on platforms to trade commodities (EuropeAid, 2012). Platforms are also integrated in South Africa tourism industry to support online reservation and booking system (Murphy *et al.*, 2014). Evidence of shifting in favor of platforms are also found in large enterprises and multinational companies (MNCs). For instance, in an unconventional move in 2017, world-famous apparel brand Calvin Klein announced that their latest underwear collections for winter holidays were available exclusively on Amazon before being sold in traditional department stores⁴.

On the one hand, the adoption of platforms in the value chain benefits firms in many aspects. In agriculture, Goyal (2010) finds that the usages of platforms can result in a higher export price for commodity exporters. The involvement of platforms also facilitates efficient trading as found by Waema and Katua (2014). Regarding information storage and management - an essential task of any company, cloud computing adoption has been found to bring several advantages such as cost reduction, flexibility, mobility and shared resources (Erdogmus, 2009; Gangwar and Ramaswamy, 2015). Using platforms also helps facilitate upgrading as noted by Hinson (2010), Tihamiyu *et al.* (2012) and Li *et al.* (2018).

At the same time, the involvement of platforms into the value chain also raises several concerns. As the power of platforms is increasing over time because of the network effect, the value is now condensed in the hand of several powerful platform providers. These platform owners, in turn, protect their positions in the value chain by utilizing their tremendous power to muscle out competitors and reduce competition in the market. This results in a monopoly or strong oligopoly position

⁴ Company's announcement. Information retrieved on June 09th 2019 at <https://www.wsj.com/articles/calvin-klein-to-begin-selling-new-underwear-only-through-amazon-1510792184>

and finally leads to potential antitrust violations (Kenney and Zysman, 2016). For instances, over the past two years, Google has been fined a total of €8.24 billion (\$9.3 billion) by EU Commission for the antitrust violations related to of its three dominant platforms: Search engine platform - Google search, mobile operating platform - Google Android and online advertising platform - Google AdSense (EU Commission, 2019). Also, as the dependence on platforms increases over time, an unfavorable change in platform policies initiated by platform providers might have a negative spillover impact on the whole value chain. Therefore, despite the clear benefits of joining platforms, some companies are still reluctant to adopt them. For instance, while several apparel brands such as Adidas and Calvin Klein are selling their products on the Amazon page, Zara decided to expand online sales in 106 countries by its own effort without working with Amazon⁵.

Full digitalization

The third and highest form of GVC digitalization is full digitalization. UNCTAD (2017a) defines full digitalization is a “fully digitally integrated systems”, a term that is close to the notion used by Mussomeli, Gish, and Laaper (2016) as “digital supply network”. In this form, information, and data through various levels, sources and locations are integrated into a single system that is finally used in making production decisions (Brenna *et al.*, 2016). The role of information, especially information from the market and material suppliers, has been stressed as one of the most critical factors in determining the success of new product development and commercialization (Ottum and Moore, 1997; Petersen *et al.*, 2005). In the digital era where things are connected and the information flows are enriched, making use of information and turning it into valuable insights becomes a key element in determining a company’s success.

⁵ Company’ announcement. Information retrieved on June 09, 2019 at <https://www.reuters.com/article/inditex-internet/corrected-zara-launches-online-sales-in-106-new-countries-idUSL8N1XI3YT>

In general, the full digitalization of the value chain usually originates from data collection. Mobile apps, IoT applications, and sensor networks are now adopted in various circumstances and industries to collect real-time and massive data. Brugger (2011) points out the use of mobile applications to collect data in the agriculture field. In the case of the tea sector in Rwanda, Foster and Graham (2015) find the adoption of on-field data collection devices. Brenna *et al.* (2016) figure that a pharmaceutical company uses sensors in its inhaler products to collect real-time data. In manufacturing fields, for instance, in an attempt to improve the performance of coal-fired steam power plants, General Electric (GE) introduced a “Digital Power Plant”. In this system, more than 10000 sensors are integrated to monitor plants’ operation and improve real-time performance (GE, 2016).

The next step after data collection is data utilization, i.e., the creation of digital solutions based on data. Generally, the massive amount of data collected is used to improve business performance and customer satisfaction. On the firm’s side, data can be utilized to drive customer insights, project customers’ need and to develop algorithms for a real-time data-based pricing strategy (Brenna *et al.*, 2016). For example, Uber’s surging price policy in high demand hours is based on a complicated algorithm that tracks the real-time data of drivers and customers. This pricing model is found to be effective as it reduces the waiting time of a ride in the peak hours and enhances the efficiency of the whole system (Hall *et al.*, 2015). Real-time data-based pricing is also the case of Deutsche Bahn AG, a cargo rail consortium. This company uses the real-time data of available capacities and customer ordering information to customize pricing (OptaSense, 2014). In the case of the aforementioned GE’s “Digital Power Plant”, as announced by the company, the system will analyze the data from the sensors network to model the real-time plant conditions. This helps administrators effectively adjust inputs and materials. The system can also run simulations based on collected data to predict demands and supply in different weather conditions (GE, 2016).

Chapter 3: Data and methodology

The research uses firm-level empirical evidence in the 2012-2018 period to explore the impacts of the last two modes of GVC digitalization. In each industry, a group of companies and leading platforms are selected. Next, data of these firms and platforms are manually collected mainly from companies' official annual and quarterly reports, filings, statements, and websites.

In the video game industry, to identify incumbent firms, the research relies on the original list of Newzoo (2018b) in which the top 25 largest public companies by game revenue are revealed. The list is then narrowed down using the following criteria:

- i.* Selecting only companies with at least \$1 billion reported revenue in 2018;
- ii.* Eliminating companies that gaming is not their main business (Google, Apple, Microsoft, etc.);
- iii.* Ruling out companies that primarily focus on console game with small PC and mobile game business which are not the research's interest: Companies with at least 75% revenue in 2018 from console game is removed (TakeTwo Interactive, Ubisoft, etc.)
- iv.* Dismissing companies where it's difficult in decomposing game revenue (Square Unix, Bandai Namco, etc.)

Next, several private leading mobile companies from a list released by Medium (2016) are also put into consideration. At the end, the group of incumbent game companies which are considered in the research consists of 8 companies in 5 countries: Activision and Blizzard, EA (US); Nexon, Netmarble, and NCSoft (Korea); Supercell (Finland); GungHo Online Entertainment (Japan); and King (Malta - before 2016; later acquired by Activision Blizzard).

In addition, empirical data from another four successful SME game companies, namely, Imangi Studios (US), Kilo and SYBO (Denmark), Com2Us (Korea) is also used in the research. Regarding platforms in the video game sector, besides the two giants: Apple App Store and Google Play Store, data from OneStore - the number three app platform in the Korean market is also included. Overall, in the video game industry, the research considers 12 game companies and 3 platforms in 6 countries.

In the apparel industry, among three main kinds of E-commerce platforms, namely, B2B (business to business), B2C (business to customer) and C2C (customer to customer), the research mainly focuses on B2B and B2C platforms while ignoring platforms that merely do C2C business. This is because the primary objective of the research is examining the economic impacts of GVC digitalization on apparel brands and manufacturers. UNCTAD (2015) reveals a list of the top 10 countries by B2C revenue in 2012-2013 and the research uses this list to identify leading B2C and B2B E-commerce platforms in each of these 10 countries. Some regional leading platforms are also put into consideration. Several indicators are used to determine leading platforms including customer base size, gross merchandise volume, and the number of monthly visitors. At the end, the E-commerce platforms which are considered in this research include Amazon (US, UK, France); eBay (US, UK); Asos (UK); Cdiscount (France); Rakuten (Japan, US); Otto (Germany); Gmarket, Coupang (Korea); Tmall, Tmall Global, JingDong Marketplace, JingDong Global, Yanxuan (China); MercadoLibre (Brazil, Argentina, Mexico); B2W Marketplace (Brazil/ Latin America); Lazada and Shopee (Southeast Asia).

Apparel brands and manufacturers which are included in the research are mostly SMEs. They consist of four Korean companies (Good People, Chuu, 8seconds, and Realcoco) and one company from each of four countries: Singapore (Mary Craft), China (Yanxuan), Australia (Cahill+), and the United State (Taylor Swift Fashion). Overall, in the apparel industry, the research considers 8 manufacturers/brands and 22 platforms in 11 countries/ regions.

Chapter 4: The digitalization of value chain in video game industry

Traditional PC game vs digitalized mobile game

Recent years have witnessed the rise of mobile games. Since the commercialization of the first iPhone in 2007, the mobile phone has been booming, making mobile games flourish. In terms of revenue, the proportion of mobile games in the global game market increased from 18% in 2012 to 51% in 2018 (Newzoo, 2018a). In the 2012-2021 period, Newzoo (2018a) also projected that mobile games revenue will grow with an annual growth rate of 26.8%, 8.6 times higher than the number of PC games (3.1%). To grab the growth opportunity in the changing environment, many game companies and publishers are shifting to mobile games, raising the question of the worth of such digitalization transformation. In other words, does a shift to mobile games really benefit game companies in terms of revenue growth and profitability?

Before answering this question, it is necessary to point out the primary differences in the value creation process of the traditional PC game and a digitalized mobile game. Figure 1 shows the value chain in PC games. It is very clear that the traditional value chain in the video game industry consists primarily of six stages including development, production, publishing, distribution, and consumption. After the development and production stages, PC games are distributed through several distributors and retailers before placing in customers' hands. Usually, retailers take three primary forms: department stores, specialty stores, and merchandise stores. For instance, in the US market, PC games are distributed through retailers such as Nordstrom, GameStop; and Walmart, which are representatives of the three types of retailers, respectively. Normally, game publishers need to pay a fee to distributors to be included in distributors' channels (distribution fee). Distributors also need to pay a retail fee to retailers.

Until the late 1990s and early 2000s, most PC games were delivered to customers' hands in physical packaged box form with CD duplications and instructions (Williams, 2002). As such, it is not surprising that distribution partners play an important role in determining the success of game commercialization. The European Games Developer Federation called this type of value chain the retailer's driven value chain in which a large part of the value chain is captured by retailers and distributors (EGDF, 2011; De Prato *et al.*, 2014).

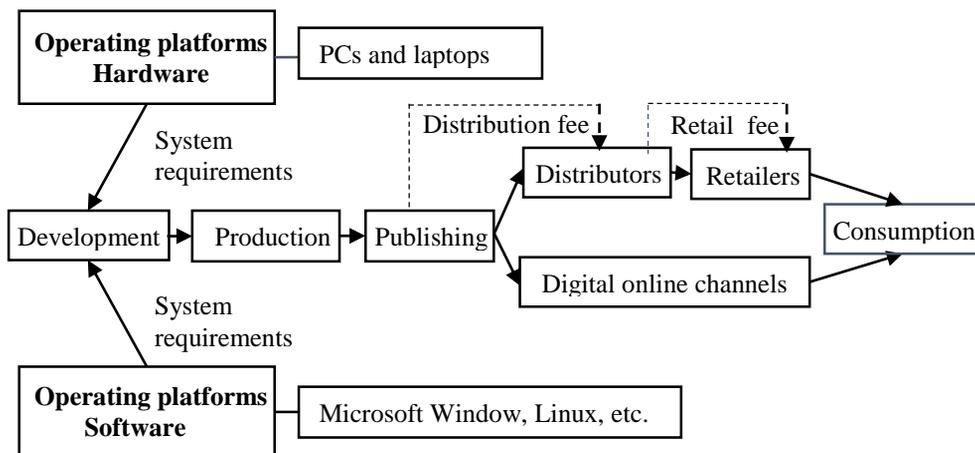


Figure 1: PC game value chain.

