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Analysis of Digital Trade Competitiveness among 28 OECD Countries (2010-2020) Using RCA Index and Diamond Model

-Case Study of South Korea's Digital Service Sector -

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Abstract

The digital transformation brought significant impacts on international trade. Access to digitalization and new technologies lowered barriers to entry in global markets, contributing to higher trade competitiveness. Digitalization has reshaped how trade is conducted by changing the "nature" of its transaction. Digital trade is now a salient feature in international trade, and the digital service sector shows prominent growth across the globe by fostering technological innovation and economic development. Countries with active participation in digital trade translate into having an international competitive advantage. The following paper aims to define what digital trade is and empirically analyze competitiveness in digital service sectors of 28 OECD member states from 2010 to 2020 using Balassa's Revealed Comparative Advantage (RCA) index and Michael Porter's diamond model to explain the surge in digital trade. To classify digital services within the commercial service sector, this paper utilizes EBPOS 2010 statistics to categorize digital trade into ICT-enabled services and other potentially ICT-enabled services. Looking at the empirical results, the paper shows a consistent RCA index in service sectors or goods commodities for certain countries while some countries go through unprecedented changes from having a comparative advantage in other service sectors to digital service sectors. Thus, this paper will analyze countries with the highest Revealed Comparative Advantage

(RCA) index in the digital service sector and apply Porter's diamond model to explain the reasons behind the sudden growth in digital trade.

Keywords: Revealed Comparative Advantage, Digital Trade, Competitiveness, Michael Porter's Diamond Model

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CHAPTER I. INTRODUCTION

1. Study Background

Digitalization enabled a reduction of the cost of trade across borders by facilitating the interconnectedness of global value chains and connecting a large number of new businesses and consumers all around the world. The rise of digitalization transformed trade completely. As digitalization expands the scale, scope, and speed of international trade, it allows businesses to provide new products and services to a greater number of consumers to be digitally connected around the globe.

Digital transformation has significant effects on international trade. Having access to digitalization and technological innovations eliminated entry barriers in global markets, enhancing trade competitiveness. Digital trade is not limited to the provision of ICT goods and services; it also affects many economic sectors. The greater the degree of digitalization, the larger the trade openness, which results in the sale of more goods and services to a wider variety of markets with less concentrated export baskets. Internet penetration is frequently used as a metric for digital connection, and greater digital connectivity leads to increased bilateral trade and trade agreement benefits. The digital transition enabled trade to become more intricate and equipped with digitally delivered services. This created new prospects for goods and service complementarities. As a result of digitalization, the trade of lower-valued physical items and digitally delivered services have expanded, and

new types of goods and services integrated in products can emerge in the future (Lopez-Gonzalez and Jouanjean, 2017). The multifaceted impacts of digital trade can provide many benefits. Digitalization can affect the distribution of products through how items or services are traded and consumed. The phenomena also affect how firms engage with consumers, with other companies, and with governments. The era of hyper-connectivity has changed the structure of production, design, consumption, and delivery as they are all geographically distributed but also intricately linked through trade (Lopez-Gonzalez and Jouanjean, 2017).

Digitalization is expanding the speed, scale, and scope of trade. In terms of scale, digitalization enables enterprises to access a larger number of consumers around the world and increase outsourcing manufacturing activities for an easier scaling process. For instance, digital services such as cloud computing services allow organizations to acquire IT services with minimal upfront investment and enhanced IT services in reaction to changes in demand. Cloud computing services' flexibility and cost-effectiveness are especially key elements for small to medium-sized enterprises aiming for internationalization. Also, firms sell digital services near zero or marginal costs of distribution but with fixed costs of production to meet demand. This is an area where technology can overcome limitations of traditional trade such as physical production and delivery taking time and having fixed costs. As a result, services that are generated at the domestic level can expand to cross-border delivery without having to build separate subsidiaries in different

locations. Hence, digital trade promotes consumers and smaller enterprises to directly participate in trade activities with more ease. Using online platforms as a venue minimizes the costs of sales between countries. Consumers can purchase intermediate or final items from the global market with more choices at a reduced price, leading to higher welfare. New technologies, such as blockchain or distributed ledgers, have created new ecosystems for trade to expedite transactions, strengthen partner trust, enable product verification, facilitate the transfer of funds, and enforce smart contracts. Digital trade can increase the resilience of global value chains for businesses while allowing the public sector to control risks and costs associated with customs duties. In terms of speed, digital connectivity offers faster access to knowledge and information to overcome the informational gap between smaller enterprises and larger firms. Digital networks allow organizations to better interact, and flexible data flows drive enterprises to develop products by tailoring them to the needs of demand. The following advantage also interconnects other businesses to participate in global value chains. Lastly, in the case of scope, digital transformation expands the scope of a company's activity and stimulates the development of new forms of services. Digitalization is connecting suppliers and customers with complementary services, such as shipping, warehousing, electronic payment, and numerous financial services. It is building a new ecosystem for enterprises engaged in digitally connected trade. Many ICT businesses are shifting from manufacturing activities to focusing on delivering cross-border services for manufactured goods. For instance, IBM sold hardware branches to provide services

like Watson. Digitalization is also encouraging new services through innovative technology improvement, exchanging data, and establishing new data-driven business models. An example is cloud computing services that store and analyze data remotely which does not require fixed assets in ICT infrastructure. New kinds of services such as internet-based payment, digital wallets, and payment solutions are developing new forms of digitally traded goods by expanding the options of online payment systems, allowing considerably faster and safer transactions.

1-1. Empirical Definition of Digital Trade

Digitalization has significantly changed the features of trade. The rapid growth of digitalization has introduced new categories of services. Extended Balance of Payments Services (EBOPS) data encompass more than just commercial services. This report utilizes EBOPS 2010 statistics to classify services expected to be delivered digitally. The increasing proportion of digitally delivered services in commercial service trade demonstrates that the value of digital services in trade is not limited to traditional exports and imports.

Despite the increasing prevalence of digital trade, there is a lack of consensus over its definition. Relevant literature focuses on the general conceptual framework of what digital trade is, as well as any related scope. Numerous attempts to define digital trade, such as e-commerce, have not effectively captured crucial characteristics including types of services, location of buyers and sellers,

and whether products are ordered and/or delivered digitally across borders. In order to describe various features of digital trade, the Organization for Economic Co-operation and Development (OECD), the World Trade Organization (WTO), and the International Monetary Fund (IMF) have established a conceptual framework for digital trade. The framework distinguishes itself from conventional methods of evaluating digital trade by focusing on the nature of the transaction rather than the nature of the product. Digital trade is essentially defined as digitally ordered and/or delivered trade. Thus, the essence of digital trade is found in the nature of the transaction characterized as digitally ordered and/or digitally delivered. Due to the absence of a globally accepted definition, there are still obstacles to the worldwide assessment of empirically evaluating and characterizing digital trade in the present day. Many have proposed various statistical measurements for digital trade in ICT-enabled services, digitally enabled services, possibly digitally enabled services, and others. Nonetheless, this broad conceptual framework lacks cohesion. In addition, little is known about the scope of digital trade. As a result of the constraints of national accounting frameworks, reliable and internationally comparable statistics for measuring digital trade still lack coherence. This can pose challenges for policymakers when implementing appropriate measures to address obstacles in digital trade. One of the biggest challenges in understanding the scale of digital trade arises from establishing clear boundaries of what digital trade covers and having a universally agreed definition. The lack of a commonly accepted framework shows obstacles in classifying the effects and extent of digital trade. A

systematic and universal framework needs to be developed to find out the impacts and challenges of digital trade.

In response to the need for a practical instrument to assess digital trade, the OECD, WTO, and IMF developed a framework to establish a comprehensive empirical definition of cross-border digital trade. A conceptual framework can serve as a practical guide for measuring digital trade in accordance with National Accounting guidelines. According to the 'Handbook on Measuring Digital Trade' issued by OECD-WTO-IMF in 2020, the three key components of digital trade are classified as follows: Nature (How), Product (What), and Actors (Who). E-commerce often corresponds with the nature of digitally ordered goods and services. The OECD defines e-commerce as "the sale or purchase of goods or services undertaken through computer networks by methods specifically devised for receiving or placing orders" (OECD, 2013). Although goods and services can be ordered online, payment and final delivery are not required to be conducted online. It is a matter of how the order is placed which shows the nature aspect of digital trade. The second aspect is digitally delivered services. The OECD framework defines the following transaction as "international transactions that are delivered remotely in an electronic format, using computer networks specifically designed for the purpose" (OECD/WTO/IMF, 2020). Examples include services or data flows that are delivered digitally or web products such as music, films, software, e-books, and computer games. Goods are not included in the measure; products that are considered digital such as online books or software are identified

as the license to use the product and not physically owning the product. Therefore, digital equivalents of online-distributed items are regarded as digitally supplied services. The third dimension of the nature of the product consists of both digitally ordered and delivered goods via online intermediary platforms. Moreover, the OECD framework identifies a fourth pillar: "where" to distinguish between "monetary" and "non-monetary" digital exchange. According to the OECD definition, "non-monetary" digital trade consists of information and data movements that do not involve monetary exchange. Obtaining cross-border data is the most difficult part of the measurement, as data flows do not clearly show money exchanges that do not appear in traditional GDP or trade statistics. Therefore, digital trade mostly emphasizes conceptual structure.

UNCTAD develops the concept of digitally delivered services into ICT services and ICT-enabled services. ICT services are service activities "designed to facilitate or fulfill the information processing and communication function" (p.5 UNCTAD, 2015). ICT services can be identified in Extended Balance of Payments Services (EBOPS) 2010 trade service statistics. UNCTAD defines ICT services as telecommunications services, computer services, and computer software reproduction and distribution licenses. Considered service activities are those that "can be specified, executed, delivered, assessed, and consumed electronically" (p.9, UNCTAD, 2015). In accordance with the General Agreement on Trade in Services (GATS) and the Manual on Statistics of International Trade in Services, ICT-enabled services in international trade are delivered remotely via Mode 1: cross-

border supply (United Nations, 2011). Statistics on international trade in services capture only the types of services that are traded in numbers, not the mode of distribution of these services. UNCTAD distinguished another category into "potentially ICT- enabled services" delivered by ICT networks from services delivered through ICT networks via Mode 1. EBPOS statistics can be used as a proxy for measuring digital trade. According to the EBPOS classification, ICT services consist of telecommunications, computer services, and computer software. Other potentially ICT-enabled services are categorized as sales and marketing services, information services, insurance and financial services, management administration and back-office services, licensing services, engineering, related technical services and R&D, and lastly, education and training services (UNCTAD, 2015). Due to the fact that digital trade is neither restricted to services nor specific goods, but rather based on the nature of trade, these measurements and standards currently lack the dimensions required to capture all features of digital trade. E-commerce, which consists of digitally ordered services, could eliminate numerous digitally supplied but not digitally ordered services, such as banking services. Also, a scale based solely on digital delivery would exclude online-ordered products. Therefore, assessment based entirely on EBOPS classification or e-commerce framework does not encompass all dimensions of digital trade. Yet, digital trade can be still defined by combining two concepts: online delivery and order.

It is important to accurately measure digital trade and not rely so much on conceptual frameworks. The COVID-19 outbreak has intensified the trend of

digital transformation, and mobility restraints have produced a growing demand for the delivery of digital services which increases the need to empirically access digital trade more than ever. During the lockdown, businesses and customers have shifted online to conduct daily activities, economic transactions, and consumption. The drive for innovations and faster online delivery of public and private services enabled by the development of digital technologies was critical to the response to the pandemic (United Nations, 2021; UNIDO, 2020; Fu, 2020). As a result, global exports of digitally deliverable services (DDS) have advanced faster than total commercial service exports over the recent 15 years as the total value of global DDS have climbed triple times from 2005 from 1.2 trillion US dollars to 3.2 trillion US dollars in 2019. Due to the pandemic, the export proportion of DDS in the entire service economy increased from 45% to 52% in total[1]. Acknowledging the rise of digital services in trade, the paper aims to assess what digital trade is by referring to UNCTAD and EBOPS service classification despite limitations in the measurement of digital trade.

1-2. “Modes” of Supply in Digital Service

One noteworthy effect of the digitalization of service is the changes in “modes” of the international supply of services. The WTO and GATS classify the global supply of services into four "modes." Mode 1 (cross-border supply) includes

[1] UNCTAD Stat

distribution services from one country to another. Mode 2 (consumption abroad) occurs when a consumer travels to a foreign country to acquire a service, such as tourism. Mode 3 (commercial presence) refers to a situation in which a service provider in one country provides a service to consumers in another country through physical presence, such as ownership or lease of properties like foreign bank branches and international hotel chains. Mode 4 (presence of people) is when individuals from one country supply services directly to clients in another country by entering that country's territory, such as physicians, educators, and accountants (Wettstein et al., 2019). Rising digitalization has prompted a shift in trade by reinforcing the specific modes of service delivery or expanding the complementarity between various modes of service delivery. By expanding the flow of Mode 1 (cross-border supply) services, digital platforms as intermediaries in cross-border transactions could become more efficient than before. Or it could simplify the research and reservation procedures for a large number of consumers who are encouraged to purchase abroad through mode 2 services (consumption abroad). Moreover, digitalization dramatically reduces the necessity for physical presence to provide services, allowing services that operated as a subsidiary office (Mode 3) to be provided by service providers in another country utilizing mode 1 through online platforms. The digital transformation in service delivery or purchasing methods could have contributed to a recent declining trend in global FDI (UNCTAD, 2021). Another effect of digitalization led to online streaming technologies being embedded in specific services to transition from physical

delivery to digital delivery. This development results in a transition from Mode 4 (cross-border individual professional service providers) or Mode 2 (consumption abroad) services to Mode 1 services (cross-border supply). This is shown by the increased use of video-conferencing services such as the zoom platform, which eliminates the need for experts to travel abroad to deliver Mode 4 services. Online video conferences are now used worldwide for many business meetings, education, training, and for other purposes. The rise in demand for video conferencing led to the success of widely providing these services. The use of artificial intelligence, 5G technology, and robotics contributes to the development of medical services. For instance, robotic surgery eliminates the need for face-to-face medical procedures (Mode 4) and medical tourism (Mode 2). An e-health business like Lindbergh provides robotic surgery as a Mode 1 service to patients across borders (Cernat, 2021). Classifying different modes of supply in services can help assess the nature, value, and measurement of digital trade.

