Master's Thesis of International Commerce

Reevaluate Trade Relations between Korea and China

- In the Perspective of Competition under GVCs-

한중 무역관계 재평가

– GVCs 경쟁 의 관점을 중심으로 –

February 2023

Graduate School of International Studies
Seoul National University
International Commerce Major

SHANG Jinghao

Reevaluate Trade Relations between Korea and China

- In the Perspective of Competition under GVCs-

한중 무역관계 재평가

- GVCs 경쟁 의 관점을 중심으로 -

Academic Advisor Prof. Cheong Young-Rok

Submitting a master's thesis of
International Commerce

February 2023

Graduate School of International Studies
Seoul National University
International Commerce Major

SHANG Jinghao

Confirming the master's thesis written by
SHANG Jinghao
February 2023

Chair	Prof. Moon Woo Sik	(Seal)
Vice Chair	Prof. Sheen Seong Ho	(Seal)
Examiner	Prof. Cheong, Young-Rok	(Seal)

Abstract

Using the value added decomposition in WWZ (2018) method, this thesis discovered that China's demand for Korea's final goods is disproportionate less than vice versa, and the increase of bilateral trade is mostly promoted by trade in intermediate goods. It shows that most of China and Korea Trade are inter-sector trade. China has a similar Revealed comparative advantage (RCA) distribution with Korea, and most of the value added trade is contributed by several industries and almost half is dominated by one single industry: C14 Electrical and optical equipment, the sector of memory chips and display production. So, C14 and other representative industries in Korea would face possible competition with China in overseas market with its technology upgrading and from domestic substitution to export orientation, like Shipment Building, automobile battery and electronic vehicle manufacturing. The relatively higher RCA of Korea shows the severity of Korea's reliance on these sectors that are overlapping with China, and may compete with Chinese products in China and other overseas market in the future. According to all above mentioned symptoms, this thesis conclude that the bilateral trade volume might almost peaked, and apart from that, the overseas competition between the two countries may erode the current global share that now grasped by Korea. To tackle that scenario, both countries must explore new ways of cooperation and further integration.

Keyword : China Korea trade, Trade Competition, Global Value Chains, Value Added Decomposition

Student Number : 202224313

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

1 Introduction

1.1、 Study Background

China and Korea economic relations have been developing steadily for a long time. By 2021, Korea has maintained China as the largest trading partner, and China has become Korea's largest trading partner in the world for five consecutive years. Korea mainly produces technology-intensive and capital-intensive products, while China mainly obtains advanced parts from developed economies such as Korea for assembly and at the same time, learning technology. However, the current international order is changing.

At present, as China launches industrial policies such as “made in China 2025” and vigorously supports high-end manufacturing, Korea's trade competitiveness is being challenged, Chinese enterprises have now begun to export more and more high-tech industrial products, which used to be Korea's strong points, especially in the field of Ship Building; Motor vehicles; Consumer Electronics and Semi-conductors such as Memory Industries. Second, Korea is lagging behind in the information manufacturing industry. Korea relies too much on the inertia development path of traditional advantageous industries such as machinery, automobile and chemical industry, and lacks keen judgment and self-adjustment ability to shift the industrial center of gravity of the world economy in the information and intelligent age. In some emerging fields, traditional advantages are difficult to cope with the change of age. Take the automobile industry as an example, Korean cars in the field of fuel vehicles are in a well-deserved leading position, while in the era of automobile electrification and automobile intelligence, Korean Hyundai, KIA are obviously lag behind (in terms of sales share) the new car-building forces such as Tesla of the United States and China, such as Xiaopeng and NIO. In terms of battery manufacturing, the production volumes of LG and SK and Samsung are lagging behind Chinese counterpart such as CATL, BYD.

1.2、 Research Questions

Due to the different trade endowment of China and Korea in the global value chain, the economic and trade ties between China and Korea have been close since China began to “reform and opening up”. However, as China growing bigger and stronger, while launching industrial policies and vigorously supports high-end manufacturing, it is questionable the win-win relationship would turn to be more competitive. So, is China and Korea trade relationship starting to shift from mutual benefit to competitiveness? Is the growing concern of the Korean politician comes from the subtle changes of the bilateral trade relationships?

1.3、 Methodology and Data

This thesis use GVC as analytical Framework. Global production, international trade and foreign direct investment are increasingly integrated with global value chains. Global Value Chains refers to the vertical integration of production processes between different countries based on economies of scale and dynamic comparative advantage helps countries to increase productivity and social wealth. Global production makes enterprises do not need to distribute resources to the whole production chain, but only focus on specific links such as intermediate product production or R&D activities in the value chain. Robert Koopman decomposes a country's total exports according to domestic and foreign parts, and analyzes the different sources of value in exports (Koopman 2010).

This thesis use UIBE database as the tool and ADB-MRIO2021 as the content. The methodology of this paper is to use database to make quantity comparison of specific sectors so as to draw a judgment from the bottom-up angle. These papers uses the UIBE database as the main source, which is a newly released secondary data resource in the field of global value chain and international trade, and UIBE extracted the database as follows:

ICIO tables	Number of economies	Number of industries	Time periods
WIOD2013	40	35	1995-2011
WIOD2016	43	56	2000-2014
OECD-ICIO 2017	64	34	1995-2014
GTAP-ICIO	121	43	2004, 2007, 2011
ADB-MRIO2022	63	35	2000, 2007-2021
Eroa(pending)	189	26	1990-2015

These above mentioned databases have their own characteristics, but considering that this article needs to analyze the characteristics of China-Korea relations in recent years, the ADB-MRIO2022 database with the most comprehensive data in the past ten years is selected as the original data of this thesis.

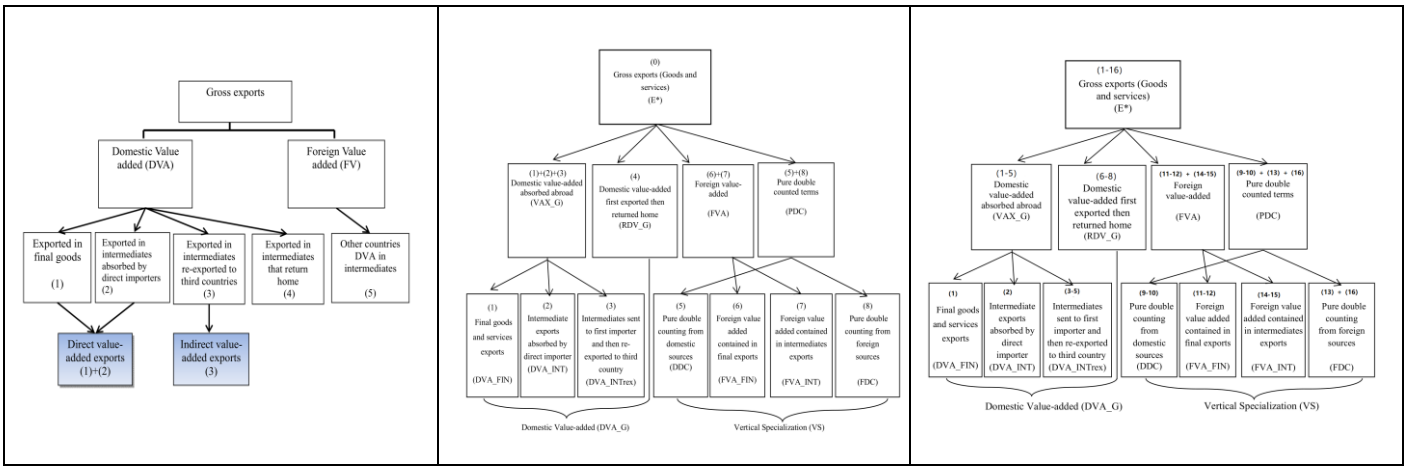
2 Literature Review

2.1、 Global Value Chain and Value Added

Added value refers to the value created through labor and equipment processing, intellectual input, thus exceeds the value of raw and auxiliary materials. In other words, value added in Global Value Chains (GVCs) is the “gain” of and in collaboration (Pang, 2021). The value-added structure is the deep structure of the GVCs, and it needs to be decomposed, traced and aggregated to reveal the global trade. The main method for global value added trade decomposition of in a country's gross exports is the Leontief decomposition using cross-country input-output (ICIO) tables (Balassa, 1965).

It is only Koopman et al (2010) invented cross country cross sector value added tracing that the research on GVCs starts to be prosperous. Then Koopman and Wang (2014) improved its methodology by taking account the calculation of domestic and foreign double counting. In 2014, they further subdivided into nine sections according to the final destination of the export value. Koopman proposed a decomposition method for a country’s total exports, decomposing exports into four parts with different economic meanings: the added value absorbed by foreign countries, the added value returned to the country, the added value abroad, and the intermediate trade goods that are purely double-counted. However, the method of Koopman et al. can only decompose a country’s total exports, and cannot reflect the heterogeneity of different export products in the decomposition of various added values and double counting. On 2018, Wang furthermore improved the method to include the methodology to be adaptable to contain not only single country analysis, but country to country, country to sector, and country to country/sector analysis together, and because of that the data and analysis of this paper is made possible. In Wang’s paper (2014), the decomposition is respectively: (1) Final goods and services exports (DVA_FIN) (2) Intermediate exports absorbed by direct importer (DVA_INT) (3) Intermediates sent to first importer and then re-exported to third country (DVA_INTrex) (5) Pure double counting from domestic sources (DDC) (6) Foreign value added contained in final exports (FVA_FIN) (8) Pure double counting from foreign sources (FDC) (7) Foreign value added contained in intermediates exports (FVA_INT). But in this paper, we further simplified the 8 parts to **DVA(1,2,3), DVArex(4), FVA, DDC(6,7) and FDC(5,8).**

Table 1 Decomposition method in WWZ 2010, WWZ 2014 and WWYZ 2018



Source: Koopman and Wang 2010, Koopman and Wang 2014, 1.3 the author revised.

Table 2 General Inter-Country Input-Output table as an example

Outputs / Inputs		Intermediate Use				Final Demand				Total Output
		1	2	⋯	G	1	2	⋯	G	
Intermediate Inputs	1	Z^{11}	Z^{12}	⋯	Z^{1g}	Y^{11}	Y^{12}	⋯	Y^{1g}	X^1
	2	Z^{21}	Z^{22}	⋯	Z^{2g}	Y^{21}	Y^{22}	⋯	Y^{2g}	X^2
	⋮	⋮	⋮	⋱	⋮	⋮	⋮	⋱	⋮	⋮
	G	Z^{g1}	Z^{g2}	⋯	Z^{gg}	Y^{g1}	Y^{g2}	⋯	Y^{gg}	X^g
Value-added		Va^1	Va^2	⋯	Va^g					
Total input		$(X^1)'$	$(X^2)'$	⋯	$(X^g)'$					

Source: UIBE Global Value Chain Indexes System – Concept Note, abstracted from the paper

Analyzing the inter-country input-output (ICIO) table is one of the main methods to systematically describe the global value chain, ICIO a multivariate network expressed in the form of a multi-matrix with a complex data structure. The ICIO table consists of four components, namely the total output matrix (X), the intermediate goods matrix (Z), the final consumer goods matrix (Y) and the value added matrix (VA), where the total output is equal to the sum of intermediate goods and final consumer goods, that is, **X=Z+Y.**

When analyzing an input-output table containing G industries in N countries, a dimension of NG×NG, we introduce A as "Input-output intermediate coefficient matrix" so that **Z=AX**.

Connect **X=Z+Y** and **Z=AX** together to get **X=AX+Y**, and simply transform it into **X= (I-A)$^{-1}$Y**, and **(1-A)$^{-1}$** is "Leontief inverse Matrix", generally denoted as B.

Suppose G=3 and N=3, where **X=BY** can be extended to

$$\begin{bmatrix} X^1 \\ X^2 \\ X^3 \end{bmatrix} = \begin{bmatrix} B^{11} & B^{12} & B^{13} \\ B^{21} & B^{22} & B^{23} \\ B^{31} & B^{32} & B^{33} \end{bmatrix} \begin{bmatrix} Y^{11} & Y^{12} & Y^{13} \\ Y^{21} & Y^{22} & Y^{23} \\ Y^{31} & Y^{32} & Y^{33} \end{bmatrix}$$

So $X^1=B^{11}Y^{11}+B^{12}Y^{21}+B^{13}Y^{31}+B^{11}Y^{12}+B^{12}Y^{22}+B^{13}Y^{32}+B^{11}Y^{13}+B^{12}Y^{23}+B^{13}Y^{33}$,

Use E^{21} to represent the export of country 2 to country 1,which include final export $Z^{21}=A^{21}X^1$ and intermediate export Y^{21}, as $E^{21}= A^{21}X^1+Y^{21}$。The total export of country 2 can be expressed as: $E^2= E^{21}+ E^{23}= A^{21}X^1+Y^{21}+A^{23}X^3+Y^{23}$, similarly we can have E^1 and E^3.

Define V_i as the "value-added ratio matrix" of each industry in country i, the matrix dimension is G×G, the diagonal elements are the direct value-added coefficients of each industry $V^i_s=Va^i_s/X^i_s$ (the subscript s represents the industry), and the other elements are 0. At the end of the decomposition, we can get 8 parts or 16 parts of the value added source(Table 3), and in this paper, we rearrange the 8 parts to 5 parts (Wang, 2017), which are DVA, DVArex, FVA, DDC and FDC.