Source: Author from Williams (2002) and Johns (2006)

Compared to the PC game value chain, the value creation in mobile games is quite different (Figure 2). First, there is a difference in operating systems. Mobile games are running on mobile phone operating systems which are dominated by the duopoly position of Apple iOS and Google Android. The second difference is a corollary of the first: there is an incorporation of platforms into downstream stages. In fact, the distribution stages in mobile games are fully digitalized through third-party app store platforms such as Google Play Store and Apple App Store. Mobile games are now published directly into app stores and instantly reach customers' hands without going through several intermediations as in the PC games value chain (EGDF, 2011). According to UNCTAD's classification of GVC digitalization which is introduced in Section 2, the digitalized game value chain (mobile game value chain) can be categorized as platform digitalization.

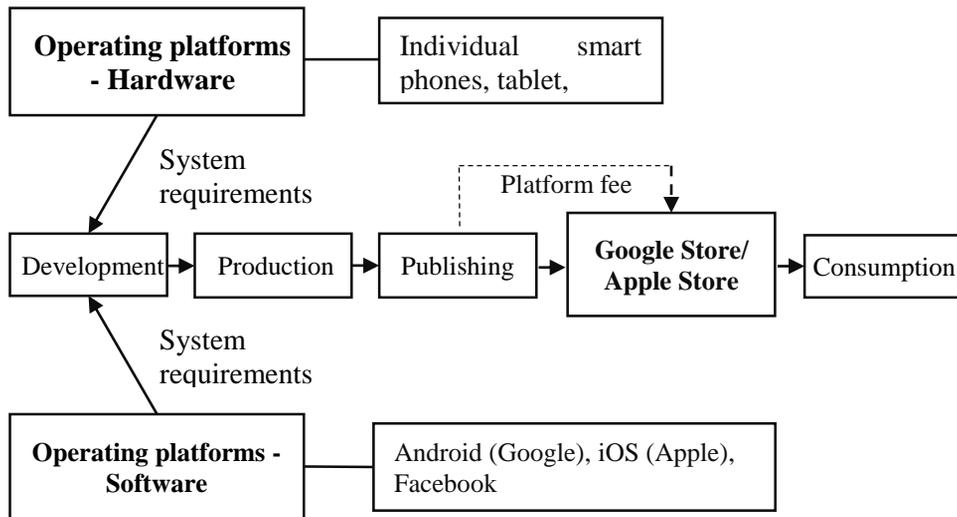


Figure 2: Mobile game value chain.

Source: Author.

The involvement of app store platforms into the value chain has profound economic consequences. Two possible impacts of the digitalized game value chain on game companies' profitability are drawn, stressed and analyzed (Table 1).

	Positive impact (+)	Negative impact (-)
Reasons	Expanding customer base that leads to a higher level of labor productivity	Paying platform provider fees
Dynamics	Might be stronger over a period of time then start declining	Increase/decrease depending on platform providers' policies

Table 1: Possible impacts of value chain digitalization on the mobile game companies' profit compared to that in PC games.

Source: Author.

Compared to PC games, given the duopoly dominant position of Google Play Store and Apple App Store, mobile games distributed through these platforms can reach a considerable number of customers. It results in lower customer acquisition costs and enhancements in labor productivity. Furthermore, these positive impacts can be strengthened over time thanks to the possibility of the network effect creation. That means, compared to PC game companies, mobile game companies can attain a higher profitability level. On the negative side, as "There is no such thing as a free lunch", to be available on app store platforms, game companies have to pay a platform

provider fee (or subscription fee) to the platform providers. Generally, platform providers charge a subscription fee of 15% to 30% revenue generated through their platforms. Given the fact that there is no such fee in PC games, the profitability of mobile game companies is expected to be much lower than that of PC game companies. In the following, each side of the GVC digitalization is scrutinized.

The apps market, platform provider fee and the negative impact of value chain digitalization

The apps market is characterized by very high entry barriers, with dominant positions of Apple App Store and Google Play Store. Apple App Store (or The App Store) is the only app store in the iOS operating system. Since its introduction in 2008, The App Store has seen a huge success. In June 2018, Apple's CEO Tim Cook announced that Apple Store hit more than 20 million developers and received an approximation of 500 million visitors per month from more than 150 countries. Also, it has made up more than \$100 billion in revenue since its launching.

In the opposite, Google Play Store (or Google Play) is the official app store for Android running devices. Android is an open-source and licensable operating system, meaning that other app stores might exist to compete with Google Play Store. Still, Google Play Store has been in a dominant position in the app market for Android running devices since 2011 (EU Commission, 2019). Indeed, it was installed in more than 2.5 billion active Android devices as of May 2019 compared to 2 billion devices as of May 2017⁶. In addition, as of 2019, Google Play Store also accounted for more than 90% of apps downloaded on Android running devices (EU Commission, 2019).

Leveraging their dominant positions in the apps market, Apple App Store and Google Play Store have been charging a significant fee to mobile game publishers. The rate is fixed, unnegotiable and completely regulated by the platform providers. In the beginning, both Apple and Google charged a subscription fee of 30%. Apple

⁶ Google's announcement. Information retrieved on June 09th 2019 at <https://www.theverge.com/2017/5/17/15654454/android-reaches-2-billion-monthly-active-users>

changed its policy for the first time in September 2016 when it lowered the subscription fee to 15%. However, the split 15/85 is only applied to subscribers whose developers can maintain subscriptions for longer than one paid year (Apple, 2019). In a similar move, Google announced a subscription fee reduction to 15%, a change that took effect on January 1st, 2018. Again, this cut only applies to developers who can retain subscriptions after 12 paid months (Google, 2019). The following table summarizes the changes in Apple and Google Play Store subscription fee policy.

	Apple App Store	Google Play Store
Before Sep 2016	30%	30%
Before Jan 2018	15% - 30%	30%
After Jan 2018	15% - 30%	15% - 30%

Table 2: Apple App Store and Google Play Store subscription fee rates.
Source: Apple and Google.

Given the fact that all game companies considered in the research do not disclose mobile platform provider fees in their reports (except EA for the fiscal year 2019), to compute the magnitude of subscription fees that mobile game publishers have to pay to platform providers, an estimation is presented (Table 3).

In general, the mobile platform provider fee is estimated as follows:

$$\text{Platform provider fee} = \text{Mobile revenue} * \text{Platform fee rate}$$

Until 2015, as both Google Play Store and Apple App Store charged a 30% subscription fee (Table 2), the rate of 30% is used for the 2012-2015 period. From 2016, as Apple changed its policy, which Google later followed, an upper bound and a lower bound estimation of platform provider fees are used. The upper bound uses a 30% rate while the lower bound is 15%.

Several issues are also taken into consideration to make the estimation more accurate. First, seven companies in Table 3 might have different revenue recognition principles. Some companies consider themselves as the principal in sales so report revenue under a gross basis. It means platform provider fees are included in mobile

revenue and it is reported as an expense. However, some companies determine that they are just agents and so report revenue on a net basis (net sales retained by platform providers). For instance, before the fiscal year 2018 (before Q2 2018), EA reported mobile revenue on a net basis and it has switched to a gross basis since Q3 2019. Therefore, in order to use the mobile revenue reported in EA reports for the platform fee formula above, the rate needs to be adjusted. The adjusted rate is $\frac{3}{7}$ for upper bound estimation and $\frac{3}{14}$ for lower bound estimation.

Second, the Apple App Store and Google Play Store might not be the only digital channels through which mobile game developers release their games. Mobile game publishers can also distribute their games through other (local) app store platforms or other digital platforms (such as Facebook). Therefore, using subscription fee rates of Apple and Google might be biased. The estimation, however, already took this issue into consideration as well. Given the fact that there are three Korean companies in the company list, the fee rate of Onestore - the third app store in the Korean market is checked. It turned out that initially, the subscription fee of Onestore was 30% but it reduced this fee to 20% in July 2018, and so it still falls into the 15-30% range. In addition, at several companies on the list, the total sales from Apple App Store and Google Play Store accounted for a very large amount of mobile revenue. As such, it still makes sense to use the fee rates of Apple and Google. Indeed, in 2017 and 2018, total sales from the Apple App Store and Google Play Store accounted for 88% and 90% mobile revenue of Activision Blizzard. The figures for GungHo Online Entertainment were 85% and 86%, respectively.

	2012	2013	2014	2015	2016	2017	2018
Activision Blizzard	210.9	188.7	129.9	<u>125.4</u>	[251.1 - 502.2]	[312.2 - 624.3]	[326.3 - 652.5]
EA⁷	135.9	168.9	207.0	282.4	[131.4 - 262.7]	[142.3 - 284.6]	<u>141.0</u>
NCSOFT⁸	*	*	*	*	<u>5.3</u>	282.7	247.4
Netmarble⁹	<u>2.6</u>	89.9	126.2	248.1	[174.8 - 349.6]	[340.8 - 681.7]	[272.8 - 545.7]
GungHo¹⁰	<u>74.9</u>	625.6	584.6	512.6	[258.7 - 370.2]	[204.5 - 297.6]	[152.4 - 304.8]
Supercell¹¹	<u>30.3</u>	267.6	533.1	697.8	[345.0 - 690.0]	[304.4 - 608.7]	[231.6 - 463.2]
Nexon¹²	30.7	87.4	97	104	[59.6 - 119.2]	[68.8 - 137.6]	[73.3 - 146.6]
Total seven companies	<u>485.3</u>	1428.1	1677.7	1970.4	[1225.9 - 2299.2]	[2274.9 - 2917.2]	[1444.8 - 2501.2]

Table 3: Mobile platform fee estimation.

**Not available. Unit: million dollars. The highest number and the lowest number in a row are marked. Source: Companies' reports and SEC filings.*

From Table 3, regarding a specific company, the fee collected by Google and Apple fluctuates over the years. It reflects that the amount of the subscription fee is heavily dependant on the yearly business performance of each company. However, on a gross basis, the subscription fee retained by Google Play Store and Apple App Store showed an upward trend in the 2012-2017 period followed by a slight decline in 2018. It indicated the increasing dominance of these two app stores in the global app market: Companies are generating more revenue and customers are spending more time and money on these two platforms.

⁷ The value in 2018 is disclosed by the company but covered only the last three quarters

⁸ The mobile revenue was first time reported in the second quarter of 2016 and the company also have reported the distribution fee since then. As said by the company, the distribution fee "related to mobile game sales"

⁹ The figure in 2013-2016 based on actual mobile revenue. However, since 2017 the company switched completely to mobile game company, thus the number is based on total revenue

¹⁰ The number is the fee pay to Apple and Google combined as the sales to Apple and Google can be explicitly decomposed

¹¹ The number is calculated based on the total revenue because Supercell is a pure mobile game company

¹² Mobile revenue is reported under a gross basis because the mobile platform fee is included in the "PG fee" item

Among all the companies in Table 3, only EA explicitly disclosed mobile platform provider fees, although the disclosure was for the 2019 fiscal year, only. Table 4 gives a very informative look at how much EA exactly paid to mobile platform providers in FY2019. The mobile platform rate reached its peak in the last quarter of 2018 with a rate of 26.5%. The lowest rate was 19.9% in Q2 2019. On average, the rate was 22.8% in FY2019. Overall, the information released by EA gives credit to the method of estimating platform provider fees above as the lowest and highest fee rates fall within the 15-30% range even while fluctuating, so narrowing down the exact range might be difficult.

