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A Comparative Analysis of Export Competitiveness of Korea in the ASEAN-5 Market

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ABSTRACT

This study aims to find out Korea's comparative advantages in the ASEAN market to accelerate the deepening GVC participation and efficiency. In particular, Vietnam, Singapore, Malaysia, the Philippines, and Indonesia were estimated to be the top trading partners, showing that higher economic cooperation among ASEAN member countries. This analysis shows that the proportion of exports between Korea and ASEAN-5 is highest in intermediate goods, and Korea's competitive advantage (RCI) in intermediate goods is also high. Analyzing the export specialization index (TSI) between Korea and the ASEAN-5 to determine export competitiveness by item shows that it is high in petrochemical products and machinery are dominant among items with relatively strong competitiveness. This demonstrates that the trade structures of the ASEAN and Korea are complementary. Meanwhile, inter-industry trade (GLI) showed a high proportion of textiles, inorganic chemicals, electronic products, organic chemicals, copper, and rubber. In this field, Korean companies should increase their technological competitiveness to maintain export competitiveness on GVC.

Keywords: ***RCI, TSI, GLI, Korea, ASEAN, GVC.***

1. INTRODUCTION

Recently, the global economy has been experiencing unprecedented uncertainty due to complex and various external shocks and risk factors. The COVID-19 pandemic that occurred in 2019 was the largest economic crisis since the Great Depression, sharply contracting economic activity worldwide (Guerrieri et, al, 2022). The pandemic shook the overall structure of the global economy and exposed the vulnerabilities of global supply chains. Due to severe restrictions on mobility resulting in a sudden decline in labor supply, demand shocks, and disruptions in global supply chains, the entire process of production and distribution was impacted (Sokolov *et al*., 2016). As of 2020, most G20 countries have experienced negative growth (IMF, 2021). South Korea (hereafter, Korea) recorded negative growth in 2020 and expected economic recovery from 2021 because of COVID-19 mitigation policies, but a sense of crisis is being created as the International Monetary Fund lowered its forecast for Korea's economic growth rate in 2023 to 1% (IMF, 2023). However, the outlook for major ASEAN countries predicts relatively high growth (ADB, 2022). The economic growth rates of Vietnam, Indonesia, and the Philippines are 7.5%, 5.0%, and 6.3%, respectively, which are notable compared to developed countries' growth rates (ADB, 2022). The vast natural and human resources of ASEAN countries are evaluated as having high growth potential. In this context, the course Korea can take amid global economic fluctuations is to strengthen economic interdependence with cooperative countries such as ASEAN countries centered on efficiency (Kim and Nasrudin, 2022). Therefore, at present, Korea's industrial competitiveness in the major ASEAN countries must be analyzed for its sustainable growth.

When estimating the trade volume for the five years following the COVID-19 outbreak (2019–2023) by country, Vietnam, Singapore, Malaysia, the Philippines, and Indonesia were estimated to be the top trading partners with Korea, showing that economic cooperation among ASEAN member countries also maintained an increasing trend. In case of FDI, Korea's FDI into ASEAN has also been rising since the Korea-ASEAN Free Trade Agreement (FTA) was signed in 2007, and as of 2022, it ranks 5th in Singapore, 7th in Vietnam, 13th in Indonesia, and 20th in Malaysia (Public data portal, 2023). This means that the economic interdependence between Korea and major ASEAN countries is increasing despite the economic downturn caused by the COVID-19 pandemic. Accordingly, this study analyzes Korea's economic competitiveness in the ASEAN-5 countries (Indonesia, Malaysia, Singapore, the Philippines, and Vietnam), to find ways to increase Korea's export competitiveness for economic development. Therefore, this study aims to determine Korea's comparative advantages in the ASEAN market.

The remainder of this paper is organized as follows. First, this study reviews the existing literature on export competitiveness in Korea. In the next section, this paper presents the research methodology for analyzing Korean export competitiveness in the ASEAN-5 market. The following section explains the research methods using the Revealed Comparative Advantage Index (RCA), Trade-Specialized Index (TSI), and Grubel-Lloyd index (GLI). The analysis results are presented in the next section. In conclusion, based on the analysis results, this study presents policy recommendations for improving Korea's export competitiveness and economic interdependence in the ASEAN market.

2. LITERATURE REVIEW

Experiencing the COVID-19 pandemic highlighted the importance of a stable supply chain, and the global industry began to prefer safer production systems even if they were less efficient. In this context, it is important for Korea to

establish a stable trade network with ASEAN, and from this perspective, this study examined existing research on building trade networks that enhance economic efficiency (Delera and Mcregor, 2020; Blyde and Faggioni, 2018; Breton *et al*., 2022; Giulia and Lucia, 2021; Kang, 2017; Hong and Son, 2017; Nam, 2019; Na, 2014).