1-3. Challenges in Data Gaps and Measurement

There are remaining challenges in measuring digital trade. Measurement of intermediaries involved in transactions is a complex component of digital trade. There is a need to identify the intermediaries in cross-border trade and any financial transactions that place through an intermediary platform, but these activities are difficult to measure. Considered "non-monetary" digital trade is free, cross-border data transfers that have no monetary value. And this "non-monetary"

digital exchange provides very little information regarding how this can be quantified. Another challenge is capturing household imports of electronic services such as digital downloads and streaming services. Measuring such low-valued in high-volume transactions below customs thresholds is an issue for de minimis trade. Therefore, additional efforts are required to effectively address the challenges in measuring the scope of the current framework. Due to the increasing presence and nature of complexity in digital trade, policymakers confront new difficulties to provide implications for digital-specific regulations in cross-border trade. However, digital trade also provides substantial economic growth prospects for emerging nations. Therefore, digital trade supports the government's continued efforts to reduce trade barriers and enhance competitiveness in the service sector. With developments in assessing digital trade and appropriate policies to overcome digital trade's obstacles, the advantages of digital trade can contribute to economic growth. Consequently, digital-specific rules, the availability of support services, and digital infrastructure, including payment systems and logistics, should be further developed to promote digital trade.

2. Motivation

Currently, there is a lack of recent data analysis on measuring competitiveness in the digital service sector. Although there have been relevant papers comparing competitiveness within the goods sector or in the service sector, the following thesis attempts to combine both goods and services to discover which

of the sector is more competitive by using Balassa's Index of Revealed Comparative Advantage. The paper primarily aims to discover the most competitive digital service sector within commercial services for each country to identify growth in digital trade. By looking at available data in OECD statistics, there are consistent data of 28 OECD countries within EBPOS 2010 trade statistics, categorized into ICT-enabled services and potentially ICT-enabled services. Using the OECD International Trade in Services Statistics (ITSS by pattern country) and good exports from Balance of Payments (BOP), this paper measures competitiveness in both goods and services from 2010 until 2020 among 28 OECD countries. And it categorizes digital service sectors within commercial services according to UNCTAD classification. The measurement of competitiveness in digital trade is assessed by using the Balassa Index of Revealed Comparative Advantage. Looking at the empirical results, data shows a consistent RCA index in service sectors or in goods commodities for certain countries while some countries go through distinctive changes from having a comparative advantage in other service sectors to digital service sectors. Thereby, this paper aims to empirically analyze how some countries have a comparative advantage in digital service compared to other sectors by calculating the highest RCA index. In addition, as a qualitative analysis, the thesis will utilize Porter's diamond model to explain the reasons behind the sudden growth in digital trade for specific countries with the highest RCA index in the digital service sector.

CHAPTER II. LITERATURE REVIEW

1. Revealed Comparative Advantage Index

Based on Ricardian trade theory, Revealed Comparative Advantage (RCA) analyzes patterns of trade between nations with relative differences in productivity. RCA index can be calculated using trade data to illustrate productivity differences. While the measurement could provide a general notion and approximation of competitive exports of a country, national measures which affect competitiveness such as tariffs and non-tariff measures are not incorporated in the RCA metric. Comparative advantage is a pattern seen in inter-industry trade. Theoretically, comparative advantage is used to assess relative prices in the absence of trade. In application, the comparative advantage could be measured indirectly using the Revealed Comparative Advantage (RCA) index to detect trade patterns and identify sectors with comparative advantage by comparing a country's trade profile with the world average. In essence, the RCA index is defined as the ratio of two shares. The numerator is the proportion of a country's total exports of the commodity of interest in relation to its total exports, and the denominator is the proportion of world exports of the same commodity in relation to global exports. The revealed comparative advantage (RCA) index is a valuable tool for evaluating export market potential. The RCA provides valuable information about potential trade products with new trade partners and determines if a country should create the following trade-potential products to have a comparative advantage. The

RCA index of the nation I for product j is frequently determined by the product's share in the country's export in relation to its proportion in world trade.

$$RCA_{ij} = (x_{ij}/X_{it}) / (x_{wj}/X_{wt}) \geq 1$$

Where x_{ij} and x_{wj} represent the country i's exports of product j and world exports of product j, respectively, and X_{it} and X_{wt} represent the country's total exports and the world's total exports, respectively. A value of less than unity or 1 shows that the country does not have a revealed comparative advantage in the product. If the RCA index is greater than 1 or greater than unity, the country has a revealed comparative advantage in the product. When a country has a revealed comparative advantage for a particular product (RCA > 1), it is regarded as a competitive producer and exporter of that product in comparison to a country that produces and exports that good at or below the world average. The greater a country's RCA value for product j, the greater it is export competitiveness in product j. The pattern of international trade is determined by comparative advantage, which is one of the most compelling claims of classical trade theory. It depicts the exports of the nation with the comparative advantage in a specific commodity or service, and the imports of the nations with the comparative disadvantage. Comparative advantage is a widely established concept in classical theories of international trade. In 1817, in response to Adam Smith's concept of absolute advantage, David Ricardo developed the concept of comparative advantage to demonstrate the positive association between specialization, the international division of labor, and global output (Ricardo 1817;

cf. Watson 2017). Ricardo's theory on comparative advantage (CA) highlights specialization in which a country with a lack of natural resources or a lack of absolute advantage in the production of a certain commodity can decide to create commodities the country can comparatively better produce than other goods. As a learning curve, specialization in a given product over time can strengthen a nation's competitive edge in the production of that certain good (Herciu 2013; Balogh and Jámbor 2017). Assuming other nations also strengthen their comparative advantage in the production of a specific good, the process of acquiring comparative advantage leads to specialization in overall international trade (Abbas and Waheed 2017). As a result, competition rises due to the principles of mutual supply and demand in the global market (Lectard and Rougier 2018). Comparative advantage can be considered a determinant of the trade structure of an economy, although Ricardo's classical method has some drawbacks in the modern economy. The primary concerns in Ricardo's theory are largely applied to trade in goods and merchandise, not services. Apart from that, the RCA indicator is utilized in investigating the international competitive position in the world economy (Misala 2005, Kuźniar 2007, Wosiek 2016). Consequently, not only theories of comparative advantage but also indexes of comparative advantage are commonly employed as measures of specialization in international trade (Balassa and Noland 1989; cf. de Grauwe 2010). Revealed comparative advantage evaluated by the Balassa index is extensively utilized in practice to find a country's weak and strong areas. Comparative advantage is very multifaceted as it is conditioned by

technological, political, economic, cultural, and environmental factors including production characteristics such as capital endowment, labor force, raw resources, and knowledge, and by the scale of production in the country. Although it is not possible to assess the degree of specialization in production or exports of a given good based on the volume of a country's foreign trade, Balassa argued that comparative advantage could be determined by knowing specific comparative advantages over other international trade competitors. Accordingly, the RCA index acts as a measurement to reveal a country's comparative advantages.

By using the RCA index, this paper will measure both goods and services from OECD data from 2010 to 2020 to discover which sector is most competitive among 28 different countries, and possibly which digital service industries are most competitive compared to other industries. RCA metric will be used as an indicator to find out the comparative advantage of each country in digital trade.

2. Michael Porter’s Diamond Model

Porter explains why some nations are more competitive than others and why certain industries within nations are more competitive than other industries. Michael Porter presented a model consisting of four broad features of a nation which are attributes that individually and collectively make up the diamond of national advantage, the playing field that each country develops and operates for its businesses (Porter, 1990). Porter created the diamond model as a framework for analyzing national competitiveness in order to identify the competitive advantage

of a country's industries and the position of a country in the global competition. The diamond model consists of four broad characteristics: 1) factor conditions 2) demand conditions 3) related and supporting industries, and 4) firms' strategy, structure, and rivalry. Additional elements are the influence of government and chance.

[Table 1] Key Features of the Diamond Model

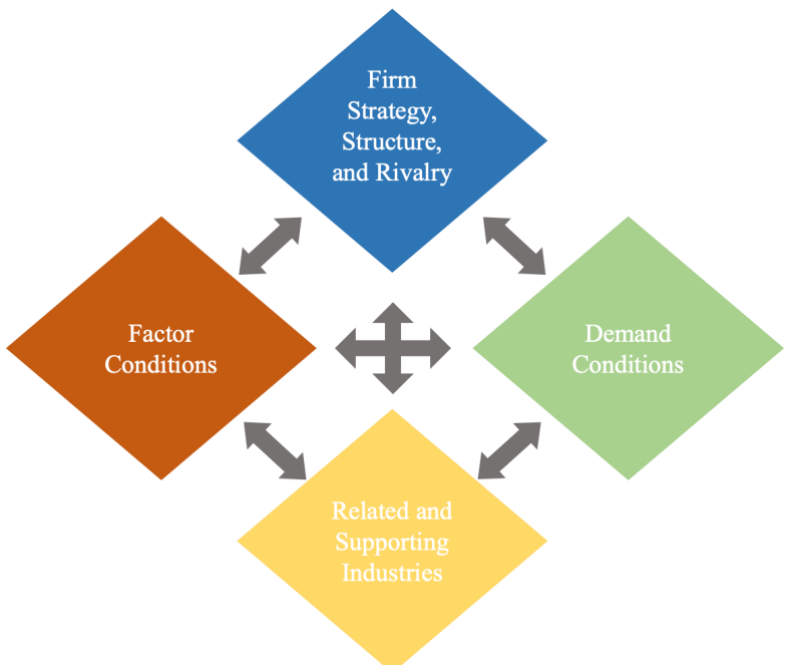
Factor Conditions	Factors of production such as labor resources or infrastructure, necessary to compete in each industry
Demand Conditions	The nature of home market demand for the industry's product or service
Related and Supporting Industries	The presence or absence of internationally competitive supplier industries and other connected industries in a country.
Firm Strategy, Structure, and Rivalry	The conditions controlling how companies are created, managed, and organized
Government	Catalyst and Challenger, to encourage enterprises to achieve higher competitive performance without intervening directly.
Chance	Random events which happened beyond the control of company

Source: Porter, M. (1990) The Competitive Advantage of Nations. Free Press, New York.

These elements combine to create an environment conducive to achieving competitive advantage. The objective of Michael Porter's Diamond Model theory is to develop a connection between academic literature in strategic management and international economics in order to propose national policies for enhancing a nation's competitiveness (Porter, 1990). Most trade theories, according to Porter, have emphasized cost, whereas his diamond model theory captures an

understanding of competition in segmented markets, differentiation between products, technological differences, and economies of scale. Consequently, the diamond model can explain reasons why corporations from certain countries enforce better strategies than other countries in the competition of certain sectors.

[Figure 1] Michael Porter's Diamond Model



Source: Porter, M. (1990) The Competitive Advantage of Nations. Free Press, New York.

1) Factor conditions

Factor conditions are the values of companies that supply factors of production that enable a unit to compete. It is expressed as the factors of production and infrastructure necessary to compete in a given industry. According

to Porter (1990), a country's inherent characteristics are not its most competitive advantages; rather, the most competitive factors are those that are developed in highly productive industries. Innovation and marketing can provide competitive advantages even in the absence of inherent advantages. Porter categorizes factors as follows: human resources (amount, abilities, and cost of employees), material resources (abundance, cost, and accessibility of the nation's natural resources), knowledge resources (the state's scientific, technical, and market knowledge on products and services), information resource (universities, government research institutions, and others), and capital resources (quantity and costs of funding in a sector). The competitive advantage depends on how "condition" variables such as quality, importance, and even shortage of resources are used.