	Mobile platform fee (\$ million)	Mobile platform rate
Q2 2018	49	21.0%
Q3 2018	44	20.0%
Q4 2018	48	26.5%
Q1 2019	47	24.7%
Q2 2019	39	19.9%
Total FY2019	188	22.8%
FY2020 (predicted by EA)	150	*

Table 4: Mobile platforms fee of EA.

**Not available. Source: EA*

Labour productivity and the positive impact of value chain digitalization

So far, the negative side of the GVC digitalization is analyzed. In this part, the positive impacts of value chain digitalization are sketched out. The research figures out two positive effects of app store platforms' involvement in the video game value chain. First, there is an expansion in the customer base. Second, as a corollary of the first, there are enhancements in labor productivity measured by the efficiency gain in revenue generation.

The expansion of the customer base is one of the most prominent benefits of value chain digitalization. Compared to the several billion potential customers that have accessibility to mobile games, the customer set in PC games is quite small due to several reasons. First, only a small fraction of the population has access to a personal computer or laptop compared to a mobile phone, especially in developing countries.

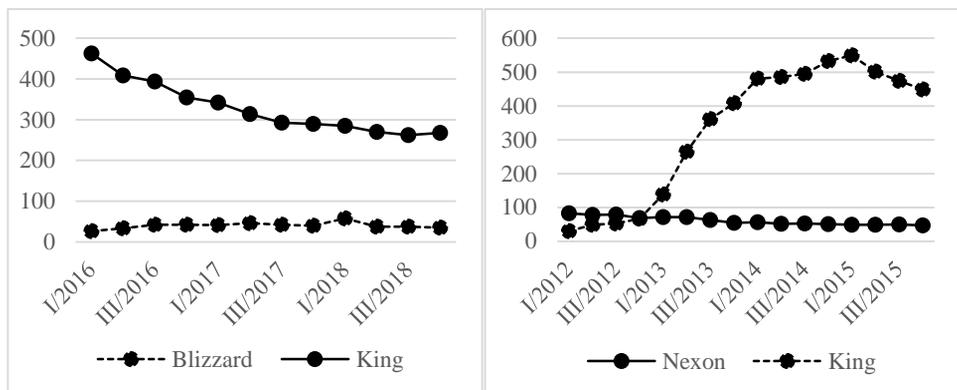
This comes from the fact that many people do not find having a computer to be useful or it is too expensive for them to buy one. In fact, in 2018, the number of PC shipments worldwide recorded nearly 260 million units. Meanwhile, there were more than 1.4 billion shipments of mobile phones in the same period (IDC, 2018). Secondly, even approaching PC-owned customers is not an easy task. Until the early 2000s, game companies had to rely on the distribution networks of distributors and retailers to reach PC game customers. The traditional distribution network, of course, has a limitation in that customers have to spend time and effort to go to stores' locations. The emergence of digital distribution channels from the 2000s allowed customers to purchase PC games even at home. As such, PC games can be accessible by a larger number of customers. However, customers still have to spend time and effort to do their own research on where the best place to order or download PC games is. This situation is not presented in the mobile game as customers know exactly where the games are.

To measure the expansion in the customer base, a monthly active users (MAUs) indicator is used. According to the 2018 annual report of Activision Blizzard, MAUs, as expressed in its name, is the number of “individuals who accessed a particular game in a given month averaged across the number of months in a respective period”. In other words,

$$MAUs = \frac{\text{Total number of users in the considered period}}{\text{Total months in the considered period}}$$

MAUs indicator is a critical measure of the overall customer size. A high MAUs number implies that game companies have been attracting lots of users and a low MAUs reflects a low level of game popularity. Figure 3 shows some facts about the MAUs of several game companies. It is a given that mobile game companies recorded a very high number of MAUs compared to that of PC game companies (Figure 3b). Another comparison of two different operating segments of Activision Blizzard is also presented. PC games-focused segment Blizzard (76.1% revenue was from PC games in 2018) recorded approximately 30-40 million active users per

month on average. Meanwhile, mobile games-focused segment King attracted more than 250 million active customers per month (Figure 3a).



a) Between segments of the same company comparison:
King segment vs Blizzard segment

b) Between company comparison: King vs Nexon (*MAUs of Nexon exclude mobile game)

Figure 3: MAUs of some game companies.

Source: Companies' reports.

One of the factors responsible for the enormous numbers of MAUs in the top mobile games is the network effect. It is further amplified by the status-quo bias created by the dominance of app store platforms such as Google Play Store and Apple App Store. That is, once a mobile game is published in the app store platforms, it is available to all customers who have access to app stores at no cost, with or without the customers' intention. When the mobile game reaches a certain level of popularity, the game popularity itself in combination with the game's availability incentivize customers to download and play the games. As an increasing number of users download and play games every day, games' popularity grows, becomes widespread and lures more and more users to join in and try the games.

The increase in MAUs, in turn, lowers customer acquisition costs (CAC). CAC measures how much money companies have to invest to attract more customers. It is simply calculated by dividing marketing expenses over the MAUs in the considered period. In the case of Activision Blizzard, the very high number of MAUs in mobile games after King's acquisition has indeed substantially lowered CAC. CAC numbers of the company before the acquisition of King were \$11.9 and \$9.8 in

2014 and 2015, respectively. It means that, on average, Activision Blizzard had to spend around 10 dollars to attract one more active user. Customer acquisition cost, however, has dramatically decreased three to four times since the acquisition of King. The CAC numbers in 2016, 2017 and 2018 were \$2.5, \$3.4, \$2.9, respectively.

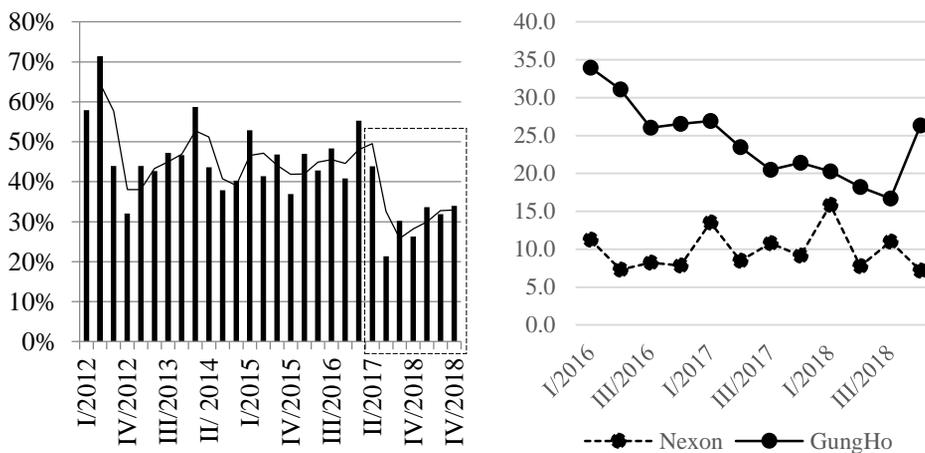
Gains in revenue generation efficiency and labor productivity

The customer base expansion and the decline in the aforementioned CAC have profound impacts on firms' efficiency and profitability. As the number of users increases, while the cost spent to acquire one came down, mobile game companies can attain a higher level of productivity.

Due to the availability of data, two indicators of measuring the efficiency in revenue generation are alternatively used in the research. The first indicator is labor to revenue ratio. It measures how efficient the company is utilizing its workforce. Labor to revenue ratio is computed by dividing labor expenses to revenue. The second indicator is revenue per employee. It is equal to the company's total revenue divided by the number of employees in the considered period. A high value of sales per employee and a low value of labor to revenue indicates a higher effectiveness degree in generating revenue. Thus, it is expected that the value of sales per employee and labor to revenue, is higher and lower, respectively, in mobile game developers. Furthermore, game developers are expected to have a higher value of sales per employee and a lower value of labor to revenue as they shift to mobile games.

Figure 4 depicts some data from several game companies. In Figure 4a, the labor to revenue ratio of NCSOFT from the first quarter of 2012 to the final quarter of 2018 is plotted. A two-year moving average trend line is used to smooth out fluctuations. It is very clear from Figure 4a that labor to revenue ratio of NCSOFT has substantially reduced since the second quarter of 2017. Not surprisingly, it coincided with the increase of mobile game revenue as a percentage of total revenue. The portion of mobile game revenue increased from 9.8% in Q1 2017 to 36% in Q2 2017. Then, it continued its upward trend to reach an all-time high of 75.8% in Q3 2017.

To verify the negative correlation between the portion of mobile game revenue and the labor to revenue ratio, quarterly data from the Q1 2016 to Q4 2018 (12 observations) is used. The starting period is the first quarter of 2016 because it is the first quarter that the company reported mobile revenue (0.1% total company revenue). The correlation coefficient is -0.87. It firmly reflects the same direction movement between mobile revenue and the efficiency of revenue generation. In other words, the more mobile game revenue is, the more effective the company generates its revenue. This finding, however, is not held for PC game companies that cannot make a significant shift to the mobile game. One typical example is Nexon. Using the quarterly data from the Q1 2013 to Q4 2018 (24 observations), the correlation between the portion of mobile revenue and labor to revenue ratio is calculated at 0.75. This is because Nexon could not increase its mobile revenue: the revenue from mobile games in the 2013-2018 period remained as low as of 18-22%.



a) Labor to revenue ratio of NCSOFT.

Correlation between Labor to revenue and % mobile revenue is -0.87

b) Sales per employee between PC game and mobile game companies

Figure 4: Labor to revenue and sales per employee of some companies.

Source: Companies' reports.

Figure 4b uses revenue per employee to present a comparison between Nexon (a typical PC game company) and GungHo Online Entertainment (a typical mobile game company). Both companies are listed on the Tokyo Stock Exchange. From Figure 4b, it is very clear that although the value of GungHo showed a declining

trend, it was still much higher than that of Nexon. As mentioned earlier, the reason is that mobile game companies such as GungHo can enjoy the benefits of the network effect to increase users without spending much money on marketing and promotions.

Upgrading in the video game industry: Entry facilitation and end-market upgrading

The involvement of app store platforms in the value chain makes it easier for mobile game companies to reach a massive number of customers. Once the game is available on app platforms, billions of customers can access the game instantly and simultaneously in a few minutes. This facilitates the entry of SMEs into the video game market.

The entry facilitation is exemplified in the case of Imangi Studios. Imangi Studio is a small US game studio that was founded in 2008 by a married couple. It is a self-funded company and has a fully independent operation. In August 2011, the studio released its' most famous franchise, the free-to-play Temple Run with the work of only three people. Since being published, Temple Run has been a big hit. As of March 2012, 13 million people played the game daily. Also, the Temple Run franchise has accumulated over one billion downloads worldwide. This made the number of Imangi's headcount increase from 3 to double in 2014 and grew to 32 employees as of March 2018. With the success of Temple Run, the company has an estimated annual revenue of \$18.8 million and is developing other mobile games¹³.