Delera and Mcregor (2020) and Blyde and Faggioni (2018) found that the normative trade policy have a larger impact on trade flows involving intermediates relative to flows involving all products, suggesting that GVC trade is particularly sensitive to economic cooperation especially, trade between bilateral countries. The result of two research has important implications for regions seeking to develop international supply chains because the participation of ASEAN and Korea on GVC has been increasing. Based on these literatures, it has significant importance to analyze the trade dependency and competitiveness of trade to develop supply chains in Asia.

Other literatures (Brenton *et al*., 2022; Felice and Tajoli, 2021) regarding the report documents how GVCs are a source of resilience, these researcher that trade is positively associated with countries' involvement in GVCs. It would promote some type of convergence across the existing agreements, a scenario that would be more conducive to the rise of regional supply chains at a wide scale. Well-operating GVCs are a source of resilience and economic efficiency. These literatures suggested that improving border procedures and easing impediments to trade flows are an appropriate approach to a supply chain crisis. It means that the improving competitiveness of trade between Korea and ASEAN could maintain and enhance trade contribute to managing a crisis and the recovery.

Research on Korea's export competition has been conducted targeting various markets by industry and product using a variety of methods. There are many studies (Kang, 2017; Hong and Son, 2017; Nam, 2019; Na, 2014) on the comparison of competitiveness of Korea, China, and Japan, which are in mutual competition. According to these analyses, there is a need to increase Korea's competitiveness in the ASEAN market; given that Japan and China each have a competitive advantage over Korea in raw materials and final goods. It was suggested that increased intra-industry trade would play a role in reducing the gap in production methods and quality levels between the two trading countries. These empirical literatures using trade index such as RCA (the Regional Competitiveness Index), TSI (Trade Specialization Index), GLI (Grubel-Lloyd Index) give a insight for adopting methodology to analyze Korean trade competitiveness.

As regional economic cooperation is decreasing due to COVID-19 and intensifying geopolitical conflict, and the economic potential of ASEAN countries is receiving attention, the competitiveness of Korea can be expected to become more intense. In particular, the ASEAN market is very important because ASEAN is expected to take charge of the global supply chain based on its abundant natural resources and labor productivity (Goldman Sachs Research, 2022). Therefore, in ASEAN, where importance is gradually increasing, Korea's export competitiveness is simultaneously compared and analyzed by industry using indicators such as import market share, market comparative advantage, and export competitiveness, thereby allowing Korean companies to establish strategies and future trade policies.

3. METHODOLOGY

Based on statistics from the UN Comtrade's Standard International Trade Classification (SITC) Rev.3, it was classified into eight industries (Table 1). Owing to the global economic downturn caused by the COVID-19 pandemic in 2019, data from 2019 to 2021 could not be analyzed for continuity. The most up-to-date data were required for this analysis. Therefore, the data were collected for 2022.

Table 1 Classification of eight industries.

No	Products	SITC
1	Food and live animals	025, 048, 071, 072, 091, 098
2	Crude materials, inedible, except fuels	231, 232, 248, 266, 269273, 274
3	Mineral fuels, lubricants and related materials	334, 335, 343, 344
4	Animal and vegetable oils, fats and waxes	422, 431
5	Chemicals and related products, n.e.s.	511, 512, 513, 524, 525, 531, 533, 553, 571, 572, 573, 574, 575, 582, 598
6	Manufactured goods	613, 621, 625, 634, 635, 651, 653, 655, 657, 663, 664, 671, 672, 673, 674, 676, 679, 682, 683, 684, 685, 686, 687, 691, 692, 693, 695
7	Machinery and transport equipment	711, 713, 724, 725, 728, 733, 735, 741, 746, 749, 752, 759, 761, 762, 763, 764, 772, 775, 776, 784, 791, 792, 793
8	Miscellaneous manufactured articles	821, 848, 871, 873, 874, 882, 884, 891, 898

Source: Organized by Author based on UNCTADSTAT (2024).

Based on statistics from the UN Comtrade's Standard International Trade Classification (SITC) Rev.3, it was classified into eight industries (Table 1). Owing to the global economic downturn caused by the COVID-19 pandemic in 2019, data from 2019 to 2021 could not be analyzed for continuity. The most up-to-date data were required for this analysis. Therefore, the data were collected for 2022.

$$RCAihwm = (\frac{Xih}{Xh})/(\frac{Miwm}{Mwm}) \quad (1)$$

Here, RCA*ihwm* means the current RCA of country *h*'s product *i* in the world market (*wm*), M*wm* is the total world import amount, M*iwm* is the total world import size of product *i*, X*h* is the total export scale of country *h*, and X*ih* is the export scale of product *i* of country *h*.