Table 3 Koopman and Wang (2013) value added sourcing

Category	Label	Terms	Math	Description
1	DVA_FIN	1	$(V^s B^{ss})^T \# Y^{sr}$	DVA embodied in final exports
2	DVA_INT	2	$(V^s L^{ss})^T \# (A^{sr} B^{rr} Y^{rr})$	DVA in intermediate exports used by direct importer (r) to produce local final products
3	DVA_INTrex	3	$(V^s L^{ss})^T \# (A^{sr} \sum_{t \neq s,r}^{G} B^{rt} Y^{tt})$	DVA in intermediate exports used to produce intermediates that are re-exported to third countries for production of local final products
		4	$(V^s L^{ss})^T \# (A^{sr} B^{rr} \sum_{t \neq s,r}^{G} Y^{rt})$	DVA in intermediate exports used by r to produce final products that are re-exported to third countries
		5	$(V^s L^{ss})^T \# (A^{sr} \sum_{t \neq s,r}^{G} B^{rt} \sum_{u \neq s,t}^{G} Y^{tu})$	DVA in intermediate exports used by r to produce intermediates that are re-exported to t for the latter's production of final exports that are shipped to other countries except Country s
4	RDV_G	6	$(V^s L^{ss})^T \# (A^{sr} B^{rr} Y^{rs})$	DVA that returns home via its final imports from r
		7	$(V^s L^{ss})^T \# (A^{sr} \sum_{t \neq s,r}^{G} B^{rt} Y^{ts})$	DVA that returns home via final imports from third countries
		8	$(V^s L^{ss})^T \# (A^{sr} B^{rs} Y^{ss})$	DVA that returns home via its intermediate imports and used to produce domestic final products
5	DDC	9	$(V^s L^{ss})^T \# (A^{sr} B^{rs} \sum_{t \neq s}^{G} Y^{st})$	DVA embodied in its intermediate exports to Country r but returns home as its intermediate imports, and used for production of its final exports
		10	$(V^s L^{ss} \sum_{t \neq s}^{G} A^{st} B^{ts})^T \# (A^{sr} X^r)$	DVA in intermediate exports to Country r that returns home as intermediate imports and used for production of its intermediate exports
6	FVA_FIN	11	$(V^r B^{rs})^T \# Y^{sr}$	FVA from the importer (r) embodied in final exports
		12	$(\sum_{t \neq s,r}^{G} V^t B^{ts})^T \# Y^{sr}$	FVA from other Countries (t) embodied in final exports
7	FVA_INT	13	$(V^r B^{rs})^T \# (A^{sr} L^{rr} Y^{rr})$	FVA from the importer (r) embodied in intermediate exports, which are then used by r to produce its domestic final goods
		14	$(\sum_{t \neq s,r}^{G} V^t B^{ts})^T \# (A^{sr} L^{rr} Y^{rr})$	FVA from third Country t embodied in intermediate exports, which are then used by Country r to produce its local final goods
8	FDC	15	$(V^r B^{rs})^T \# (A^{sr} L^{rr} E^{r*})$	FVA from the importer (r) embodied in intermediate exports to produce its exports
		16	$(\sum_{t \neq s,r}^{G} V^t B^{ts})^T \# (A^{sr} L^{rr} E^{r*})$	FVA from third Country t embodied in intermediate exports to produce its exports to the world

Source: Wang et al. 2018, abstracted from the paper

2.2、 Perception on Sino-Korea Trade

Regarding the Sino-Korea trade relations, Hwang has already noticed that the Sino-Korean trade has considerable similarities in the industrial and export structures of the two countries, and the technology gap between Korea and China has narrowed to only a few years, so competition in the global market is inevitable (Hwang, 2021). Tomoo Marukawa used Overlaps in export value (OVic) to imply that competition with China has increased in Japan, Korea, the Philippines and Vietnam, but it

has weakened in Indonesia. Korea faced Chinese competition in a wider range of products in 2018 than in 2000 (Marukawa 2021).

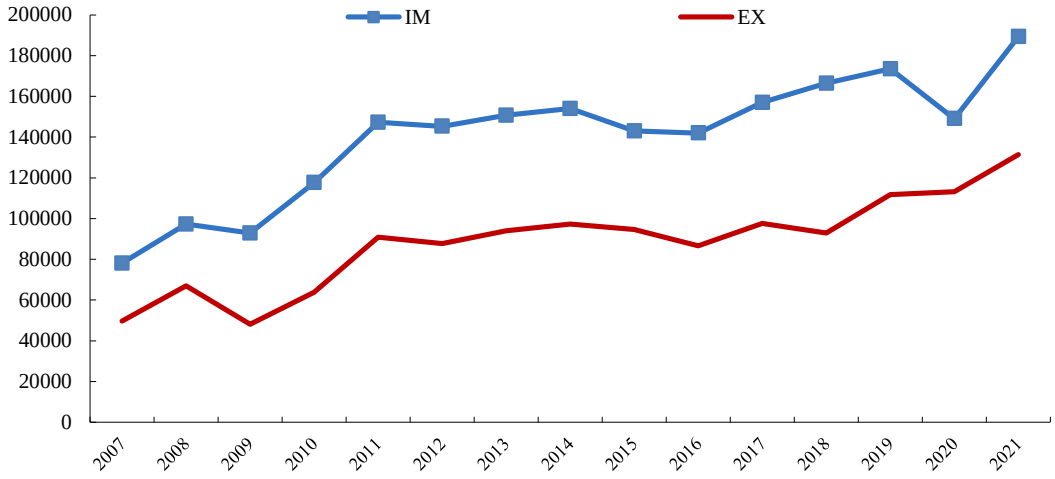
Regarding Global Value chains, Yin (2017) concluded Theoretical Integration of Global Value Chains, and Pang (2021) used GVCs to analyze the structural power and thus depicted the evolution of the international system in global value chains. Koopman also used the methodology that himself devised to depict the Chinese economy (Koopman et al. 2013). However, none of the above mentioned paper analyzed and depicted the key symptom of China and Korea's trade relations through the angle of GVCs and value added data. The third part of thesis use GVCs as tools to depict the China and Korea trade, and then in the fifth part, this thesis choose some of the most intensified sector to have a further qualitative analysis.

3 Bilateral Trade Overview

3.1、 Final and Intermediate goods

China and Korea's bilateral trade has increased steadily. The annual trade volume between China and Korea has grown rapidly from less than US$5 billion at the beginning of the establishment of diplomatic relations to more than US$300 billion, increased 72 times that of the year when diplomatic relations were established. China has been Korea's largest trading partner, largest export market and largest source of imports for many years, and Korea has also been China's third largest trading partner for many years (see figure 1) .

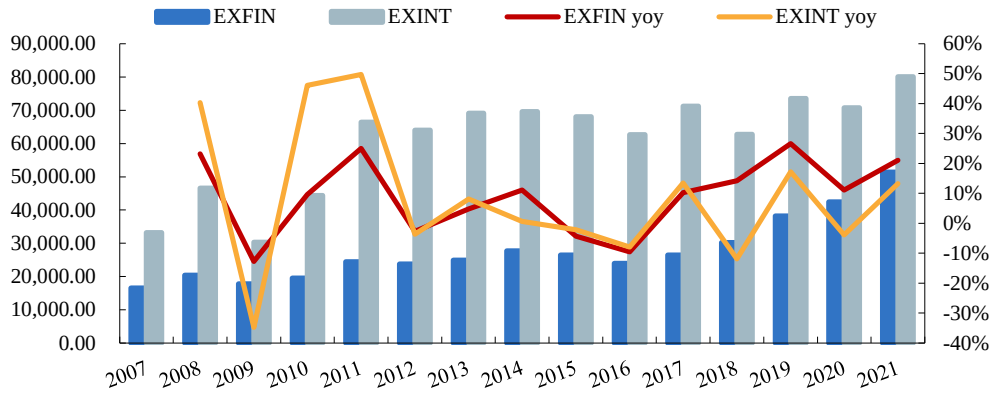
Figure 1 China's exports to Korea and Imports from Korea, in gross trade, millions



Data source: ADB-MRIO2022

In the past, a typical feature of China and Korea trade cooperation is that Korea exported intermediate products such as parts and components to China, and China then processed them into finished products and sold them back. From 2009 to 2012, the main driven force of China export to Korea is intermediate goods. Today, with the improvement of China's manufacturing capabilities, and the upgrading of industrial structure, China is now more good at exports final goods with the EXFIN yoy continue to rise since 2016, and, China's final goods exports yoy have outpaced the yoy growth rate of its intermediate exports since 2018(see figure 2). Under such circumstances, there are also many voices in Korea, suggesting that the government take necessary measures to discover high value-added export products and strengthen export competitiveness to China.

Figure 2 China's export to Korea as Final Goods (EXFIN) & as intermediates (EXINT), millions

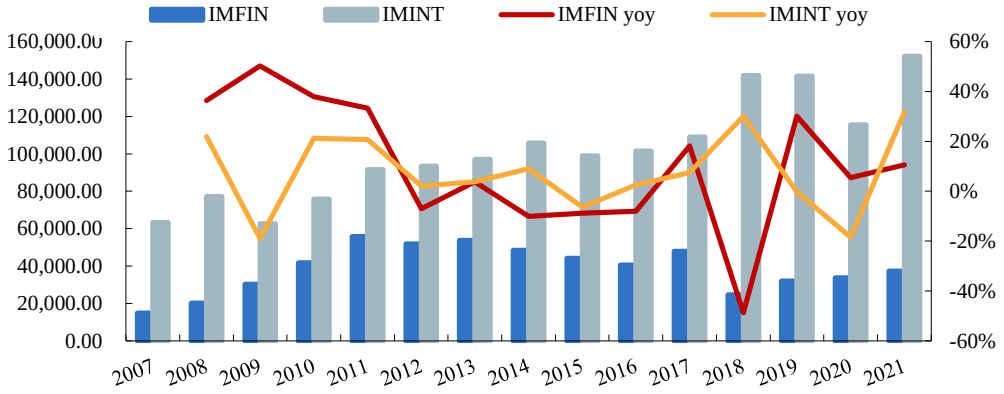


Data source: ADB-MRIO2022, Author's derivation using UIBE database

From 2007 to 2011, due to the great gap of product quality and manufacturing capabilities between China and Korea, imports of final goods increased significantly higher than that of intermediate goods. However in terms of volume, imports of intermediate products still outnumber final products at that time. But behind the rapid development of economic and trade relations between China and Korea during the decade, the highest volume of final products imported into Korea by China was quietly reached in 2011. Since then, China's imports of Korean final products, instead of growing, have maintained a downward trend with an average annual decline of 1.46%. The steady growth of China's imports from Korea in the last decade has been literally fully contributed by intermediate goods, with the compound annual average growth of imports of intermediate goods reached 7.61% from 2007 to 2021(see figure 3). Besides, the 2020 decrease of the imports volume is fully contributed by

intermediates as well.

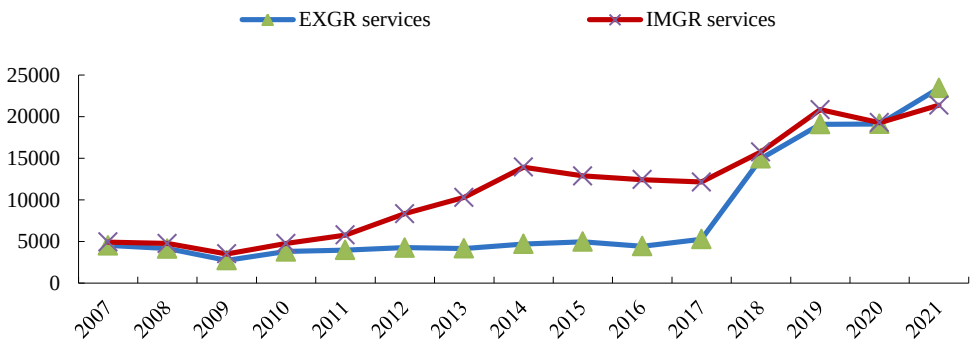
Figure 3 China's import to Korea as Final Goods (IMFIN) & as intermediates (IMINT), millions



Data source: ADB-MRIO2022, Author's derivation using UIBE database

After seeing the hidden problems of China-Korea trade in goods, what is perhaps exciting is the China-Korea trade in productive services. Since 2009, China's imports to Korea's trade in terms of "services related to production" have grown steadily, showing that China is gradually absorbing Korea's advanced management experience. And since 2017, Korea's imports of services related to production to China suddenly rose, perhaps due to the fact that China has formed industrial clusters with a significant increase in the competitiveness of industries such as automobile batteries and semiconductors.