Another successful case is Subway Surfers, an endless runner mobile game. The game is co-developed by two Danish game developer companies, namely, Kilo and SYBO. Both Kilo and SYBO are small private companies and were founded in 2000 and 2010, respectively. Since its release in May 2012, Subway Surfers was the most downloaded game in 2017 across the Apple App Store and Google Play Store. It was also the first game in history to have more than 1 billion downloads on Google Play

¹³ Information retrieved mainly from the company website at <https://www.imangistudios.com/> on June 10th, 2019. The estimated annual revenue is from Crunchbase.

as of January 2018. In terms of revenue, Subway Surfers has made up more than \$80 million on iOS devices with the number in the first half of 2018 reaching \$4.3 million on iOS¹⁴.

As the app store platforms are available in most parts of the world, mobile games can be easily accessed by a large number of foreign customers. It blurs out the hard border between the local and international markets and in most cases, eliminates it. Mobile game companies can take advantage of this characteristic to quickly increase their sales and profit. The case of the aforementioned Subway Surfers is a typical example. It is also the case of Summoners War, a mobile game that is developed by Com2Us. Before releasing Summoners War in June 2014, Com2Us was a relatively small Korean game company (compared to the other three giants in the Korean game market: NCSOFT, Netmarble, and Nexon). Its revenue and operating income in 2013 was KRW 81.4 billion (\$77.2 million) and KRW 7.7 billion (\$7.3 million), respectively. The release of Summoners War, however, has been flourishing the company's performance. Shortly after releasing Summoners War, in 2014, Com2Us recorded a 108% year-on-year growth in revenue and a 1,209% jump in operating income. As of February 2019, Summoners War had over 100 billion downloads worldwide with an accumulated revenue surpassing \$1 billion, significantly contributing to Com2Us's KRW 481.8 billion (\$433.6 million) revenue in 2018. Intriguingly, as of Q2 2017, the domestic market only accounted for 11% of Summoners War lifetime revenue. The remaining 89%, or KRW 1 trillion (\$890 million), was generated overseas. In terms of game sales, this game ranked first in 59 countries. It also belonged to the top 10 in the other 125 countries.

¹⁴ Information retrieved mainly from the official website of Subway Surfers at <https://subwaysurfers.com> on June 10th, 2019. The estimated revenue on iOS is from Sensor Tower.

Before and after value chain digitalization: A group-level comparison

So far, the entry and upgrading facilitation of app market platforms are analyzed. Two possible impacts of the game value chain digitalization are also pointed out. Still, the interplay, dynamics and the relationship (that is, which one dominates) between these two impacts are not yet scrutinized. To conclude this section, two levels of comparison in profitability between the digitalized value chain (PC games) and traditional value chain (mobile games) are performed. The first one is a group-level comparison in which PC game companies and mobile game companies are compared. The second one is performed at the company level. It means comparing the same company at two different periods of time.

At the group-level comparison, all companies on the list (except EA) are divided into two groups: PC game group and mobile game group. A simple majority rule is applied in determining which group a company belongs to. That is, the PC game group contains all companies in which more than 50% of revenue is from PC games, and the same is done for the mobile game group. In addition, the classification is reviewed on a yearly basis. It means that one company can belong to different groups in different years. A special rule is also applied to Activision Blizzard. This company has three different reported segments: Activision (mainly console games), Blizzard (mainly PC games) and King (mainly mobile games). As such, the Blizzard segment is counted in the PC games group while the King segment is placed on the mobile game group. Using these classification criteria, the PC games group consists of NCSOFT (before 2017), Nexon and the Blizzard segment of Activision Blizzard. The mobile game group includes King (before 2016) and the King segment of Activision Blizzard (since 2016), NCSOFT (since 2017), GungHo Online Entertainment, Supercell, and Netmarble.

Table 5 below shows the profitability of the two groups. As the list includes companies from diverse countries, using net income margin might not be a good profitability measurement in comparison due to differences in tax rates. Therefore, Table 5 uses the operating margin as a profitability measurement. The profitability

number in each group is calculated by dividing the total operating income of all companies in the group by the total revenue of all companies in the group¹⁵.

	2018	2017	2016	2015	2014	2013	2012
PC game group	34.6	35.9	33.4	33.2	35.2	31.9	39.5
Mobile game group	30.2	33.4	37.9	36.3	36.6	44.0	21.5
Mobile game group (Supercell excluded)	28.0	30.1	31.0	34.2	38.0	42.2	17.0

Table 5: Profitability comparison between PC and mobile game groups
Unit: %. Source: Companies' report.

Clearly, there are dynamics in profitability comparison. In the first period (2013-2016), the profitability in the mobile game group was higher than that in the PC game group while the situation was reversed in the second period (2017-2018). The third row of Table 5 provides the calculation when Supercell is excluded. As a private company, Supercell does not reveal much of its information so there is no data of operating income. Still, EBITDA is reported so EBITDA is used instead. However, because EBITDA is generally higher than operating income, the usage of EBITDA might slightly increase profitability. Therefore, the third line of Table 5 is added for a robustness check. Not surprisingly, it still shows a similar and consistent pattern. Interestingly, in the second period (2017-2018), both Google and Apple reduced their subscription fee rates as shown in Table 2. It means that the negative effect of the value chain digitalization (having to pay a large amount of money to the platform providers) was alleviated. As such, it is natural to think that the pattern which is shown in the first period should, at least, continue in the second period. However, clearly, it is not the case as shown in Table 5.

¹⁵ A simple average method (calculating the operating margin of each company first then do average) is not used due to the possible bias of treating a large company as a small company. However, as a robustness check, this averaging method is also used to calculate operating margin in each group. Result shows similar and consistent pattern (mobile games profit > PC games profit at the first period: 2013-2016 then switched in the second period: 2017-2018). Details are available upon request.

To explain the puzzle, the research hypothesizes that in the first period, the positive effect of value chain digitalization (economics of scales) was too strong. It outweighed the negative effect (paying platform provider fee). Consequently, it resulted in a higher profit rate for mobile game companies. In the second period, although the negative effect was not as severe as in the first period, the positive effect decreased at a faster rate. As a result, the PC game group dominated the mobile game group in terms of profitability (Figure 5).

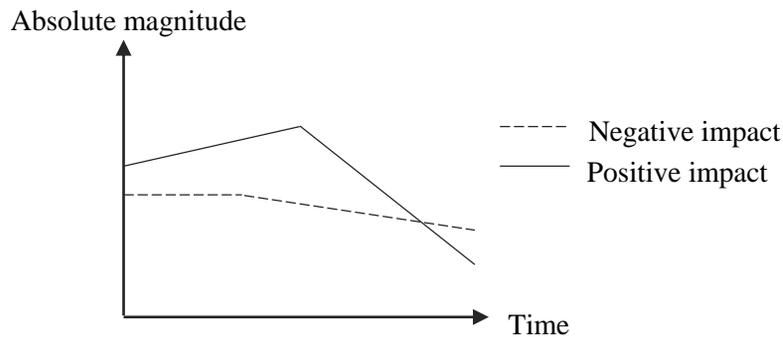


Figure 5: Dynamics of positive and negative impacts of game value chain digitalization.

Source: Author

Fundamentally, mobile games are played on mobile devices. It means that the higher number of mobile devices leads to stronger positive impacts. Once the mobile phone market becomes stagnated, so do mobile game companies. According to IDC, the number of smartphone shipments worldwide reached its peak in 2016 and then gradually decreased in both 2017 and 2018 (Table 6).

	2011	2012	2013	2014	2015	2016	2017	2018
No. of units (millions)	494.6	712.6	1004.2	1301.7	1432.9	1473	1465.5	1404.9
Growth rate		44%	41%	30%	10%	3%	-1%	-4%
Average growth rate				24.4%			-2.4%	

Table 6: Number of smartphone shipments worldwide.

Source: IDC

The booming of mobile phone shipments worldwide in the first period (2012-2016) benefited mobile game companies. In this period, mobile game publishers paid almost zero cost while still approaching more and more customers over time thanks

to the booming of smartphones used. Still, this was not the case in the second period (2017-2018) when the number of mobile phone shipments worldwide recorded a decline.

Another factor that might intensify the shrinking trend of positive impact is the fierce competition in the mobile game market. As mentioned earlier, the involvement of app store platforms in the game value chain facilitates entry and upgrading. It helps new players have an easier time of publishing their games and joining the mobile game value chain. Under these circumstances, incumbent mobile game companies are facing the possibility of losing customers to thousands of potential new players in the mobile game market. It is not difficult to find highly successful mobile games that were developed and released by (prior) small game studio and companies. All of the three games mentioned earlier: Temple Run, Subway Surfers, and Summoners War are typical examples. The double impacts of the decline in mobile phone shipments worldwide and the increased competition in the mobile game market lowered the profitability of mobile game companies. Consistently, there has been a very clear trend of a decline in the operating margin of three among four game companies considered in this research since 2016 (Figure 6).

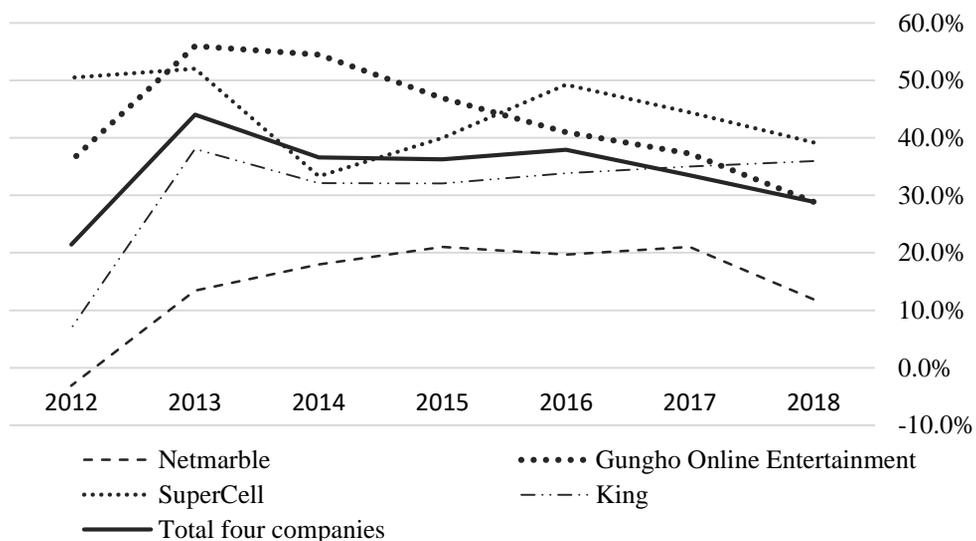


Figure 6: Operating margin of mobile game companies.

Source: Author's calculation from companies' report.

The only exception in Figure 6 is King. The case of King can be explained as follows. Firstly, King has exhibited a very slight increase in operating margin since 2016 (around 34% in 2016 to 35% in 2017 and 36% in 2018). Secondly, this minor increase might pertain to the efficiency gain when King was completely acquired by Activision Blizzard in early 2016.

Before and after value chain digitalization: A company-level comparison

After analyzing profitability between groups, a company level comparison is performed to verify whether a shift to mobile game benefits game developers or not. Only companies that have recorded an increasing trend in the proportion of mobile game revenue in total revenue are considered. Pure mobile game companies such as King (before 2016) and Supercell are excluded. Among considered companies, a simple correlation between the portion of mobile game revenue and companies' profitability is calculated. Quarterly data is used to compute the correlation. The period is from the first quarter of 2012 to the last quarter of 2018 (28 observations per company). The exception is the case of Netmarble with the period from Q1/2012 to Q2/2015 (14 observations). Since Q3/2015, Netmarble has not reported mobile game revenue as the company might consider itself as a pure mobile game company. Indeed, as of Q2/2015, mobile revenue accounted for 90.4% of Netmarble's total revenue.

