

모바일 기반 전자상거래 시장의 구조적 변화 분석

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Analysis of Structural Changes in the Mobile-base E-commerce Market

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ABSTRACT

Purpose: The purpose of this study is to identify any structural change and analyze detailed aspects of the e-commerce market in Korea.

Methods: The Cumulative Sum(CUSUM) test was conducted with time-series data including e-commerce transaction value and user data including MAU, usage time, download, etc. from 2015 to 2024. Transaction value data were aggregated solely from transactions made through mobile applications, and user data were collected using a mobile application data analysis platform. Based on the results of the CUSUM test, detailed aspects of user data at the structural change points were analyzed.

Results: The results of this study confirmed three structural change points in the last 10 years of Korea's e-commerce market. The first structural change was confirmed in early 2018. The second structural change was identified in late December 2020, and the third occurred around the end of 2023. The number of active users showed a slightly different pattern compared to the three structural changes, with the number of users growing significantly due to the COVID-19 pandemic and then fluctuating repeatedly. Usage time exhibited somewhat different patterns between the time per user and the time per session. The time per user increased significantly until early 2018 but has been steadily decreasing since then. In contrast, the time per session continuously decreased until early 2018, then showed a slight upward trend immediately after the COVID-19 outbreak but has been steadily decreasing since.

Conclusion: The size of Korea's e-commerce market has demonstrated consistent growth over the past dec-

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ade, undergoing significant structural transformations. The results of this study confirm that the growth of the e-commerce market has been accompanied by structural changes. Notably, while the number of users, downloads, and retention rates fluctuate over time, the usage time exhibits a continuous decrease. It seems that the time users spend on e-commerce applications is getting shorter, which explains the industry's adoption of various strategies, such as gamification, to increase user's time spent on applications.

Key Words: E-commerce, Structural Change, CUSUM Test

1. Introduction

The growth of the e-commerce market continues unabated. Network effects play a crucial role in e-commerce platforms; however, unlike other platform-based business models, no single network achieves a dominant position in the e-commerce sector. The Korean market, which ranks fifth globally in terms of e-commerce scale, exemplifies this dynamic(MSS, 2022). In Korea, the early e-commerce business models which were centered on transaction intermediation, have diversified into social commerce and specialized vertical platforms. These have further expanded with the entry of traditional retail companies into the on-line domain, driving continued growth and intensifying competition. On a global scale, prominent Chinese e-commerce platforms such as AliExpress and Temu have been rapidly gaining market share, not only domestically but also in the global market, including the United States, Europe, and South Korea through aggressive low-cost strategies(Lim & Kim, 2024).

In the United States, traditional e-commerce like Amazon and eBay, which have long-established network bases, along with offline retailers, have maintained a strong foothold. However, the low-cost strategies of Chinese e-commerce platforms have enabled them to build extensive customer networks rapidly. These examples illustrate the high level of competition within the e-commerce sector. This competition is further intensified in the platform industry, characterized by multi-sided markets where, especially in e-commerce, the conditions for multi-homing allow users -both seller and consumer- to engage with multiple platforms, thereby heightening the competition for user acquisition.

The intensely competitive e-commerce market has demonstrated growth in key indicators such as active users, transaction volume, and usage time. Additionally, the COVID-19 pandemic accelerated the adoption of contactless commerce, attracting more users to e-commerce platforms. The aforementioned low-cost strategies of Chinese e-commerce players have further drawn in users, leading to numerous predictions about potential shifts in the e-commerce landscape. Against this backdrop, this study aims to examine recent trends within the rapidly evolving e-commerce platform market to determine whether the observed growth and changes reflect structural shifts in the e-commerce market. Specifically, we will apply the CUSUM(Cumulative Sum) test to identify structural change points and analyze their characteristics in detail. This research will provide an overview of the e-commerce market's characteristics and the current state of the Korean market. Based on the results, we will identify key change points and assess the conditions before and after these shifts, thereby enhancing our understanding of the growth and transformations in the

e-commerce market over the past decade.

Research on e-commerce has been diverse and in-depth, encompassing studies from various perspectives: user behavior and continued usage intentions from the standpoint of information systems (Bhattacharjee, 2001; Kim, Minji, & Choi, 2023; Venkatesh & Davis, 2000), the usage intentions of e-commerce platforms from the perspective of consumer research, and quantitative analyses of the growth potential of platform economies and network effects. However, most prior studies have examined research questions based on the premise of the growth and expansion of the e-commerce industry and market size, both domestically and globally. This study distinguishes itself by investigating whether such market expansion has been accompanied by structural changes, thereby offering a novel contribution to the existing body of research.

2. Theoretical Background and Literature Review

2.1 E-commerce Industry of Korea

E-commerce in South Korea began in 1996 with the launch of Interpark's online shopping services (Lee & Kang, 2024). Subsequently, various e-commerce platforms, including Gmarket, emerged, and the market began to take shape. The e-commerce sector has presented an attractive opportunity for both platform companies entering the market and retail businesses expanding their traditional offline operations into the online space (Lee & Kang, 2024). Thereafter, the emergence of social commerce, which leveraged social media and online platforms, diversified the e-commerce market. In South Korea, social commerce was introduced with the establishment of a group-buying platform, in the early 2010s (Son, Kim, & Ahn, 2014). Following its introduction, social commerce experienced rapid growth, with the so-called "Big 3" companies—Coupang, WeMakePrice, and TicketMonster (TMON)—capturing 42% of the total social commerce revenue, driving the market's expansion (Son, Kim, & Ahn, 2014). Subsequently, Coupang decided to expand beyond social commerce into a broader e-commerce business, while TMON and WeMakePrice retained their social commerce characteristics and continued to lead the domestic e-commerce market. Meanwhile, Naver Shopping, an open market service provided by Naver, which holds a dominant share of the portal platform market in South Korea, has become a major pillar of the current e-commerce landscape alongside Coupang. Naver Shopping has received particularly positive responses for its business model, which offers support and sales channels for small business owners.

One axis of the domestic e-commerce market is a complex service formed by home shopping companies expanding from TV-based to Internet- and mobile-based. It grew rapidly in the 2000s through the increase in cable TV subscribers, the expansion of credit card use, the development of the courier industry, and the expansion of infrastructure such as e-commerce payment solutions (Lee & Park, 2011). Since then, domestic home shopping companies have gradually increased, and competition has continued, with the leading company in market share shifting from GS Home Shopping to CJ O Shopping. During the 2010s, with the

expansion of mobile-based platforms, mobile application services for TV home shopping were introduced (Eum, Ahn, & Rhim, 2019). In the case of Home & Shopping, which was launched in 2011, the proportion of mobile sales quickly surpassed that of TV, and through the synergy of TV and mobile, sales grew rapidly within a short period. Since then, TV home shopping has launched various services enabling two-way communication with customers and is competing with e-commerce companies through diverse formats, such as social commerce and intermediary platforms (Eum, Ahn, & Rhim, 2019). The e-commerce industry in South Korea, which has grown significantly over the years, reached a transaction volume of 227.347 trillion KRW in online shopping in 2023, marking an 8.3% increase compared to the previous year (KOSTAT, 2024). Of this, mobile shopping accounted for 167.827 trillion KRW, reflecting a 7.0% increase (KOSTAT, 2024). The annual online shopping transaction volume, which was only 54 trillion KRW in 2015, grew by 320% in just eight years. This growth can be attributed to various internal and external changes within the industry, including the expansion of mobile-based platforms, the adoption of simple payment technologies, and advancements in logistics infrastructure. Notably, the expansion of the contactless economy, spurred by the COVID-19 pandemic, played a significant role in driving this growth (Park, 2020).