Figure 4 China to Korea's export and import in terms of "services related to production", millions



Data source: ADB-MRIO2022, Author's derivation using UIBE database

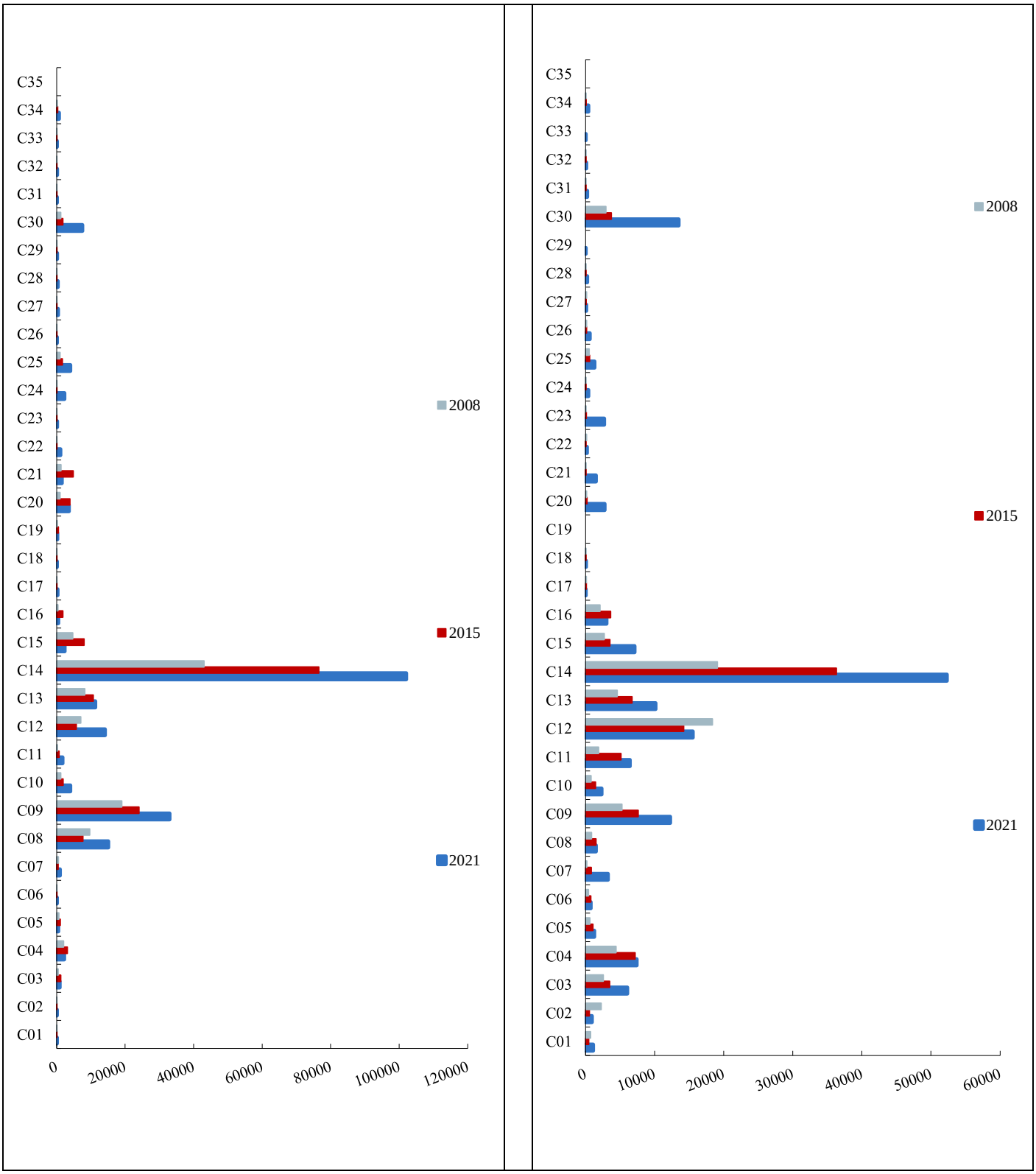
By splitting China's imports and exports to Korea and splitting its respective shares of final and intermediate goods, we can see that China's trade with Korea is imbalanced, with half danger and half opportunity. Korea's demand for both intermediate and final goods from China is steadily increasing, while the future for Korea’s export to China is gloomy, for the share of final goods in total export is small in terms of trade structure, and growth rate has staled of China's final goods imports from Korea. In addition, trade in services related to production between China and Korea has grown rapidly in recent years, and is expected to achieve greater contribution in the future.

3.2、 Trade Structure in Industries

The figure below gives the distribution of China's imports from Korea and the distribution of China's exports to Korea in 35 industries. We can see that the trade between China and Korea is in fact mostly intra-industry trade, which is also reflected the trade characteristics between other East Asian countries. The main industries traded are:

Code	Industry Name
c8	Coke, refined petroleum, and nuclear fuel
c9	Chemicals and chemical products
c12	Basic metals and fabricated metal
c13	Machinery, nec
c14	Electrical and optical equipment
c15	Transport equipment
c30	Renting of M&Eq and other business activities

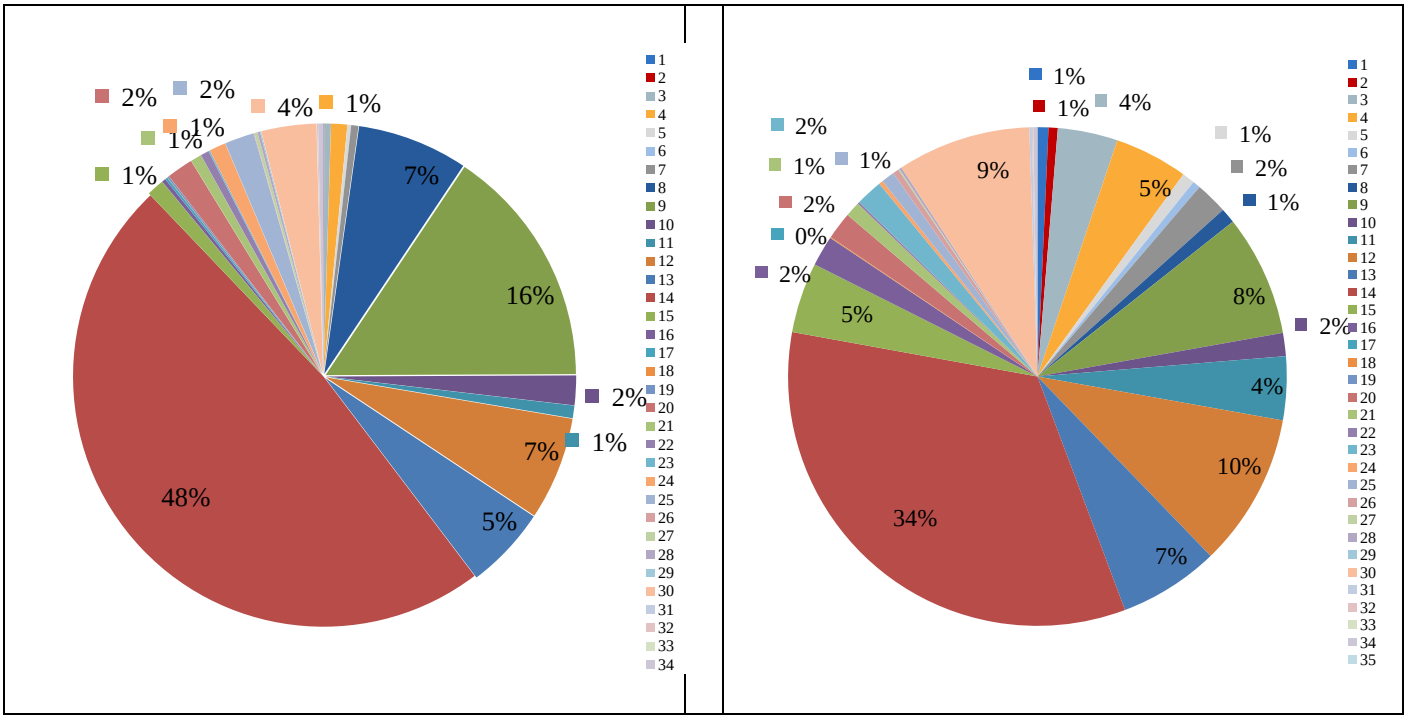
Figure 5 China's exports and imports to and from Korea, in industries, millions



Data source: ADB-MRIO2022, Author's derivation using UIBE database

The above figure shows that the bilateral trade volume between China and Korea also grows unevenly within industries (if not only within the stream of GVCs). The increase in trade volume from 2008 to 2015, and then to 2021, are achieved only in a few industries such as C09(**Chemicals and chemical products**), C13(**Machinery**), C14(**Electrical and optical equipment**), and C30(**Renting of M&Eq and other business activities**). In other words, the prosperity of trade relations between China and Korea is really only dependent on these few specific industries.

Figure 6 Share of China to Korea's imports & exports, in industries, in 2021



Data source: ADB-MRIO2022, Author's derivation using UIBE database

The most striking conclusion of the above chart is the importance of the C14 (electrical and optical equipment) industry. C14 accounts for 48% of China's imports from Korea and 34% of China's exports to Korea. In other words, if we can judge the trend of China-Korea trade in C14 industry, then the overall situation of China-Korea trade can be clear with it. Beside, other industries that also deserve attention are listed in the table below, and they are industries that account for more than 5% of the unilateral trade volume between China and Korea.

Table 4 Code and Name of 35 Industry, and important industries noteworthy

Code	Industry Name	Noteworthy reminder(from PRC side) more than 5%_Industry accounts for:
c1	Agriculture, hunting, forestry, and fishing	
c2	Mining and quarrying	

c3	Food, beverages, and tobacco	
c4	Textiles and textile products	
c5	Leather, leather products, and footwear	
c6	Wood and products of wood and cork	
c7	Pulp, paper, paper products, printing, and publishing	
c8	**Coke, refined petroleum, and nuclear fuel**	**7% of IM and 1% of EX**
c9	**Chemicals and chemical products**	**16% of IM and 8% of EX**
c10	Rubber and plastics	
c11	Other nonmetallic minerals	
c12	**Basic metals and fabricated metal**	**7% of IM and 10% of EX**
c13	**Machinery**	**5% of IM and 7% of EX**
c14	**Electrical and optical equipment**	**48% of IM and 34% of EX**
c15	**Transport equipment**	**1% of IM and 5% of EX**
c16	Manufacturing, nec; recycling	
c17	Electricity, gas, and water supply	
c18	Construction	
c19	Sale, maintenance, and repair of motor vehicles and motorcycles; retail sale of fuel	
c20	Wholesale trade and commission trade, except of motor vehicles and motorcycles	
c21	Retail trade, except of motor vehicles and motorcycles; repair of household goods	
c22	Hotels and restaurants	
c23	Inland transport	
c24	Water transport	
c25	Air transport	
c26	Other supporting and auxiliary transport activities; activities of travel agencies	
c27	Post and telecommunications	
c28	Financial intermediation	
c29	Real estate activities	
c30	**Renting of M&Eq and other business activities**	**4% of IM and 9% of EX**
c31	Public administration and defense; compulsory social security	
c32	Education	
c33	Health and social work	
c34	Other community, social, and personal services	
c35	Private households with employed persons	

3.3、 Domestic and Foreign Value Added

According to the method proposed in the literature review, we decompose the added value of bilateral exports of China and Korea into five items, FDC, FVA, DDC, DVArt and DVAex, which stands for Foreign Double Counting, Foreign Value Added, Domestic Value Added and then returned to home, and Domestic Value Added used for export. The decomposition used the method of WWZ(Wang, et, al, 2017).

Figure 7 Simplified Chart of Koopman's 8 parts and 16 parts decomposition

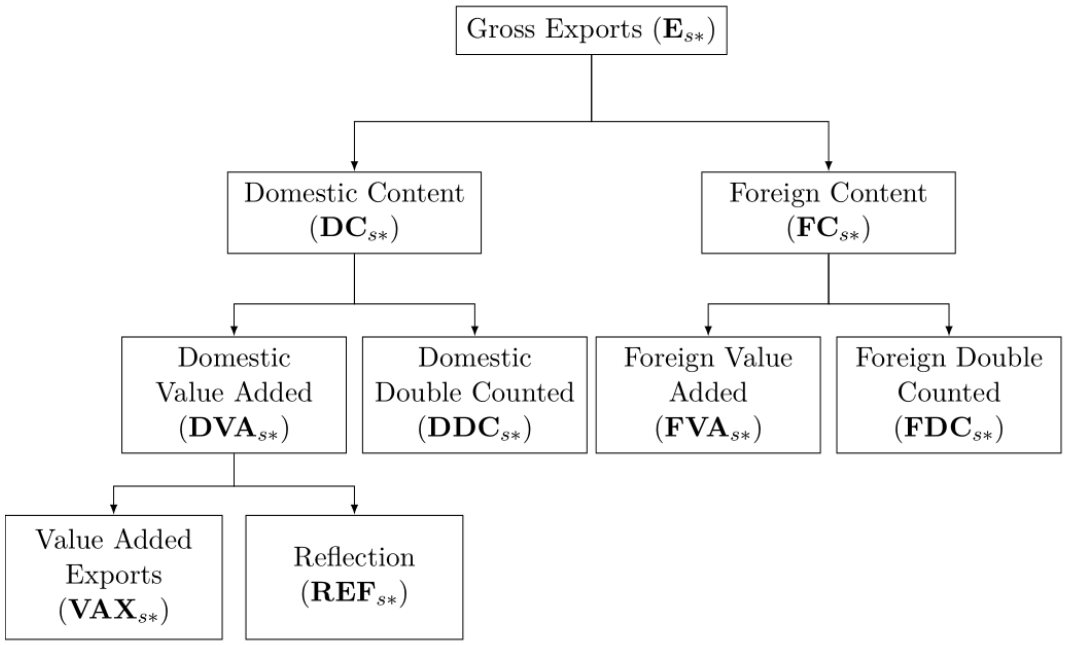
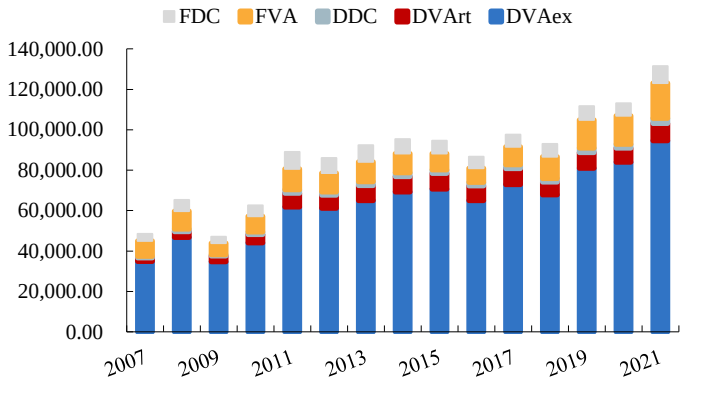
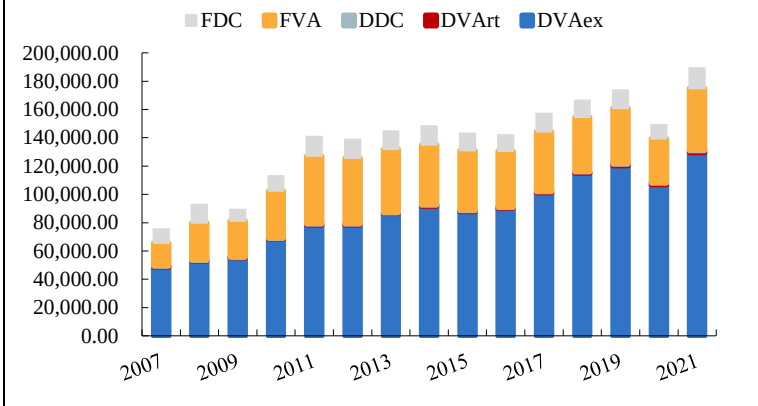