2) Demand conditions

Demand conditions are features of domestic product and service demand in terms of quantity, quality, and degree of innovation. Additionally, a nation's competitiveness is affected by both internal and foreign market demand. Porter argues that the demand condition is a crucial factor in determining a nation's competitive advantage. In a particular industry, the pressures exerted by buyers' needs for certain items based on quality, price, and services shape demand conditions. Certain factor conditions can be influenced by demand conditions from buyers with sophisticated tastes since they can alter the course of innovation and product development. Countries have a competitive edge in industries where

domestic demand provides a clearer and more timely picture of buyer demand than their overseas counterparts (Tuna, 2006: 8). When a sector operates in a complex and demanding domestic market, suppliers are compelled to innovate and earn profits as a result of market survival and competition (Porter, 1990). Furthermore, the size and growth pattern of home demand, which includes the number of individual buyers, the rate of growth in home demand, and the early saturation are considered important components in demand conditions. According to Porter, depending on the size of the domestic market, it can stimulate investment, reinvestment, and dynamism. The rate of growth of investments in a specific industry indicates how rapidly the domestic market is evolving. Early domestic demand can prompt local businesses to act before their international competitors, providing them with an early advantage. Thus, demand conditions are societal demand values that are essential for national competitiveness.

3) Related and Supporting Industries

The presence of related and supporting industries is the third dimension of Porter's diamond model. The industrial cluster is comprised of related sectors and supplier industries that interact with the targeted industry. The industrial cluster is a significant indicator of a nation's competitiveness, resulting from connected and supporting industries in a competitively advantaged sector. If a domestic provider is highly competitive, its performance will result in positive spillover effects. In the 1980s, for instance, the U.S. semiconductor sector had a ripple effect on personal

computers and other technologically advanced electronic goods, thereby positioning the U.S. as a technologically competitive nation. According to Porter, it is difficult to have a successful industry without powerful or challenging associated sectors. Industry clusters serve as proxies for success because "they operate learning, innovation, and competitiveness, and are designed to achieve maximum synergies when all necessary institutions and economic agents are connected" (Porter, 1990). By providing inputs, suppliers can build a path to develop a competitive advantage and create new opportunities to use or transfer innovative technologies to other industries. As a result of the related supporting sectors, new competitive industries grow in need of informational and technological exchange. Suppliers have the potential to gain a competitive advantage over firms in various ways. First, firms can have access to efficient, speedy, and cost-effective production processes. They could also encourage the upgrading of other firms in the regional value chain. Second, there are continuous opportunities for innovative partnerships between suppliers and buyers. The proximity of related industries provides a speedier response to market trends and makes innovation easier. Thirdly, the competitive advantage in related businesses is strengthened when suppliers are strong and become international competitors. Vertical or horizontal clusters are characterized by interdependent relationships between firms and others of a particular sector, such as private firms of varying sizes, suppliers, clients, and financial institutions. Vertical clusters within buyers and suppliers improve the quality of products and their processes, whereas horizontal clusters

generate a more competitive atmosphere. Thus, Porter believes that the "diamond" and its systematic qualities shape both supportive and related industries.

4) Firm’s Strategy, Structure, and Rivalry.

Porter (1990) argues that a nation's competitive advantage is developed by continuous innovation and industrial development activities. The competitiveness of industries can originate in competition among local firms by stimulating research and development (R&D) and innovation capacities among industries. In addition, businesses' strategy, structure, and competition are measures of situations that describe "how a sector is founded, systematized, and managed, and the nature of domestic competition that could help a nation establish a sustainable competitive advantage." According to Porter, domestic competition, and the need to improve one's competitiveness can motivate supply industries to build a competitive advantage on a global scale. In global competition, the rivalry is a very significant factor if companies constrain one another to develop and innovate. Additionally, cultural variables play a crucial role. Most business practices require distinctions in training, backstage, and orientation of leader's management, hierarchy, decision-making, work morale, and relationship with consumers or companies in order to gain competitive advantages in various industries.

5) Government

The government is an additional variable in the diamond model. It determines how government policies affect the competitiveness of private enterprises. Porter states that the government can function as a “catalyst or challenger”, an exogenous influence of the diamond model. Governments encourage, promote, and guide the goals of businesses by fostering an atmosphere conducive to achieving competitive advantages instead of direct intervention. Domestic competition is influenced by numerous policies, including subsidies, taxes, financial incentives, antitrust laws, public procurement, and capital market rules. In the diamond model, the government can avoid "direct" treatment in the market system, but it should strive to foster a competitive atmosphere and innovation.

6) Chance

Chance is another external variable that happens when a corporation or state cannot predict or control an event beforehand. This component could alter existing positions in the market or other factors of the diamond model, influencing competitive advantage. Porter believes that "chance" does not apply to the domestic circumstances of the country. Chance events arise when external influences outside the control of the companies happen. Chance occurrences are viewed as outside the control of businesses, but they can modify the structure of industries, allowing enterprises to change their competitive positions. In this sense, events could prevent previously formed rivalries and empower a nation's

competitive edge to reach its full potential in response to new and different conditions. ‘Chance’ is generally external to the sector such as new innovations, political decisions from foreign governments, wars, changes in financial markets or new foreign or regional demand, discontinuities in input costs, and other rapid technological advancements. An example of an unexpected chance occurrence is the heightened border security resulting from the September 11 terrorist attacks, which negatively impacted Mexican exporters by reducing import traffic volumes. Chance is an exogenous factor that is added to the diamond model and provides the chance for a nation to gain competitiveness in specific industries from unforeseen circumstances.

3. Application of Literature Review

The literature review on Revealed Comparative Advantage is used as an empirical tool to analyze the competitiveness of digital service sectors in 30 OECD countries from 2010 until 2018 and 28 OECD countries from 2019 and 2020 (due to missing service data in Türkiye in 2019 and Israel and Russia in the year 2020). By categorizing digital trade into ICT services and Potentially ICT-enabled services within commercial service from OECD service data according to EBPOS 2010 classification, this paper aims to find countries with notable changes in digital service sectors with the highest RCA index. The paper explains why some countries have higher RCA indexes in digital services than other nations or have consistent RCA indexes in digital services or in other service and goods sectors.

The paper incorporates Michael Porter's diamond model as a qualitative analysis framework to analyze factors of the competitiveness behind certain countries with the most notable transition into the digital service sector.

CHAPTER III. Empirical Analysis

Out of all service sectors, this paper has distinguished digital service according to UNCTAD's EBPOS 2010 classification into potentially ICT-enabled services and ICT services. The services that are treated as ICT-delivered services are telecommunications, computer services, computer software, and licenses to reproduce or distribute computer software. Other categories are identified as potentially ICT-enabled services looking at the following table 2. The data consists of both goods[2] and services[3] from OECD data among 30 countries from 2010 to 2018, and 28 countries from 2019 to 2020 (due to missing data on Türkyie in 2019, and Israel and Russia in 2020). The paper aims to calculate the highest revealed comparative advantage (RCA) in the digital service sector using Balassa's RCA formula to measure the comparative advantage of a nation. The paper also includes total goods exports in RCA calculation to see if some countries have a comparative advantage in goods over services. If countries have shown revealed comparative advantage in the service sector, the paper will observe which categories of ICT services or potentially ICT-enabled services have the highest RCA index in digital trade.

[Table 2]

[2] OECD Stat, Balance of Payments - Good Exports

[3] OECD Stat, EBPOS 2010 - Trade in Services by Partner Economy

Category	Sub-categories of services	EBPOS 2010 Codes
ICT Services	1.1 Telecommunications	9.1 Telecommunication services
ICT Services	1.2 Computer services	8.3 Licenses to reproduce and/or distribute computer software 9.2.1 Computer services – Computer software 9.2.2 Computer services- Other computer services
Other Potentially ICT-Enabled Services	1.3 Sales and marketing services, not including trade and leasing services	10.2.2 Advertising; market research, and public opinion polling
Other Potentially. ICT-Enabled Services	1.4 Information services	11.1.1 Audiovisual services 11.2.1 Health services 11.2.3 Heritage and recreational services 9.3.1 Information services-News agency services 9.3.2 Information services-Other information services
Other Potentially ICT-Enabled Services	1.5 Insurance and financial services	6.2 Reinsurance 6.3 Auxiliary insurance services 7.1 Financial services 7.2 Financial Intermediation Services Indirectly Measured (FISM) 6.1.1 Direct Insurance 6.4.1 Pension services 6.4.2 Standardized guarantee services
Other Potentially ICT-Enabled Services	1.6 Management, administration, and back-office services	10.2.1.1 Legal services 10.2.1.2 Accounting; auditing; bookkeeping; and tax consulting services 10.2.1.3 Business and management consulting and public relations services 10.3.5 Other business services n.i.e.

Category	Sub-categories of services	EBPOS 2010 Codes
Other Potentially ICT-Enabled services	1.7 Licensing services	8.1 Franchise and trademarks licensing fees 8.2 Licenses for the use of outcomes of research and development 8.4.1 Licenses to reproduce and/or distribute audio-visual products 8.4.2 Licenses to reproduce and/or distribute other products
Other Potentially ICT-Enabled services	1.8 Engineering, related technical services and R&D	10.1.1.1 Provision of customized and non-customized R&D services 10.1.1.2.1 Patents 10.1.1.2.2 Copyrights arising from research and development 10.1.1.2.3 Industrial processes and design 10.1.1.2.4 Other 10.1.2 Other research and development services 10.3.1.1 Architectural services 10.3.1.2 Engineering services 10.3.1.3. Scientific and other technical services 10.3.5 Other business services n.i.e
Other Potentially ICT-Enabled services	1.9 Education and training services	11.2.2 Education services

Source: UNCTAD 2015, International trade in ICT Services and ICT-enabled services

[Table 3]

Country	Goods and Services 2010	Highest RCA
Australia	Pension services	40.5954449
Belgium	Provision of customised and non customised R&D services	6.08184405
Canada	Scientific and other technical services	9.61042526

Chile	Total Goods	1.74634503
Colombia	Telecommunications services	2.31447381
Costa Rica	Health services	98.324664
Czech Republic	Standardized guarantee services	81.752932
Denmark	News agency services	6.57598423
Estonia	Other business services n.i.e.	3.80925114
France	Insurance and pension services	1.17629049
Germany	Reinsurance	3.16487639
Greece	Health services	5.53844135
Hungary	Accounting, auditing, bookkeeping, and tax consulting services	7.38917123
Israel	Computer software	16.9546018
Italy	Heritage and recreational services	5.97148612
Japan	Total Goods	1.39269332
Korea	Other business services n.i.e.	3.02834559
Latvia	Architectural services	15.269781
Lithuania	Health services	9.2342818
Luxembourg	Direct insurance	7.50740866
Mexico	Reinsurance	4.61974723
New Zealand	Other business services n.i.e.	2.42568185
Poland	Accounting, auditing, bookkeeping, and tax consulting services	7.30094197
Portugal	Heritage and recreational services	25.1724801
Russia	Advertising, market research, and public opinion polling services	2.62648683

Slovenia	Health services	24.364497
Sweden	Heritage and recreational services	9.11017457
Türkiye	Auxiliary insurance services	3.33221243
United Kingdom	Insurance and pension services	3.60138281
United States	Licenses to reproduce and/or distribute computer software	3.97264976

[Table 4]

Country	Goods and Services 2011	Highest RCA
Australia	Pension services	36.1685356
Belgium	News Agency Services	4.73050988
Canada	Scientific and other technical services	6.14932146
Chile	Total Goods	1.73420958
Colombia	Telecommunications services	1.93753021
Costa Rica	Health services	96.7863656
Czech Republic	Licenses to reproduce and/or distribute audiovisual and related products	4.32389204
Denmark	News agency services	4.03167233
Estonia	Telecommunications services	3.01981326
France	Standardized guarantee services	11.7236498
Germany	Financial intermediation services indirectly measured (FISIM)	3.26343382
Greece	Health services	4.92527946
Hungary	Accounting, auditing, bookkeeping, and tax consulting services	8.20081247
Israel	Computer software	33.4913772
Italy	Other business services n.i.e.	3.68824323

Japan	Total Goods	1.41453064
Korea	Other business services n.i.e.	2.54591561
Latvia	Architectural services	26.7465132
Lithuania	Health services	10.1869723
Luxembourg	Direct insurance	7.68078866
Mexico	Reinsurance	4.58478171
New Zealand	Other business services n.i.e.	2.17140191
Poland	Pension services	10.5131483
Portugal	Heritage and recreational services	10.7141437
Russia	Advertising, market research, and public opinion polling services	2.81827915
Slovenia	Health services	34.1098741
Sweden	Heritage and recreational services	8.49532669
Türkiye	Auxiliary insurance services	3.50984032
United Kingdom	Insurance and pension services	4.09445845
United States	Licenses to reproduce and/or distribute computer software	4.17454063

[Table 5]

Country	Goods and Services 2012	Highest RCA
Australia	Pension services	39.3476999
Belgium	Business and management consulting and public relations services	4.15032103
Canada	Scientific and other technical services	6.538414614
Chile	Total Goods	1.88683966
Colombia	Telecommunications services	2.02505754
Costa Rica	Health services	87.4102769

Czech Republic	Standardized guarantee services	17.0541209
Denmark	News agency services	4.75615638
Estonia	Architectural Services	6.39584027
France	Standardized guarantee services	10.8380987
Germany	Reinsurance	3.562860128
Greece	Direct Insurance	3.07123851
Hungary	Accounting, auditing, bookkeeping, and tax consulting services	9.048953734
Israel	Computer software	30.0795173
Italy	Other business services n.i.e.	3.7687866
Japan	Total Goods	1.5310846
Korea	Other business services n.i.e.	2.67725959
Latvia	Architectural services	14.7064567
Lithuania	Health services	8.48292055
Luxembourg	Direct insurance	7.5940421
Mexico	Reinsurance	3.674756
New Zealand	Other business services n.i.e.	2.19853257
Poland	Health Services	9.16649331
Portugal	Health Services	12.2748808
Russia	Advertising, market research, and public opinion polling services	2.9273508
Slovenia	Health services	31.5237015
Sweden	Heritage and recreational services	5.34824705
Türkiye	Direct Insurance	3.42959476
United Kingdom	Insurance and pension services	5.13036022
United States	Licenses to reproduce and/or distribute computer software	4.17656039