According to previous studies, the e-commerce market in South Korea exhibits several characteristics that distinguish it from other markets. First, it is a market without a clear dominant player. According to the Fair Trade Commission, based on transaction volume, the market share of the leading e-commerce companies in 2022 was 24.5% for Coupang and 23.3% for Naver, with only a 1.2 percentage point difference between them. Additionally, multiple platforms actively compete in the market. This phenomenon is attributed to companies that initially operated in various sectors—such as portal platforms, offline retail, and social commerce—expanding their strengths into the e-commerce market (Lee & Kang, 2024). According to prior studies, customer loyalty toward online stores is determined more by the efficiency of the shopping experience than by resistance to platform switching (Zhang, Agarwal, & Lucas, 2011). Based on this premise, the efficiency of the online purchasing process can be understood as having a significant impact on consumer loyalty (Park & Park, 2024). In cases where existing offline customer networks, such as those established by large retail chains, are integrated and expanded into online platforms, the ability to leverage these pre-established networks presents a key advantage of Online to Offline (O2O) based e-commerce platforms.

Secondly, the domestic e-commerce market features a diverse range of business types. South Korea's e-commerce businesses can be categorized based on the number of product categories they handle, with general malls covering multiple sectors and specialized vertical malls focusing on specific categories. They can also be classified by the nature of the products, such as fresh food e-commerce and non-fresh food e-commerce. Fresh food e-commerce requires a significant initial investment in a specialized delivery system, known as the “cold chain”. However, a unique feature of the South Korean e-commerce market is the ability to utilize existing stores as delivery bases for cold chain systems. This approach enables these companies to compete effectively without relying solely on large-scale investments in fresh food e-commerce.

The growth of the e-commerce industry can be attributed to advancements in both technology and logistics. From the enhancement of user interfaces (UI) and user experiences (UX), which improve the convenience of mobile application users, to the introduction of simple payment systems and the adoption of live commerce for real-time communication, these technological innovations have evolved to not only to streamline the product and service purchase process but also to enhance the enjoyment of the purchasing experience itself. Additionally, the e-commerce industry generates synergies through advancements in delivery systems, which are supported by logistics networks. Recently, the expansion of logistics infrastructure, including fulfillment centers, cold chains, and last-mile delivery services, has significantly contributed to the growth of the e-commerce market. Research has also examined the implications of digital technology-driven order processing and logistics innovations for various participants in the business ecosystem (Holmström, Holweg, Lawson, Pil, & Wagner, 2019), as well as how fulfillment and on-demand logistics innovations serve as sources of competitive advantage. Fulfillment refers to the transformation of traditional distribution warehouses into new types of storage facilities, involving the development of in-house logistics systems to overcome price competition and secure a comparative advantage through delivery services. Fulfillment centers handle the majority of logistics operations for the sellers who utilize them, enabling small businesses to overcome logistical challenges. Over time, these centers have developed into integrated systems offering platform-based services. From the consumer's perspective, purchasing products pre-stocked at regional hubs enables faster delivery, leading to higher customer satisfaction and establishing fulfillment as a dominant trend in the retail industry.

2.2 Contactless Economy

The COVID-19 pandemic, which spread globally in early 2020, brought significant changes to various sectors, including the economy, society, and culture. Among these, the most profound and visible change was the shift towards minimizing in-person contact and expanding contactless processes across economic and social activities. The crisis caused by the virus was recognized as having the potential to impact not only economic and social dynamics but also the global order (Park, 2020). The most significant impact of COVID-19 stemmed from its high infectivity and lethality, which sparked widespread fear and concern globally. By early 2023, over 670 million confirmed cases and 6.8 million deaths had been reported worldwide (Yoo & Park, 2023). During this period, numerous studies were conducted on various multi-disciplinary impacts triggered by COVID-19 and the corresponding future strategies. These include the effectiveness of infection prevention through social distancing (Lee, 2023), public intention of vaccination as a means of controlling the spread (Yoo & Park, 2023), governance related to the government's crisis management capacity (Kim, 2022), and the influence of remote methods in educational processes (Cho, 2020). These concerns quickly materialized, establishing a new global normal. Amid the economic contraction caused by the spread of COVID-19, various economic and social changes emerged. The significant reduction in face-to-face interactions has brought notable changes to customer engagement methods and the key factors influencing customer satisfaction in the service industry. For instance, in the aviation sector, factors

such as aircraft facilities, cabin crew services, and in-flight meals were paramount before the onset of COVID-19. However, in the post-pandemic period, the emphasis has shifted to airport-based services such as ticket booking and modifications, which has shifted to airport-based services such as ticket booking and modifications, which have gained greater importance due to the increased demand for these services (Kang, J. & Lee, 2021; Yeo, Lee, Choi, & Kim, 2023). This phenomenon extends beyond the service industry, influencing public services within the public sector. Evidence of this shift has been observed across both private and public sectors, exemplified by changes in the determinants of customer satisfaction with police civil services during the COVID-19 pandemic (Yeo, Lee, Choi, & Kim, 2023). Notably, there was a significant increase in remote interactions in workplaces, leading to heightened interest in remote interactions in workplaces, leading to heightened interest in remote access and collaboration solutions. Additionally, the proportion of online transactions conducted through the internet and mobile platforms rose substantially. Ray, Redaelli, Rudich, & Wong (2020) predicted growth in B2B business, particularly in the e-commerce sector, as a response to the economic and societal changes brought about by the spread of COVID-19. They anticipated that this shift would not be temporary but rather a transformation of the entire ecosystem. (Kim, 2020) analyzed the global e-commerce landscape post-pandemic and confirmed that the e-commerce sector in South Korea already accounted for over 28% of the retail market in 2019, positioning the country at a globally leading level. Furthermore, citing a survey of the U.S. baby boomer generation, Kim explained that the number of older consumers, who are at higher risk from the virus, engaging in online shopping had increased. An analysis highlighting the polarization in the retail industry due to the pandemic also noted that, while offline channels suffered significant setbacks, online channels benefited from a surge. Convenience stores and online sales, in particular, saw growth driven by preferences for proximity and contactless transactions (Samjung KPMG, 2020).

The first area where contactless methods became commonplace was in the expansion of online shopping. In 2020, the online shopping transaction volume reached 15.9946 trillion KRW, a 26.1% increase compared to 2019, while mobile shopping grew by 33.8% reaching 11.1488 trillion KRW. This upward trend reflects the accelerated development of the e-commerce industry, fueled by the introduction of various technologies, with COVID-19 serving as a catalyst. There are differing views on the relationship between COVID-19 and the growth of e-commerce. Some argue that even after the pandemic ends, the gap between the offline and e-commerce markets will continue to be affected. Others contend that while COVID-19 appeared to drive the rapid growth of e-commerce, such changes would likely have occurred regardless of the pandemic (Sheth, 2020).

2.3 China e-Commerce

Recently, Chinese companies have made significant strides in the global e-commerce market. Among them, platforms such as AliExpress, Temu, and SHEIN have gained international attention by expanding their user bases and driving changes in global consumption patterns. China's major trade partners in the e-commerce market include the United States, Japan, Germany, South Korea, Australia, the Netherlands,

France, and the United Kingdom. Chinese consumers primarily purchase cosmetics, CDs, dietary supplements, and computer hardware and software online, while China exports items such as mobile phones and accessories, clothing, health and beauty products, and sports and outdoor goods. China's e-commerce revenue grew substantially, from 3 trillion yuan in 2008 to over 10 trillion yuan in 2013. By 2017, it had more than tripled, reaching 29 trillion yuan compared to 2013. By the end of 2018, it surpassed 31 trillion yuan, marking a tenfold increase over a decade (Koh, 2024).