Table 7 summarizes the correlation results. There is a significant difference among the five companies considered. These five companies can be divided into two groups. One group consists of Activision Blizzard, EA, and Nexon. Members of the other group are NCSOFT and Netmarble. In the first group, a shift to mobile games hurts game developers and publishers as their profitability goes down. The situation is reversed in the second group. Increases in mobile game revenue, measured as percentages of total revenue, are accompanied by a higher number of operating margin. A robustness check by using net income margin as an alternative

profitability measurement is also performed. The result is totally consistent with the case where the operating income margin is used.

	With operating income margin	With net income margin	A substantial jump in mobile game revenue	Platform digitalization degree
Activision	-0.319	-0.223	No	Partly
EA	-0.115	-0.120	No	Partly
Nexon	-0.583	-0.385	No	Partly
NCSOFT	0.390	0.136	Yes	Fully
Netmarble	0.910	*	Yes	Fully

Table 7: Correlation of the portion of mobile game revenue with companies.

**Not available. Source: Author calculate from companies' report.*

So what can explain the differences between the two groups? The research hypothesizes that the underlying reason is the degree of digitalization. This reflects firms' ability to harness and utilize the positive impacts of value chain digitalization. Generally, the negative impact of the digitalized mobile game value chain is heavily dependant on app store platform policies. In most cases, subscription rates are fixed. Game publishers and developers almost have zero power in negotiating these fee rates. Therefore, reducing the magnitude of negative impact is out of game developers' hands.

However, game developers can still leverage the positive impacts of value chain digitalization. They can do that by creating a network effect that can maintain the dominant position of games over time. Eventually, this helps companies to fully switch to platform digitalization. A full platform digitalization is defined as when mobile games account for more than 50% of the company revenue. In this case, the positive effect dominates the negative one and results in higher profitability as the portion of revenue from mobile game increases (Company 1 in Figure 7). If the network effect is not strong enough to maintain games' position over time (and yet, can not reach a full platform digitalization), the profitability will decrease (Company 2 in Figure 7).

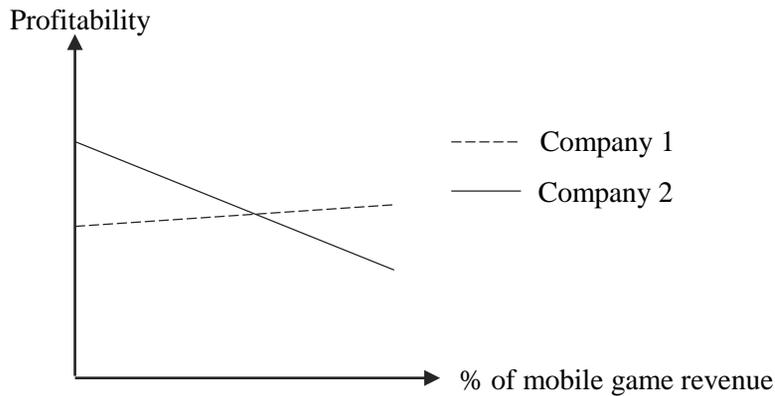


Figure 7: Possible scenarios of companies' profitability in heading to the mobile game.

Source: Author.

In examining the positive impacts of value chain digitalization in five companies in Table 6, a very interesting pattern is found. That is, there is a substantial jump in the portion of mobile game revenue in all companies in the second group (NCSoft and Netmarble). On the other hand, there is no such jump in all companies in the first group (Activision, EA, and Nexon). A substantial jump is defined as the circumstance in which there exist two consecutive quarters that mobile game revenue, as percentages of total revenue, differs more than 25%¹⁶. Indeed, NCSoft recorded two substantial jumps of 26.5% and 39.5% when the portion mobile game revenue increased from 9.8% in Q1 2017 to 36.2% in Q2 2017 and reached 75.8% in Q3 2017. Netmarble saw one substantial jump of 46.4% when the portion of mobile revenue increased from 7.2% in Q4 2012 to 53.6% in Q1 2013. All companies in the first group (Activision, EA, and Nexon) did not show any substantial jump. The longest jumps in mobile game revenue of three companies are 13.6%, 9.6%, and 20.5%, respectively.

So why is a substantial jump good and how does it relate to the captured amount of positive impacts? First, a substantial jump implies that the mobile game had made a big hit in a very short period of time (three months). The dramatic increase of the

¹⁶ 25% threshold is subjective. As 5 companies in Table 6 recorded a total revenue of at least \$1.5-1.6 billion in 2018, a 25% increase QoQ on revenue implies an increase of at least \$100 million QoQ, a number which the authors consider as "substantial"

game's popularity in such a short period of time potentially creates a network effect: The high level of game popularity attracts more customers to download and try the game. The increasing number of customers, in turn, strengthens and spreads the game's popularity. The result is, through time, the position of the game becomes stronger and that makes it difficult to compete with. This helps the company attain a higher level of efficiency in generating revenue (Figure 6).

In the case of NCSoft, the above logic was exemplified in a big hit Lineage M which was released in June 2017. Lineage M had a pre-order from 5.5 million people and got more than 10 million users after one month. In just 12 days after launching, it generated \$89 million in revenue, the fastest rate in the Korean game industry¹⁷. In the case of Netmarble, it was the mobile game tile "Everybody Cha Cha Cha", which was released in December 2012 in Korea and later in July 2013 in China. This title was the first game to reach 10 million downloads in 2013 in the Korean market. It was also downloaded 2 million times in just 4 days from the release date in China. In particular, on July 28, Everybody Cha Cha Cha was downloaded more than 800,000 times – a record in the China game market at that time¹⁸.

Digitalization path and digitalization degree: M&A vs self-development; partly vs fully

The next analysis takes a closer look at two companies in Table 7 which show the most apparent inclination of heading to the mobile game: NCSoft and Activision Blizzard. A comparison between two companies is drawn as these two companies share many similarities as well as differences. First of all, both companies initially did not participate much in the mobile game. Activision Blizzard used to focus on PC and console games while the majority of NCSoft's revenue was from PC games. But then two companies switched to mobile games by very different paths and at different degrees. NCSoft switched to the mobile game by self-development way

¹⁷ Information is mainly from NCSoft quarterly reports and Korean websites <https://pulsenews.co.kr/view.php?year=2017&no=490995>. Retrieved on June 11th, 2019

¹⁸ Information is from CJ's quarterly reports

while Activision Blizzard chose to do M&A with a leading mobile game company (King). As mentioned earlier, NCSOft can be categorized as “fully platform digitalization” because its mobile revenue in 2018 accounted for more than 53.4% of total revenue, nearly double revenue from PC games while Activision Blizzard, however, can only be labeled as “partly platform digitalization” because mobile revenue still accounts for around one-third of total revenue.

In both companies, the timing that separates before and after periods of platform digitalization is determined. In the case of NCSOft, the criteria are such that the before periods are periods when revenue from PC games is still higher than mobile games revenue while after periods are periods when the relationship is reversed. In the case of Activision Blizzard, the before periods are the prior time of King acquisition while the after periods start from the completion of the deal. Table 8 below provides an informative look at the profitability in two companies before and after platform digitalization.

	Activision Blizzard		NCSOft	
	Before (Before 2016)	After (Since 2016)	Before (Before Q3 2017)	After (Since Q3 2017)
Operating income margin	28.8%	22.3%	27.2%	36.2%
Net income margin	21.0%	14.4%	22.0%	26.2%

Table 8: Before and after digitalization profitability.

Source: Author calculate from companies' reports

Being very consistent with Table 7, after digitalization, the profitability of NCSOft goes up while that of Activision Blizzard goes down. One of the reasons that explain to the difference is the degree of platform digitalization which is mentioned earlier. A full switch to platform digitalization in the case of NCSOft results in a large efficiency gain in revenue generation shown earlier in Figure 6. In the opposite, a partly platform transformation in the case of Activision Blizzard cannot make the network effects stronger enough, yet, there is weak efficiency gain in revenue generation and profitability goes down.

Another reason that explains the difference between the two companies is the path to digitalization. As shifting to the mobile game by its own effort, NC Soft recorded a very low level of intangibles assets' amortization. Indeed, the company reported less than \$4.5 million of intangibles assets' amortization every year in the 2014-2018 period. On the opposite, King's acquisition has required Activision Blizzard to report a substantial amount of intangibles assets' amortization. Before King's acquisition, the company recorded the amortization intangibles assets at \$12 billion and \$11 billion in 2014 and 2015, respectively. Right after King's acquisition, in 2016 - the first year that King's result was consolidated in the Activision Blizzard's business performance, the amortization of intangible assets increased more than 64 times, from \$11 million in 2015 to \$706 million. It continued an upward trend to reach \$757 million in 2017 after cooling down to \$370 million in 2018. This high value of intangibles assets' amortization has hurt the profitability of Activision Blizzard. As acknowledged in the 2016 company annual report, one of the reasons that are responsible for the decline of operating income margin in 2016 (21.4%) compared to that in 2015 (28.3%) is "amortization of intangible assets acquired in the King Acquisition". The amortization further lowered the operating income to 18.7% in 2017 – the lowest level since 2007 before showed a recovery in 2018 to 26.5% thanks to a massive reduction in intangibles assets' amortization (\$387 million).

However, this finding does not imply that, on heading to mobile games, game developers and publishers should prioritize the self-development path over M&A. Indeed, it is widely acknowledged that doing M&A is one of the fastest ways to penetrate into a new market. Nevertheless, firms should also consider the negative impact of doing M&A as it will increase the reported value of intangible assets' amortization. In the case of Activision Blizzard above, doing M&A has hurt companies' profitability in the short term but as time passes, the value of intangible assets' amortization will decrease and it might not have any significant impact on the company's profitability on the long term.

Chapter 5: The digitalization of value chain in apparel industry

Traditional vs digitalized apparel value chain

The traditional apparel value chain consists of five stages, including raw material network, component network, production network, export network, and marketing network (Figure 8). In the traditional apparel value chain, retailers such as department stores and mass merchandise stores play an important role in the success of apparel brands as they enable customers to reach apparel products. The traditional apparel value chain is also characterized as a buyer-driven value chain in which a small number of global lead firms control production and distribution networks (Gereffi, 1999). These global lead firms decide where to buy materials and designate manufacturers to produce products. Taking the advantages of information collection and interpretation, these companies have been maintaining a strong bargaining power and dominant positions (Gereffi 1997; Coe *et al.*, 2004).

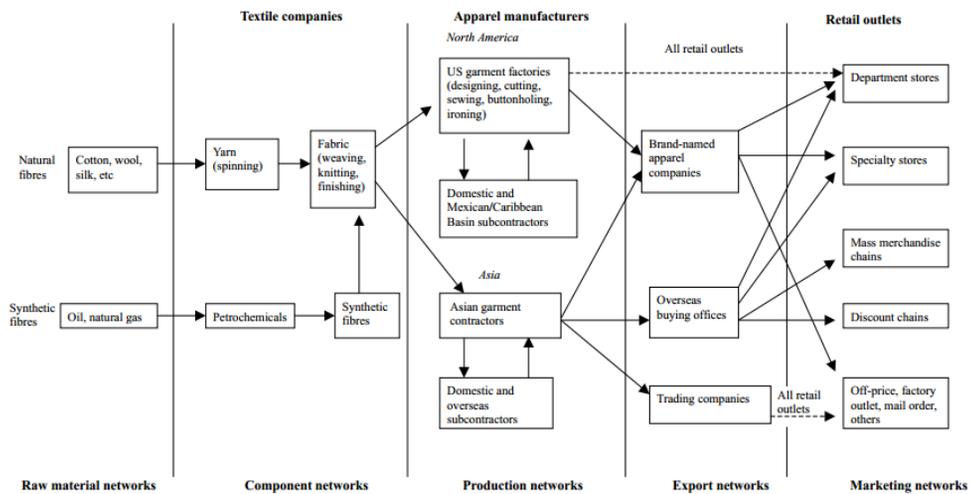


Figure 8: The traditional apparel value chain.