[Table 6]

Country	Goods and Services 2013	Highest RCA
Australia	Pension services	41.0911288
Belgium	Business and management consulting and public relations services	4.661664212
Canada	Scientific and other technical services	5.23991815
Chile	Total Goods	2.00821738
Colombia	Total Goods	1.76554942
Costa Rica	Health services	107.581673
Czech Republic	Pension Services	8.41197574
Denmark	News agency services	4.60387324
Estonia	Heritage and recreational services	5.21968213
France	Standardized guarantee services	10.62547555
Germany	Computer software	4.308247107
Greece	Direct Insurance	2.73101488
Hungary	Accounting, auditing, bookkeeping, and tax consulting services	7.846710864
Israel	Computer software	8.46712162
Italy	Other business services n.i.e.	3.44609714
Japan	Total Goods	1.54578136
Korea	Other business services n.i.e.	3.05371367
Latvia	Architectural services	13.1441956
Lithuania	Health services	5.9189875
Luxembourg	Heritage and recreational services	13.5880488
Mexico	Reinsurance	5.36122341
New Zealand	Other business services n.i.e.	2.34934593
Poland	Accounting, auditing, bookkeeping, and tax	8.26204368

	consulting services	
Portugal	Health Services	7.64704786
Russia	Advertising, market research, and public opinion polling services	3.14112051
Slovenia	Health services	20.0807592
Sweden	Heritage and recreational services	7.94932656
Türkiye	Direct Insurance	3.26904123
United Kingdom	Insurance and pension services	4.93128042
United States	Licenses to reproduce and/or distribute computer software	4.27616159

[Table 7]

Country	Goods and Services 2014	Highest RCA
Australia	Pension services	35.947514
Belgium	Business and management consulting and public relations services	5.042073469
Canada	Scientific and other technical services	4.82777813
Chile	Total Goods	2.29133205
Colombia	Total Goods	1.86685571
Costa Rica	Health services	94.165995
Czech Republic	Pension Services	6.98129494
Denmark	Health services	3.70512488
Estonia	Heritage and recreational services	8.513734208
France	Standardized guarantee services	10.56274572
Germany	Computer software	3.785857146
Greece	Direct Insurance	3.04104329
Hungary	Accounting, auditing, bookkeeping, and tax	8.70757889

	consulting services	
Israel	Computer software	9.79803918
Italy	Other business services n.i.e.	2.993836217
Japan	Total Goods	1.49068457
Korea	Other business services n.i.e.	3.35762811
Latvia	Architectural services	14.685233
Lithuania	Architectural services	5.81126351
Luxembourg	Heritage and recreational services	11.86856697
Mexico	Reinsurance	7.32020174
New Zealand	Other business services n.i.e.	2.246969425
Poland	Accounting, auditing, bookkeeping, and tax consulting services	8.94341211
Portugal	Heritage and recreational services	5.88244318
Russia	Advertising, market research, and public opinion polling services	2.97092977
Slovenia	Health services	18.52266105
Sweden	Standardized guarantee services	10.7833958
Türkiye	Direct Insurance	4.18867973
United Kingdom	Insurance and pension services	5.59849192
United States	Licenses to reproduce and/or distribute computer software	4.47130938

[Table 8]

Country	Goods and Services 2015	Highest RCA
Australia	Pension services	38.7972602
Belgium	Business and management consulting and public relations services	5.494685325

Canada	Scientific and other technical services	4.534481388
Chile	Total Goods	2.41302002
Colombia	Telecommunication Services	1.78694944
Costa Rica	Health services	85.6766113
Czech Republic	Accounting, auditing, bookkeeping, and tax consulting services	6.58448119
Denmark	Architectural services	3.43205484
Estonia	Heritage and recreational services	9.98568189
France	Standardized guarantee services	16.7485133
Germany	Provision of customised and non customised R&D services	3.869357128
Greece	News Agency Services	2.188814932
Hungary	Accounting, auditing, bookkeeping, and tax consulting services	8.239172539
Israel	Computer software	13.9157169
Italy	Telecommunication Services	2.82405448
Japan	Total Goods	1.48236878
Korea	Other business services n.i.e.	3.29493123
Latvia	Architectural services	10.1330554
Lithuania	Architectural services	7.4138909
Luxembourg	Heritage and recreational services	9.25191655
Mexico	Reinsurance	6.2858408
New Zealand	Audiovisual Services	4.84731127
Poland	Accounting, auditing, bookkeeping, and tax consulting services	9.66052818
Portugal	Heritage and recreational services	5.43936199
Russia	Advertising, market research, and public opinion polling services	2.80414823
Slovenia	Health services	17.4816534

Sweden	Computer Services	5.29645575
Türkiye	Direct Insurance	4.54554017
United Kingdom	Insurance and pension services	4.57560333
United States	Audiovisual Services	4.1481341

[Table 9]

Country	Goods and Services 2016	Highest RCA
Australia	Pension services	43.1041657
Belgium	Business and management consulting and public relations services	4.965542687
Canada	Scientific and other technical services	3.88705073
Chile	Total Goods	2.5195883
Colombia	Total Goods	1.60543565
Costa Rica	Health services	145.912324
Czech Republic	Pension Services	6.40231619
Denmark	Health services	5.47804444
Estonia	Heritage and recreational services	7.82673266
France	Standardized guarantee services	11.98687634
Germany	Provision of customised and non customised R&D services	3.690012453
Greece	News Agency Services	2.45454046
Hungary	Accounting, auditing, bookkeeping, and tax consulting services	8.43101414
Israel	Computer software	16.4199744
Italy	Telecommunication Services	2.53247928
Japan	Total Goods	1.50180276
Korea	Other business services n.i.e.	2.793245043

Latvia	Architectural services	10.51129843
Lithuania	Architectural services	5.69677801
Luxembourg	Financial services	7.26415056
Mexico	Reinsurance	4.20526104
New Zealand	Audiovisual Services	5.99506292
Poland	Accounting, auditing, bookkeeping, and tax consulting services	10.5282383
Portugal	Architectural services	7.32079682
Russia	Advertising, market research, and public opinion polling services	2.39738713
Slovenia	Health services	34.1723436
Sweden	Standardized guarantee services	6.83413735
Türkiye	Auxiliary insurance services	2.5640137
United Kingdom	Direct Insurance	7.35256782
United States	Audiovisual Services	4.18670745

[Table 10]

Country	Goods and Services 2017	Highest RCA
Australia	Pension services	20.9292981
Belgium	Pension services	12.41251381
Canada	Scientific and other technical services	5.22437346
Chile	Total Goods	2.48957292
Colombia	Total Goods	1.61302885
Costa Rica	Health services	148.879984
Czech Republic	Pension Services	5.10139051
Denmark	Health services	5.07889805

Estonia	Heritage and recreational services	8.38551552
France	Standardized guarantee services	11.25909
Germany	Provision of customised and non customised R&D services	3.524333371
Greece	News Agency Services	8.56629773
Hungary	Accounting, auditing, bookkeeping, and tax consulting services	8.35660927
Israel	Computer software	14.7503264
Italy	Telecommunication Services	2.69250015
Japan	Total Goods	1.47057311
Korea	Other business services n.i.e.	2.87573168
Latvia	Architectural services	7.10396785
Lithuania	Architectural services	5.8468109
Luxembourg	Financial services	7.34969378
Mexico	Reinsurance	5.84717272
New Zealand	Audiovisual Services	4.57207108
Poland	Accounting, auditing, bookkeeping, and tax consulting services	9.94071695
Portugal	Architectural services	6.21066529
Russia	Advertising, market research, and public opinion polling services	2.20045061
Slovenia	Health services	29.8018783
Sweden	Standardized guarantee services	10.47108676
Türkiye	News Agency Services	2.93212166
United Kingdom	Direct Insurance	7.23810539
United States	Audiovisual Services	3.83896886

[Table 11]

Country	Goods and Services 2018	Highest RCA
Australia	Pension services	12.852018
Belgium	Pension services	18.143326
Canada	Scientific and other technical services	5.799292443
Chile	Total Goods	2.55881801
Colombia	Total Goods	1.58688577
Costa Rica	Health services	132.21714
Czech Republic	Pension Services	5.00166004
Denmark	Health services	3.68530607
Estonia	Heritage and recreational services	13.27478718
France	Standardized guarantee services	11.71576907
Germany	Reinsurance	2.47012214
Greece	News Agency Services	14.3472549
Hungary	Accounting, auditing, bookkeeping, and tax consulting services	7.57759323
Israel	Computer software	15.303368
Italy	Provision of customised and non customised R&D services	2.644603771
Japan	Total Goods	1.49647087
Korea	Other business services n.i.e.	2.534211664
Latvia	Architectural services	14.656124
Lithuania	Health services	7.16034214
Luxembourg	Financial services	7.28483095
Mexico	Reinsurance	4.88179288
New Zealand	Audiovisual Services	6.75733322
Poland	Accounting, auditing, bookkeeping, and tax consulting services	10.5495975

Portugal	Heritage and recreational services	5.59194852
Russia	Advertising, market research, and public opinion polling services	2.07014532
Slovenia	Health services	30.0891776
Sweden	Standardized guarantee services	8.95986829
Türkiye	Auxiliary insurance services	2.04454052
United Kingdom	Direct Insurance	7.04153204
United States	Audiovisual Services	4.25868277

[Table 12]

Country	Goods and Services 2019	Highest RCA
Australia	Pension services	14.6225074
Belgium	Pension services	12.5937296
Canada	Scientific and other technical services	6.48644978
Chile	Total Goods	2.67786094
Colombia	Total Goods	1.62025318
Costa Rica	Health services	118.511058
Czech Republic	Pension Services	9.5002768
Denmark	Architectural services	4.10840064
Estonia	Architectural services	7.66197924
France	Standardized guarantee services	12.2307214
Germany	Reinsurance	2.48115195
Greece	News Agency Services	17.4931058
Hungary	Accounting, auditing, bookkeeping, and tax consulting services	7.61348344
Israel	Computer software	14.06035572

Italy	Telecommunication services	2.47314229
Japan	Total Goods	1.44126065
Korea	Information services	3.035335496
Latvia	Architectural services	19.4559549
Lithuania	Health services	6.22522284
Luxembourg	Heritage and recreational services	8.420408727
Mexico	Reinsurance	4.53549437
New Zealand	Audiovisual Services	6.05683249
Poland	Accounting, auditing, bookkeeping, and tax consulting services	11.8936726
Portugal	Heritage and recreational services	5.598108911
Russia	Total Goods	2.10406023
Slovenia	Health services	29.7785335
Sweden	Standardized guarantee services	7.236817887
Türkiye	** Missing **	
United Kingdom	Direct Insurance	6.62817619
United States	Audiovisual Services	4.12470176

[Table 13]

Country	Goods and Services 2020	Highest RCA
Australia	Pension services	10.9193489
Belgium	Pension services	16.1798528
Canada	Licenses to reproduce and/or distribute computer software	2.629835039
Chile	Total Goods	2.92132506
Colombia	Total Goods	1.8712526

Costa Rica	Health services	75.4508699
Czech Republic	Pension Services	7.20921527
Denmark	Architectural services	4.80819945
Estonia	Health services	21.3083871
France	Standardized guarantee services	10.7268385
Germany	Engineering services	2.71330955
Greece	News Agency Services	5.65119852
Hungary	Health services	6.64319972
Israel	**Missing**	
Italy	Provision of customised and non customised R&D services	2.834860679
Japan	Total Goods	1.54152349
Korea	Licenses to reproduce and/or distribute audiovisual and related products	3.034396762
Latvia	Architectural services	20.1010694
Lithuania	Computer Software	6.43382201
Luxembourg	Heritage and recreational services	10.37008532
Mexico	Reinsurance	4.94000992
New Zealand	Audiovisual Services	9.75620152
Poland	Accounting, auditing, bookkeeping, and tax consulting services	11.5790302
Portugal	Health services	6.60393734
Russia	**Missing**	
Slovenia	Health services	23.9239793
Sweden	Standardized guarantee services	10.8616037
Türkiye	Insurance and Pension services	2.464898796
United Kingdom	Direct Insurance	6.23944714

United States	Audiovisual Services	4.37553042

1. General Trend of RCA Index Calculation

The calculation results of the RCA index in digital service sectors from 30 OECD countries from 2010 until 2018 and 28 countries from 2019 to 2020 show that there are consistent, highest RCA indexes of the same sectors for seven countries. Chile and Japan, unlike other remaining OECD countries, showed consistently the highest RCA index in goods commodities over services throughout 2010 up to 2020. Australia has consistently the highest RCA in pension services, but the RCA index declined drastically by 2020. Costa Rica and Slovenia also have consistently highest RCA in health services for 11 years. Latvia has consistently highest RCA index in architectural services for 11 years as well. And, Mexico appears to have the highest RCA index in reinsurance services during the same time span. Although countries with consistent service data are categorized as potentially ICT-enabled services, there are limitations to finding out which year and what kind of services are delivered and received digitally.