If the RCA index value is greater than 1, country *h*'s items have a comparative advantage and competitiveness in the international market; if it is less than 1, they are at a comparative disadvantage. The TSI is a slightly modified version of the intra-industry trade index developed by Grubel

and Lloyd (1975). It is possible to estimate the degree of export specialization of a country's export items.

$$TSIia = \frac{Xia - Mia}{Mia + Mia} \quad (2)$$

In (2), the TSI index value of country a is within the range of -1 ≤ TSI ≤ 1. If the value of TSI is positive (+), product *i* has an international comparative advantage; that is, it is an export-specialized product. If it is negative (-), the export specialization of item *i* is low, meaning that it is an import-specialized product with a comparative disadvantage in international competitiveness. Therefore, the closer the TSI is to 1, the greater the degree of export specialization.

Intra-industry trade (IIT) refers to the simultaneous import and export of similar products within the same industry. Among the various indices that are easy to calculate, the Gruble-Lloyd index (GL index) is widely used to measure the degree of trade volume within an industry. It is calculated based on the import amount of the same industry that exactly overlaps the export amount of each industry by comparing the trade situation within a specific industry with a specific country (Mikie and Gilbert, 2009).

$$GLIKij = 1 - \left|\frac{(Xkij - Mkij}{(Xkij + Mkij}\right| \quad (3)$$

GLIK*ij* : Intra-industry trade index between country *i* and region *j*

X*kij* : Export amount of industry *k* from country *i* to region *j*,

M*kij* : The amount of *k* industry from country *i* to region *j*

If the export and import amounts of a specific industry between each country of Korea, China, and Japan and ASEAN in this study were the same, the intra-industry trade index would be 1. In other words, a GL index close to 1 means that the export and import amounts of a specific industry with a specific country are similar, and the second absolute value term on the right side of (3) is close to 0. If GLI = 0, only inter-industry trade exists, and if GLI = 1, only intra-industry trade occurs, so GLI has a value between 0 and 1. If exports are high or imports are high unilaterally, the GL index will be close to 0, and at the same time, it can be interpreted that the industrial competitiveness of the exporting or importing country is strong (Lee *et al*., 2017, p. 70).

4. TRADE ANALYSIS

The development of global value chains is shifting toward Asia. Specifically, while the roles of the US and Germany as regional production hubs in global value chains have slowed since 2000, China's presence in Asia has grown significantly. Since 2010, the business environment in China has deteriorated due to rising wages and environmental costs, as well as reduced tax benefits, leading to an exodus of global manufacturers from China. Recently, this trend has accelerated due to the impact of the US-China trade war (Kim, 2019). Meanwhile, major ASEAN countries are also showing signs of integration into Asia-centric global value chains (WTO, 2019).

In this context, the current trade environment in Asia has highlighted the urgent need to understand the trade dependency on suppliers across the ASEAN. This section suggested that the right analysis on trade can help major ASEAN countries and Korea maximize their participation in GVCs.

4.1 Trade between Korea and Malaysia

Korea's total exports to Malaysia have been steadily increasing since 2000 (Figure 1). In particular, exports increased after the conclusion of the FTA with ASEAN in 2007 and decreased slightly in 2009 during the financial crisis but showed a rapid recovery thereafter. Although they decreased slightly due to the global economic crisis and the COVID-19 pandemic in 2015 and 2019, respectively, trade between Korea and Malaysia has increased since 2019. As of 2023, imports from Malaysia are exceeding exports to it (K-Stat accessed on March 1, 2024).

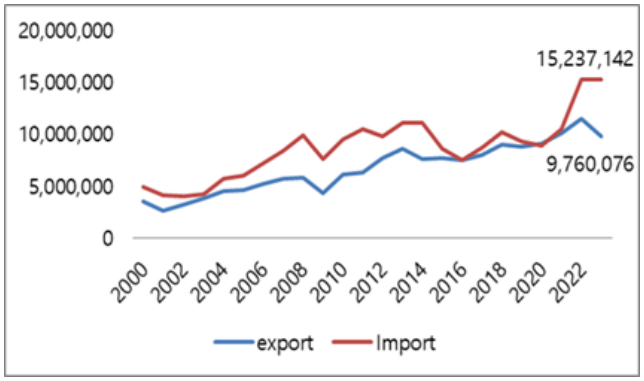

Figure 1 Trade between Korea and Malaysia from 2000 to 2023 (US 1,000 dollars)
Source: K-Stat (2024).

Table 2 shows the top 10 export industries in which Korea exports to Malaysia, as of 2022. Among them, the oil refining and electrical equipment-related industries account for approximately 40% of total exports. Subsequently, the proportion of exports of intermediate goods such as nuclear reactors and boilers, steel, plastics, rubber, automobile parts, and copper is high (TriBig, 2023). Imports from Korea to Malaysia also account for a high proportion of similar commodities (HS codes 27 and 85). However, most imports are raw mineral materials from Malaysia and Korea. Overall, the trade structure between Korea and Malaysia can be seen as Malaysia's role as a production base is increasing.