Figure 8 decomposition of Goods trade China's export to (left) and import from Korea (right)

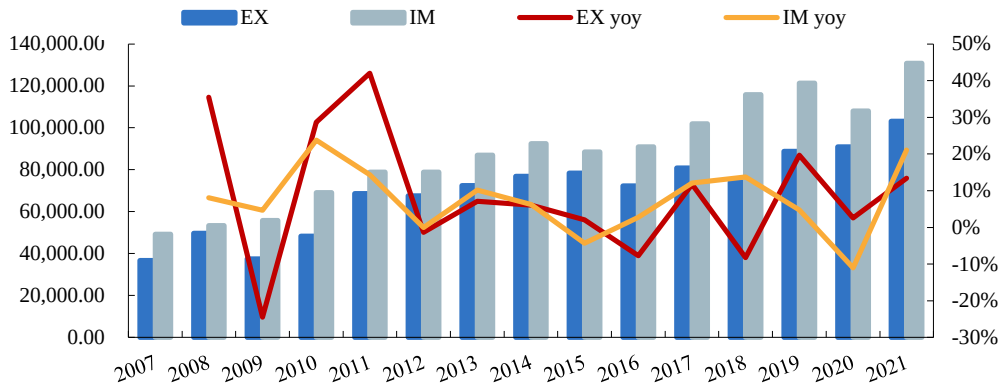




Data source: ADB-MRIO2022, Author's derivation using UIBE database

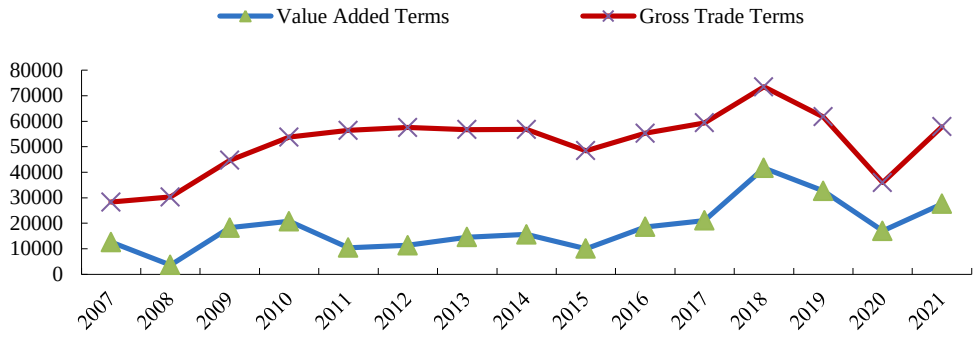
Overall, the share of DVA in China's exports to Korea is much higher than the share of DVA in Korea's exports to China. However, considering that Korean exports have been larger than Chinese exports (China in trade deficit with Korea) for all the time, the actual deficit in value added terms may not be as large as the gross trade data suggested, but China still has a deficit with Korea in value added terms as well.

Figure 9 Domestic Value Added for China' export to and import from Korea, millions USD



Data source: ADB-MRIO2022, Author's derivation using UIBE database

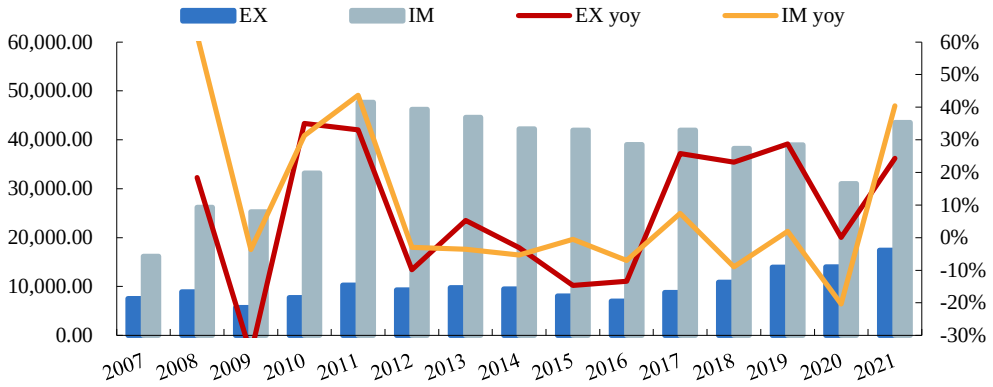
Figure 10 China and Korea's Trade Deficit is much smaller in value added terms



Data source: ADB-MRIO2022, Author's derivation using UIBE database

In terms of Foreign Value Added, the share of foreign value added in China's exports to Korea has been very small, while the share of foreign value added in exports from Korea to China is relatively larger. The domestic value added of exports and imports of China relative to Korea has grown more steadily over the last decade, while the foreign value added of exports from China has grown faster than Korea since 2017. This is perhaps reflecting China's deeper integration into the global value chain over the last five years, thus has resulted in a faster growth rate of foreign value added of exports compared to Korea.

Figure 11 Foreign Value Added for China' export to and import from Korea, millions USD



Data source: ADB-MRIO2022, Author's derivation using UIBE database

3.4、 Revealed Comparative Advantage in year

The concept of Revealed Comparative Advantage is proposed by Balassa(1965), In general, When a country has a revealed comparative advantage for a given product or a given industry(RCA >1), it is inferred to be a competitive producer and exporter of that product relative to a country producing and exporting that good at or below the world average(Wang and Koopman, 2010). When the RCA is below one, the country is said to have a revealed comparative disadvantage in that sector. A country with a revealed comparative advantage in product is considered to have export strength in that product (UNCTAD, 2022). The calculating method of RCA is

$$RCA_{Ai} = \frac{\frac{X_{Ai}}{\sum_{j \in P} X_{Aj}}}{\frac{X_{wi}}{\sum_{j \in P} X_{wj}}} \geq 1$$

Where P is the set of all products (with i∈P),

XAi is the country A's exports of product i,

Xwi is the worlds's exports of product i,

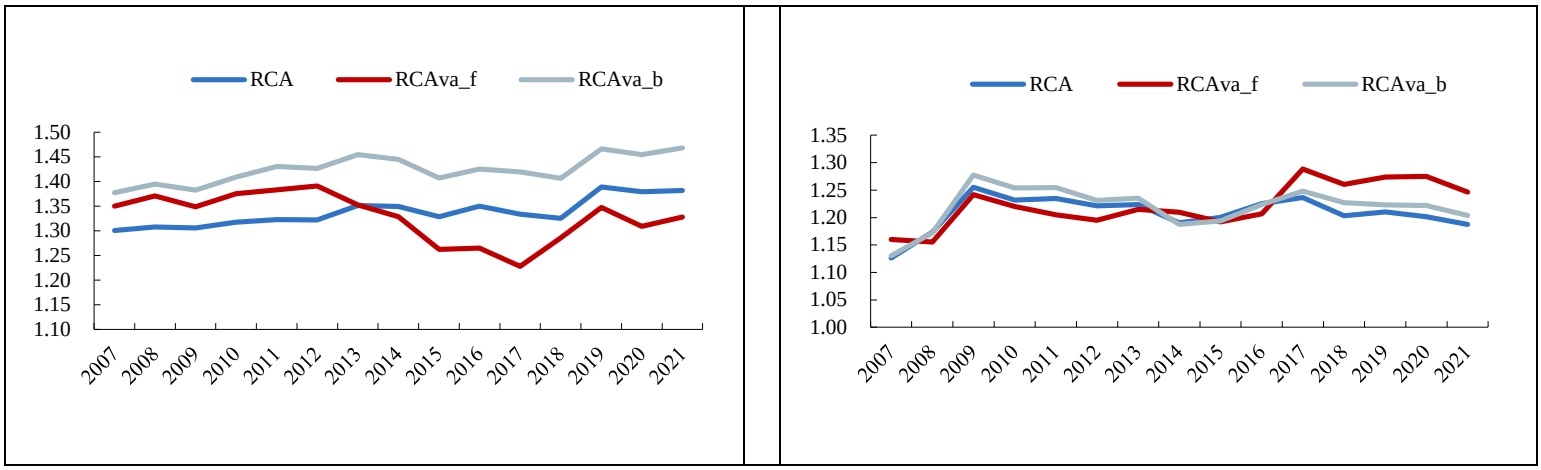
Σj∈PXAj is the country A's total exports (of all products j in P), and

Σj∈PXwj is the world's total exports (of all products j in P).

Wang and Koopman further improved the equation in calculating RCA, Changed the RCA ratio as calculating gross export, to the value added export, and further performed it to two types, forward decomposition, the decomposition of value added/industry GDP; and backward decomposition, the decomposition of final product (Wang and Wei, 2013). The following figure shows the RCAva in

forward decomposition and RCAva in backward decomposition, and the RCA index in value added is the sum of RCAva_f and RCAva_b, namely RCA= RCAva_f+ RCAva_b. In general, China's RCAva_b is obviously higher than its RCAva_f, and Korea's RCAva_f is higher than its RCAva_b. It means compared with Korea, the China's economy is still a type of "Processing on Order", relies on foreign high tech parts and components.

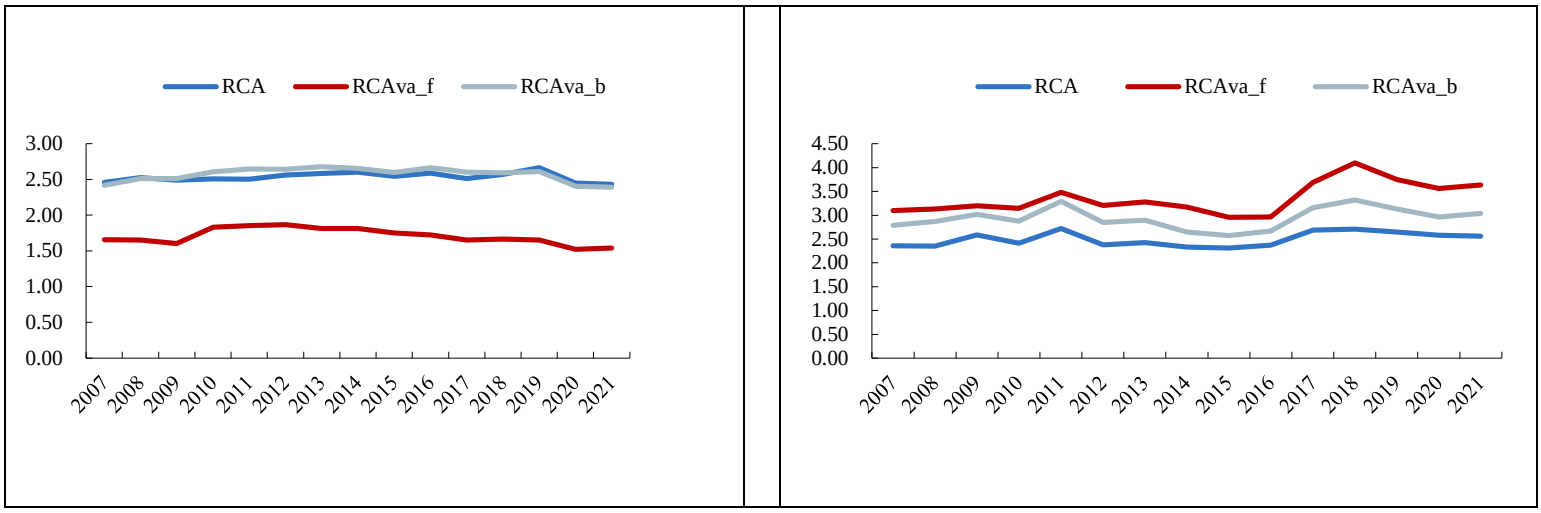
Figure 12 China (left) and Korea's (right) RCA in Goods comparison



Data source: ADB-MRIO2022, Author's derivation using UIBE database

Take C14 Electrical and optical equipment as an example, China's RCAva_f is significantly lower than that of Korea, and the overall RCA is lower than RCA of Korea as well. On the one hand, it clearly shows that in C14 Korea still lead in its value added in GVCs, and surely advanced in technology. But on the other hand, it shows the heavy reliance of Korea economy to that specific sector, which would be very danger for Korean if C14 is being threatened by the bilateral trade competition in the future through China's product upgrading.