Chinese e-commerce platforms have expanded into the South Korean market and are influencing the local market dynamics. As of the first quarter of 2024, based on the proportion of active users, Coupang (0.373) ranks first, followed by AliExpress (0.107) and Temu (0.093), with 11st (0.093) and Gmarket (0.077) trailing behind.¹⁾ AliExpress entered the South Korean market in earnest in 2018 and began advertising in South Korea in 2023 to attract local users. These Chinese e-commerce platforms have entered the South Korean market backed by large-scale capital and a low-price strategy. By offering lower prices and a wide range of products, they have expanded consumer choices while exerting pressure on the market share of domestic small and medium-sized e-commerce businesses (Koh, 2024).

AliExpress has set a goal of having more than half of South Korea's online shopping platform customers using its service within the next three to five years. As of September 2024, the number of e-commerce users in South Korea is estimated to be around 34 million, and AliExpress plans to secure 17 million of these users as customers by 2027 (Park, 2024). To lock in South Korean consumers, AliExpress has initiated marketing strategies tailored to the local market and is expanding its workforce of Korean staff to enhance consumer trust. Additionally, the company is expanding its domestic logistics and delivery networks, establishing strategic partnerships with local logistics companies, and building large-scale fulfillment centers in South Korea to further strengthen its logistics capabilities (Won, 2024). Another strategy employed by AliExpress to attract South Korean consumers is the expansion of K-Venue, which sells Korean products in addition to items purchased directly from China. To achieve this, AliExpress is actively working to attract South Korean companies and sellers. The platform's policy of waiving sales commissions has garnered significant support from Korean sellers (Ha, 2024).

As Chinese e-commerce platforms expand their advertising and aggressively pursue low pricing to attract Korean users, the increase in active users has been accompanied by growing concerns about the quality and safety of products and services. Online shopping inherently carries the risk that the items received may not match the seller's description until they are physically delivered and confirmed. This concern also applies to Chinese e-commerce platforms. Rather than issues related to products falling short of consumer expectations, the ongoing safety concerns over excessive harmful substances in direct purchases from China have become a persistent issue (Oh, 2024). Concerns over the safety of products from China have been mounting, with carcinogenic substances detected in children's products at levels 258 times higher than domestic standards (Kim, Chaebin, 2024), and in clothing and accessories at levels 229 times higher than domestic standards (Han, 2024). In response to the increased influx of hazardous products due to the

1) data.ai montly active user data, author's calculation

expansion of direct purchases from China, the Seoul Metropolitan Government, in collaboration with specialized institutions through the Seoul E-commerce Center, conducts weekly safety inspections of overseas direct purchase products and publicly announces the results. Additionally, the Fair Trade Commission has signed voluntary product safety agreements with AliExpress and Temu, making efforts to prevent the distribution and sale of products with toxic substances (Fair Trade Commission, 2024).

3. Research Model

3.1 Research Question

The domestic e-commerce industry has continuously grown, driven by a solid foundation in internet and mobile infrastructure and advancements in technology. Additionally, the expansion of the contactless economy due to the COVID-19 pandemic in 2020 has attracted more users and further expanded the market size. Recently, various changes, such as delays in settlement by major social commerce companies and the full-scale entry of Chinese e-commerce platforms into the domestic market, have emerged. This study seeks to determine whether there have been structural changes caused by the aforementioned issues and events through the following research questions (RQ).

RQ1: Does COVID-19 cause a structural change in the domestic e-commerce market in terms of transaction value?

RQ2: Does the growth of c-commerce cause a structural change in the domestic e-commerce market in terms of transaction value?

RQ 3: How does structural change in the domestic e-commerce market impact the performance aspects of e-commerce?

Active users and revenue in e-commerce have been consistently increasing, while the market is expanding with the activation of live commerce and the entry of OTT platforms (e.g., YouTube, TikTok) into e-commerce, leading to the diversification of channels. Although various indicators show an upward trend despite fluctuations, it is difficult to confirm whether these developments indicate not just external growth but also structural changes. Therefore, this study aims to examine whether there have been any structural changes in the e-commerce market indicators over the past decade and identify the key factors that influenced these changes.

3.2 Methodology

3.2.1 Data Description

The data used in this study were obtained from the monthly online shopping trend surveys published by the Korean Statistical Office. This survey targets businesses that operate online shopping malls, requiring

them to include an order function and formalize agreements regarding the buyer's payment obligations and the seller's delivery responsibilities. The trend survey indicators are based on transaction volume, covering total sales as well as various categories of product groups, which include general malls offering a wide range of products, specialized vertical malls focusing on specific product categories, online-only malls selling products exclusively through network platforms, and hybrid online-offline shopping malls that combine traditional and online commerce. For this study, data from January 2015 to September 2024 were analyzed to analyze changes in the e-commerce market over the past decade. Furthermore, the domestic application market has gained significant prominence since the widespread adoption of smartphones in 2009, which has led to the expansion of the mobile ecosystem. As of the end of 2023, mobile-based online shopping transactions accounted for over 73% of the total transaction volume, underscoring their importance. Accordingly, this study focused on analyzing mobile transaction volumes and usage metrics.

Table 1. Online Shopping Transaction Value(KRW, million)

Year	Total Online Shopping Transaction Value	Internet Transaction Value		Mobile Transaction Value	
			%		%
2015	54,055,617	29,198,635	54.02	24,856,980	45.98
2016	65,617,046	30,072,455	45.83	35,544,592	54.17
2017	94,185,765	41,276,422	43.82	52,909,341	56.18
2018	113,314,010	44,108,995	38.93	69,205,015	61.07
2019	136,600,838	49,236,981	36.04	87,363,860	63.96
2020	158,283,970	48,896,323	30.89	109,387,646	69.11
2021	190,223,110	51,514,955	27.08	138,708,155	72.92
2022	211,123,590	53,078,749	25.14	158,044,843	74.86
2023	228,860,713	59,828,698	26.14	169,032,017	73.86

source:(KOSTAT, 2024)

User behavior is a key factor influencing the size of the e-commerce market, and major indicators from mobile application usage data were utilized. Active user numbers are a representative user metric for various mobile applications, including those in the e-commerce sector, and they can provide an estimate of the network scale and influence of a mobile application. For reference, KakaoTalk, South Korea's leading messaging app, recorded an average monthly active user (MAU) count of 48.93 million in Q3 2024(Kakao, 2024). Meanwhile, Naver, the leading domestic portal search site, had an MAU of approximately 42.97 million as of early 2024 (Lee, 2024).

Usage time is a commonly used performance metric for mobile applications, and in the e-commerce sector, it reflects various elements designed to retain users for a longer time. It incorporates strategies to not only encourage initial purchases but also to drive additional purchases through various incentives, which

are then leveraged for marketing purposes. In particular, gamification has been emphasized as a key strategy. By adding entertainment elements to app usage and offering rewards such as a sense of achievement and financial benefits upon achieving specific goals, gamification naturally leads to the integration of fun with transactions. Recent studies on gamification in the e-commerce sector have shown that such strategies can stimulate positive consumer behavior and contribute to improving business profitability (Azmi, Ahmad, & Iahad, 2021). The introduction of engaging, achievement-oriented content, which provides enjoyment and a sense of accomplishment, has become a strategy to not only attract new customers but also increase usage time, retention rates, and other metrics. This approach has already been implemented in the industry, yielding various positive outcomes. E-commerce applications, in particular, are a prime example of the growing field of “AppTech”—a combination of apps and financial technology—offering both customer attraction effects and revenue growth potential (Kan, 2024). This study utilizes the average usage time per session per month as an indicator.