Other important key takeaways from the data results are countries with distinctive shifts to digital service sectors from 2010 to 2020. Despite Japan being the world's third largest economy reaching 4.3 trillion dollars of nominal GDP according to the World Economic Outlook database in 2020, Japan continues to lag in service sectors relative to other countries. Japan has consistently highest RCA index in good commodities from 2010 to 2020. On the other hand, Israel is

consistently competitive in the computer software category (categorized as ICT services) from 2010 to 2019. And France is consistently competitive in standardized guarantee services (potentially ICT-enabled services) starting from 2011 to 2020. U.K shows consistent data in insurance and pension services (potentially ICT-enabled services) from 2010 to 2020. U.S. is competent in license to reproduce and/or distribute computer software (ICT services) from 2010 until 2014, and competent in potential audiovisual services (ICT-enabled services) from 2015 to 2020. Lastly, Russia has the highest RCA index in advertising, market research, and public opinion services (potentially ICT-enabled services) from 2010 to 2018. But from 2019, the nation reached the highest RCA index in goods commodities relative to services. This showcases that Russia has lost its competitive advantage in services compared to goods.

Looking at the data results, digital trade competitiveness among OECD countries has different patterns in the RCA index over 11 years. Some countries are consistently competitive in one specific sector for 11 years. Israel especially has been very competitive in the computer software category which pertains closely to the digital service sector, as it is classified as ICT services according to UNCTAD. Another notable finding is that the U.S. had competitiveness in licenses to reproduce or distribute computer software from 2010 to 2015 but has shifted to audiovisual services as the most competitive service sector from 2015 until 2020. The U.S. has been consistently competitive within the digital service sector, but the category has been differentiated. On the contrary, a developed nation like Japan is

not competent in the digital services sector and instead competent in goods industries which seems ironic as Japan is the third largest economy in the world. Lastly, the most distinctive changes in the RCA index pattern in digital services have been apparent in three different countries over 11 years which are Korea, Canada, and Lithuania. Canada has the strongest competitiveness in scientific and other technical services (potentially ICT-enabled services) from 2010 to 2019, but in 2020, the country has the highest RCA index in licenses to reproduce or distribute computer software (ICT services). Lithuania also has the highest RCA index in health services (potentially ICT-enabled services) from 2010 up to 2013, and from 2017 until 2019. From 2014 to 2016, the country shows the highest RCA index in architectural services (potentially ICT-enabled services). However, the nation displays a drastic change, having the highest RCA in the computer software sector (ICT services) in 2020. Similarly, Korea also experiences a dramatic shift. The country has the highest RCA index in other business services n.i.e category (potentially ICT-enabled services) from 2010 up to 2018 and shows strength in information services (ICT services) in 2019. In 2020, the nation has competitiveness in licenses to reproduce and/or distribute audiovisual and related products (potentially ICT-enabled services). The three countries go through the most distinctive transformation in recent years. And to find out the causes behind the sudden shift to digital trade competitiveness, the paper will further analyze the background, causes, and effects behind having the highest revealed comparative advantage in specific digital service sectors from several case studies.

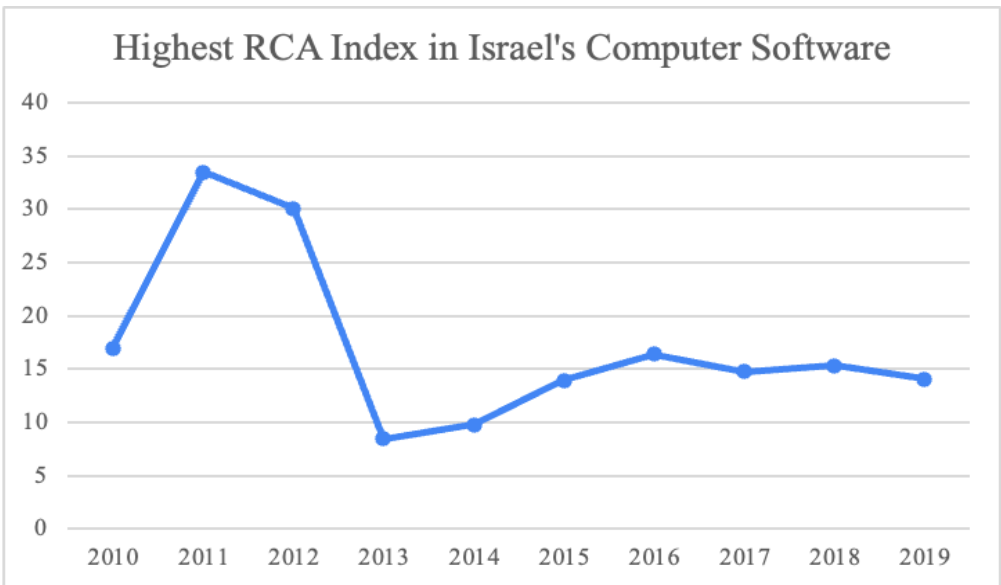
2. Case Study of Israel

In Israel's example, the nation has constantly been most competitive in the category of computer software services from 2010 through 2020. According to EBPOS 2010 and the central product classification, computer software includes sales of customized software and related licenses to use, development, production, supply, and documentation of customized software, computer operating systems, non-customized (mass-produced) software downloaded or otherwise electronically delivered, whether with a periodic license fee or a single payment, licenses to use non-customized (mass-produced) software provided on a storage medium, and licenses to use non-customized (mass-produced) software provided on an (MSITS 2010, para. 3.225). According to Israel's Ministry of Economy and Industry, Israel exports digital services worth an estimated 140 US billion dollars in 2021. Israel is an important player in the digital world. In terms of export volume growth, service exports (51 percent) have surpassed goods exports (49 percent) for the first time. Continuous development of software and R&D fields provides for 24 percent of Israel's total exports, or nearly a quarter. The government has positioned the ICT industry as the core of the knowledge economy. Israel's ICT sector expansion began in the early 1970s with a concentration on information technology and enterprises specializing in software, communications, and the internet. The government invested substantially in building talented human resources as strategic assets and actively endorsed the private sector's innovation efforts. With an emphasis on government support in education, Israel contributed to the success of

its high-technology industries. Beginning in the 1980s and into the early 1990s, Israel took advantage of educated immigrants who migrated from the former Soviet Union by investing human resources in higher education. As a result, Israel was able to become a "Start-Up Nation" in the field of defense technology distinguished by the culture of innovation in the ICT sector. Some well-known Israeli ICT businesses are Amdocs, Check Point, Converse, Mercury Interactive, Nice Systems, VocalTec, and Wix which all produced a technological breakthrough in software solutions. Israel has attracted multinational technology titans such as HP, IBM, Microsoft, Oracle, and Sun, which have established operations and production facilities in Israel. There were problems for ICT companies to compete internationally while having competitiveness in the domestic ICT sector due to the geographical distance from their clients in foreign nations like U.S. and Europe. Hence, research and development (R&D) remained at the domestic level in order to take advantage of highly educated human capital. As the ICT industry rapidly catches up, foreign corporations seeking innovative technology have acquired Israeli startup companies and established local R&D centers. The majority of the business ecosystem is software companies. One specific field of computer software development is cybersecurity. Since 2013, it is projected that over 200 Israeli companies have specialized in cybersecurity technologies, exporting approximately $3 billion in anti-hacking products. One-fourth of the world's venture capital funds mostly support Israeli cybersecurity startups. Core ICT cluster sectors in Israel include software development, data

communications, electro-optics, hardware design, and internet technologies, including cybersecurity software. Other related high-technology industries are medical technology, biotechnology, agricultural technology, materials technology, and military technology included in the final end products.

[Figure 2]



3. Case Study of U.S.

According to the data, the U.S. has the highest competitiveness in the software sector from 2010 to 2014 and in the audiovisual sector from 2015 to 2020. The United States software market is dominated by multinational corporations such as Microsoft, IBM, Alphabet, and Oracle. Multinational software businesses concentrate on developing databases and middleware. One-third of the global IT

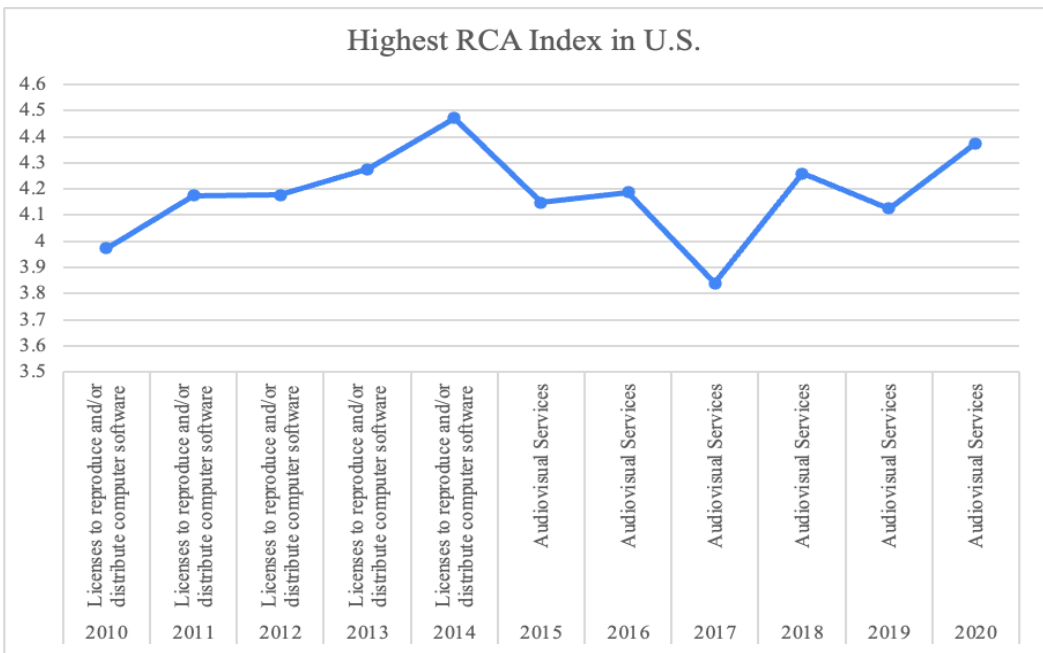
market is located in the United States, making it the world's largest IT market with a value of 5 trillion US dollars. According to Select USA poll[4], the IT industry accounts for 1.9 trillion US dollars of U.S value-added GDP which is more than 10 percent of the national economy. Also, according to CompTIA [5], there are approximately 557,000 software enterprises and IT service firms in the states as of 2019. The tech industry employs software publishers, suppliers of computer program services, computer system designs, and computer system management firms. The software sector in the U.S. is known for strong intellectual property rights law and enforcement. Thus, U.S. corporations lead one of the world's highly valued software markets and are most competitive across the world. According to the RCA index data, the U.S. has been more competent in licenses to reproduce and/or distribute computer software from 2010 until 2015. From 2015 to 2020, however, the most competitive industry has switched to the audiovisual services sector. As previously indicated, the IT services industry has one of the largest market shares and is the leading sector in the United States. In recent years, the consumption of audiovisual services has increased significantly. Although traditional television is the dominant consumption of audiovisual content for older audiences, younger viewers are consuming more audiovisual content through internet streaming platforms such as Netflix or YouTube, referred to as video-on-

[4] A government program established to facilitate business environment in the U.S

[5] Computing Technology Industry Association is an American non-profit trade association, issuing professional certifications for the information technology industry.

demand (VOD). In the audiovisual service industry, on-demand streaming of film and television is replacing traditional sources of entertainment, such as movie theaters, television, and air broadcasts that are aired on a set schedule. A declining trend in traditional media could be attributed to the impacts of the COVID-19 pandemic and the movement toward internet streaming services. Currently, 44 U.S. streaming platforms, including Netflix, Amazon Prime, Disney plus, HBO Max, NBC universal Peacock, Apple TV+, Viacom CBS, and Hulu, are the leading suppliers of streaming services (Sherman, 2021).