Source: Appelbaum and Gereffi (1994).

However, the bargaining power between players in the apparel value chain has been shifting in the digitalization era where digital platforms are penetrating into the value

chain. Generally speaking, the digitalization of the apparel value chain is originated in the downstream stages where traditional distributional channels such as department stores and mass merchandise stores are replaced by online marketplaces and E-commerce platforms (Figure 9).

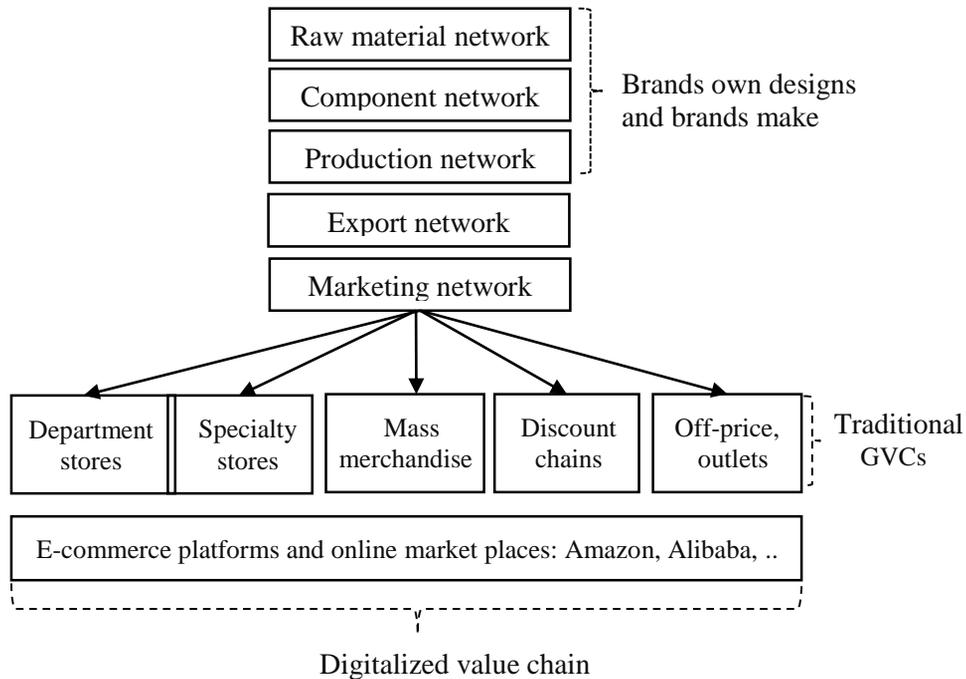


Figure 9: Platform digitalization in the apparel value chain (E-commerce).
Source: Author.

This level of value chain digitalization, or E-commerce, is corresponding to platform digitalization mode which was introduced earlier in Section 2. In this form, global dominant brands still own designs and derive production decisions. However, apparel products are now digitally distributed through E-commerce platforms. Traditional methods of distribution such as department stores and mass merchandise stores are bypassed. The value chain is becoming flattened and customers can now purchase apparel products at their homes within several clicks. This characteristic is very similar to what happens in the video game industry as the emergence of app store platforms displaces the traditional distribution methods. Following the analysis in the video game sector, both positive impacts (large numbers of customer reach) and negative impacts (paying platform provider fee) of platform digitalization in the

apparel industry are explored. The possibility of industrial upgrading thanks to the facilitation of E-commerce platforms is also examined.

E-commerce platforms adoption: Network effect and Customers reach

The emergence of E-commerce platforms offers a great opportunity for apparel manufacturers to reach an enormous number of customers. Although several concerns such as fake products, security, and privacy issues persist, it is indisputable that E-commerce brings convenience, competitive price, and rich information about products. Therefore, it is not surprising that E-commerce platforms increasingly attracts more and more customers. As more buyers come to E-commerce platforms to purchase products, more and more sellers are shifting to E-commerce platforms to get new orders and push sales. The influx of greater supply, in turn, enriches product diversity and availability in the platforms. It makes E-commerce platforms a more attractive place in the customers' eyes, to purchase apparel products. This network effect grows stronger over time and it has resulted in an enormous number of annual active customers in leading E-commerce platforms (Table 9).

E-commerce Platforms	No. of membership/ customers (millions)	Note
Amazon	Over 100	Paid Prime members, globally
eBay	179	Annual active customers, globally. StubHub customers included
Rakuten	100.2	Only in the Japanese market
JingDong	305.3	Annual active customers
Tmall	636	Annual active customers
MercadoLibre	267.4	Confirmed registered users, Latin America region
	37.4	Annual active customers, Latin America region
Asos	18.4	Active customers globally
Cdiscount	9	Active customers in France
Otto	6.6	Active customers, 2017 data

Table 9: Selected E-commerce platform's customers.
Source: Author from companies' data in 2018.

It is worth noted that all nine E-commerce platforms in Table 9 are operating in populous countries/regions (US, Japan, China, Germany, France, UK, Latin America).

Platform provider fee in the apparel industry

As in the video game industry, to be included and appear in platforms, apparel sellers have to pay a fee to platform providers. Table 10 provides an informative look at how much platforms charge apparel sellers. The table covers 22 leading platforms from 11 different countries/regions. Overall, the platform provider fee in the apparel industry ranges from as low as 2% (Shopee, in Philippines) to as high as more than 27% (MercadoLibre, in Argentina).

Platforms	Country/Region	Listing fee	Commission fee	Additional fee	Note
Amazon	US	\$39.99	17% min: \$0.3 on per item basis		Professional plan
eBay		\$299.95 (yearly renewal)	10% (max: \$250 per sales)	5% if the performance level is below standard	Anchor eBay Store subscription
Rakuten		\$39	15% per sale + 99 cents per item sold		
Amazon	UK	\$30 (£25)	15% min: £0.25, per item basis		Professional plan
eBay		\$480 (£399)	10%	4% if the performance level is below standard	Anchor eBay Shop subscription
Asos Marketplace		\$24 (£20)	20%		
Amazon	France	\$44 (€39)	15% min: €0.3 on per item basis		Professional plan
Cdiscount		\$45 (€39.99)	<ul style="list-style-type: none"> • Used product: 17% • New product: 15% 		
Amazon	Japan	\$46 (¥4,900)	15%		Professional plan
Rakuten		\$946 (¥100,000) plus a one-	For purchase made via <ul style="list-style-type: none"> • PC: 2-4% 	0.1%-1% and 8% more for	Mega Shop Plan, Japanese entity

		time registration fee of \$568 (¥60,000)	<ul style="list-style-type: none"> • Mobile: 2.5-4.5% • PC: 3.5-5% • Mobile: 4-5.5% 	sales through affiliates	Mega Shop Plan, US entity
Gmarket	Korea	-	13%		
Coupang		-	10%		
Tmall	China	\$4500-9000 annually (RMB 30000-60000)	5%	Deposit of \$425-21250 (RMB 30000-150000)	Chinese sellers
JingDong Marketplace		\$142 (RMB 1000)	8%		
Tmall Global		\$5000-10000 annually	5%	0.5% + deposit of \$21250 (RMB 150000)	Foreign sellers
JingDong HK		\$3000 annually	6%	Deposit of \$15000	
Mercado Libre	Brazil	-	16% + \$1.27 per unit (for sales below \$44.2 only)		Premium Plan
	Mexico		17.5%		
	Argentina		27% + \$0.22 per unit (for sales below \$30.5 only)		
B2W Marketplace	Brazil/Latin America	-	16%		
Lazada	Southeast Asia	-	5%		LazMall sellers
Shopee		-	2-5%		Shopee Mall sellers

Table 10: Leading E-commerce provider's fees for apparel products.
Source: Author from E-commerce providers' websites, data as of August 12th, 2019. The listing fee is on a monthly basis unless stated otherwise. The exchange rate is retrieved from XE.com on August 12th, 2019.

Normally, the platform provider fee in the apparel industry consists of three components, namely; listing fee, commission fee, and additional fee:

Platform provider fee = Listing fee + Commission fee + Additional fee

Listing fee (subscription fee/platform service fee) refers to the fee that apparel sellers have to pay to E-commerce platform providers to be included and appear in providers' platforms. The listing fee usually comprises a registration fee plus a monthly (or yearly) expense. The monthly expense ranges from as low as \$24 (Asos Marketplace) to as high as \$946 (Rakuten Japan). Also, Rakuten Japan is the only platform listed in Table 10 that charges sellers a one-time registration fee of \$568. It is worth noting that some platforms allow sellers to join for free. This is the case of Mercado Libre, the leading E-commerce platform in Latin America or Shopee and Lazada, two leading E-commerce sites in Southeast Asia. To encourage sellers to enhance their products' quality, some E-commerce platforms even conditionally return the listing fee to sellers if some requirements are met. For instance, Tmall refunds annual service fees to sellers who have a strong sales performance and a good rate of customers' reviews.

Commission fee (referral fee/real-time transaction fee) indicates a fee that E-commerce platforms collect on a sale (or an item) basis. There are two popular methods of calculating commission fee: relative measure and absolute measure. The relative value is usually calculated as percentages of the final transaction value. Most of the E-commerce platforms considered in the research follow this kind of calculation. For instance, the commission fees of apparel products are 13% (Gmarket), 5% (Tmall) and 5% Lazada. Mercado Libre uses both measures as its commission fee consists of both relative term and absolute term. With different pricing strategies, some platforms even set the minimum value (Amazon) or maximum value (eBay US) for the commission fee. The lowest commission fees are the cases of Rakuten Japan, Shoppe and Lazada. The reasoning is as follows: first, Rakuten Japan only collects a small commission fee because it already charges a lot for the registration fee and monthly listing fee. Second, Shoppe and Lazada mainly maintain a low fee level to attract more sellers as the two platforms are operating in Southeast Asia – the region in which E-commerce activities are not yet developed compared to other regions and countries in Table 10.

Additional fees are other fees that are subjective to each E-commerce platform. Some E-commerce platforms require sellers to pay a small fee to improve the quality of the system (0.1%, Rakuten) or contribute to promotional programs (the customer loyalty program of Tmall, 0.5%). In addition, sellers also have to submit a payment processing fee which usually ranges from 1% to 4%. For instance, Tmall Global charges 1% for Alipay while Rakuten Japan charges US entity 4% for card payments. However, this fee is not mentioned in Table 10 as it is not the core capability of E-commerce platforms.

From Table 10, it is clear that the fee rate in the apparel industry is significantly lower than that in the video game industry. In addition, there are various pricing strategies in the apparel industry. These differences can be primarily attributed to the availability of options facing mobile game developers and apparel manufacturers. It is worth noting that mobile game developers have almost no choice but to distribute their mobile games through third-party platforms dominated by the duopoly positions of Apple and Google. Meanwhile, apparel manufacturers and brand owners have various options to distribute their products. They do not have to rely on a small set of platforms to reach customers.