Export statistics between the two countries show that Korea's export competitiveness is strong for intermediate goods, especially semi-finished products. In particular, it has a complementary export structure, importing and re-exporting Malaysia's natural resources. However, the trade balance continues to record a deficit. Accordingly, Korea's industrial competitiveness in Malaysia must be analyzed according to the research methodology.

Table 2 Export from Korea to Malaysia by Major commodities (2022, billion US$).

HS Code	Products	Export	Import
27	Mineral Fuels, Mineral Oils and Products of their Distillation; Bituminous Substances; Mineral Waxes	3,370	6,130
85	Electrical Machinery and Equipment and Parts there of; Sound Recorders and Reproducers; Television Image and Sound Recorders and Reproducers, parts and Accessories of such articles	2,690	3,460
84	Nuclear Reactors, Boilers, Machinery and Mechanical Appliances	1,130	958
72	Iron and Steel	648	606
28	Inorganic Chemicals; Organic and Inorganic Compounds of Precious Metals; of Rare Earth Metals, of Radio-Active Elements and of Isotopes	506	40
39	Plastics and articles there of	448	227
90	Optical, Photographic, Cinematographic, Measuring, Checking, Medical or Surgical Instruments and Apparatus; parts and accessories	194	636
40	Rubber and articles there of	379	134
87	Vehicles; other than Railway or Tramway Rolling Stock, and parts and accessories thereof	166	28
74	Copper and articles thereof	374	248

Source: TriBig, Kotra (2023).

4.2 Trade between Indonesia and Korea

As of 2022, Korea's trade volume with Indonesia is $2.59 million, showing the sharpest increase since reaching its peak in 2011. This trade volume recorded a significant decline in value from 2011 to 2016. Korea's exports to Indonesia increased by 19.5% compared to the previous year, and imports from Indonesia increased by 46.7% (Figure 2).

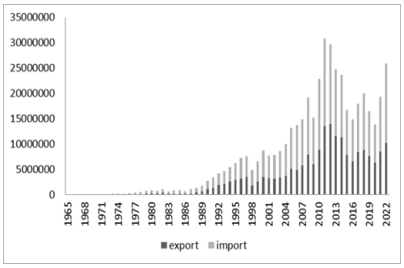

Figure 2 Trends in Korea's trade with Indonesia (US$ 1,000)
Source: KITA (2023).

The trade volume between the two countries, which was only $185 million when diplomatic relations were established in 1973, increased by more than 140 times by 2022, showing that the economic cooperation relationship between Indonesia and Korea has been deepening (KITA, 2023). As of 2023, the largest share of Korean exports to Indonesia is machinery. This statistic shows that Korea is considered to have an advantage in secondary production technology over Indonesia. In addition, metals, plastics, petroleum products, chemicals, transportation, and textiles are all prominent exports from Korea to Indonesia in the manufacturing sector (Table 3).

4.3 Trade between Singapore and Korea

Korean exports to Singapore were US $20.21 billion during 2022, according to the Korea International Trade Association database on international trade (2024). This statistic shows the value of goods exported from Korea to Singapore up to 2017, after the FTA between the two governments came into force in 2006. In 2017, the export value amounted to approximately US $11.65 billion (Figure 3).

Table 3 Export from Korea to Indonesia by commodities (2023, million US$).

No	Commodity	Export	Import
1	Animal Products	14,752,442	65,875,867
2	Vegetable Products	11,184,355	49,782,340
3	Animal and Vegetable Bi-Products	4,440,669	575,991,307
4	Foodstuffs	213,563,205	348,873,635
5	Mineral Products	995,374,412	5,364,987,889
6	Chemical Products	859,898,671	41,925,771
7	Plastics and Rubbers	1,045,745,384	202,409,204
8	Animal Hides	45,101,312	52,116,232
9	Wood Products	4,627,656	387,812,439
10	Paper Goods	146,462,263	343,855,057
11	Textiles	692,202,119	493,272,526
12	Footwear and Headwear	29,071,611	244,712,000
13	Stone and Glass	49,419,364	46,465,048
14	Precious Metals	117,721,361	92,123,619
15	Metals	1,590,046,118	612,771,152
16	Machines	3,492,335,027	763,078,094
17	Transportation	759,653,909	38,643,012
18	Instruments	355,506,448	38,427,408
19	Miscellaneous	62,111,262	7,496,518
20	Arts and Antiques	140,555	212,966

Source: UN Comtrade (2023).

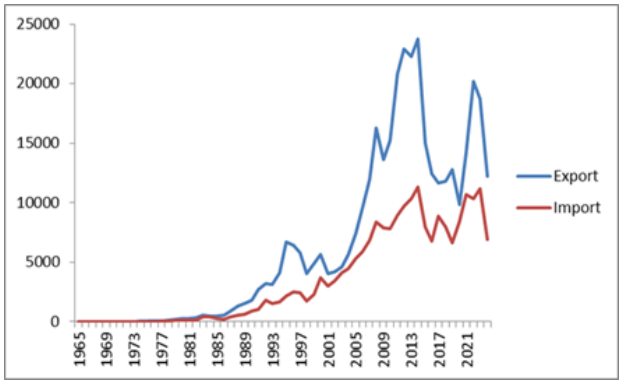

Figure 3 Trends in Korea's trade with Singapore (million US$)
Source: KITA (2023).