Retention rate is an indicator of customer loyalty, reflecting consumers’ continued purchases and service usage. In this study, the retention rate after 7 days was adopted as an indicator. As customer satisfaction increases, customer loyalty also rises, ultimately enhancing a company’s revenue, which confirms the relationship between “customer satisfaction—customer loyalty—business performance.” In this study, the retention rate is used as an indicator of customer loyalty and applied in the analysis.

Retention is determined by how the user interacts with it. In the case of e-commerce, increasing the number of times a customer visits the platform increases the number of purchases, so e-commerce platforms are trying to encourage customers to visit more often. Retention rate is related to the customer’s intention to continue using the service, and this intention is a key concept in maintaining a continuous relationship between the company and the user (Venkatesh & Davis, 2000). Because the continued use of a particular technology determines its success, it can be said that ultimate success occurs when a user continues to use the selected information system, rather than merely when the user first selects and uses it. (Bhattacharjee, 2001). Research on applications, including e-commerce platforms, focuses on identifying antecedent factors through the analysis of users’ reuse intentions (Kim, Minji, & Choi, 2023; Lee, S., Kim, Park, & Kim, 2022; Wang & Kim, 2019). In this study, we intend to analyze the actual retention rate, rather than users’ usage intentions, to determine the impact of the retention rate on the e-commerce market. According to a survey, 31% of our citizens make online shopping purchases 2–3 times a month, and 30.3% make online shopping purchases once a week (Korea Consumer Agency, 2024). Since mobile application usage indicators are usually constructed for periods of 7 days, 30 days, etc., I intend to reflect the retention rate based on 7 days and check the changes during the time of structural change.

The download status is an indicator that can be used to estimate the level of penetration of applications installed on mobile devices, which have become essential for modern life. Since the use of applications requires installation, companies are making various efforts to increase the download rate of new applications. For instance, when a user searches for purchases on a portal, they may repeatedly be exposed to price information for a specific application through linked advertisements, or when they access the company’s website and search for purchases, they are encouraged to download the application, thereby inducing

downloads in various ways. However, since the download itself is an indicator that only indicates potential for purchases, transactions, and reuse, actual engagement is only measured after the mobile application is actively used. Thus, download status is primarily reflected in analyzing trends visible at the time when structural changes are later confirmed.

Table 2. Data Description

Classification	Variable	Detail	Reference
Transaction value	Mobile shopping transaction value	monthly	KOSIS Online Shopping Survey (2015 Jan~2024 Sep)
Performance	Monthly Active Users(MAU)	aggregated value of top 10 general e-commerce application	data.ai (2015 Jan~2024 Sep)
	Usage time/session	average value of top 10 general e-commerce application	
	Retention rate in day 7		
	Paid download	number of downloads through paid advertisements, marketing events	
	Organic download	number of downloads through users' voluntary searches	

Source: Author regenerate the information on Kosis and data.ai

3.2.2 CUSUM test

This study aims to investigate whether there has been a structural change in the e-commerce market by applying the CUSUM (Cumulative Sum) test to identify the presence of structural change and determine its timing. Methodologies applicable for testing structural changes include the Chow test, Hansen test, and CUSUM test. The Chow test is used in time series models to determine if there is a structural change in the model coefficients around a specific point in time. This is done by dividing the entire period into two segments before and after the specific point, then estimating each segment using a linear regression model and testing whether the coefficients of the explanatory variables are the same (Kim, 2023). However, the Chow test has limitations in its application to this study, because there is no information about the exact timing of when the change occurred. In contrast, the Hansen test checks whether the coefficients remain stable throughout the entire sample period, unlike the Chow test, which focuses on stability around a specific point in time (Min, 2009). Despite its usefulness, there has been little research on structural changes in the e-commerce market. Therefore, it will be valuable to examine whether the growth of the e-commerce market has been accompanied by structural changes and the timing, and examine the aspects of the relationship indicators at that time. CUSUM test will be used, rather than the Chow test, which performs an analysis based on the timing information of policy or condition changes, or the Hansen test, which tests the stability of the estimated coefficients in a linear regression model. This will allow for identifying whether structural changes occur and pinpointing when they occur.

Song & Sung(2015) analyzed the impact of the dynamic innovation efficiency of government support policies on exports using the CUSUM test. It was used in a study on the future housing demand change factors of the financially constrained class in the housing market, and it was confirmed that the economic situation such as strengthened financial regulations and rising real estate prices in the housing market starting from 2017 had a significant impact on the relative financially constrained class (Kim, 2023). In a study analyzing the impact of international financial market instability on Korea's port imports from China, the CUSUM test was applied to analyze the impact of financial crisis shocks, exchange rate shocks, and economic shocks.

The CUSUM test, introduced by Brown, Durbin, and Evans (1975) involves repeatedly estimating the model while gradually changing the sample period and then testing the stability of the coefficients. Unlike the Chow test, the CUSUM test can be used when the timing of a structural change is unknown, making it widely applicable. If the path of the test statistic falls outside a certain range at the significance level of the CUSUM test, the null hypothesis of coefficient stability is rejected.

$$Y = X\beta + e \quad t = 1, \dots, K, K+1, \dots, T \quad \text{Equation (1)}$$

Let X be a $T \times 1$ matrix and β be 1×1 vector proposed the following test statistic for testing the stability of the coefficients (Brown, Durbin, & Evans, 1975) (Equation 1).

$$W_t = \sum_{r=K+1}^t \frac{W_r}{s}, \quad t = 1, \dots, K, K+1, \dots, T \quad \text{Equation (2)}$$

$$w_r = \frac{(y_r - x_r' \hat{\beta}_{r-1})}{(1 + x_r' (X_{r-1}' X_{r-1}) x_r)} \quad \text{Equation (3)}$$

$$s = \sqrt{\frac{\hat{e} \hat{e}'}{T-l}} \quad \text{Equation (4)}$$

Here, w_r represents the scaled residual, and $\hat{\beta}_{r-1}$ is the estimated coefficient using the sample for $t=1, \dots, r-1$, while s is the standard error of the regression calculated using the entire sample period. If the coefficients are stable throughout the sample period, the expected value of W_t will be 0. When the significance level for hypothesis testing is set at 5%, the straight line connecting the values calculated at the K and T time points becomes the critical value (Equation 2:4).

The CUSUMQ test also involves repeatedly estimating the model while gradually changing the sample period and testing the stability of the coefficients. However, unlike the CUSUM test, the CUSUMQ test checks for the stability of the error term variance rather than the coefficients.

$$s_t = \frac{\sum_{r=K+1}^t w_r^2}{\sum_{r=K+1}^T w_r^2} \quad \text{Equation (5)}$$

Brown, Durbin, and Evans (1975) define $E(S_t) = (t - K)/(T - K)$, where at time K , the value is 0, and at time T , the value is 1 (Equation 5). If the value does not exceed the 5% significance level threshold, it indicates that the variance of the error term is stable throughout the entire sample period. Thus, in this study, this paper conducts the CUSUM test, presents it visually using the recursive cusum plot, and analyzes the result which indicates the significant structural change through the plot, extraordinarily fluctuating from the 95% confidence band.

However, while the CUSUM test has been widely utilized in various studies for its ability to visually identify the timing of structural changes, it has limitations when directly attributing such changes to specific events. Accordingly, this study employs the CUSUM test to examine whether structural changes have occurred in the scale of mobile-based e-commerce transactions and to pinpoint their timing. Subsequently, it analyzes the patterns of related indicators before and after the identified time points.