Figure 13 China (left) and Korea's (right) RCA in C14 Electrical and optical equipment

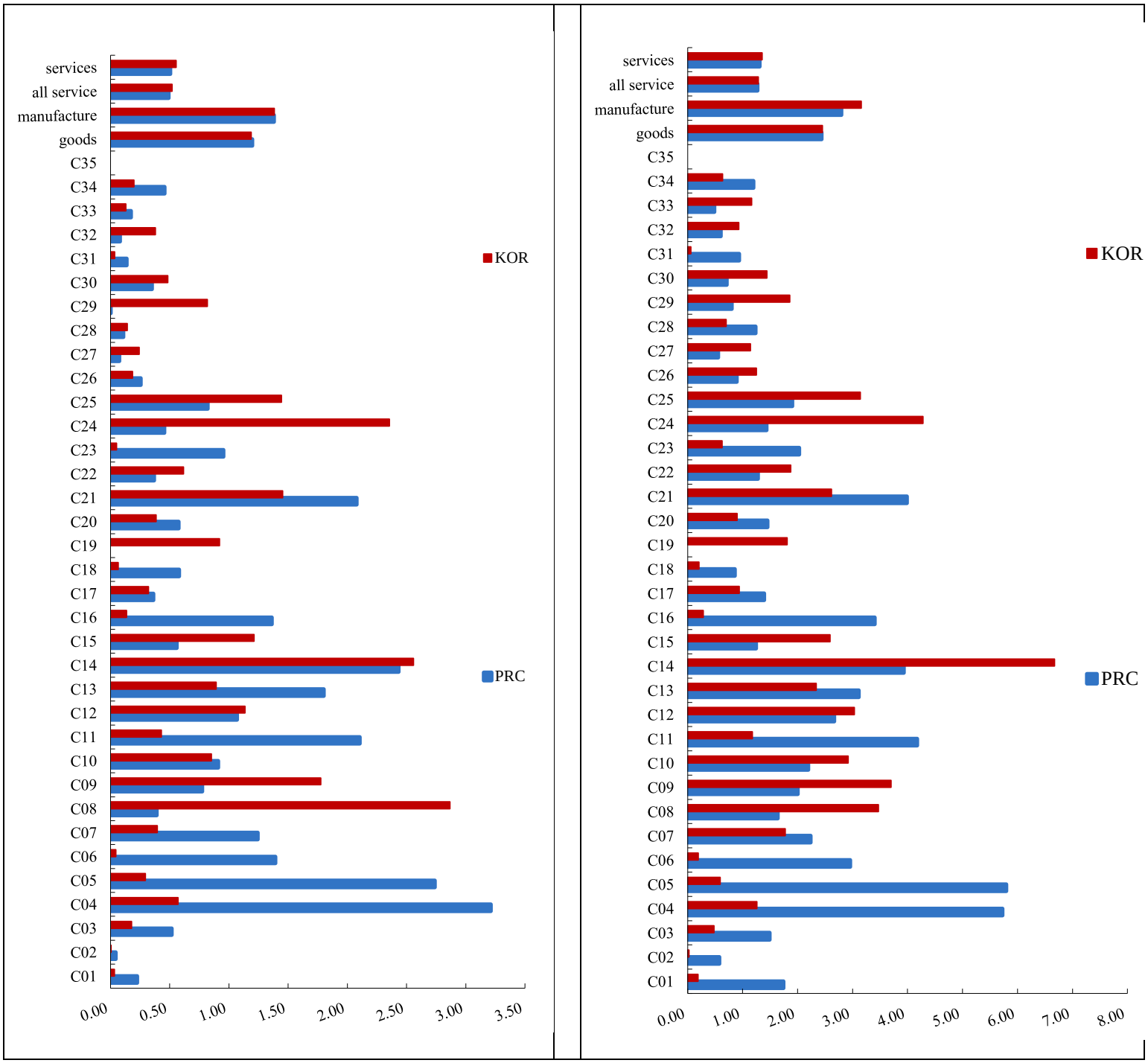


Data source: ADB-MRIO2022, Author's derivation using UIBE database

3.5、 Revealed Comparative Advantage in Industry

The figure below shows the RCA and RCAva in 2021 for China and Korea in 31 industries respectively. it is worth noting that in RCA China and Korea has the almost same score, while in RCAva, it shows that for manufacturing part, Korea still get a higher score than China. Besides, in C14, the industry of Electrical and optical equipment shows Korea has a much stronger RCA in value added terms than in gross trade terms.

Figure 14 RCA and RCAva comparison, China and Korea, in 2021



Data source: ADB-MRIO2022, Author's derivation using UIBE database

For further compare China and Korea's relative Comparative Advantage, I use

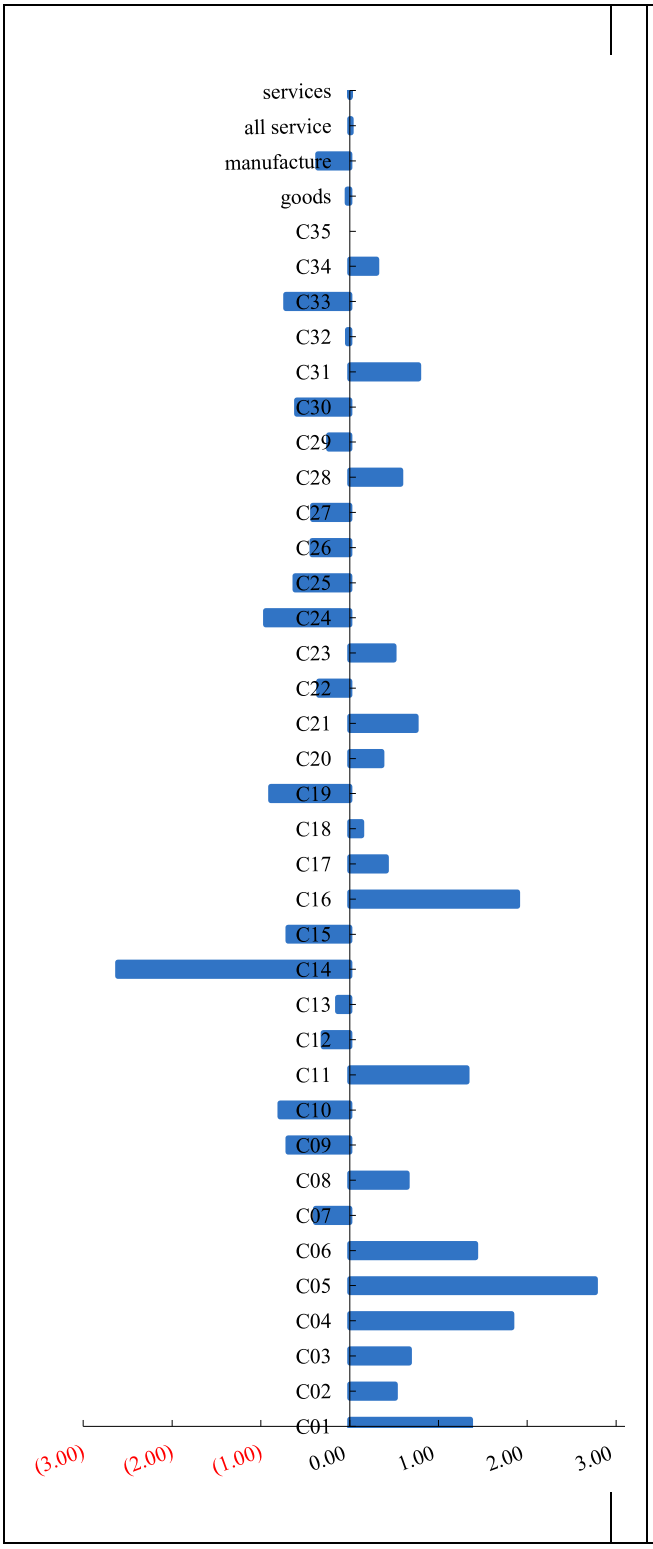
$RCA^{*}_{prc}=RCA_{prc}-RCA_{kor}$,

$RCAva^{*}_{prc}= RCAva_{prc}-RCAva_{kor}$,

$RCAva_{prChina\ and\ Koreaor} = RCA^{*}_{prc} - RCAva^{*}_{prc}$

When $RCAva_{prChina\ and\ Koreaor}$ is positive, it means China has a better than expected performance under that industry revealed by the value added RCA model, and When $RCAva_{prChina\ and\ Koreaor}$ is negative, it shows that Korea has a better than expected performance under that industry. And for several important industries, the result is that China only wins C08, while Korea wins C9, C12, C13, C14, C15, C30 (See figure 12).

Figure 15 $RCAva_{prChina\ and\ Koreaor}$ in 35 industries



c35	Private households with employed persons
c34	**Other community, social, and personal services**
c33	Health and social work
c32	Education
c31	**Public administration and defense; compulsory social security**
c30	Renting of M&Eq and other business activities
c29	Real estate activities
c28	**Financial intermediation**
c27	Post and telecommunications
c26	Other supporting and auxiliary transport activities; activities of travel agencies
c25	Air transport
c24	Water transport
c23	**Inland transport**
c22	Hotels and restaurants
c21	**Retail trade, except of motor vehicles and motorcycles; repair of household goods**
c20	**Wholesale trade and commission trade, except of motor vehicles and motorcycles**
c19	Sale, maintenance, and repair of motor vehicles and motorcycles; retail sale of fuel
c18	**Construction**
c17	**Electricity, gas, and water supply**
c16	**Manufacturing, nec; recycling**
c15	Transport equipment
c14	Electrical and optical equipment
c13	Machinery, nec
c12	Basic metals and fabricated metal
c11	**Other nonmetallic minerals**
c10	Rubber and plastics
c9	Chemicals and chemical products
c8	**Coke, refined petroleum, and nuclear fuel**
c7	Pulp, paper, paper products, printing, and publishing
c6	**Wood and products of wood and cork**
c5	**Leather, leather products, and footwear**
c4	**Textiles and textile products**
c3	**Food, beverages, and tobacco**
c2	**Mining and quarrying**
c1	**Agriculture, hunting, forestry, and fishing**

Data source: ADB-MRIO2022, Author's derivation using UIBE database

4 Case Studies: From Dependence to Competition

This paper hold the view that, China, once an economic opportunity for Korea, is now a threat to Korea's economy, and competition between the two sides in the global market is intensifying. For example, it is worth noting that new features have been raised. Previously, due to the outbreak of covid-19 in 2020, China's imports from Korea declined, while exports remained stable, thus the China-Korea deficit narrowed. All of these have raised concerns that due to the industrial upgrading of China's manufacturing industry, the trade relations between China and Korea will become more competitive and less complementary. Furthermore, in May, June and July in 2022, Korea's trade with China has been in deficit for this three consecutive months, while in the past 30 years, Korea has always maintained a trade surplus with China every consecutive month.

Now China and Korea trade has gradually changed from a vertical and complementary relationship to a horizontal competitive relationship，mainly because China's economy is developing faster and faster, thus the gap with Korea is narrowing, and China is constantly improving itself and upgrading its industrial structure, and there are many industries that China and Korea will support and cultivate in the future Parts are overlapping. In this way, the competition between the two countries—that is, in the international arena—for high-tech products will be highlighted and Korean companies may not have as many opportunities in the Chinese market as before.