By 2022, Singapore had exported $11.9 billion to Korea. The main products exported were integrated circuits ($3.28 billion), machinery with individual functions ($2.33 billion), and refined petroleum ($566 million). Over the past five years, Singapore's exports to Korea have decreased at an annualized rate of 3.72%, from $14.4 billion in 2017 to $11.9 billion in 2022. In 2022, Korea exported $22.5 billion to Singapore. The main products that Korea exported to Singapore were integrated circuits ($7.89 billion), refined petroleum ($7.15 billion), and passenger and cargo ships ($1.28 billion). Over the past five years, South Korea's exports to Singapore have increased at an annualized rate of 1.44%, from $20.9 billion in 2017 to $22.5 billion in 2022 (The Observatory of Economic Complexity, 2023)

Table 4 Major trading commodities of Korea to Singapore.

No	Commodity	Export	Import
1	Electrical, electronic equipment	$6.40B	$17.77B
2	Mineral fuels, oils, distillation products	$7.68B	$6.80B
3	Machinery, nuclear reactors, boilers	$2.15B	$2.19B
4	Optical, photo, technical, medical apparatus	$253.93M	$935.56M
5	Pearls, precious stones, metals, coins	$550.67M	$448.22M
6	Miscellaneous chemical products	$157.96M	$297.46M
7	Organic chemicals	$261.71M	$278.16M
8	Plastics	$247.33M	$224.29M
9	Essential oils, perfumes, cosmetics, toiletries	$114.63M	$220.13M
10	Articles of iron or steel	$128.32M	$169.01M

Source: Trading Economics (2023).

4.4 Trade between the Philippines and Korea

After the COVID-19 pandemic, the volume of trade between the Philippines and Korea decreased. However, with the signing of an FTA, trade between the two countries reached $20.6 billion in 2023, the highest ever. In 2022, exports to the Philippines recorded $12.3 billion (a 27.5% increase) and imports $5.2 billion (a 32.9% increase) (Figure 4).

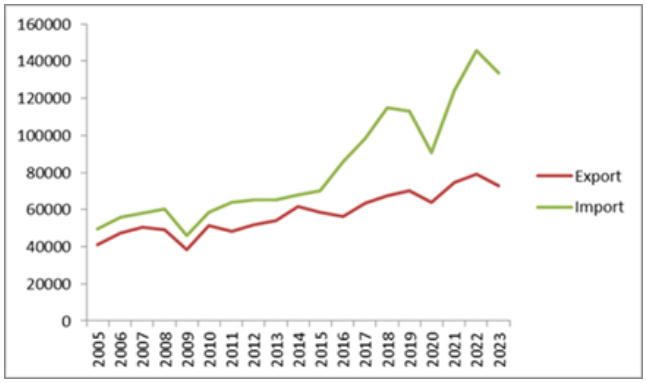

Figure 4 Trends in Korea's trade in Philippine (million US$)
Source: KITA (2023).

Exports of products such as petroleum products (gasoline and diesel), semiconductors, copper products, and wireless communication devices account for 71% of exports to the Philippines. The main export items that increase or decrease (in 2022, compared to the previous year) are petroleum products, semiconductors, and copper products. Imports account for 56% of items such as industrial electrical equipment, semiconductors, copper ore, and coal, which are reimported after outsourcing (Ministry of Trade, Industry and Energy, 2023).

With the conclusion of the Korea-Philippines FTA, the Philippines is seeking to expand its agricultural and fishery product exports to Korea. As of 2021, the Philippines' agricultural, fishery, and food exports to Korea recorded $526.8 million (approximately KRW 703.5 billion), a 20% increase from the previous year, and $228.4 million through agricultural, fishery and food trade with Korea. It has recorded a surplus of approximately KRW 379.2 billion. As of 2021, the Philippines' seafood exports to Korea amounted to $29.5 million (about KRW 39.39767 billion), and most of them were expensive products such as octopus, abalone, prawns, sea cucumbers, and smoked tuna (KIEP, 2024).

4.5 Trade between Vietnam and Korea

According to the Korea International Trade Association's trade statistics system "K-stat," as of 2023, Korea's exports to Vietnam were $53.49 billion, imports from Vietnam were $25.94 billion, and the trade surplus was $27.55 billion. Vietnam ranked third in terms of trade volume with Korea, following China and the United States. In particular, since the signing of the Korea-Vietnam FTA in 2014, the volume of trade between the two countries has grown more than 2.5 times, from $30 billion to $80 billion (KITA, 2024).

Table 5 Export from Korea to Philippine by major commodities.