[Figure 3]

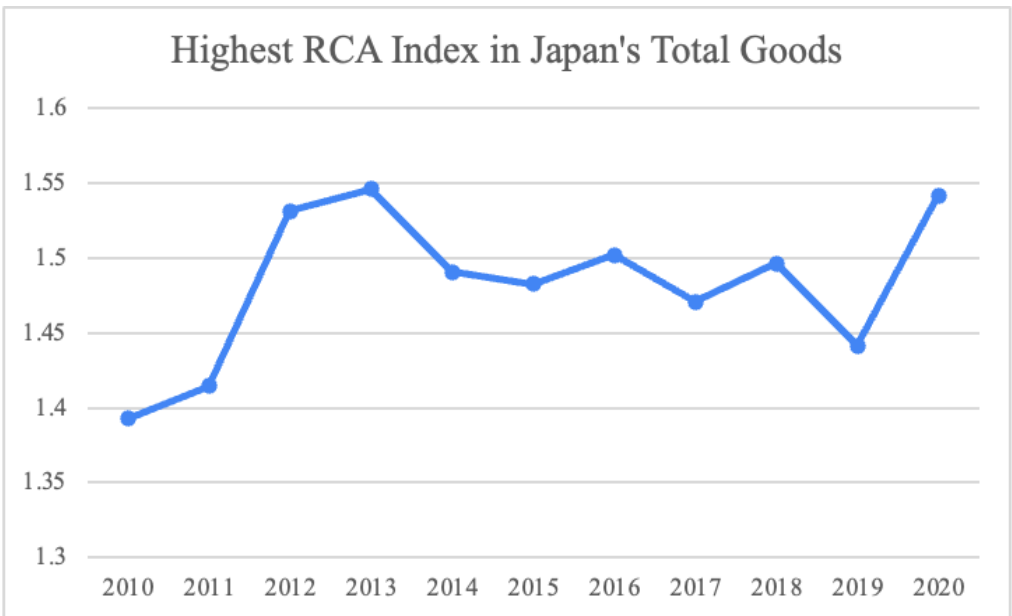


4. Case Study of Japan

Despite Japan’s status as the third largest economy in the world and a long history of being one of the frontiers in technological development, the country is consistently competitive in the goods sector rather than the service sector from 2010 to 2020. Japan ranks 27th in the latest IMD World Digital Competitiveness Ranking (a survey of how countries employ digital technologies). The results show that Japan is falling behind other industrialized nations, declining from 23rd to 27th place in 2019. In contrast, Japan's economic near counterparts such as South Korea have significantly improved digital competitiveness by rising from 14th to 8th rank in 2018, while China has risen from 30th to 16th place. One of the main reasons behind Japan’s weak competitiveness in digital service is due to aging population trend. According to IMF data, Japan's labor force is expected to decrease by 24 million people between 2018 and 2050. To address this challenge, Japan will need to utilize innovative technologies and digitalization more effectively to sustain present levels of productivity and output. Japan's technology innovation initiatives are also hindered by its underdeveloped startup business ecosystem. Currently, Japan has only three "unicorn" businesses, which are privately owned companies with a value of over $1 billion USD. However, the United States and China have 242 and 119 startups, respectively, including well-established businesses such as Byte Dance and SpaceX. South Korea has a greater number of unicorn startups than Japan. Thirdly, Japan's research and development is characterized as an 'in-house’ culture. Japanese businesses are less capable of technical innovation when compared to foreign corporations like Google or

Amazon that have worked with emerging startup enterprises. According to the 2018 Bank of Japan white paper, Japan's R&D attitudes tend to prioritize incremental improvements over the creation of innovative products. As a result of the lack of innovative attitudes in R&D in the ICT industry, Japan lacks a competitive advantage in digital services and has the highest RCA Index in the goods sector from 2010 to 2020.

[Figure 4]



5. Countries with Notable Changes in Digital Services Sectors

Canada, Lithuania, and South Korea have transformed drastically from 2010 until 2020, having the highest revealed comparative advantage in digitally

delivered or digitally ordered service sectors. In the case of Lithuania, from 2010 to 2013, and from 2018 to 2019, the country has the highest RCA index in health services, from 2014 to 2017 in architectural services, and the highest RCA index in computer software in 2020. Canada also has undertaken drastic changes. Canada has been consistently competitive in scientific and technical services from 2010 until 2019 but has the highest RCA index in licenses to reproduce and/or distribute computer software in 2020 within one year. In the case of South Korea, the nation has consistently highest RCA index in other business services n.i.e and has the highest RCA index in information services in 2019, and the highest RCA index in licenses to reproduce and/or distribute audiovisual and related products in 2020. The following three nations have undergone notable changes in the RCA index pattern recently contrary to other countries from data results.

Out of the three nations, this paper aims to particularly focus on South Korea's competitiveness in the digital service sector by applying a qualitative analysis framework: Michael Porter's model to discover factors behind South Korea's growth in digital services. As of 2022, according to IMD World Digital Competitiveness ranking[6], South Korea is ranked 8th out of 63 economies, which is higher than Canada at 10th, and behind, Lithuania ranks at 25th out of 63 economies. Despite having competitiveness in the digital sector in its own nation,

[6] IMD World Digital Competitiveness Ranking, produced by the IMD World Competitiveness Center, measures the capacity and readiness of 63 economies based on a mixture of hard data and survey replies from business and government executives, to adopt and explore digital technologies as a key driver for economic transformation in business, government, and wider society. A total of 63 global economies were studied in terms of their ability to adopt and explore new digital technologies.

Lithuania's digital competitiveness ranking is much lower than other countries. Although Canada is highly ranked in digital competitiveness ranking, South Korea has surpassed Canada in the year 2022. South Korea has experienced an 11-position improvement from 19th position to 8th position throughout the years 2017 to 2022 whereas Canada has stepped down from 9th in 2017 to 10th by 2022. The Korean digital service sector was driven by high R&D investments, increased levels of business agility, the adoption of robotics in companies, and the diffusion of digital technology. Also, South Korea is known for being one of the most advanced technology frontiers in the world with progressive history in ICT services. Therefore, this paper will analyze South Korea's unprecedented growth in digital trade competitiveness out of the three countries that have gone through the most evident transformation into the digital service sector.

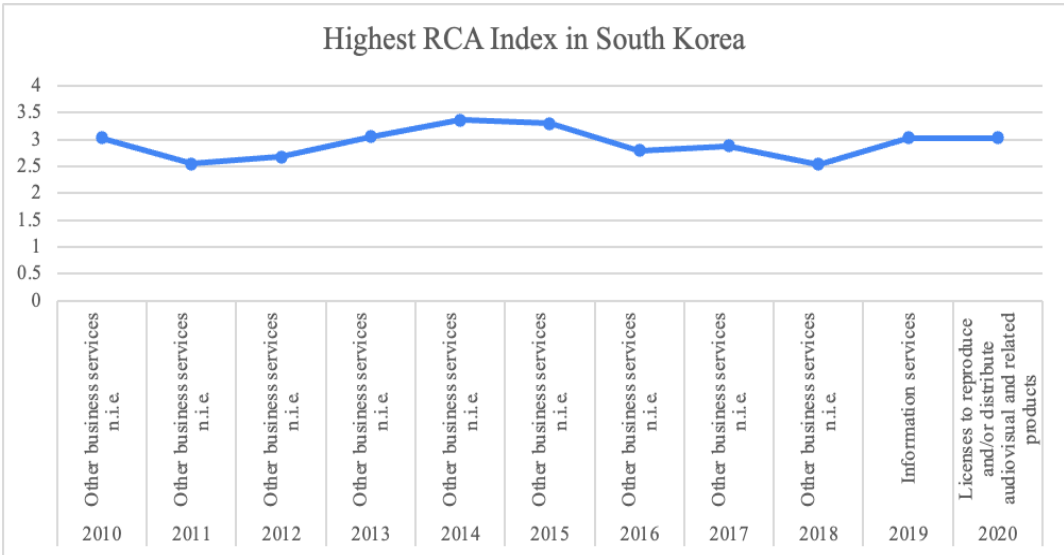
CHAPTER IV. Qualitative Analysis Using Diamond Model

This section of the paper aims to analyze the qualitative factors behind the reasons why South Korea has the highest RCA index in the audiovisual sector in 2020 and information services in 2019 according to empirical data results. By using Porter's diamond model, the purpose is to discover 6 factors: factor conditions, demand conditions, related and supporting industries and firm strategy, structure and rivalry, government, and chance behind South Korea's growth in most highly competitive industries which are audiovisual and information services sectors.

South Korea has the highest RCA index in licenses to reproduce and/or distribute the audiovisual service sector in 2020. In 2019, South Korea has the highest RCA index in information services. According to EBPOS 2010 and the central product classification, information services are defined as database services such as database conception, data storage, and the dissemination of data and databases extracted from online. Also, it includes subscriptions to newspapers by mail or other means and other online content provision services (MSITS 2010, para. 3.232). Licenses to reproduce and/or distribute audiovisual products are defined as covers fees for the authorized reproduction and/or distribution, and licensing agreements, of audio-visual originals or prototypes such as cinematographic works and soundtracks. Also, rights of reproduction and

distribution of live recordings, performances, and radio, television, cable, and satellite broadcast are included (MSITS 2010, para. 3.220).

[Figure 5]



1. Analysis of South Korea’s Information Services Sector

1) Factor Conditions

In South Korea, information services primarily consist of cybersecurity, artificial intelligence, cloud computing, and related service products. South Korea's extensive 5G network deployment, strong internet connection, high mobile device penetration, and advanced intellectual property contribute to the country's established information service sector. Because of these attributes, the nation has positioned itself as a dominant leader in information service technologies. Cybersecurity technology has been one of the most advanced but also vulnerable

areas to be further progressed. South Korea has also been developing AI technology to establish itself as a global leader in the Artificial Intelligence market, in addition to improving its cybersecurity solutions. Government officials view AI technology as a crucial factor condition for the country's powerhouse in the ICT service sector. Other services that Korean private companies and government institutions are adopting are cloud computing services. Compared to other IT services, the cloud computing industry in South Korea is anticipated to rise at a quick rate. According to the International Trade Administration, the South Korean computing market is projected to reach $2.8 billion in 2021, a 20 percent increase from the previous year. In addition, the market is anticipated to expand to $ 3.1 billion by 2022. According to the Ministry of Science and ICT, the South Korean government is promoting 89,000 additional personnel to specialize in software technology during the next five years in order to solve a shortage of digital talent. The government aims to support young generations to address the challenges of rapid digital transformation. By 2025, the ministry predicts a total of 413,000 digital talents to be supplied. Marked by its highly skilled workforce, South Korea is recognized for its high-speed internet access and advanced ICT infrastructure, making it an ideal international market for many foreign companies seeking to invest in the information service sector.

2) Demand Conditions

South Korea's demand for information services has increased due to the following reasons. According to the 2020 VMware-Deloitte Cyber Smart Index[7], South Korea is the second most exposed country in the Asia-Pacific (APAC) region to potential cyber-attacks. The 2017 WannaCry ransomware attack[8] alerted the IT industry to its susceptibility to cyberattacks and their ease of penetration. South Korea has lately identified advanced malware, supply chain attacks, crypto-jacking, and zero-day attacks, as the frequency and sophistication of cyberattacks continue to rise. In order for South Korea to preserve its competitiveness in the information service sector, a greater awareness of cyber security concerns has led to an increase in the market demand for cybersecurity products and services. According to the Ministry of Science and ICT, the market for cybersecurity will increase by 12 percent to nearly $3.3 billion in 2022. Cyber security is an issue of national security for South Korea. Therefore, South Korea seeks solutions for cyberattack vulnerabilities. Government officials and private companies in South Korea are reevaluating their cyber security strategy. Another important demand condition comes from cloud services. In response to the worldwide IT trends of digitalization and remote work, cloud services in Korea have exploded during the past decade. Cloud services are frequently used by Korean customers for data and

[7] The Deloitte Cyber Smart Index 2020 examines the level of cyber risk exposure faced by countries i n the region, and the degree of cyber-attack preparedness

[8] The WannaCry ransomware attack was a worldwide cyberattack in May 2017 by the WannaCry ransomware crypto worm, which targeted computers using the Microsoft Windows by encrypting data and demanding ransom payments in the Bitcoin cryptocurrency.

information management since cloud technology can be utilized for both business and personal needs. E-commerce enterprises utilize public cloud technology to anticipate the fastest delivery time by predicting demand surges, automating logistics, and resolving online traffic concerns. Using the public cloud service enables many customers to access financial services with ease. New changes to South Korea's Credit Information Act permit non-critical and non-identifying data to be stored in the public cloud beginning in 2019, making it more convenient for clients and encouraging more businesses in the financial sector to adopt public cloud services. As a result, the Financial Services Commission (FSC) is encouraging cloud-based financial services. For AI technology, customized financial services are introduced which improves consumers' convenience in making online payments. Moreover, AI technology can improve financial intermediary services, risk management functions based on analysis and assessment, and access to financial services for vulnerable users with limited credit histories. Due to the potential impacts of what AI technology and cloud services could bring to consumers, the demand for information services in AI and cloud technology can increase even more in the future.

3) Related Supporting Industries

There are various critical governmental and private subsectors within the market for information services. Korea expects that ransomware, data security, operational technology, and AI technology solutions will be major sub-sectors for

the cybersecurity industry in 2022. Global investors have partnered to invest in Korea. Companies such as AWS and Microsoft, for instance, have created three data centers in Korea. In 2020, Google opened its first data center in Korea. For cloud computing, big IT firms like Naver and NHN and mobile carrier firms like KT and LG U+ have entered the global IT industry. The South Korean government also recognized the need to reduce the engineering skills gap for experienced AI talent, so it established ten local colleges to train AI engineers, and four public universities as AI research centers by 2022. Following this decision, national R&D capabilities will be realigned into more specialized research domains, such as core AI, AI ethics, AI convergence, and other related supporting industries. With the development of AI technology, companies, research institutions, and universities may build a more robust AI ecosystem. As a result, government agencies have established an AI-focused startup incubation program to promote the development of new high-tech businesses. There are currently more than 100 new AI startups in 2021, and the country has a total of 400 A.I startups. Various industries seek cutting-edge technologies to improve their IT capabilities and integrate them into their products and services. Therefore, numerous businesses are seeking prospects for technological or business partnerships with foreign firms. For example, newly related sectors have spillover effects on the development of On-Device AI to reduce the power consumption of electronic devices and accelerate AI computation. Currently, Korean companies are investing in the production of rapid and deep learning solutions that enable devices to execute AI and cloud computing

from any external server, not just local servers. Emerging technologies also include the AI chip. AI chip technology enables devices to execute AI computations on any electronic product, hence eliminating the requirement to send and receive through the internet network. The monetization of AI is another emerging technology from the information services sector. Using AI technology as part of their core competencies, Korean companies are increasingly monetizing the technology depending on how it can be incorporated into new goods and services. As the impact of information service expands into other industries, such as healthcare, banking, and defense technology, corporations are seeking explainable AI technology, which consists of AI models with enhanced interpretability and reliability. The collaboration of government institutions, universities, and foreign companies for high technology and business partnerships is creating spillover effects of AI and cloud computing technologies as related supporting industries of the information services industry in Korea.