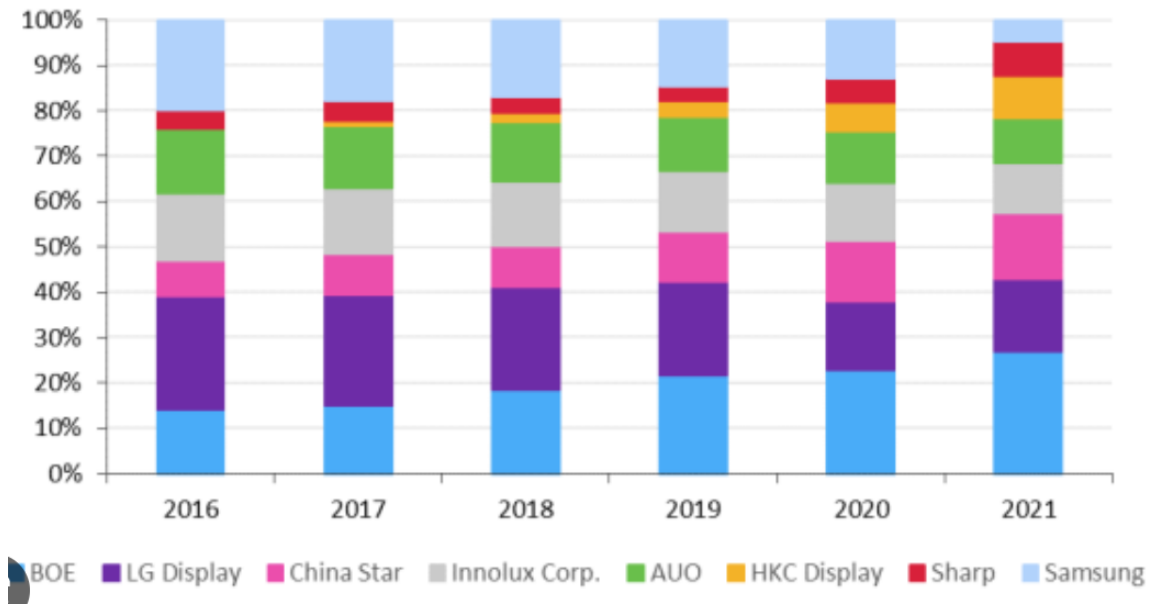
4.1、 C14 Electrical and Optical Equipment

Display

China's LCD panel companies have developed rapidly, and it's already an end game that took by China. Since 2009, China's two largest LCD panel manufacturers, BOE Technology and China Star Optoelectronics Technology (CSOT, also known as for China Star), have entered a period of expansion. They gradually started to build LCD panel of technology level comparable to Japanese and Korean companies. Until two years ago, they began to build the world's most advanced 10.5/11-generation LCD panel production line, and within these years, they have achieved same generation with Korean LCD panel companies and forced Samsung to transfer LCD product capability to China due to inferior comparative cost and less profit. The cost of labor in China is already lower than that of Korean panel companies. This gives Chinese LCD panel companies a huge competitive advantage in terms of cost. The following figure shows the share of display panels，where BOE and China Star is expanding very fast and the share of LG and Samsung is significantly

shrinking.

Figure 16 Share of display panels in the past years

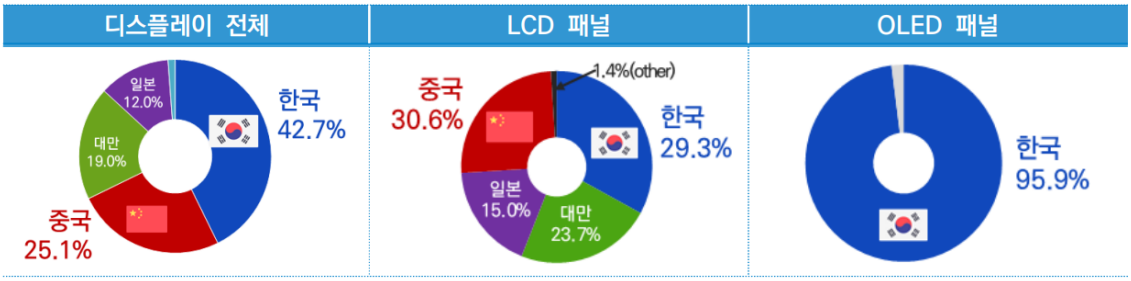


Source: Omdia, HIS Markit

If LCD market is already a half finished battlefield, Future competition comes to OLED. Chinese companies originally focused on assembling modules and sets, but over time they've climbed the display value chain to full LCD production—and now they're aggressively pursuing OLED manufacturing. BOE now is shipping millions of OLED panels monthly; its goal is to lead not only in display production, but also in technology[1]. The following figure shows that Korea Company currently hold the monopoly in OLED manufacturing, which is THE battlefield that need to be defended from its only competitor, China.

[1] BOE is producing or planning alternative technologies such as OLEDs on silicon, electrophoretic displays (EPD), white OLEDs (WOLEDs) and inkjet printed OLED TVs, as well as augmented reality/virtual reality displays.

Figure 17 Share of display panels in different types (in 2018)



Source: Invest Korea, HIS Markit

Smartphone Manufacturing

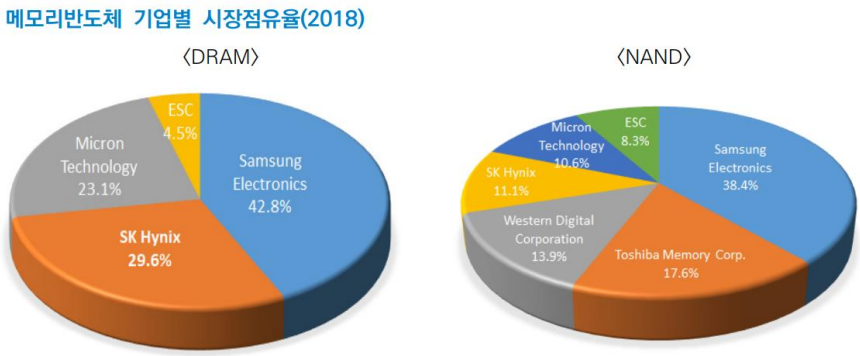
In smartphone manufacturing field, although Samsung's share has remained steady for nearly a decade, Chinese companies are catching up. In the past ten years, Xiaomi took 8 years to become a Fortune 500 company from a startup. Huawei still has a high reputation in the Chinese mainland market although being sanctioned by US, while Samsung mobile phone has lost almost all market shares from China in the past ten years. Both Samsung mobile phones and Chinese companies use Android as the operating system, and this similarity would cause competition in overseas market in the future, like Southeast Asia, Africa and Latin America.

Semiconductor

China is the world's main semiconductor demand country and a major trade partner for Korea. In 2021, Korea's semiconductor exports accounted for 39.7% of exports to China, which is larger than the proportion of exports to China (25.3%) in Korea's total exports. However, the development of Korea's semiconductor industry is not balanced. Korea's leading position in GVC in terms of Semiconductor is mainly about the share of memory chips. Korea has the largest market share in the memory chip industry[2] in the world, and China needs to import a large number of memory chips from Korea every year. The figure below shows Korea's technological leadership and international market share in the memory chip field in the world market. Korea's 2018 sales accounted for 63.7% of the world's storage semiconductor market, of which DRAM and NAND accounted for 72.3% and 49.5% respectively.

[2] Computer memory consists primarily of dynamic random-access memory (DRAM), which is used for temporary storage in personal computers, servers and mobile devices, and NAND flash, which is used for permanent storage in mobile devices.

Figure 18 Global Share of DRAM and NAND



Source: Invest Korea, SEMI

The technology monopoly of panel industry depends on the size of wafer, while the memory chip mainly depends on its storage capacity. Upgrading of these industries is relatively heavy investment dependent, while highly predictable, and pays attention to economies of scale. Korea's strategy of supporting a small number of large enterprises with all the power of the whole country perfectly fits these industries. And it is precisely because Korea is supporting a small number of companies with the strength of the whole country. The sales of the top 30 companies account for 40% of the total revenue of Korean companies, and their assets account for 95% of Korea's GDP. As a result, these companies occupy too many social resources; the social plutocracy hinders the overall improvement of the country's innovation capability, making it difficult for small and medium-sized enterprises to develop.

However, the path of China's industrial policy implementation is exactly the same as Korea's previous industrial policy. It supports individual enterprises, tilts national resources, cultivates the domestic market for them, and gives a large amount of industrial subsidies in the early stage. Hefei Changxin Storage (合肥长鑫存储) has formed in the DRAM field, and Wuhan Changjiang Storage （武汉长江存储）has already taken the lead in the NAND field. China's Changjiang Storage has reached the world's leading level in terms of technology, and in DRAM Changxin Storage is about to usher in a breakthrough in the world's leading level using its own technology route map. It is not difficult to foresee that once Chinese companies get done with the industrial chain that US bloc blocked for China, the economic and trade relations between China and Korea will be greatly affected.

DRAM	2014		2015		2016		2017		2018		2019	
	1H	2H	1H	2H	1H	2H	1H	2H	1H	2H	1H	2H
삼성전자	20nm					18nm				1ynm		1znm
SK하이닉스	25nm				21nm			18nm		1ynm		
마이크론			20nm				18nm			1ynm		1znm

NAND	2014		2015		2016		2017		2018		2019	
	1H	2H	1H	2H	1H	2H	1H	2H	1H	2H	1H	2H
삼성전자			48단		64단				96단		128단	
SK하이닉스			36단		48단		72단			96단		
도시바+WD				48단		64단				96단		
YMTC										32단(시제품)		64단

Source: Invest Korea, SEMI

4.2、 C15 Transport Equipment

Shipment Sector

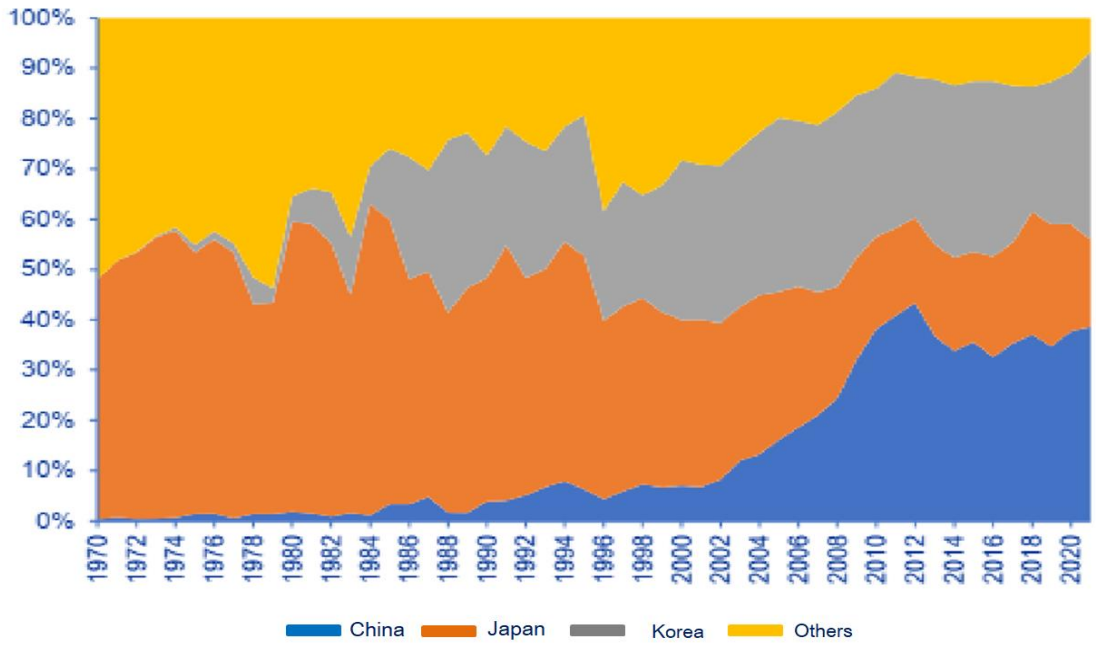
Shipbuilding has also been half danger and half for Korea. The shipbuilding industry is Korea's dominant industry, and Korea has always occupied the number one position in the world in the shipbuilding industry. The high prosperity of the shipbuilding industry in 2022 seems to have broken people's doubts about the Korean shipbuilding industry. However, while the Korean shipbuilding industry is booming, it also hints at the future competition between China and Korea in the shipbuilding industry. In 2022, Samsung Heavy Industries and Hyundai Heavy Industries, Daewoo Shipbuilding & Marine Engineering, and Hyundai Samho Heavy Industries occupy the top four in the world in terms of new orders[3]. But then there are China's Hudong-Zhonghua（沪东中华）, Hyundai Mipo Shipbuilding, China Jiangnan Shipbuilding factory (江南造船厂) falling behind close. Orders from Chinese shipyards, like those from Korea, are similarly scheduled after 2027. At present, the strategy of Korea's Hyundai Heavy Industries, Samsung Heavy Industries, Daewoo Shipbuilding and other enterprises is to give up competition with China in normal shipbuilding and focus on the high value-added shipbuilding field.

Among the 18 major ship types in the world, China ranks first in the market share of 10 ship types. Among them, China's market share in container ships, bulk carriers, chemical tankers, multi-purpose

[3] In terms of ship types, until June 2022, Korea has undertaken 71% of global LNG ship orders (63 ships), and 43% of all orders for large container ships. In terms of order value, Korea ranking first with 47% of all orders. China, who lagged behind Korea in terms of order volume (43%) and order value (40%), ranking second. In terms of tonnage, the Korean shipbuilding industry ranked first in the world with 45.5% (9.79 million CGT) of the 21.53 million corrected gross tonnage (CGT) global ship orders, and high-tech ships accounted for the order volume 62% of the total (6.92 million CGT) until June 2022.

ships (MPP), offshore engineering ships, and Pure Car Carrier/ Pure Car and Truck Carriers (PCC/PCTC) has exceeded 50%, occupying an absolute advantage(China Shipbuilding Industry Association, 2021). It can also be seen from the figure below that China and Japan are the biggest rivals of Korea's shipbuilding industry. Since the beginning of the 21st century, Japan's share has been squeezed by China and Korea at the same time, and China's share has increased faster than Korea's share. Since 2010s, the share of shipbuilding in China and Korea has remained at a relatively stable position, but behind the stagnation of the share is China's possible technological breakthrough.