3.2.3 Research Model

The linear regression model for the CUSUM test is as follows (Equation 6).

$$\ln(mobsale) = \beta_0 + \beta_1 \ln(mau) + \beta_2 \ln(time) + \beta_3 \ln(retention) + \epsilon \quad \text{Equation (6)}$$

The logarithmic values of MAU, usage time, and retention rate were used to analyze the elasticity of each variable. This approach demonstrates how much the dependent variable, mobile shopping transaction volume, changes proportionally when the independent variable increases by 1%, thus allowing for an examination of the relationship between proportional changes in the variable.

4. Result

4.1 Structural change

Over the approximately 10-year period since 2015, structural changes in the e-commerce market were identified, occurring once around 2018–2019. These changes were observed at points where the values exceeded the 5% significance level threshold, as indicated by the shaded region. While the e-commerce industry has demonstrated consistent growth, its explosive expansion was triggered by the contactless economic conditions following the COVID-19 pandemic, during which structural changes were expected to have occurred. However, the results of the CUSUM test suggest that structural changes in the mobile-based e-commerce market had already taken place before the pandemic. Growth continued even after the onset of the COVID-19 pandemic (Figure 1).



Figure 1. Recursive cusum plot analyzing the structural change(2015–2024)

Based on the results of the CUSUM test, which indicates that the structural change occurred before the COVID-19 pandemic, we aim to examine this more closely by dividing the period for analysis. To investigate whether structural changes occurred around the onset of the pandemic, the CUSUM test was performed separately for the periods from 2015 to 2019 and from 2020 onward.

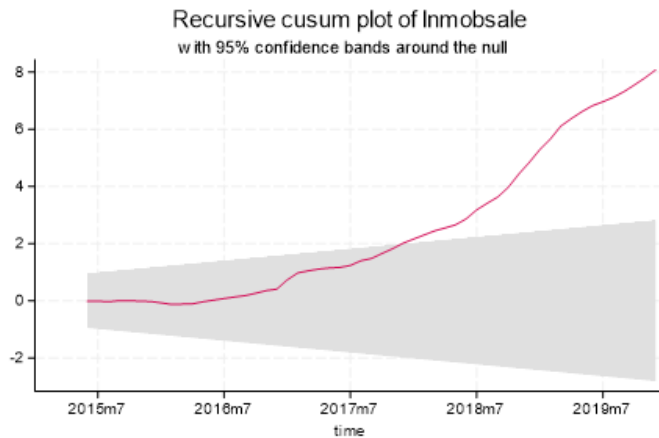


Figure 2. Recursive cusum plot analyzing the structural change(2015–2019)

The CUSUM test for the period from 2015 to 2019 provided more detailed insights into the timing of the structural change. While the test for the entire period suggested that a structural change likely occurred between 2018 and 2019, the analysis of the segmented period pinpointed early 2018 as the specific timing of the change. Notably, 2018 marked a pivotal point for the e-commerce industry, following SoftBank's significant investment in Coupang at the end of 2017, which was a major industry milestone. This period witnessed substantial growth in the e-commerce sector, as evidenced by shopping apps being included for the first time in the annual popular app rankings of the two major app stores. Mobile shopping transaction volumes experienced rapid growth from 2015, with an average annual growth rate of 27.7%. Starting at 67%

in 2015, mobile shopping transactions continued to grow by more than 40% annually, reaching a structural turning point in early 2018.

From 2020 onward, fluctuations persisted within a 5% significance level; however, structural changes were observed by the end of 2023. This is likely attributable to the domestic expansion of Chinese e-commerce platforms. An analysis of the quarterly active user share for shopping applications, based on usage data provided by data.ai, reveals that Chinese e-commerce platforms entered the top four rankings in Q4 2022. By Q4 2023, they ascended to the top three, and by 2024, their growth continued, with Chinese platforms securing the second and third positions.

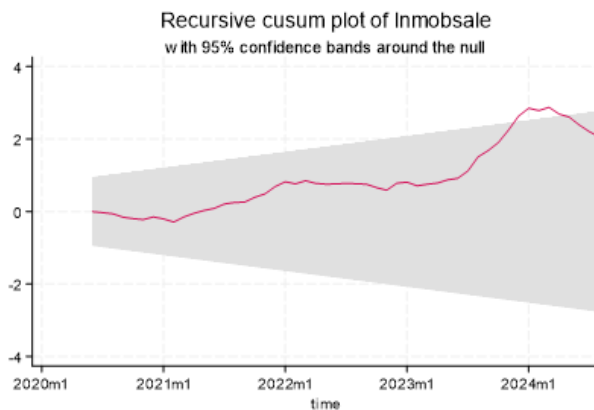


Figure 3. Recursive cusum plot analyzing the structural change(2020–2024)

Table 3. Market Share by Mobile Shopping Apps (based on Avg. MAU)

Rank	2022				2023				2023		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
1	CP (.407)	CP (.419)	CP (.418)	CP (.420)	CP (.424)	CP (.424)	CP (.418)	CP (.387)	CP (.373)	CP (.364)	CP (.388)
2	11st (.138)	11st (.132)	11st (.133)	11st (.125)	11st (.124)	11st (.123)	11st (.118)	11st (.108)	Ali (.107)	Ali (.108)	Ali (.113)
3	Gmk (.083)	Gmk (.081)	Gmk (.083)	Gmk (.086)	Gmk (.089)	Gmk (.091)	Gmk (.093)	Ali (.099)	Temu(.093) 11st(.093)	Temu (.114)	Temu (.109)
4	Auc (.054)	Auc (.052)	Auc (.052)	Ali (.057)	Ali (.064)	Ali (.077)	Ali (.086)	Gmk (.088)	Gmk (.077)	11st (.091)	11st (.092)

1) CP: Coupang, 11st: 11st, Gmk: Gmarket, Auc: Auction

2) calculated by author based on data from data.ai

However, the structural changes observed after 2020 appear to have reverted to within the significance level shortly after their emergence at the end of 2023, as indicated by the CUSUM plot. The explosive growth in transaction volumes of Chinese e-commerce platforms—driven by ultra-low pricing strategies,

the exemption of sales commissions, and substantial advertising expenditures—has introduced structural shifts in domestic market. However, these changes do not appear to have been sustained over time.

That said, as 2024 has not yet concluded, and considering that Chinese e-commerce platforms continue to make significant efforts, such as establishing fulfillment networks in Korea, operating customer service centers staffed by Korean representatives, and implementing measures to enhance product quality and customer safety, it remains essential to closely monitor their influence. The ongoing impact of Chinese e-commerce platforms on Korea's mobile-based e-commerce market warrants continued observation.

To examine the impact of the COVID-19 pandemic, structural changes during the period from 2019 to early 2022 were analyzed. The results suggest that the effects of the pandemic emerged around October 2020, with an approximate nine-month lag. Although South Korea implemented social distancing policies following the spread of the coronavirus in January 2020, the country did not enforce full-scale shutdowns as seen in other nations, which left offline shopping largely unrestricted. However, consumer concerns about virus transmission led to a preference for contactless transactions. As consumers became accustomed to the convenience of last-mile delivery, transaction volumes increased, and even older consumers, who were previously less familiar with mobile shopping, began to participate. This confluence of factors is believed to have led to the structural change observed around October 2020.