4) Firm's Strategy, Structure, and Rivalry

With fierce domestic and international competition, Korean companies are contributing to the country's AI research and development efforts due to the rise of new AI startups. Major ICT companies are developing information services such as artificial intelligence and cloud computing. Among the corporations that have made significant investments in artificial intelligence are Samsung and LG electronics, Kakao, Naver, SK, and KT. In the case of Samsung Electronics, seven

AI centers are established in five countries to focus on machine learning algorithms, voice and vision AI, and AI chip projects. One of the largest search engines in Korea, Naver, launched an AI research center in Europe in 2017 and created its own core AI engines for image and speech recognition, machine learning platforms, and data analysis. In addition, Naver is considered the most active investor in AI and smart technology businesses, having invested in over 35 AI-related startups. Similarly, KT, which is the second-largest mobile broadband provider in Korea, invested $300 million in core AI research technologies until 2023. KT also announced a plan to increase the number of AI engineers and partnerships with companies like LG Electronics, Hyundai, and other IT industries. Rivalries act as a catalyst by affecting how IT service providers react in strategic marketing. Cloud service companies such as Amazon Web Services dominate the serverless computing market in South Korea. Consequently, many domestic enterprises are attempting to catch up in order to fight against the rising presence of foreign rivalries. According to the market research firm International Data Corporation, foreign companies account for 51.4% of cloud service sectors in 2019, and their revenue has increased to 572 million dollars compared to the prior year. The foreign market for cloud services has now exceeded the domestic market. With its aggressive marketing strategies and R&D facilities to promote the cloud service sector in Korea, many analysts anticipate that foreign enterprises' share of the Korean market will grow even further. In response to intense international competition, the Korean company, Naver, intends to build a second data center in

Chuncheon in 2022 along with its International Data Center (IDC) in the administrative capital in Sejong. Moreover, Kakao, a prominent supplier of online messaging apps, will launch IDC in 2023 in partnership with a Korean university. In collaboration with the NHN firm, Samsung is also developing a serverless cloud computing solution. KT Corporation, a telecommunications business, is also enhancing cloud-based digital services. The emerging foreign cloud service providers are pressuring Korean domestic companies to be on edge and local providers to advance their position in the cloud service market.

5) Government

In 2019, the Korean government announced its first national cybersecurity strategy. The strategy includes strengthening collaborations with other nations and corporations in order to invest in the domestic cybersecurity sector. To accelerate the growth potential of the cybersecurity business, the Korean government has implemented a "strategic plan to foster the data protection industry" as of 2022. In 2019, the government also announced the first national AI strategy to expand AI infrastructures and the adoption of AI technology across all industries. In 2020, the government released the “digital new deal” which is the national strategy for digital innovation to achieve development in AI technology at both industrial and educational levels. Moreover, the government has set a fiscal budget plan for 2022 that will allocate almost $3 billion to AI technology projects. South Korea has been at the forefront of cloud computing strategy. In 2015, the government unveiled its

first plan to promote the cloud computing industry. By 2018, the government issued new guidelines and regulations for the use of private cloud services in the public sector to strategically target the sector. The guidelines outline cloud computing as a new alternative resource for cybersecurity and the storage of key data such as private financial information. In 2020, the government included cloud computing as a sub-key sector for the transition of cloud services through state-led projects and investments as part of the Digital New Deal. The government will devote $750 million over the next five years to shift administrative and public data to cloud storage. Consequently, the South Korean government plays a crucial role in promoting information services by implementing cloud computing, AI technology, and cybersecurity services as a national policy and global agenda.

6) Chance

Chance events are exogenous variables that occur unexpectedly when a business or government cannot forecast or control them. This factor could affect the market positioning of current enterprises or other diamond model factors, hence determining competitive advantage. Lessons from the example of Korea demonstrate that more prominent research and policy implications reflect digital resilience, thereby increasing the competitiveness of the digital service sector. Digital resilience is characterized by the rapid development of digital applications, data governance, and active public and private partnerships.

Due to the COVID-19 pandemic, Korea has a technologically advanced system that has undergone social, technical, economic, environmental, and political breakthroughs (Park & Kim, 2020). External factors such as the COVID-19 pandemic paved a new path for technological progress and the socioeconomic structure. As a result of the outbreak, the "untact" culture has become the norm (Kim et al., 2020). Individuals purchase goods and services online, interact through online meetings, conduct online transactions, build new AI technology, share data through cloud computing, safeguard data, and utilize other digital services. The fourth industrial revolution replaced traditional production with the emergence of e-commerce. This chance factor of the COVID-19 pandemic created many consequences, and the incident has accelerated customers' and businesses' adoption of emerging technologies in information service industries such as artificial intelligence, cloud computing, and cybersecurity.

2. Analysis of South Korea’s Audiovisual Sector

According to the Services Sectorial Classification of the World Trade Organization (WTO), audiovisual services are classified as film, video production and distribution services, radio and television, radio and television transmission services, and sound recording (WTO, 1991). The expansion of this industry is highly dependent on the caliber of the content that audiovisual services distribute to their diverse audiences. The technological advancement has profoundly affected and transformed the structure of this industry so that content may be distributed on

a variety of online platforms and by various servers, giving customers more options for what to watch or listen to whenever, wherever, and they prefer. As a result of development in telecommunications technology, audiovisual content can be transmitted across international boundaries more quickly and affordably. However, General Agreement on Trade in Services (GATS) only has a small portion of specific regulations in the audiovisual sector (WTO 2010). Under the World Trade Organization, the audiovisual industry does not necessarily benefit from specific commitments from individual WTO members and has brought about numerous "most-favored-nation" (MFN) exemptions. This demonstrates the vulnerability of the audiovisual industry to economic, social, and cultural influences. Because it overlaps with social cohesion, cultural identity, and economic progress, audiovisual services are frequently subject to tight government controls. Some regulations are about intellectual property, competition, protection against illegal or objectionable content, advertising, language requirements for subtitling and dubbing, and spectrum management for broadcast radio waves (WTO 2010). The WTO acknowledges the complexity of audiovisual content and differentiates cultural services from other products and services.

In the case of South Korea, the country's objective is to become one of the world's leading exporters and importers in the entertainment and media industries, which corresponds to the distribution of many audiovisual contents. Globally, the "K-Wave" or Korean Wave or Hallyu trend is currently gaining immense popularity. K-pop, K-dramas, and even the gaming industry have expanded media

distribution and consumption. Korean government views the entertainment and media industry as a significant, potential economic growth driver and national strategy. As of 2020, audiovisual and related services exports in South Korea have reached 830 million US dollars. At an average annual growth rate of 16%, audiovisual and related services exports have surged from 122 million US dollars in 2006 to 830 million US dollars in 2020.

1) Factor Conditions

The factor endowments in South Korea's audiovisual industry are shaped largely by the country's abundant ICT infrastructure, which includes high-speed mobile connectivity, internet access, and diverse purchasing power in the entertainment sector. The advanced infrastructure of South Korea became an ideal investment destination for new media and entertainment technology. For example, Virtual Reality (VR) and other innovative technologies are frequently utilized in gaming and sports media. In addition, OTT (over-the-top) services are supplied rapidly to viewers via the Internet. According to a 2016 report by the Korea Communications Commission on competition in the broadcasting market, the OTT video market was estimated to be worth 278 billion dollars in 2016 and to expand by 53.7% to 438 billion dollars in 2017. The sudden expansion of OTT services in South Korea can be attributed to three distinct factors (Cher, 2017). First, the rapid proliferation of smart devices such as smartphones, tablet PCs, computers, and internet platforms expedited the development of OTT services. Korea has one of

the highest rates of mobile network penetration in the world. 88% of the population in Korea owns a smartphone (Spring 2015, 2015). Second, video-on-demand (VOD) services are now daily activities for Korean consumers. Using smart devices to watch various movies and online services is prevalent now that online video views outnumber traditional television views. It is said that Korean audiences are more likely to watch videos on smart devices which is 55 % than through TV which is 22%. Changes in viewing patterns can be attributed to the increased availability of OTT video services ("Video Is Mobile", 2016), which led to the growth of audiovisual content. Thirdly, less regulations in the media business led to the expansion of audiovisual services. For instance, in Korea, cable TV and IPTV are strictly restricted compared to OTT services. Despite the stringent laws governing cable services, public channels, domestic broadcasting content, and commercial advertisements, OTT services are not required to comply with these regulatory frameworks because they do not apply to online content (Hsu, Liu, & Chen, 2016). According to the 2020 Content Industry Statistics compiled by the Korean Creative Content Agency, 43 foreign film buyers and distributors, including Warner Bros, Walt Disney, Universal Pictures, and Sony Pictures, have been imported into Korea for the distribution of audiovisual content. Foreign films account for 90 percent of all film imports. With the launching of one of the most popular OTT services: Netflix in 2016, online media and audiovisual services in Korea have surged during the last 6 years. By 2020, Netflix Korea has achieved 356 million US dollars in total revenue, an increase of 123.5% since 2016. (Netflix

Services Korea, 2021). In addition, the number of paid subscribers reached 3.8 million by February 2021 (Sim, 2021), illustrating the future potential of audiovisual content distribution services. The domestic Subscription Video on Demand (SVOD) market is currently projected to be worth 700 million US dollars. The unprecedented expansion of audiovisual services and online distribution channels like Netflix was able to attract foreign streaming services like Disney + to launch in South Korea (Shin, 2021). Another important audiovisual content service is shown in the music industry. According to the 2021 IFPI Global Music Report[9], South Korea's music market is the sixth largest in the world and the second largest in Asia after Japan. The estimated overall worth of the Korean music industry in 2021 is 6 billion US dollars. K-pop is a core industry in the audiovisual sector due to the popularity of artists such as Black Pink, BTS, SNSD, and other artist groups, as well as the Hallyu wave, which includes K-drama, Korean food, cosmetics, and tourism. The K-pop industry is highly dependent on widely adopted audiovisual services, as performances and sound recordings are widely distributed on various online channels that global audiences may easily access. Major SVOD platforms view Korea as a major hub for the production of original content targeting both the Korean and Asian markets. In 2021, Netflix plans to invest a total of 491 million US dollars in generating Korean original content (Kim, 2021a). In addition, the success of several Netflix original series, such as *Sweet Home* (2020), a thriller

[9] The report shows annual review of the global recorded music market providing the official data on recorded music revenues.

drama series with 22 million views in four weeks globally, as well as the melodrama series *Crash Landing on You* (2019) and *Squid Game* (2021), showed Netflix how successful Korean media products and audiovisual services would be in attracting Koreans and foreign audiences (Sim, 2021). The cost of production of the Netflix series in Korea is cost-efficient compared to foreign drama series. *Squid Game* (2021) costs 2.4 million US dollars per episode, which is significantly less than the cost of *Stranger Things* (2016), which was 10 million US dollars per episode. In contrast to Hollywood, Korean enterprises are recognized as providing cost-effective original content (Kim, 2021e). Evidently, the lower production costs became one of the most significant competitive advantages and investment attraction factors for global online platforms to invest in the audiovisual sector of Korea's entertainment industry.

2) Demand Conditions

Currently, the rise of streaming video-on-demand (SVOD) services is a crucial role in the success of global media industries. Streaming services like Netflix and Amazon Prime have emerged as a new distribution powerhouse for film and television services. The successful outcomes of the audiovisual market generated a new profit model based on paid subscriptions and changed the production and distribution structure by delivering on-demand and just-in-time media content directly to viewers (Herbert et.al., 2020). Netflix investment in local production studios to produce new original series is showing their goal to expand

both local and international markets (Khan, 2020). According to a survey conducted by the Korean Communications Commission, the number of users of SVOD platforms who use streaming services and watch audiovisual content increased by 5%. (Korean Communications Commission, 2016). Due to the 'untact' culture, the Korea Productivity Center (KPC) predicts that viewer satisfaction with audiovisual streaming content will increase as intense competition among OTT (Over the Top) services attracts a diverse range of subscribers, which will become a key revenue source of entertainment during COVID-19. The NCSI index, which analyzes customer satisfaction, indicated that OTT media service suppliers and the music streaming industries experienced a rise in subscribers in 2022. KPC predicts an increase in customer satisfaction for OTT services comes from the fierce competition amongst companies to deliver higher quality content at a lower cost to have a stronger competitive advantage in the market. In addition to audiovisual content markets, the Korean music streaming industry is expanding rapidly as physical album sales have transitioned to digital downloads due to the accessibility of audiovisual services. In 2021, the Korean Creative Content Agency reported that over 65% of Korean music customers have paid subscriptions to internet music streaming services, while only 37% of respondents purchased hard copies in 2020.