Figure 19 China's Shipbuilding sector is catching up



Source: Shenwan Securities

In the past, Korea believed that China's strength was to manufacture general bulk carriers and ships with a container capacity of less than 8,000 containers, and China was unable to manufacture high value-added ships. But now China will soon have the manufacturing capacity of LNG ships and cruise ships. China's high-end shipbuilding industry has only developed in recent years[4], and it was not until 2008 that China's first LNG ship was delivered. It is said that China's shipbuilding technology strength has reached Korea's 80% to 90%, and the era when Korea monopolized more than 90% of

[4] "High value-added" ships include: deep-sea drilling ships, offshore production storage and unloading ships, large container ships with more than 8,000 containers, liquefied natural gas (LNG) ships.

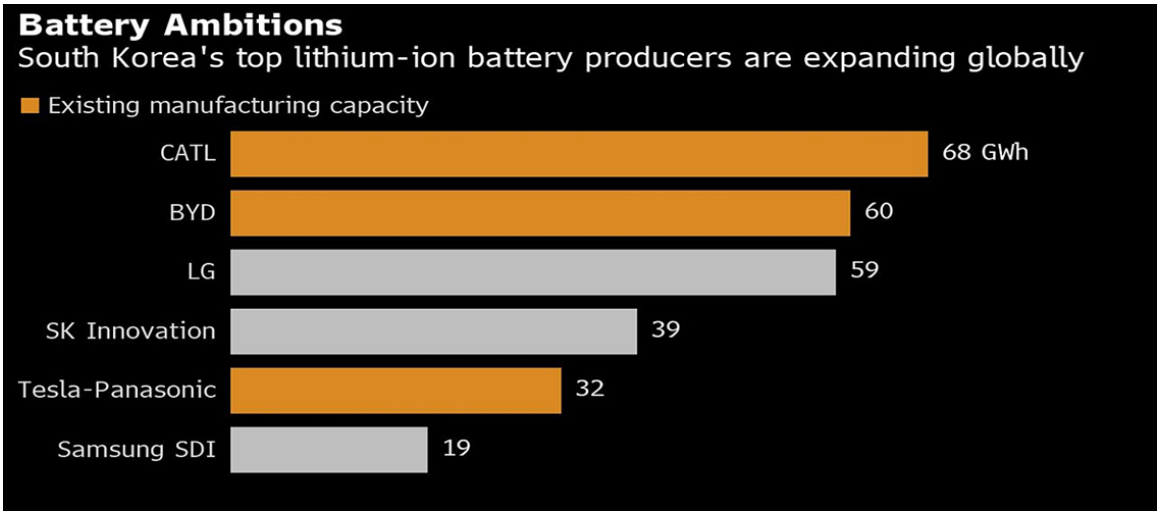
LNG ships seems to have passed (Xi, 2020). In the future, environmentally friendly and autonomous ships will gradually shape the shipbuilding market. If the Korean shipbuilding industry cannot take the lead in developing new technologies and achieving a substantial increase in orders in this field, the ranking of the Korean shipbuilding industry will inevitably decline (Woo, 2022).

Taking offshore drilling ships and LNG ships as examples, currently Korea still take the lead in LNG shipbuilding. From January to June 2022, the Korean shipbuilding industry has also received orders for 69 large container ships with a capacity of more than 8,000 tons, accounting for 75% of the total global orders, and received orders for 19 LNG ships. Among non-Korean companies that have received orders for LNG carriers, only China's Hudong-Zhonghua Shipyard has four ships, and Japan's Mitsubishi Heavy Industries has one. In terms of offshore drilling ships, China is also vigorously developing even it is the market that is still monopolized by Korea. As the Chinese government advocates the concept of "National Ships, National Manufacturing" project, the Chinese shipbuilding industry has benefited a lot from domestic market. At present, the Chinese government produces bulk carriers and container ships to domestic shipyards. If the Chinese government also places orders for drilling ships and floating oil factories only to Chinese shipyards in the future, then Chinese shipbuilding will accumulate technology and experience of building offshore oil production platforms in the short term, catching up with Korea in technology (Samsung Economic Research Institute, 2021).

Batteries and Automobile

In addition to semiconductors, the most promising industry in Korea and the most competitive industry in the world may be automotive battery manufacturing. But in this field, China and Korea are also facing competition rather than complementarity. In the future, supply side will definitely usher in a commercial war of cost, technology and production capacity. At present, the aggressiveness of Chinese companies' expansion in capacity is higher than that of Korean companies and higher than that of Japanese companies too. The figure below shows the existing production capacity in 2021. CATL and BYD rank first and second in the world respectively. Although Korean companies also occupy half of the top six, they only rank third, fourth and sixth.

Figure 20 China has outperformed Korea in Battery Shipment, and production capacity plan is more radical is future



Source: Bloomberg NEF

4.3、 Case study: Future Cooperation on Electrification of Motorcycle

Background of Korea's Takeaway Motorcycle Market

According to the vehicle registration situation report of the Ministry of Land, Infrastructure, Transport and Tourism, Korea has increased from 11,949 vehicles in 2018 to 52,114 vehicles in 2020, an increase of about 5 times. The growth of the express delivery industry and the motorcycle industry is directly proportional. By the end of 2021, Seoul has provided more than 7,000 electric motorcycles. However, due to the short mileage and long charging time (5 hours), it is difficult for takeaway drivers who travel 50-200 kilometers per day to use electric motorcycles, and the supply is insufficient. According to the Seoul Metropolitan Government, converting internal combustion engine motorcycles to electric vehicles is expected to save 2.45 million won per year per electronic motorcycle. Seoul plans to work with the electric motorcycle industry to develop a delivery-only electric motorcycle and adopt a standard charger model. Besides, Korean shared Scooter Company SWING has provided electric motorcycle options on the takeaway-only Rider sharing platform. The model is "Blue Shark R1-Lite" which is released by Korean Blue Shark, and can travel 160km with the dual batteries fully charged. Its maximum speed is 80 km/h, and the maximum climbing ability is 40°. Additional functions such as Advanced Driver Assistance Systems (ADAS) and parking mode have also been installed. The current way to replenish the energy of shared takeaway electric motorcycles is to change vehicles, that is, driver drives vehicle A to the charging area, and then rides vehicle B away.

Features of Korean and Chinese Market

For the Korea side, firstly, there are many steep slopes on the roads in Seoul: the fuel engine of the motorcycle has been in the low combustion efficiency range for a long time. Secondly, the noise of food delivery in Seoul is loud: Delivery drivers can be seen everywhere, and the roar of motorcycles is one after another in the city. The noise is loud, and in standby time drivers usually do not turn off the lighter when waiting, thus still consuming fuel. For the China Side, firstly it is the birthplace of food delivery, from charging infrastructure to the manufacturing of electronic bikes, China has the most comprehensive and mature profit models and products. It has the most concentrated production capacity: 90% of the world's electronic bikes and its accessories are produced in China, and 60% of the global electronic bikes market is in China.

Korea’s Carbon Neutrality Policy needs Electrification of Motorcycle in Urgent

Korea sets its carbon neutrality goal in its 2030 National Determined Contributions (NDC): to sets the goal of reducing greenhouse gas emissions by 40% compared with 2018 by 2030 and achieving carbon neutrality by 2050.The carbon emission reduction plan of the transportation sector is: plan A is to increase the penetration rate of green vehicles such as electric vehicles and hydrogen fuel vehicles to more than 97%, and plan B is to increase the penetration rate of green vehicles to more than 85%, while retaining some fossil fueled motorcycle with complete capability of carbon- neutrality. However, the current situation of Korea's transportation sector is going slow: the penetration rate of new energy vehicles is much lower than that of China, takeaway motors are mainly fossil fueled motorcycles, although there are many electric-driven short-term traffic scooters.

5 Conclusion and Discussion

5.1、 Conclusion

This article improved the China Korea trade relations analysis by using the value added model terms with WWZ (2018) decomposition method and case study, to clarify the prospect of future China Korea trade directions. In decomposing the value added elements in the perspective of Global Value Chains, several different perspectives are introduced.

By decomposing bilateral trade in final goods and in intermediate goods, we found China’s demand for Korea’s final goods is disproportionate less than vice versa, and the marginal increase and prosperity is mostly promoted by intermediate goods demand from both side.

By decomposing the bilateral value added trade in 35 industries, we found almost half of the value added trade is contributed by one single industry: C14 Electrical and optical equipment, the sector of memory chips and Display. C14 accounts for 48% of China's imports from Korea and 34% of China's exports to Korea, thus is the vital industry in judging the future direction of the bilateral trade. Plus, more than 90% of value added trade is from some specific industries: C8(Coke, refined petroleum, and nuclear fuel, accounts for 7% of IM and 1% of EX), C09(Chemicals and chemical products accounts for 16% of IM and 8% of EX), C13(Machinery accounts for 7% of IM and 10% of EX to and from China, same below), C14(Electrical and optical equipment accounts for 48% of IM and 34% of EX), C15(Transport equipment accounts for 1% of IM and 5% of EX) and C30(Renting of M&Eq and other business activities accounts for 4% of IM and 9% of EX).

By simplifying the 8 parts of decomposition of value added trade in KWW (2014) and 16 parts in WWZ (2018) to 5 parts, which is Foreign Double Counting (FDC), Foreign Value Added(FVA), Domestic Double Counting (DDC), Domestic Value Added and then returned to home (DVArt), and Domestic Value Added used for export (DVAex), we found China enjoys a higher rate of DVA in bilateral trade with Korea, which indicates the deficit between China and Korea is smaller generally perceived.

By comparing the revealed comparative advantage of China and Korea, firstly we found that most of China and Korea Trade are inter-sector trade, then we found that the current data shows Korea are enjoying a higher RCA value added improvement in bilateral trade relations with China, especially in C14. China raised its RCA value added mainly in resources sector, which shows the severity of Korea’s reliance on these overlapping sectors that going to compete with Chinese products in China and other overseas market. And if the comparative improvement continues to happen in China, the comparative welfare of Korean people may go down with the overlapping and competition going deep.

In case studies this thesis analyzed the most influential industries of China and Korea trade in value added, and they are also the pillars of Korea’s economy: Display, smartphone manufacturing, Shipment Building, Memory Chips and automobile battery and electronic vehicle manufacturing, which is accounts for most of Korea’s export competitiveness. Basic conclusion is that the RCA of the two country is indeed overlapping, and either China is already taking the lead (in automobile battery and electronic vehicle manufacturing), or China is aspiring to catch up Korea to achieve not only domestic substitution but also get its own global share(Display, Shipment Building, Memory Chips). In smartphone manufacturing, Samsung is being surrounded by Chinese companies.

To simply put, from the perspective of RCA and VA, the bilateral trade volume might almost peaked, and apart from that, the overseas competition between the two countries might erode the current global share that now grasped by Korea. To tackle that scenario, two countries must explore new ways of cooperation and integration.

5.2、 Discussion

Investment more to find complementation

To deepen the cooperation, if not only competition, between two countries, exploring complementation in other field is needed and can be created through investment. From the perspective of investment, the economic and trade relations between the two countries have also continued to expand. Korean companies such as Samsung, SK, Hyundai Motor, and LG have built factories in many places in China, and brands such as Xiaomi and DJI have also entered Korea. The construction of the park is in full swing. According to Korean data, since 2008, the economic development correlation between China and Korea has been 0.56, while Korea and the United States have only 0.054 in the same period, a difference of 10 times. The mutual investment between China and Korea has exceeded 250 billion US dollars. In addition, from January to July in 2022, Korea's actual investment in China increased by 44.5%, the highest growth rate among all countries. It can be seen from this that Korea actually hopes to invest more in China, especially in high-tech fields, such as high-end manufacturing, modern service industry, digital economy, marine economy, international logistics, etc. But investment in some labor-intensive industries is shrinking.

Chapter 4 already raised a possible scenario which shows that Government leading Investment can be a two-way integration, that when China's production capacity is combined with Korea's demand, a closer cooperation space is born. China can take advantage of its own industrial clusters to provide Korea with e-bike or e-motor assembly OEMs, while Korea can use its advantages in design and R&D to jointly realize the electrification of motorcycles in the Korean takeaway market. Above is just a example on the future economic cooperation, with the core concept of combining the comparative advantage, instead of only unitizing it respectively. The possible competition in some specific sectors is inevitable, but more possible scenarios can be invented, through the complementary culture and advantages.

Policy on Service Sector

The signing of the China-Korea Free Trade Agreement has played a crucial role. In terms of the level of openness, the liberalization ratio of trade in goods between the two sides exceeds "90% of tax items and 85% of trade volume". The scope of the agreement covers 17 areas of trade in goods, trade in

services, investment and rules, including "21st century economic and trade issues" such as e-commerce, competition policy, government procurement, and the environment. Since the signing of the China-Korea Free Trade Agreement in 2015, the two sides have reduced tariffs eight times. China has implemented zero-tariff tariffs for goods imported from Korea. The second phase of negotiations is to carry out high-level consultations on trade in services and investment liberalization in the form of a negative list. On issues such as investment liberalization, the level of bilateral openness and cooperation is higher. On the other hand, at a time when regional and global industrial and supply chains are relatively fragile, China and Korea have focused on supply chain security issues to carry out consultations and cooperation, which benefits both sides and is also a counterattack to the so-called "decoupling" and "broken chain" words and deeds.

Figure 4 in chapter 3 shows that services trade increased almost 4 times since 2007 in both export and import. With the China-Korea Free Trade Agreement moving to the second phase, there will be indefinite possibility of further integration in service sector.