Firstly, the traditional distribution methods are still prevalent in many countries due to their long tradition and well-established networks. As in the case in developing countries, the conventional methods are still superior. This is because online payment has not become popular yet and other facilitating facilities such as logistics networks are not well-developed.

Secondly, selling products on third-party E-commerce platforms and online marketplaces is not the only available option to digitally distribute apparel products. Indeed, apparel manufacturers and brand owners can develop their own E-commerce platforms. In this way, they can sell their products directly to customers without referring to any third parties.

Thirdly, different from the duopoly dominant positions of Apple and Google in games app platforms, the E-commerce platforms market is very fragmented. Indeed, there is no global dominant E-commerce platform. In most cases, it is regional or local E-commerce platforms that dominate the regional or local market. For instance, Amazon, one of the world's largest e-commerce platforms, is popular in the United States, Canada and some Europe countries such as the United Kingdom and Germany. Rakuten is the most popular E-commerce platform in Japan while Alibaba (Tmall) and JingDong Marketplace dominate the Chinese market.

Besides the complex fee structure and the lower fee rate, group pricing is also a popular characteristic of the platform provider fee in the apparel industry. This characteristic is not present in the video game industry. Based on the size of sellers (in terms of potential sales and number of merchants), E-commerce platforms often offer different fee rates and other additional benefits. Rates are usually lower for big sellers as they bring greater profit to platform providers. Also, large sellers can enjoy additional benefits such as unlimited listing and more image capacity (Rakuten); or unique flagship pages and the possibility to sell products on foreign countries (Amazon). Furthermore, Some E-commerce platforms differentiate sellers by their origins. Local sellers usually enjoy a lower rate compared to foreign sellers (Lazada, Rakuten, JingDong Marketplace). For instance, US sellers on Rakuten Japan have to pay a larger amount of service usage fees compared to domestic sellers.

End market upgrading via E-commerce platforms

So far, two opposite effects of E-commerce platforms adoption in the apparel industry have been analyzed. The next analysis explores the economic consequences of platform adoption in small and medium apparel manufacturers with a focus on the possibility of industrial upgrading, one of the key dimensions in global value chain research (Gereffi, 2019).

End market upgrading refers to the diversification of products to new buyers or new locations (Frederick and Gereffi, 2011, p.73). Traditionally, when apparel companies

want to do business abroad, they usually have to set up their own store chains. That has been how big foreign brands like Uniqlo (2002), Zara (2006) and H&M (2007) entered the Chinese apparel market. However, this method is usually costly, risky, inflexible and time-consuming. It not only takes a lot of time to obtain necessary documents and find optimal locations, but also requires a large amount of money for initial investments. As such, it is out of reach for a lot of companies, especially SMEs with constrained financial resources and low implementation capabilities. However, thanks to platform digitalization, apparel companies can now start selling abroad without establishing physical stores. Li *et al.* (2018) point out successful end-market upgrading cases of small Chinese SMEs that sell apparel products directly to US customers. In this research, two different cases are drawn.

The first case is of foreign apparel brands that sell in the Chinese market. Many foreign brands decided to enter the Chinese market for the first time through partnerships with leading E-commerce platforms. Small Korean apparel brands such as Chuu, Good People, 8seconds and RealCoCo entered the Chinese apparel market for the first time in 2016 by listing their products on E-commerce platforms (Fung Business Intelligence, 2016). While Chuu, Good People and 8seconds formed partnerships with Tmall, RealCoCo decided to go with Mengdian. In 2016, Australian apparel brand Cahill+ also worked with Tmall to enter the Chinese apparel market. One year earlier, JingDong announced the opening of the first official online store of Taylor Swift Fashion, a US famous fashion brand¹⁹.

The second case is that of a Singapore-based apparel brand that sells products in the US market. Mary Craft is a small, female-focused apparel company with a company headcount of only 80 to 100 people. This company was founded in 2013 with its headquarters in Singapore and 4 production plants in Vietnam. Mary Craft is one of the typical successful cases of selling on Amazon as it was officially introduced on Amazon websites. Since the company started selling products on Amazon in 2015,

¹⁹ Company's announcement. Accessed June 27th, 2019 at <https://ir.jd.com/news-releases/news-release-details/jdcom-announces-first-and-only-official-taylor-swift-online>

the company's sales have increased by 150%. Using the Fulfillment by Amazon services, the company can deliver its products to US customers within one or two days. In comparison, it normally takes up to 10 days when using traditional distribution methods. At present, the company is also considering expanding its market outside the US by starting to sell on Amazon UK and Amazon Canada.

Full digitalization of apparel value chain and upgrading of E-commerce platforms

A more sophisticated level of digitalization in the apparel value chain is identified. Initially, E-commerce platforms act as a two-sided marketplace that merely connects sellers and buyers and collects a small part of the transaction value. Still, these E-commerce platforms are trying to penetrate deeper into higher value-added stages in the apparel value chain. By exploiting a large loyal customer base and utilizing the massive amount of data collected, E-commerce platforms are reshaping business models in the apparel industry. They not only act as product distributors but also participate in designing products and becoming brand owners (Figure 10).

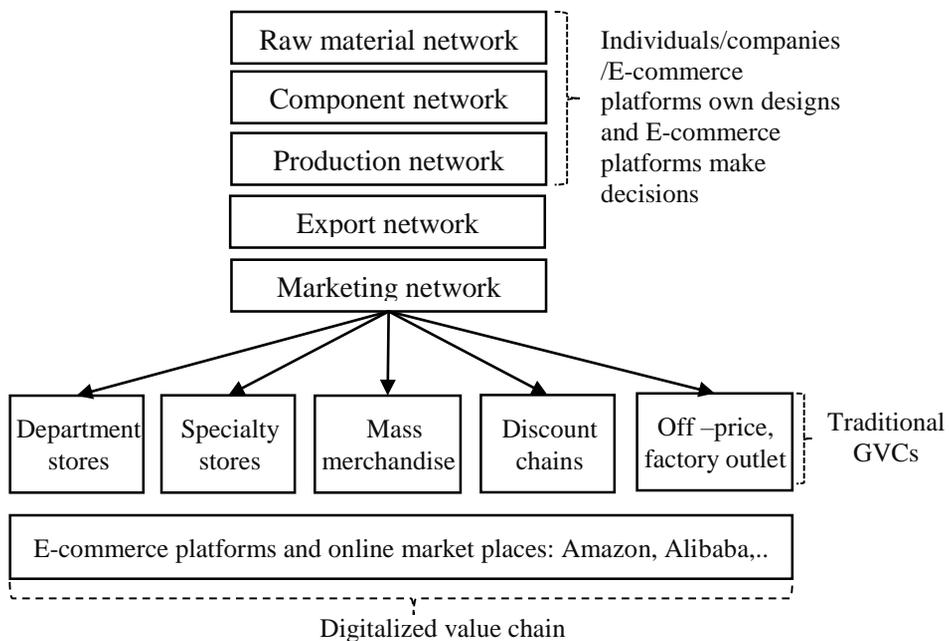


Figure 10: Full digitalization in the apparel value chain.

Source: Author.

At this level, E-commerce platforms' involvement in the value chain ranges from downstream stages to the production network. Under full digitalization, the E-commerce providers can capture more value on the chain as they gain value at both downstream stages as distributors and at production stages as design owners and product manufacturers. In addition, an expansion beyond its core business of a marketplace can benefit E-commerce providers in many aspects. In particular, the expansion can enhance efficiency through economies of scope derived from the better utilization of intangible or tangible assets (Panzar and Willig, 1981). In the case of E-commerce providers, intangible assets are invaluable connections with a large number of customers in the ecosystem created by their platforms. These intangible assets are then translated into massive amounts of data collected from millions of transactions each day. This valuable information can be analyzed to figure out trends in customer behavior. In general, this involves a very high level of technology. Big data is usually used to derive customers' insights which are useful in production decision making. Other advanced technologies such as 3D printing can be also adopted in the internal production process. In the following, two typical cases are drawn to examine in detail the full digitalization in the apparel value chain.

The appearance of an "Individual ODM" class: A case of Merch by Amazon

Merch by Amazon is a program that was launched in 2015 by Amazon. It has a print-on-demand business model. Until early 2019, the primary products of Merch by Amazon were T-shirts. The idea behind Merch by Amazon is very similar to that of ride-sharing company Uber or co-working place We Work. It makes money by utilizing decentralized under-utilized assets. Essentially, Merch by Amazon operates on the utilization of individual talents in designing T-shirts. Millions of individuals own creative abilities to make beautiful and funny designs. Nonetheless, most of them have few chances to commercialize their artworks due to the limited funding and the difficulty in acquiring customers and handling productions. With Merch by Amazon program, all content creators need to do is uploading their artworks to Amazon, choosing appropriate product type and color, adding a product description

and setting the price. Then, Amazon will handle all of the remaining tasks with no upfront costs incurred to individuals. When customers order products, Amazon will handle production, fulfillment, distribution, and customer service. Using a print-on-demand business model, individuals do not have to worry about inventory risk as products are only printed after customers made orders. Amazon also signs contracts with two US manufacturers: Port and Company and Bella + Canvas to produce T-shirts. For every T-shirt sold, the design owner will receive a royalty ranging from 13% to 40% of the product price. Normally, the higher price of the product is, the larger amount of royalty the design owner receives. For example, if a standard T-shirt price \$25.99 is sold to customers in the US market, the individual who owns the design will receive a royalty of \$9.77 (37.6%). In the case of a \$15.99 T-shirt, the royalty is only \$2.21 (13.8%). With the prospect of enjoying royalties without being worried about the risks, thousands of individuals can become "Individual Original Design Manufacturer" in the apparel industry.

Not just for ordinary people, Merch by Amazon program is also expanding to attract designs from entertainment brands, social influencers, musicians, singers, etc. Some of the famous names that have partnerships with Merch by Amazon are Disney, Marvel, Cartoon Network and Dr. Seuss. All these companies have reported an increase in sales and profitability. Among which, Dr. Seuss is a highly successful case. The company's revenue through Merch by Amazon has increased by 40% since its partnership with Amazon in late 2017 (Reuter, 2019).

Amazon takes advantage of two things in the Merch by Amazon business model. The first is a large number of loyal customers who purchase on Amazon very frequently. The second is the world-class printing technologies that allow production can be completed within a couple of days. Regarding this aspect, Amazon is investing lots of money in developing printing technologies that can further reduce cost and improve product quality. In fact, Amazon has been granted several US patents related to on-demand-printing technologies that use lasers and robotic systems for cutting fabric.

The appearance of a "Platform ODM" class: The case of NetEase Yanxuan

In the Merch by Amazon model, the E-commerce platform only takes part in the production process. Products are still designed by outsiders. It will be shown that in "Platform ODM", E-commerce platforms are going deeper into production networks by participating in product designs. This business model is exemplified in the case of NetEase Yanxuan.

Yanxuan is an E-commerce platform owned by Chinese internet giant NetEase. It was launched in April 2016 in China. Normally, the products sold on a majority of E-commerce platforms are under third-party sellers' names. However, all products sold in Yanxuan are under the company-owned brands (private label products). Therefore, different from B2C and C2C models which are prevailing in the Chinese E-commerce market, Yanxuan's business model is seen as "a self-run E-commerce platform with original design manufacturer (ODM) model" rather than a mere two-sided platform for commodities, manufacturers and brands to base on. Yanxuan's slogan is "a better life doesn't have to be costly" and it competes in the E-commerce market by proving "consistent high-quality products at competitive prices"²⁰. The company claims that it sells products with quality as high as those of global leading brands but at substantially lower prices.