3) Firm’s Strategy, Structure, and Rivalry

The rise of audiovisual content as part of the OTT streaming platforms is changing the Korean film industry. The number of film views on OTT platforms

has now overtaken theatre views. Movies that were postponed and canceled due to the pandemic were instead released on OTT platforms. The new services are now providing opportunities for film markets to access a wider range of audiovisual content which is more convenient and easier to watch and produce. The tremendous popularity of over-the-top (OTT) services among Korean viewers prompted collaborations with other major OTT platforms, allowing U.S. and other international corporations access to the Korean market. In recent years, competition between domestic and international OTT platforms has risen for this reason. Local broadcasting companies such as Korean Broadcasting System (KBS), Munwha Broadcasting Company (MBC), and Seoul Broadcasting System (SBS) are threatened by the presence of large OTT service providers like Netflix and the entry of foreign streaming services like Apple TV, Disney+, and HBO Max into the Korean domestic market. In 2019, KBS, MBC, and SBS introduced a local online streaming service: Wavve in partnership with SK Telecom company. The traditional broadcasting companies which have dominated the production and distribution of television content for years see foreign streaming platforms as a great threat along with paid television networks and cable television broadcasting companies like CJ ENM since the early 2010s. In 2020, CJ ENM and JTBC introduced Tving, another local streaming platform. OTT services are drastically changing traditional television broadcasts since audiovisual content may be supplied directly to viewers over the internet whenever and wherever. This allows streaming services an advantage against cable, satellite, and terrestrial broadcasting

companies that operate traditional television. Thus, online streaming platforms are developing their efforts to import more innovative and new audiovisual content. Now, there are new competitors, including Disney+ in November 2021. Active Korean OTT platforms include Wavve, Tving, Coupang Play, and Watcha. Two major Korean film suppliers: CJ entertainment and Lotte entertainment produce and distribute films and biggest importers of foreign films. Other large-scale film importers include JOYCINEMA, NOORI pictures, Pop Entertainment, and Mountain Pictures. Major film industries provide rising opportunities to connect businesses and build partnerships with local Korean film importers with foreign film markets.

4) Related Supporting Industries

In the audiovisual industry, the "Korean Wave" is sweeping the world. This trend enabled the Korean cultural industries to revolve around the Korean cinema and television industry through the use of audiovisual content. Recently, numerous film market-related industries have been linked to the economic growth of South Korea, which strengthened cultural soft power. Korean audiovisual industry, especially OTT services are recognized by consumers in Asia and around the world. In the big picture, the Korean media and entertainment industry are not confined to the entertainment sector alone; it has spillover effects on other industries, such as audiovisual industries, electronic products, clothes, catering, cosmetics, skincare, and tourism in South Korea. The Korean audiovisual industry

and entertainment industry are at its core reflecting Korean cultural soft power, establishing a wide range of industrial value chains with strength in commercial values. According to Deloitte Consulting Korea, Netflix's investment in content production in Korea generated approximately 5.6 trillion won in 2021, along with more than 16,000 jobs and related industries such as publishing webtoons that successfully adapted into OTT series and byproducts of consumer goods. In 2016, the entry of OTT service providers like Netflix into the Korean market had an immediate impact on the creative ecosystem in the audiovisual content production and distribution business. According to Deloitte Korea, the economic value of Netflix's investment alone has established business partnerships with set designers, graphic designers, visual effects artists, and production editors worth over 2.7 trillion won. Korean production firms also had ripple effects on the original intellectual property (IP) content industry, consumer goods, and tourism, naturally attracting audiences to experience Korean culture. According to the survey conducted by Deloitte and Netflix of 2000 streaming service subscribers, around 42% of Netflix users have read the webtoons and novels that were adapted by Netflix drama series and listened to the soundtrack used in the series. Songs from the drama: *Itaewon Class* and *Crash Landing on You*, for instance, have scored highly on Japan's Oricon music charts, with 60,000 albums of the OST sold in Japan alone. Netflix reported that investment in Korean content generated 2.7 trillion won in related industries such as food, cosmetics, and fashion that were featured in the OTT series. The virtuous cycle of Korea's cultural and audiovisual

industries led to global commercial success. It is predicted that South Korea will continue to ride the successful Hallyu strategy utilizing audiovisual content with its fast, advanced, direct delivery and connectivity by promoting other related industries including content production, metaverse projects, promotion of Korean brands, and intellectual property protection. This spillover effect in other industries illustrates South Korea's unprecedented smart catch-up strategy using its competitive advantage in the audiovisual sector.

5) Government

Government plays a prominent role in the audiovisual industry. The government takes measures to target cultural objectives like protecting and promoting domestic cultural content, diversity, pluralism, and intellectual property rights. Although the World Trade Organization (WTO) estimates that the trade in audiovisual and related services accounts for 1% of all commercial services, the WTO notes that relative advantages differ from country to country. In the case of South Korea, the government made a decision to develop its own domestic streaming platforms in response to the growing SVOD market. In 2018, the Korean government announced a "Grand OTT" project in collaboration with terrestrial television providers and telecommunications corporations including SK Telecom, KT, and LG U+. The project is now serving as an intermediary for the implementation and promotion of partnerships between regional audiovisual service platforms such as Wavve and Tving, as well as for the expedited merger

and acquisition process between Wavve and Tving (Kim, 2020). In a similar vein, the Yoon Suk-yeol government aims to take more interventionist measures to create a "Korean Netflix" by utilizing public-private funding and promotion organizations to create streaming content and invest in media industry infrastructure (Lee, 2022). In response to the growing popularity of the Hallyu wave or "K-pop" in South Korea, the government intends to strengthen the IP protection framework for audiovisual films. Since joining the WTO in 1995, South Korea has actively participated in global negotiations on intellectual property and copyright issues. In addition, South Korea has signed international IP agreements including the Bern Convention, the Universal Copyright Convention, the Geneva Convention, the Rome Convention, the Brussels Convention, the Beijing Treaty on Audiovisual Performances, and the World Intellectual Property Organizations treaty[10]. Officials from South Korea actively monitored and enforced copyright violations resulting from the global distribution of audiovisual services, such as movies and music, via online platforms.

6) Chance

The COVID-19 pandemic has brought many changes in Korea's film industry as OTT services have dominated and became a technological breakthrough in audiovisual industries. Due to COVID-19 regulations, the majority of movie theaters have shut down. As a result, Netflix has become a viable

[10] Source: International Trade Administration

alternative for filmmakers seeking outlets for film distribution. Many Korean films such as the thriller: *Time to Hunt* (2020), the science fiction film: *Space Sweepers* (2021), and the romantic comedy: *Sweet and Sour* (2021) were distributed by Netflix, a prominent OTT platform. Netflix and international SVOD services have become crucial for the Korean television and film industry to produce and distribute their audiovisual content globally. In 2020, a COVID-19 outbreak resulted in the lockdown of the entire nation. Consequently, millions of people switched to using streaming services to gain access to entertainment, music, education, and other related industries, resulting in a dramatic increase in audiovisual service usage and revenue. The digital streaming industry generated a total of 140 billion dollars in profit. This effect challenged traditional television distributors due to the lower price and high quality of online audiovisual content. Korea, which has the highest average internet connection speed in the world, has become a dynamic player in the audiovisual sector due to its ability to produce high-quality content that can reach a global audience.

3. Implications

After looking at the six factors of Porter's diamond model, the most important factor that affected the growth of the information service industry and audiovisual industry as the most competitive sector in South Korea lies in factor conditions. As Porter mentioned, the most important influence in the diamond model is heavily weighted in factor conditions. Regardless, South Korea's case

study shows that without existing factor endowments and capital, the industry cannot develop and innovate constantly. Factor conditions in information services in South Korea are marked by 5G network distribution, high internet connectivity, AI technology, and high-tech infrastructures. For the audiovisual industry, high-speed internet, mobile connectivity, and diverse purchasing power in the entertainment industry facilitated the growth potential of audiovisual services. OTT services, the prime example of the recent development in audiovisual content, have been promoted due to the hasty adoption of smart devices. Also, the Korean wave trend has established the K-pop music industry as the core leverage of the audiovisual industry. Therefore, existing infrastructures, highly invested capital, and technology endowment for information services and audiovisual services lead to the most competitive sectors in South Korea. Another factor that also transformed the growth of information and audiovisual services is chance. The pandemic was also a significant factor influencing audiovisual and information services to accelerate. The information service industry benefitted highly from factor endowments, but it was able to prosper during the COVID-19 pandemic times due to the 'untact' culture. Consumers switched to using online services for convenience and due to physical limitations. Impacts of the pandemic provided a new emerging opportunity for Korea's information services like cloud services and AI to innovate at a rapid pace because the pandemic restricted physical work and instead promoted online services instead. This also applies to the audiovisual industry. Although Netflix and OTT platforms existed, it was not until the COVID-

19 pandemic that Netflix became immensely popular. People could not have access to films in movie theaters, so instead, they turned to online, leading to higher demand for online streaming services and sharing various audiovisual content. South Korea is a case in which already existing factor endowments flourished with the effect of the COVID-19 pandemic that promoted competitiveness in information services in 2019 and audiovisual services in 2020.

CHAPTER V. CONCLUSION

The paper empirically analyzed the highest revealed comparative advantage (RCA) index of 30 OECD countries from 2010 until 2018, and 28 OECD countries from 2019 to 2020 to find out which digital service sectors in these countries have a competitive advantage compared to other counterparts. By examining the data results, seven countries have consistently the highest RCA index in the goods or services sectors. Chile and Japan have the highest consistent RCA index in good commodities while Australia in pension services, Costa Rica and Slovenia in health services, Latvia in architectural services, and Mexico in reinsurance services. And three countries: Canada, Lithuania, and South Korea had shown drastic changes in the RCA index pattern within the digital service sector. South Korea is chosen as the main case study to be analyzed through Michael Porter's diamond model because its digital competitiveness ranking is higher than Lithuania and Canada according to IMD world digital competitiveness ranking. South Korea's competitiveness in the digital service sector is utilized as a qualitative case study to examine factors behind rapid development in digital service industries through Michael Porter's diamond model. From the analysis of six factors in the diamond model, there are two most influential factors: factor conditions and chance events in explaining South Korea's competitive advantage in the information service and audiovisual service sectors. The digital services are classified by EBPOS 2010 statistics and categorized into ICT services and potentially ICT-enabled services. Although there are still challenges in drawing

clear-cut distinctions between digital services and commercial services, this paper emphasizes the "nature" of trade. The conceptual framework of digital trade is characterized as digitally ordered and delivered services or potentially ICT-enabled services. Despite the lack of literature on empirical assessment of measuring the competitiveness of digital trade, Balassa's RCA index to calculate comparative advantage across different digital service sectors and utilizing Michael Porter's diamond model as an analysis framework to determine international competitiveness are the main objectives of this study and to be further developed for future policy making.

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Abstract in Korean

디지털 전환은 국제 무역에 상당한 영향을 미쳤다. 디지털화와 신기술에 대한 접근성은 무역 경쟁력을 높이는 데 기여하여 세계 시장에서의 진입 장벽을 낮췄다. 디지털화는 거래의 "성질"을 바꿈으로써 무역이 이루어지는 방식을 변화시켰다. 디지털 무역은 이제 국제 무역에서 두드러진 특징이며, 디지털 서비스 부문은 기술 혁신과 경제 발전을 촉진함으로써 전 세계적으로 빠른 성장을 보이고 있다. 디지털 무역에 적극적으로 참여하는 국가는 국제적인 경쟁 우위를 갖는 것으로 해석된다. 다음 논문은 디지털 무역의 급증을 설명하기 위해 Balassa 의 현시비교우위지수 (RCA)와 Michael Porter 의 다이아몬드 모델을 이용하여 2010 년부터 2020 년까지 OECD 28 개 회원국의 디지털 서비스 경쟁력을 실증연구 방법론과 질적연구 방법론으로 분석하는 것을 목적으로 한다. 본 논문에서는 상용 서비스 분야 내에서 디지털 서비스를 분류하기 위해 EBPOS 2010 통계를 활용하여 디지털 서비스를 ICT 지원 서비스와 기타 잠재적인 ICT 지원 서비스로 분류한다. 실증분석 결과를 살펴보면, 본 논문은 일부 국가가 다른 서비스 분야에서 디지털 서비스 분야로 비교우위를 갖는 것에서 전례 없는 변화를 겪은 반면, 특정 국가에 대한 서비스 분야 또는 상품 분야에서 일관된 RCA 지수를 보여주고 있다. 따라서 본 논문에서는 디지털 서비스 분야에서 가장 높은 RCA 지수를

보유한 국가들 중 한국의 디지털 서비스 분야의 사례를 분석하고 포터의 다이아몬드 모델을 적용하여 디지털 무역이 급성장하는 이유를 질적연구 방법론을 이용하여 설명하고자 한다.

Keywords: 현시비교우위지수, 디지털 무역, 경쟁력, 마이클 포터의 다이아몬드 모델

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