Export			Import		
Major Item	**Value (million US$)**	**Growth (%)**	**Major Item**	**Value (million US$)**	**Growth (%)**
Petroleum products	4,506	169.2	Industrial electrical equipment	1,312	54.6
Semiconductor	3,774	1.4	Semiconductor	1,020	99.9
Copper product	307	13.2	Copper	296	3,326.1
Wireless communication	208	294.5	Coal	284	9,961.8
Total	12,314		Total	5,117	

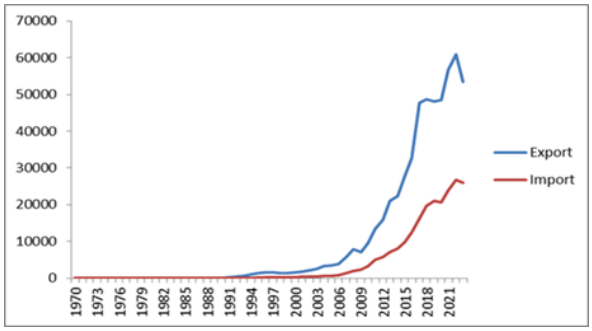

Figure 5 Trends in Korea's trade with Vietnam (million US$)
Source: KITA (2023).

The volume of trade between the two countries, which was only $500 million when diplomatic relations were established, has grown more than 150 times over 30 years later, and traded items have also evolved from labour-intensive products such as textiles and clothing to high value-added items such as semiconductors and wireless communication devices. However, in 2023, most of Vietnam's export items decreased. The export amount of computers, electronic devices, and components increased by 3.2% compared to the previous year, reaching $57.34 billion, accounting for 16.2% of total exports and ranking first among export items. Conversely, major items such as cell phones and parts (-9.7%), mechanical equipment and parts (-5.7%), textiles and clothing (-11.4%), and shoes (-15.3%) decreased.

In 2023, Vietnam's imported items also decreased in all major items except computers, electronic devices, and parts, whose imports increased 7.4% from the previous year to $87.87 billion, accounting for 26.9% of total imports and ranking first among imported items. By contrast, imports of major items such as mechanical equipment and parts (-7.9%), textile and shoe raw materials (-14.0%), cell phones and parts (-58.6%), and plastics (-21.2%) decreased. There are limits to understanding trade cooperation with Korea through export and import statistics because of the annual volatility of imports and exports.

Table 6 Export from Korea to Vietnam by major commodities (billion US$).

Major Item	2022		2023	
	Export	Import	Export	Import
Computers, Electronics and Components	555.4	818.8	573.4	879.7
Cell Phones and Parts	579.9	211.3	523.8	87.5
Mechanical equipment and parts	457.5	451.9	431.3	415.8
Textiles, clothing	375.7	279.6	333.3	241
Steel	79.9	119.2	83.5	104.3

Source: Vietnam General Department of Customs (2024).

5. RESULT OF ANALYSIS

Global trade and production are increasingly structured around global value chains (GVCs). GVCs constitute a series of links that create goods or services, from conception to final sale, and even, in some cases, waste recycling. These GVCs foster international production fragmentation, thereby enhancing corporate efficiency and competitiveness (OECD, 2013). In this context, diverse trade areas including logistics, trade facilitation and industrial development affect the success of GVCs). Accordingly, this paper argues that understanding the trade competitiveness of Asian countries with high GVC participation rates will increase global GVC efficiency and bring about synergy effects of free trade. Therefore, this research is to reproduce the functions of GVCs that are becoming fragmented by analysing the RCA, TSI, and GLI of major ASEAN countries and Korea.

5.1 Analysis results using RCA

Table 7 shows the results of calculating the RCA of Korea against the ASEAN-5 countries to determine Korea's export competitiveness by commodity. According to the results of the analysis, Korea has a comparative advantage in chemicals and transport equipment among the ASEAN-4 countries, except for Vietnam. When analyzed by country, Indonesia was found to be competitive in Korea's manufacturing exports overall, including plastics, oil refining, chemical products, and electronic products. By contrast, the sectors where Korean exports stand out in Malaysia are metal and iron, machinery, and transportation, and exports from Korea's comparative advantage, which are the highest among the ASEAN-5 countries. A comparison of Korea's RCA among the ASEAN-5 countries shows that Korean exports appear to be more competitive in the Malaysian market than in other ASEAN countries. Specifically, in the steel sector, Korean exports were found to be more competitive in Malaysia, owing to the large number of Korean companies. For example, large Korean companies (e.g., POSCO and SeAH Steel Corporation) invest in the Malaysian market through FDI.

Table 7 RCA of Korea in the ASEAN-5 market by commodities in 2023.