The starting point in Yanxuan's model is data collection and interpretation. By analyzing the massive amount of data and information generated through daily customers' transactions, Yanxuan derives valuable insights into customers' behaviors. The most relevant and powerful insights on popular patterns, prevailing colors, favorable fabrics, etc. are gathered to create product designs.

At the next stage, Yanxuan works with big Chinese apparel manufacturers to improve product designs and handle mass production. The company chooses manufacturers on a merit-based system: the selected producers should have a good

²⁰Company' press release in 2018. Accessed June 20th at http://media.corporateir.net/media_files/IROL/12/122303/2019/NetEase%20Explores%20An%20Innovative%20Model%20For%20China.pdf

ranking in the industry with sufficient production capacity. Credits will be given to producers who have experience in working with global brands. In many cases, the chosen producers are also the original design manufacturers (ODM) for global famous apparel brands. The partnership is welcomed as it benefits both sides. On the Yanxuan side, as production know-how is not the core capability of the company, working with experienced ODMs is the best way to ensure products' quality. On the ODMs' side, as many global apparel brands are cutting orders and leaving China for countries with significantly lower costs such as Bangladesh, India, and Vietnam, many Chinese ODMs are having a difficult time doing business. In this context, working with Yanxuan offers another channel to generate sales and overcome difficulties in the market. In fact, it is reported that Yanxuan has more than 3000 manufacturers, among which around 100 are overseas suppliers (Fung Business Intelligence, 2019).

In the final stage, apparel products that are produced by ODMs will be eventually sold directly to customers through the Yanxuan's E-commerce platform. By doing that, the company can provide good quality products as offered by big brands, but at a much lower price. This is because of the elimination of brand premium and the cutting cost of distributor layers and retailers. For instance, as of August 2018, UGG ankle boots were priced at \$200 on both two Chinese authorized sellers JD.com and Tmall. Still, the very similar one made by "a manufacturer of UGG" was sold at just \$45 in Yanxuan (Forbes, 2018). As they are offering good quality products at reasonable and affordable prices, it is not surprising that Yanxuan has achieved great success. Starting from home textiles and household products, as of December 2018, Yanxuan expanded its business to 10 categories with more than 20000 stock keeping units (Fung Business Intelligence, 2019). According to the NetEase annual reports, net revenues from the E-commerce segment (mainly from Yanxuan) increased by 287% to \$661.0 million in 2016 from \$170.8 million in 2015. The figure continued increasing to \$1,698.8 million in 2017 after reaching a new record of US\$2,797.7 million in 2018.

Intriguingly, Yanxuan is also acting like a “true brand owner”. Besides its own E-commerce platform, the company also opened online flagship stores on other E-commerce platforms to sell its own products. Yanxuan has online stores in other E-commerce platforms in China (JingDong and Sunning) and in foreign countries (Shopee Singapore and Shopee Malaysia). The store of Yanxuan in JingDong attracted more than 2 million customers as of September 2018 (Fung Business Intelligence, 2019).

It is worth noting that Yanxuan's ODM model is increasingly becoming popular. The other two E-commerce giants in the Chinese market, Alibaba and JD, are also resembling Yanxuan's model. In fact, Alibaba launched Taobao Xinxuan in 2017 while JD released Jingzao in 2018. Other E-commerce platforms, for instance, Coupang in the Korean market, also have their own programs. Surprisingly, Yanxuan's model of shifting from a marketplace to a “brand owner” is not new in the apparel industry. Amazon was first to launch this business model by introducing its private-label AmazonBasic in 2009. As of January 2019, Amazon had a total of 109 labels under the apparel category (TJI Research, 2019).

Chapter 6: Conclusion and discussion

Digitalization is a major trend that is sharply reshaping the global value chain. By using firm-level empirical evidence, the research elaborates on the value chain digitalization process in the video game and apparel industry. The research finds that the value chain digitalization in two industries is usually originated in the downstream stages where platforms emerge and displace traditional distribution methods. At this level of value chain digitalization, the chain becomes disintermediated and flattened with the involvement of fewer players. The platforms' involvement helps connect the decentralized buyers and sellers. It also makes the transaction faster and easier, and facilitates the entry of SMEs.

A higher level of value chain digitalization is also found in the apparel industry where platform owners, after certain success in downstream stages, are trying to penetrate deeper into the production networks. By exploiting the technical superiority and massive data collection, these platforms are going beyond the primary role of a two-sided marketplace to take production-related tasks. Some serve as the principal agents in the production network (Amazon with Merch by Amazon) while others directly join product design stages and become a "brand owner" (Yanxuan). At this level, platform owners can capture more value on the chain as they get value at both downstream stages as distribution partners and at production stages as production agents.

Regarding the manufacturers' position, the value chain digitalization creates two possible opposite effects. On the positive side, partnership with platforms provides a great opportunity to expand the customer base and push sales. Eventually, this leads to enhancements in labor productivity. Both prospective domestic and global customers can be reached through a large number of loyal users attracted by leading platforms. This is especially valuable for SMEs as they usually find it difficult to acquire customers and orders due to limited resources and capabilities. With regard

to large companies, working with platforms has proved to be an effective way to lower customer acquisition costs and boost labor productivity measured as efficiency gain in revenue generation.

On the negative side, as “There is no such thing as a free lunch”, to be included in platforms, companies have to pay a large amount of money to platform providers. Platform provider fees are a new component of the digitalized value chain. The platform provider fees in the video game industry range from 15% to 30% while the number in the apparel industry is much lower, from as low as 2% to more than 27%. In addition, while the fee is fixed and unnegotiable in the video game industry, in the apparel sector, it has a complex structure with various pricing models. The differences reflect the divergence in the bargaining power of platform owners in the two industries. In the video game sector, mobile game publishers have almost no alternative choices but to publish mobile games onto third-party platforms dominated by Apple and Google. As a result, platform providers in the video game industry have a strong bargaining power which leads to a very high fee rate. On the other hand, in the apparel industry, as there are no global dominant E-commerce platforms and the traditional distribution methods are still prevailing in many countries, leading E-commerce platforms are less powerful and can not charge a high fee.

The interaction between the negative and positive impacts of value chain digitalization derives its ultimate economic consequences. Regarding SMEs, it is more likely that the latter dominates the former, meaning that digitalization adoption is generally beneficial. This is because the value chain digitalization lowers the entry barriers and facilitates upgrading. The implication is that the value chain digitalization can serve as a window of opportunity and not an additional barrier for SMEs in the process of moving up the value chain. Indeed, this argument is exemplified in several companies in both sectors which successfully made an upgrade in the end market. With regard to incumbent firms, mixed results are found. In the video games industry, while a shift to the digitalized value chain is found to

be profitable in some companies, such transformation did hurt others. Meanwhile, in the apparel industry, partnering with platforms can potentially create direct competitors in the future.

The research has determined implications that should be noted for business practices and policymakers. The first implication covers platforms and value chain digitalization governance. Due to the network effect, the positions of leading platforms in the value chain are reinforced over time. In the near future, it might be the case that a very small number of platforms have substantial power in the world's flow of goods and services. As such, simply ignoring platforms in favor of conventional players and incumbents is not an optimal choice. Although the involvement of platforms into the value chain brings both negative and positive consequences, the question should not be how to resist them and protect traditional players but how to harness the positive impacts of value chain digitalization while mitigating the negative ones. In this sense, the regulatory sandbox approach should be employed. It enables the experimentation of new technologies and business models (UNSGSA, 2018).

The second implication is that of the digital transformation of SMEs. There is strong evidence that digitalization can serve as a window of opportunity for small and medium firms to enter into the value chain and support growth. Still, with limited resources and low technological capabilities, it is quite difficult and challenging for SMEs to gain digital transformation. As such, government agencies should prioritize policies that facilitate the digitalization adoption of SMEs. Assistance and support should be provided. The policy packages should include financial and technical assistance and the training of good practices in digital adoption (OECD, 2019).

The third implication is that of the “naïve” digitalization and strategic digitalization of large organizations. Digitalization is becoming a global phenomenon and many incumbent firms are setting out plans to an “as fast as possible” digital transformation. Still, taking advantage of the value chain digitalization is not an easy task and a simple digital transformation might not work. Besides the direct negative economic

consequence of having to pay a large amount to platform providers, incumbent firms should also be aware of other potential risks. The fact that digitalization facilitates entry into the value chain implies that heading to digitalization is doing business in a very competitive market with low entry barriers. This means that firms' competitors are not only the current ones on the market but also the potential ones who can spring up in the future. Also, a shift to digitalization by working with platforms can potentially create direct competitors in the future. As such, a realistic and holistic view of cost and benefit of digitalization should be taken into consideration before making any decisions.

There may be some potential limitations of this research. First of all, conclusions in the research are based on the empirical data collected from a relatively small selected group of companies and platforms. Therefore, they are subject to bias. The results in the research might be changed if a more comprehensive data set is used. Secondly, by narrowing its focus on the internal production process and downstream stages, the research might overlook the impacts of GVC digitalization at upstream stages. The overall impacts of GVC digitalization on manufacturers stated in the research may be different if impacts from upstream stages are included.

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국문 초록

이 논문은 디지털화가 어떻게 글로벌 가치 사슬 (GVC)에 영향을 미치는지를 조사한다. 기업의 경험적 증거를 사용하여 비디오 게임 및 의류 산업에서 가치 사슬 디지털화 프로세스에 대해 자세히 설명한다. 연구 결과는 두 부문에서 가치 사슬의 디지털화는 일반적으로 플랫폼이 등장하고 기존 소매 업체를 방해하고 대체하는 다운 스트림 단계 (플랫폼 디지털화)에서 시작된다. 이 수준에서 제조업체 입장에서는 두 가지 반대 영향이 식별된다. 긍정적인 측면에서,이 플랫폼의 통합은 고객 확보 비용을 낮추고 회사의 생산성을 향상시킨다. 반면에, 기업은 플랫폼 공급자 수수료를 통해 플랫폼 소유자에게 상당한 금액을 지불해야 한다. 특별히, 비디오 게임 산업에서 중소기업 (SME) 및 선도 기업에 GVC 디지털화가 비대칭적인 영향을 미친다. 중소기업 입장에서는 GVC 디지털화는 일반적으로 진입 장벽을 낮추고 업그레이드, 특히 최종 시장 업그레이드를 용이하게하므로 유리하다. 한편, 선도 기업은 매출 (및 고객) 성장과 수익성 사이에서 트레이드 오프 가능성이 높다. 플랫폼과 관련되고 데이터 중심 특성의 출현과 함께보다 정교한 수준의 가치 사슬 디지털화는 의류 산업에서도 식별된다. 이 수준에서 의류 플랫폼은 양면 시장의 주요 역할을 넘어서 고 부가가치 단계에 더 깊이 침투하려고 한다. 이러한 노력은 특히 경제적 인 결과를 초래하는 “개별 ODM” 및 “플랫폼 ODM” 클래스에서 새로운 오리지널 디자인 제조업체 (ODM)의 출현으로 이어진다.

주요어: 디지털화, 플랫폼 제공 업체 수수료, 가치사슬, 업그레이드, 비디오 게임, 의류.

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