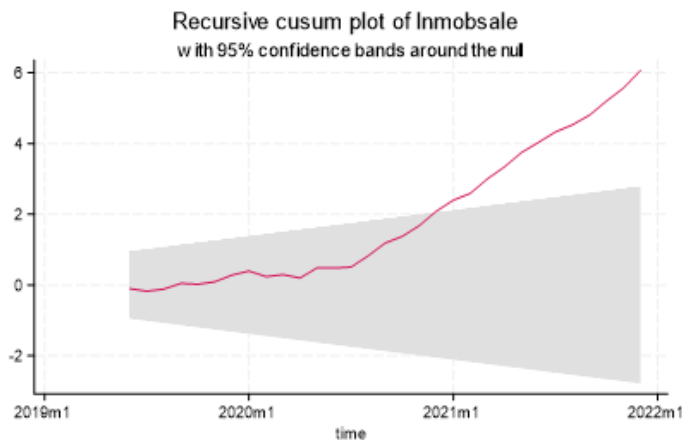


Figure 4. Recursive cusum plot analyzing the structural change (COVID-19)

Through statistical testing, it was confirmed that structural changes in South Korea's mobile-based e-commerce market occurred three times over the past decade: in February 2018, October 2020, and October 2023.

The structural change observed in 2018 can be attributed to the rapid growth in mobile transaction volumes, driven by the development and advancement of direct and indirect e-commerce related factors. These include Coupang's large-scale funding, the expansion of fulfillment infrastructure, intensified price competition between e-commerce platforms, and the proliferation of simplified payment systems. Notably, data released by the Financial Supervisory Service highlight that the scale of domestic simplified payment

services increased threefold, growing from KRW 26.88 trillion in 2016 to KRW 80.15 trillion in 2018 (Kim, Miyoung, 2019). As of the end of 2018, 43 domestic companies were offering a total of 50 simplified payment services. The number of registered users, based on overlapping counts, reached 170 million, indicating that, on average, each individual in the country used three simplified payment services. This underscores the significant growth in the adoption of such services.

In 2020, the expansion of the contactless economy driven by the COVID-19 pandemic is expected to have caused a structural shift in mobile e-commerce transaction volumes by increasing transactions among existing users and attracting new users to the platform.

The short-term deviation observed in the CUSUM plot in 2023 can be attributed to the effectiveness of aggressive marketing campaigns and low pricing strategies employed by Chinese e-commerce platforms. However, following the entry of Chinese e-commerce platforms into the Korean market and their subsequent expansion in market share, user behavior appears to be influenced by a combination of factors. These include the sensitivity of some users to the low quality and potential risks of harmful substances in products purchased directly from China, as well as the preference of other users who prioritize price as the most critical factor in their decision to continue using these platforms (Han, 2024; Oh, 2024). Thus, rather than exhibiting a consistent trend after the point of structural change, the data appear to adjust back within the range of statistical significance. This suggests that various factors influencing e-commerce consumer decision making – such as quality, price, and delivery – play a role in shaping purchasing behavior. However, the impact of these factors is likely to differ from the dynamics observed during the two earlier instances of structural change.

To better understand the nature of these changes, this study examines in greater detail the trends in mobile application metrics before and after each of these time points, providing insights into the specific patterns of transformation.

4.2 Details of changes

4.2.1 Mobile transaction

The mobile transaction volume in online shopping has shown consistent growth since 2015, with no significant changes observed around the three-time points mentioned earlier. However, the growth rate appears to decelerate in certain periods, which may be interpreted as the domestic mobile-based e-commerce market approaching its peak potential size.

4.2.2 Active users

The trends in active users do not adequately explain the

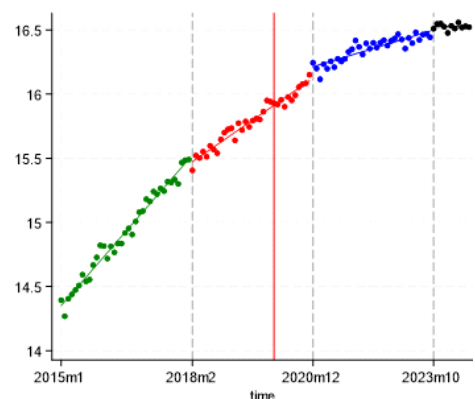


Figure 5. Mobile transaction volume

structural changes observed at the three previously identified time points. To address this, the periods were adjusted to better capture the changes, and the results are shown in the figure on the right. The number of active users for mobile applications can be interpreted as a real-time indicator of user preferences, reflecting economic and social issues immediately. Elaborating on social issues causing the change in active users, active user numbers increased sharply from early 2015 but showed a significant decline in early 2017. This period coincides with the aftermath of the presidential impeachment decision, a time characterized by a general decline in consumer sentiment as denoted in Figure 7. The impeachment of the president had a major impact on the overall economy and society of our country, and, as shown in Figure 7, the decline in consumer sentiment that began in the second half of 2016 reached its lowest point in early 2017 and has been gradually recovered since the impeachment. The Consumer Sentiment Index, published monthly by the Bank of Korea, measures the public’s perception of the current economic conditions and future outlook, including expectations for consumption expenditures (Bank of Korea, 2024).

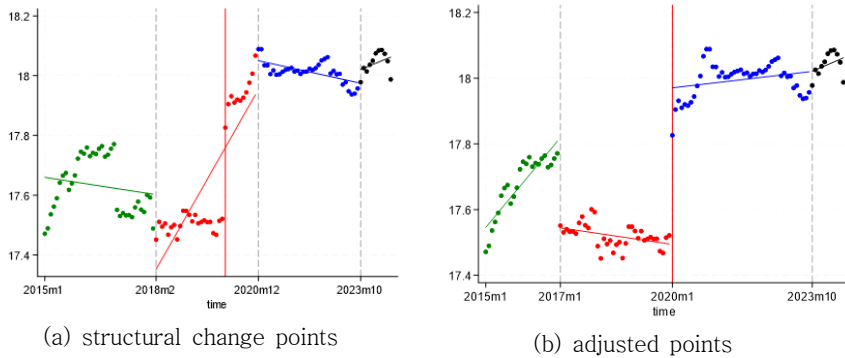
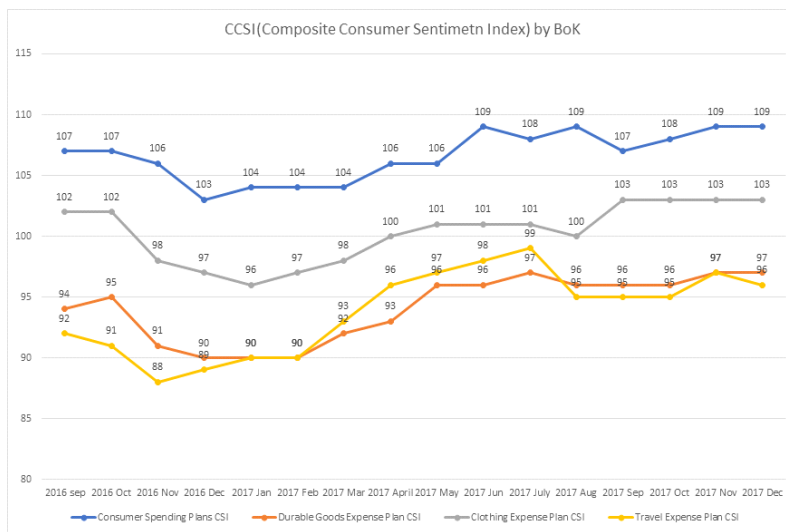


Figure 6. Active users trend



Source: Bank of Korea

Figure 7. CCSI trend including impeachment of the president

Consumption expenditures encompass durable goods, clothing, dining, travel, education, healthcare, cultural and recreational activities, transportation, and housing. Among these, the indices for durable goods, clothing, travel, and overall consumption expenditures—which are relevant to spending through e-commerce platforms—support this interpretation, reflecting the trends observed during that period.