Products	Malaysia	Indonesia	Singapore	Philippines	Vietnam
Food and live animals	0	0.27	0.98	0.83	0.32
Crude materials, inedible	1.04	0.79	0.64	0.33	0.03
Mineral fuels, lubricants	1.7	0.44	0.28	0.29	0.49
Animal and vegetable oils, fats	0.8	1.25	0.04	1.46	0.42
Chemicals and related products	2.58	0.94	2.80	4.73	0.27
Manufactured goods	1.175	0.79	0.03	0.02	0.00
Machinery and transport equipment	1.51	1.19	0.30	0.68	0.12
Miscellaneous manufactured	1.47	0.57	0.02	0.04	0.01

Sources: Calculated by the author based on data from UN Comtrade (2023).

In Indonesia, the manufactured goods mineral fuels sector involves more competitive export commodities from Korea to Indonesia, because Indonesia imports a considerable amount of refined oil from Korea. Korea's secondary processed products are highly competitive. In particular, memory, processors and controllers, boilers, and television parts are the top export items, and Korea's intermediate goods manufacturing industry has a comparative advantage in Indonesia.

Chemical products are the most competitive Korean export products to Singapore, followed by food and beverages. Notably, although Korea's overall raw material export proportion is not high, its exports of pearls, precious stones, metals, and coins to Singapore are relatively large and competitive. In the case of the Philippines, Korea's export competitiveness in overall export products is not as high as that in Malaysia, but it has high export competitiveness in the fields of chemical products, food and beverages, and animals and plants. Vietnam's results are puzzling, showing that Korea's export competitiveness is lowest in the Vietnamese market. Vietnam's economic cooperation with Korea is increasing rapidly, and based on these results, the Korean government may need to consider export diversification.

The RCA results are similar to those of Korea's exports to the ASEAN-5 by product. In other words, products with high export volumes appear highly competitive.

5.2 Analysis results using TSI

Table 8 shows Korea's trade specialization index with respect to the ASEAN-5 countries. The data were classified based on HS codes. As this index is calculated based on export volume, the TSI of the top export items is comparatively high. Based on the analysis in Indonesia, TSI is the highest in the following order: refined petroleum, integrated circuits, light rubberized knitted fabric, synthetic rubber, hot-rolled iron, coated flat-rolled iron, and cars. Similar to the RCA results, the TSI of manufactured intermediate goods is high, and the final goods are cantered on vehicles. Malaysia is particularly unusual in that there is competitiveness in primary industries, such as food and live animals, which are not Korea's main industries. Generally, Korea has a competitive advantage in export-specialized products, such as metal products, general machinery, and equipment, and import specialization in mineral products, petrochemical and rubber products, and textile products (Table 8). Overall, the TSI shows that Korea's exports to Malaysia are competitive in the manufacturing sector. However, because the competitiveness of mineral fuels, a major export product of Korea, appears to be relatively low, a change in the current export structure between Korea and Malaysia is necessary.

Table 8 TSI of Korea in the ASEAN-5 market by commodities in 2023.

Products	Malaysia	Indonesia	Singapore	Philippines	Vietnam
Food and live animals	0.94	0.31	0.13	-0.91	-0.71
Crude materials, inedible	0.56	-0.64	0.49	-0.53	-0.29
Mineral fuels, lubricants	0.51	0.84	0.84	0.96	0.96
Animal and vegetable oils, fats	0.74	-	-0.02	-0.97	-0.86
Chemicals and related products	0.88	0.58	-0.48	-0.59	0.72
Manufactured goods	0.86	1.2	0.26	-0.10	0.72
Machinery and transport equipment	0.84	0.78	-0.16	-0.67	0.23
Miscellaneous manufactured	0.94	-0.02	0.02	0.04	0.01

Sources: Calculated by the author based on data from UN Comtrade (2023).

Looking at Korea's trade competitiveness with Singapore according to the classification in Table 6, we can see that there is only one mineral fuels, lubricants and related materials product in 2023. In the case of the remaining eight items, they have a competitive advantage in other ASEAN markets in some cases, but the degree of advantage appears to have weakened as Korea's trade specialization index in Singapore has decreased. In trade with Singapore, import-specialized items with a negative trade specialization index include animal and vegetable oils, organic chemicals, and machinery, as of 2023. The Philippines has characteristics similar to those of Singapore. In the case of Vietnam, the TSI index is relatively high in the petroleum products, chemical products, and other manufacturing sectors, but it does not exceed 1, so it is not very high. In addition, for most raw materials, Vietnam appears to be competitive in terms of trade with Korea.

According to the Federation of Korean Industries, to promote the expansion of Korea's exports in the future, efforts are urgently needed to convert items that are currently

specialized for import into those that are specialize for export. Furthermore, competitiveness must be

strengthened, especially for high-tech products with high demand in the global import market. For example, aircraft, spacecraft, and semiconductor manufacturing equipment are among the top 100 imported goods in the world and require cutting-edge technology; however, Korea appears to be in a state of import specialization with a negative trade specialization index for these items (The Federation of Korean Industries, 2024).

5.3 Analysis results using GLI

Additionally, Korea's GLI in ASEAN was calculated to analyse its export structure. The intra-industry trade index was calculated to identify the characteristics of the trade structure. As an index that measures the degree of intra-industry trade, the GLI was used as shown in the following equation.

In Table 9, Korea shows high intra-industry trade in related industries, such as electronic machinery, inorganic chemicals, and staple fibers. In addition, organic chemical products, copper, and rubber are traded within the industry. This is because intra-industry trade with ASEAN in various industries is closely related to the establishment of global supply chains and the promotion of division of labour by multinational companies using ASEAN labour to reduce costs. China has served as Korea's global production base since 2000; however, owing to the recent slowdown in China's economic growth, the role of ASEAN countries is being highlighted (Cho and Oh, 2016). In the case of vehicles, plastics, and boilers, the intra-industry trade index is very low, indicating that Korea's one-way exports occur in these fields. Moreover, the trade structure between Korea and ASEAN is asymmetrical, in that the intra-industry trade index is low for final export products, which do not account for a high proportion of exports between the two countries. This index also indicates that Korea has a comparative advantage in terms of export competitiveness in vehicles, plastics, and boilers.

Table 9 GLI of Korea in the ASEAN-5 market by commodities in 2023.

HS code	Commodity	GLI
87	Vehicles; other than Railway or Tramway Rolling Stock, and parts and accessories there of	0.12985023
39	Plastics and articles there of	0.16397504
84	Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; parts there of	0.17291326
62	Apparel and Clothing accessories; not Knitted or Crocheted	0.24903758
27	Mineral Fuels, Mineral Oils and Products of their Distillation; Bituminous Substances; Mineral Waxes	0.33218672
38	Chemical Products N.E.C.	0.56863631
48	Paper and Paperboard; article of Paper Pulp, of Paper or Paperboard	0.6143283
72	Iron and Steel	0.63158553
40	Rubber and articles there of	0.77389135
74	Copper and articles there of	0.79598557
29	Organic chemicals	0.7971853
85	Electrical Machinery and Equipment and part there of; Sound Recorders and Reproducers; Television Image and Sound Recorders and Reproducers, parts and accessories of such articles	0.82184792
28	Inorganic Chemicals; Organic and Inorganic Compounds of Precious Metals; of Rare Earth Metals, of Radioactive Elements and of Isotopes	0.84727505
55	Man-made Staple Fibers	0.84828939

Note: Indonesia, Malaysia, Singapore, Philippines, Vietnam.
Sources: Calculated by the author based on data from UN Comtrade (2023).

6. CONCLUSIONS

Owing to China's slowing economic growth and the COVID-19 pandemic, volatility in the global economy has intensified. However, previous research found that trade has provided sustained foreign demand for exports and ensured the availability of imported intermediate products and services. And despite these changes in the international economy, ASEAN's economic growth and potential are expected. At this point, Korea needs to deepen its economic cooperation with the major ASEAN countries to facilitate GVC participation and enhance economic contribution. This study analyse Korean export competitiveness in the ASEAN market to improve Korea's industrial competitiveness and deepen economic cooperation by reconstruction GVC.

For these reasons, this study analyses the RCA, TSI, and GLI indices between Korea and the ASEAN-5 countries. The analysis shows that the GVC structure of Korea and ASEAN-5 is highest in intermediate goods, and Korea's competitive advantage (RCI) in intermediate goods is also high. Analysing the export specialization index (TSI) between Korea and the ASEAN-5 to determine export competitiveness by item shows that it is high in integrated circuits, fabric, and other manufactured products. First, petrochemical products and machinery are dominant among items with relatively strong competitiveness. Items belonging to the weak group include raw materials, such as food, animals, and crude oil, which show absolute inferiority in competitiveness. This demonstrates that the trade structures of the ASEAN and Korea are complementary. Second, different results are shown by country, indicating that the major ASEAN countries have different trade structures. Therefore, an individual approach through FTA with individual countries is required. Third, after the COVID-19 pandemic, Korea's manufacturing export competitiveness appears to be weakening with the ASEAN, indicating urgent need for Korea's R&D.

By contrast, interindustry trade (GLI) showed a high proportion of textiles, inorganic chemicals, electronic products, organic chemicals, copper, and rubber. Export

products with a high proportion of exports from Korea to ASEAN countries include automobiles, plastics, and machinery. Therefore, among intermediate goods, the industries in which Korea has export competitiveness in the ASEAN trade market include fibers, machinery parts, and automobile parts. In this field, Korean companies should increase their technological competitiveness, and the Korean government should utilize the FTA to facilitate the entry of companies into the Indonesian market. Finally, new export opportunities will arise in the enhanced participation of GVCs, as Korea improve their production techniques and cooperative policy framework and ensuring that they have capacity to exploit ASEAN market in which they can be competitive in global trade.

DATA AVAILABILITY STATEMENTS

Data available upon request to the authors.

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