The reason why the change in the number of active users differs from the timing of the structural change confirmed in the CUSUM test is that the political, economic, and social risks resulting from the impeachment of the president had a much greater impact than general domestic and foreign risks, and thus had an immediate impact on various aspects of people's consumption.

Following early 2020, the number of monthly active users increased significantly, which can be attributed to the immediate rise in online shopping via mobile platforms triggered by the spread of the coronavirus. This upward trend continued until October 2020, as confirmed by the earlier CUSUM test, before experiencing a decline. This adjustment appears to reflect the inability of newly acquired early users, drawn in during the pandemic, to sustain their activity. Additionally, as offline activities resumed under relaxed social distancing conditions, the scale of active users stabilized.

By the most recent structural change identified in October 2023, the trend of increasing active users was already underway, driven by the entry of Chinese e-commerce platforms into the market.

4.2.2 Usage time

Since 2015, total usage time has exhibited distinct variations across different periods. From 2015 to February 2018, fluctuations were observed with repeated increases and decreases. Between February 2018 and October 2020, encompassing the onset of the COVID-19 pandemic, a significant upward trend was observed. From October 2020 to October 2023, total usage time stabilized within a narrow range, showing relatively consistent figures. Beginning in October 2023, the aggregate usage time increased in a stepwise manner, maintaining similar levels until September 2024.

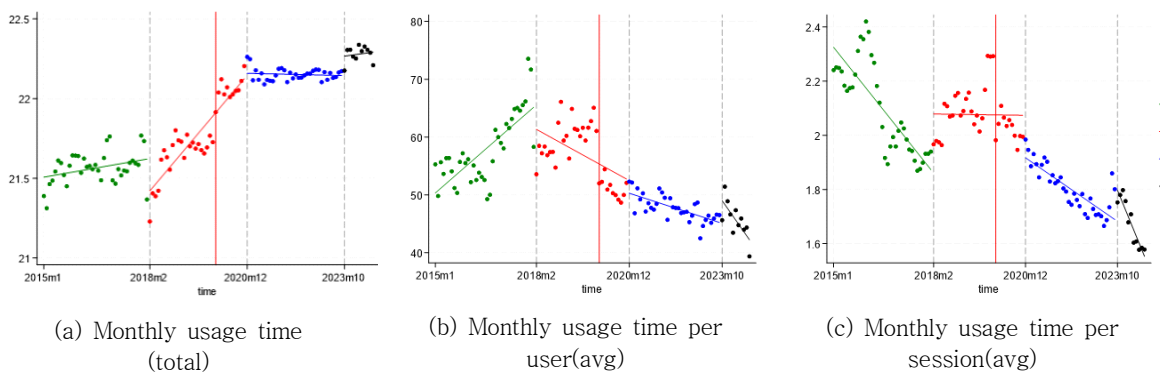


Figure 8. Usage time trend

Usage time per user consistently increased from 2015 to February 2018, followed by a renewed upward trend starting from the 2015 baseline level and continuing from February 2018 until the onset of the

COVID-19 pandemic. However, immediately after the pandemic, the average usage time per user began to steadily decline.

This post-pandemic decline can be attributed to the global pandemic significantly restricting economic and social activities, resulting in a substantial shift from offline to online purchasing for essential goods. It is presumed that this shift led to a higher proportion of efficient purchases focused on necessities, which reduced the exploration of new products, and thereby contributed to the decrease in average usage time per user. It can also be expected that as users build transaction experience and trust in the e-commerce platform, they will reduce the time they spend searching for information and verifying information about products and platforms.

As of October 2023, the entry of Chinese e-commerce platforms and their extensive marketing efforts led to an increase in user engagement time on these platforms. However, this trend was short-lived, followed by a sharp decline.

The average session duration showed a continuous decline from early 2015 to 2018. After February 2018, session duration exhibited a slight upward trend, but no clear pattern of increase or decrease emerged, except during the early stages of the COVID-19 pandemic in early 2020. However, from December 2020 onward, a sharp decline was observed. By October 2023, session durations temporarily increased due to the influence of Chinese e-commerce platforms but quickly declined again, continuing this downward trend through September 2024.

When comparing user-level usage time with session-level usage time, distinct patterns emerge across different periods. In the first period, from 2015 to February 2018, user-level usage time increased, while session-level usage time decreased. During the second period, starting in 2018, both metrics either declined or remained stable. In the third period, beginning in December 2020, both user-level and session-level usage times consistently showed a downward trend.

4.2.3 Retention rate

The retention rate shows a somewhat different pattern from the previously confirmed point of structural change.

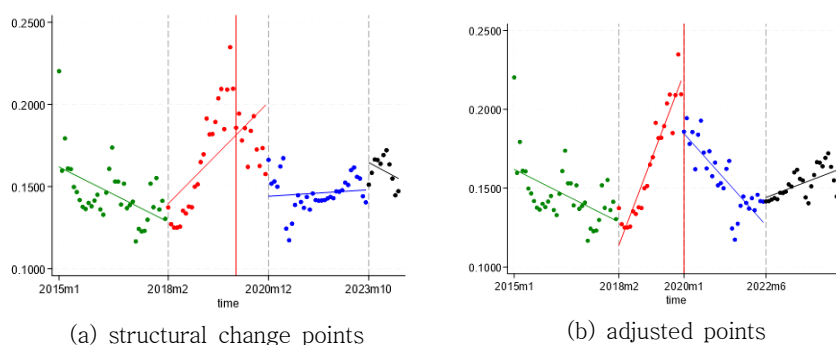


Figure 9. Retention rate trend

Until the first point in time, 2018, the retention rate tended to decrease while repeating periods of increase and decrease. However, in the section from February 2018 to December 2020, the number that had been increasing sharply until the outbreak of COVID-19 quickly returned to pre-outbreak levels. In the section from December 2020 to October 2023, there is no particular trend of increase or decrease. As of October 2023, the retention rate shows a tendency to decrease again.

To understand the trend of the retention rate more accurately, we analyzed it based on adjusted points that match the trend of the retention rate rather than using classifications based on the timing of structural changes. The decreasing section until early 2018 remained unchanged, but the retention rate, which began increasing again starting from February 2018, reached its peak during the COVID-19 period and then began decreasing again. After the outbreak of COVID-19, it showed a downward trend again and started to rise around June 2022, but as time passed, the retention rate fluctuated in short cycles and increased by a small amount. The retention rate, like the number of active users examined earlier, showed a tendency to respond immediately to specific situations or conditions.

It is expected that various factors contributed to the decrease in the retention rate during the COVID-19 pandemic, and the upward trend that started in June 2022 is likely attributable to full-scale marketing and promotion of Chinese e-commerce platforms. The tendency to fluctuate in short cycles after that can likely be attributed to seasonal factors, such as large-scale shopping events like Black Friday held every November and the significant increase in new transaction volume every March, which have had a greater impact on the trend of the retention rate than in the past.

4.2.4 Download

Mobile applications begin their lifecycle with downloads from app marketplaces such as the App Store or Google Play Store. The methods of downloading can be categorized into two types: voluntary downloads initiated by users based on their needs through searches, and downloads driven by advertisements or promotional events aimed at attracting new users.

In the case of paid downloads, no specific trend is observed during the first period. The second period can be divided into two phases: from February 2018 to the onset of the COVID-19 pandemic, when a consistent decline is evident, and from the onset of the pandemic until December 2020, during which no clear pattern is observed.

From December 2020 to October 2023, paid downloads display a fluctuating but generally upward trend. This increase appears to be driven by intensified competition among e-commerce platforms, which leveraged diverse marketing strategies to attract users. After October 2023, a sharp increase in paid downloads is observed, followed by a subsequent decline.

In the case of organic downloads, which occur without the influence of advertisements or marketing and are driven solely by user needs or voluntary interest, a general decline is observed from January 2015 to October 2023. By October 2023, it was evident that organic downloads had already started to increase from mid-2023. This rise can be attributed to heightened user curiosity, likely sparked by the extensive market-

ing efforts of Chinese e-commerce platforms, despite not being directly associated with paid advertisements. Similar to paid downloads, organic downloads reached their peak in October 2023 and then experienced a steep decline thereafter.

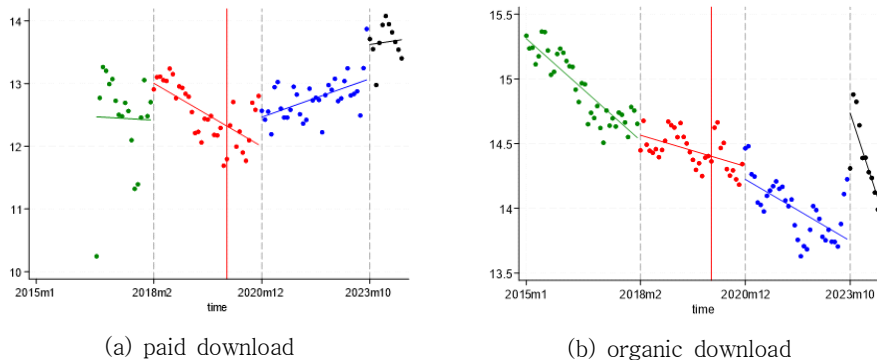


Figure 9. Download trend

5. Conclusion

This study aims to examine whether the e-commerce industry, which has undergone continuous competition and growth, has experienced structural changes over time, and to assess its specific performance at key points. The e-commerce industry has demonstrated steady growth, with the COVID-19 pandemic—a global crisis of unprecedented scale—further driving its expansion by strengthening the foundation of the contactless economy. External indicators, such as online shopping transaction volumes and active users, have fluctuated but have continued to exhibit an overall upward trajectory. Through analysis, this study seeks to determine whether this growth has been driven by structural changes.

Through the CUSUM test, we identified three instances of structural change in the domestic mobile-based e-commerce market over the past decade, beginning in 2015. The first structural change occurred in February 2018, suggesting that the consistently growing e-commerce platform market had reached a turning point. At that time, Coupang, one of Korea’s leading social commerce platforms, was enhancing consumer satisfaction through innovative services such as expanded Rocket Delivery, funded by a \$1 billion Series A investment secured in 2016. In early 2018, Coupang secured additional significant funding, signaling major future investments, including expanding fulfillment centers.

Rocket Delivery, a last-mile delivery service widely praised by consumers, prompted competitors to introduce similar services, offering consumers access to increasingly diverse and convenient e-commerce platforms. During this period, the introduction of new services and intensified market competition likely contributed to the structural transformation and growth of the domestic e-commerce market.

The second structural change was identified in December 2020. Although the spread of the COVID-19 virus began in early 2020, leading to increases in direct indicators such as transaction volumes and the

number of users in the e-commerce market, it did not immediately result in structural transformation. However, as the contactless economy persisted, a new demographic of the older generation, who had previously not participated in online shopping, began to engage with the market. Furthermore, as users became accustomed to the convenience of contactless transactions and last-mile delivery, it is presumed that these behavioral shifts eventually contributed to structural changes in the market after a certain delay.

The final structural change was identified in October 2023, likely influenced by the expanding presence and impact of Chinese e-commerce platforms. In early 2023, AliExpress selected a prominent actor as its advertising model and implemented extensive marketing campaigns to attract new customers. This influence appears to have culminated in the structural change observed in October 2023.

November marks the annual Singles' Day (Guanggunjie), China's largest shopping event, and the combined effects of sustained marketing efforts aimed at acquiring new customers and promotions for Singles' Day likely had an immediate impact on key metrics, including user numbers, usage time, and downloads. By early 2024, mobile-based e-commerce transaction volumes returned to within the 5% significance threshold. This finding suggests that while the aggressive and large-scale marketing campaigns by Chinese e-commerce platforms in 2023 had a substantial short-term impact on the domestic market, these efforts acted as temporary drivers and did not result in sustained structural changes.

Over the past decade, the domestic e-commerce industry in Korea has demonstrated substantial and sustained growth, accompanied by three distinct structural changes, as analyzed in this study. The Korean e-commerce market established its foundation early through a well-developed mobile infrastructure and has evolved into a dynamic and competitive landscape. Platform companies and traditional retail enterprises compete to offer consumers a broader range of choices and benefits, fostering innovation and market efficiency.

For instance, the introduction of consumer-centric services such as Rocket Delivery garnered significant consumer response, prompting competitors to launch similar services and thereby enhancing consumer utility. This environment of competition and innovation led to the first structural change observed in early 2018. Subsequently, the COVID-19 pandemic further accelerated the growth of the contactless economy, triggering a second structural change.

The third structural change appears to have occurred around October 2023, likely influenced by the entry of Chinese e-commerce platforms into the Korean market. Their aggressive penetration strategies, including ultra-low pricing, reshaped the competitive dynamics during this period. However, the influence of Chinese e-commerce platforms seems to reflect a temporary shock rather than a sustained impact. Continued observation will be necessary to determine whether their presence evolves into a lasting structural change in the Korean e-commerce market.

This study aimed to determine whether the steady growth of the domestic e-commerce market was accompanied by structural changes due to various internal and external variables. Through analysis, it was confirmed that structural changes occurred three times: in early 2018, late 2020, and late 2023. The study found that the expansion of the non-face-to-face economy and the growth of the e-commerce market due to the COVID-19 pandemic entailed structural changes. In early 2018, it was suggested that the growth

strategies of companies were selected by the market based on the potential and growth prospects of our e-commerce market and that growth accompanied by structural changes was possible. In addition, it can be inferred that the ultra-low-price strategy and aggressive marketing of Chinese e-commerce platforms, which have been gradually increasing their market share, are contributing to and influencing structural changes in the domestic market.

From the above results, several implications were drawn to incumbents and potential entrants. The structural changes confirmed in 2018 are based on the advancement of the industry and the growth of the market itself, and it was not temporary. The structural changes confirmed in 2023 do not seem to have a lasting impact yet, which is likely because of large-scale promotional marketing and low-price strategies of Chinese e-commerce. It can be deduced that implementing fundamental growth strategies aimed at addressing latent consumer needs, such as the introduction of innovative services to the market and the expansion of infrastructure, has the potential to drive transformative growth beyond existing paradigms, provided they are embraced by users.

This study confirmed that timing of structural changes based on transaction amount data and user data indicating the market size, however, due to the methodological limitation of CUSUM that has a limitation of not being able to confirm specific factors causing structural change but requires complement analysis to detect factor. Thus, complementing the limitation of CUSUM, it is expected that follow-up research for analyzing the detailed factors of structural change at each point in time, especially in 2018, and examining the growth factors of the e-commerce market, will provide implications for corporate strategies and industrial policies.

Furthermore, this study analyzed historical trends based on actual usage data from the past decade, including metrics such as usage time and retention rates. However, it has a limitation in explaining users' behavioral changes in depth, as it does not incorporate qualitative data such as user perceptions, understanding, satisfaction, or intentions to use. Addressing these aspects is identified as a task for future research.

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- 조영주** 네브라스카 주립대에서 경영학사와 데이터 분석 석사 과정 졸업 후, 연세대학교 산업공학 박사과정에 재학 중이다. 주요 관심분야는 기술경영, 조직관리이다.
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