Bibliography

Literature

[1] Ando, Mand FKimura, 2003, The formation of international production and distribution networks in East AsiaNBER Working Paper No10167National Bureau of Economic Research, Cambridge, MA.

[2] Eichengreen, B., YRhee and HTong, 2004, The impact of China on the exports of other Asian countriesNBER Working Paper No10768National Bureau of Economic Research, Cambridge, MA.

[3] Lall, Sand MAlbaladejo, 2004, China's competitive performance: A threat to East Asian manufacturing exportsWorld Development, 32, pp1441–66.

[4] Gaulier, G., FLemoine and DÜnal-Kensenci, 2005, China's integration in East Asia: Production sharing, FDI and high-tech tradeCEPII Working Paper No2005-09Centre d'Études Prospectives et d'Informations Internationales (CEPII), Paris.

[5] Rodrik, D., 2006, What's so special about China's exports? NBER Working Paper No11947National Bureau of Economic Research, Cambridge, MA.

[6] Koopman R.,Powers W.,Wang Z.,Wei S.J.Give Credit Where Credit is Due:Tracing Value Added in Global Production Chains[R].NBER Working Paper.2010.

[7] Koopman R.,Wang Z.,Wei S.J.Tracing Value-added and Double Counting in Gross Exports[J].American Economic Review,2014,104(2):459-494.

[8] Borin, A. and M. Mancini, 2019, "Measuring What Matters in Global Value Chains and Value-Added Trade", Policy Research working paper. no. WPS8804.(Background Paper for World Development Report 2020)

[9] Wang Z., S. Wei, X. Yu, and K. Zhu. 2017a. "Measures of Participation in Global Value Chain andGlobal Business Cycles." NBER Working Paper No. 23222, NBER, Cambridge, MA.

[10] ———. 2017b. "Characterizing Global Value Chains: Production Length and Upstreamness." NBER Working Paper No. 23261, NBER, Cambridge, MA

[11] Wang Z, Wei S J, Zhu K. Quantifying International Production Sharing at the Bilateral and Sector Level.NBER Working Paper Series, 2013.

[12] UNCTAD.Global Value Chains and Development:Investment and Value Added Trade in the Global Economy[R].2013.

[13] Antràs P, Chor D, Fally T, Hillberry R. Measuring the Upstreamness of Production and Trade Flows. The American Economic Review: Papers & Proceedings, 2012, 102(3): 412-416.

[14] Antràs, P., Chor, D. Organizing the global value chain. Econometrica, 2013, 81(6), 2127-2204.

[15] Dietzenbacher, E. and I. Romero "Production chains in an interregional framework: identification by means of average propagation lengths". International Regional Science Review, 2007, 30, 362-383.

[16] Johnson R C, Noguera G. Accounting for Intermediates: Production Sharing and Trade in Value Added. Journal of International Economics, 2012, 86(2): 224-236.

[17] Koopman, R, Wang, Z and Wei, S-J. 2008: How much of Chinese exports is really made in China? Assessing domestic value-added when processing trade is pervasive. NBER Working Paper No. 14109, June.

[18] Linden, G, Kraemer, KL and Dedrick, J. 2007: Who captures value in a global innovation system? The case of Apple's iPod. Working Paper, Personal Computing Industry Center, Irvine, California, June.

[19] Science, Technology and Industry Working Papers No. 1997/2, OECD Publishing. Hausman, R, Hwang, J and Rodrik, D. 2007: What you export matters. Journal of Economic Growth 12: 1–25.

[20] Johnson, DKN. 2002: The OECD technology concordance (OTC): Patents by industry of manufacture and sector of use. OECD Science, Technology and Industry Working Papers No. 2002/5, OECD Publishing.

[21]

[22]马涛,刘仕国.全球价值链下的增加值贸易核算及其影响[J].国际经济评论,2013,(4).

[23]宋玉华,张海燕.亚太价值链解构与中国的利得——基于 APEC 主要国家的投入产出分析[J].亚太经济,2014,(2).

[24]周升起,兰珍先,付华.中国制造业在全球价值链国际分工地位再考察——基于 Koopman 等的"GVC 地位指数[J].国际贸易问题,2014,(2).

[25]于津平,邓娟.垂直专业化——出口技术含量与全球价值链分工地位[J].世界经济与政治,2014,(4).

[26]蒲红霞,马霞.增加值贸易下金砖国家服务贸易竞争力比较分析[J].亚太经济,2015,(1).

[27]张咏华.中国制造业在国际垂直专业化体系中的地位——基于价值增值角度的分析[J].上海财经大学学报,2012,(5).

[28]文东伟,冼国明.中国制造业的垂直专业化与出口增长[J].经济学(季刊),2010,(4).

[29]李昕.中国外贸依存度和失衡度的重新估算——全球生产链中的增加值贸易[J].中国社会科学,2013,(1).

[30]徐清军.贸易增加值统计方法改革研究[J].国际贸易,2013,(5).

[31]王岚.融入全球价值链对中国制造业国际分工地位的影响[J].统计研究,2014,(5).

[32]刘重力,赵颖.东亚区域在全球价值链分工中的依赖关系——基于 TiVA 数据的实证分析[J].南开经济研究,2014(05).

[33]潘文卿,王丰国,李根强.全球价值链背景下增加值贸易核算理论综述[J].统计研究,2015,(3).

[34]夏明,张红霞.增加值贸易测算:概念与方法辨析[J].统计研究,2015,(6).

[35]闫云凤.中日韩在全球价值链中的地位和作用——基于贸易增加值的测度与比较[J].世界经济研究,2015,(1).

[36]段小梅.两岸在全球价值链中的分工地位和依赖关系——基于 TiVA 数据的实证分析[J].世界经济研究,2016(12).

[37]人民网,中韩经贸合作展现新气象,
http://fta.mofcom.gov.cn/article/rcep/rcepgfgd/202209/49682_1.html

Database

UIBE GVC indictor database: http://139.129.209.66:8000/d/daedafb854/

World Input-Output Database https://www.rug.nl/ggdc/valuechain/wiod/

ADB the World Input-Output Tables https://mrio.adbx.online/

OECD Inter-Country Input-Output (ICIO) Tables TiVA

https://www.oecd.org/sti/ind/inter-country-input-output-tables.htm

Abstract

본 논문은 WWZ(2018)의 부가가치 분해법을 이용하여 한국의 최종재에 대한 중국의 수요가 불일치하며, 반대로 해도 마찬가지의 결과로 얻었으며, 양국간 교역의 한계증가는 대부분 중간재 교역에 통해 촉진했다는 것을 발견하였다.

이에 부가가치 모델에 의하여 한중 무역의 대부분은 산업간 무역이며, 중국은 한국과 유사한 RCA(Revealed Comparative Advantage)를 갖고 있다는 점을 비로소 대부분의 부가가치 무역이 단일 산업을 통해 이루어진다는 것에 증명했다.

C14 는 전기 및 광학 장비, 메모리 칩 및 디스플레이 부문라고 한다. C14 는 업종 간 무역과 해외 경쟁을 가리키며, 또한, 한국의 다른 대표적인 산업은 자동차 배터리 및 전기 자동차 제조와 함께 하여 한국의 기술 업그레이드와 내수 대체에서 해외 수출 지향을 전향해졌으므로서 전체 시장에 대해 중국과 경쟁할 가능성이 있습니다.

이상에서 언급한 현장에 따라양국 교역량이 거의 정점에 달할 수 있으며, 또한 양국 간의 해외 경쟁에 대해 한국 측에 자금 장악하고 있는 글로벌 점유율을 잠식할 수 있다는 결론을 내린다. 이 시나리오를 해소하기 위해 두 나라에 대해서로 협력 및 통합 촉진 방법을 모색해야 합니다.

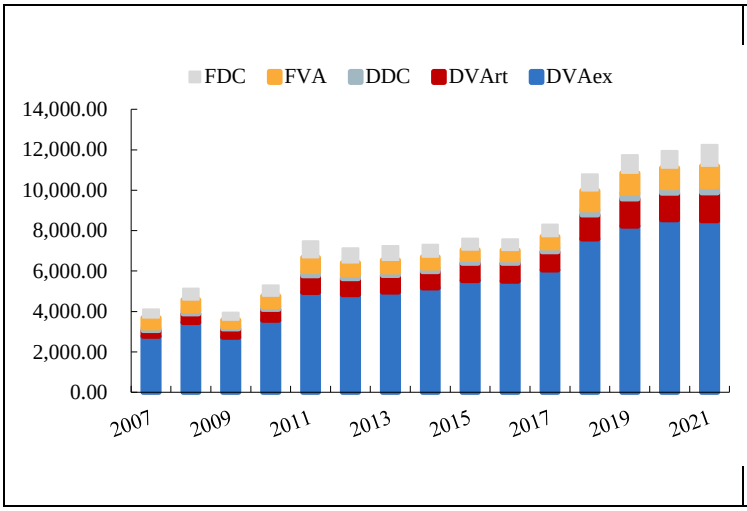
중국 측은 주로 자원 분야의 RCA 부가가치를 높였는데, 이는 한국이 중국과 해외 시장에서 중복한 분야을 경쟁할 성향은 심하며 이러한 산업들에 대해서 한국의 의존도가 확실히 높다.

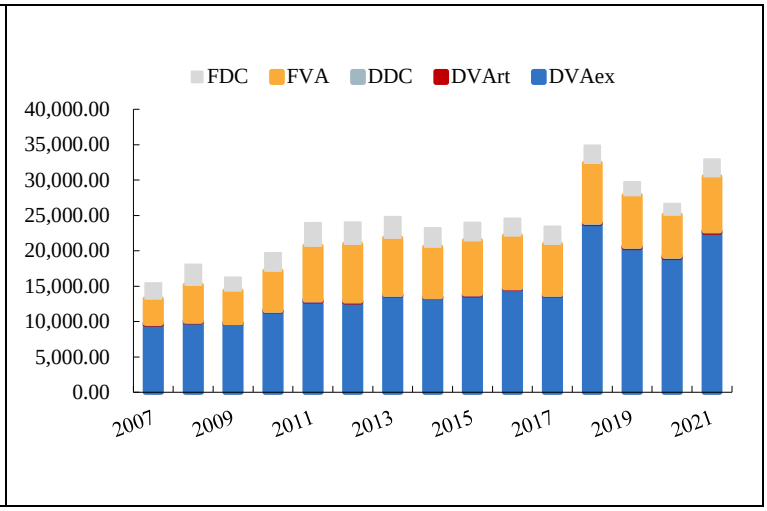
키워드 : 한중무역, 무역경쟁, 글로벌 가치사슬, 부가가치분해
학생번호 : 202224313

Appendix

1. Decomposition of trade in important industry, China's export to (left) and import from Korea (right), millions USD

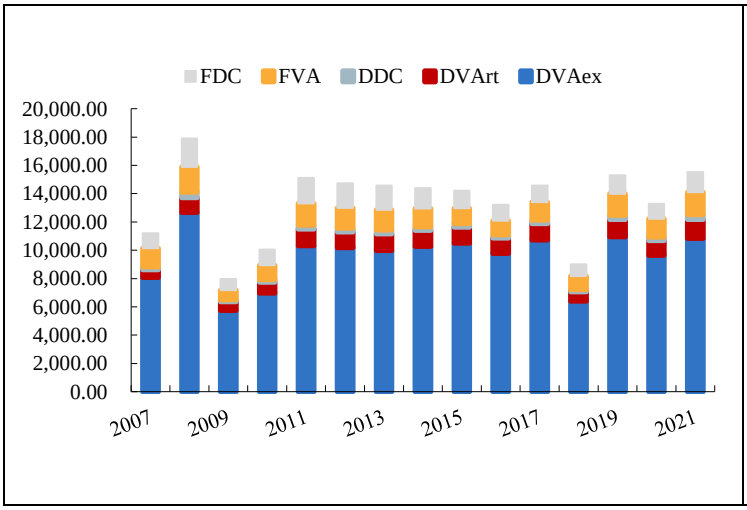
C9 Chemicals and chemical products

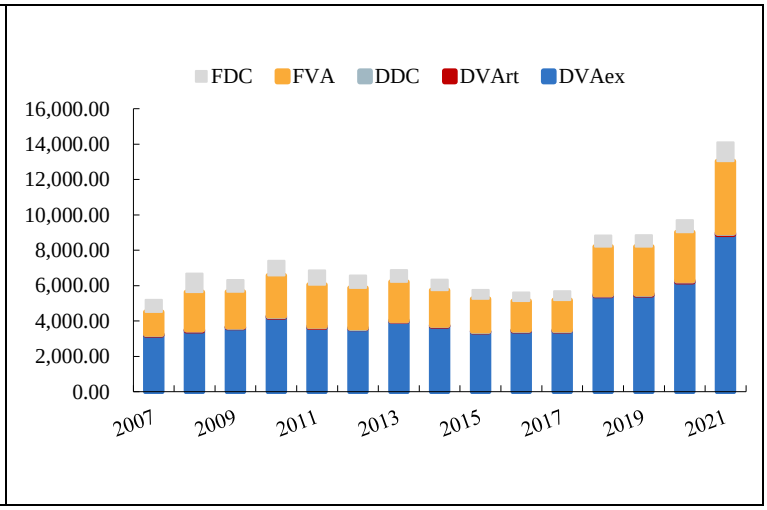




Data source: ADB-MRIO2022

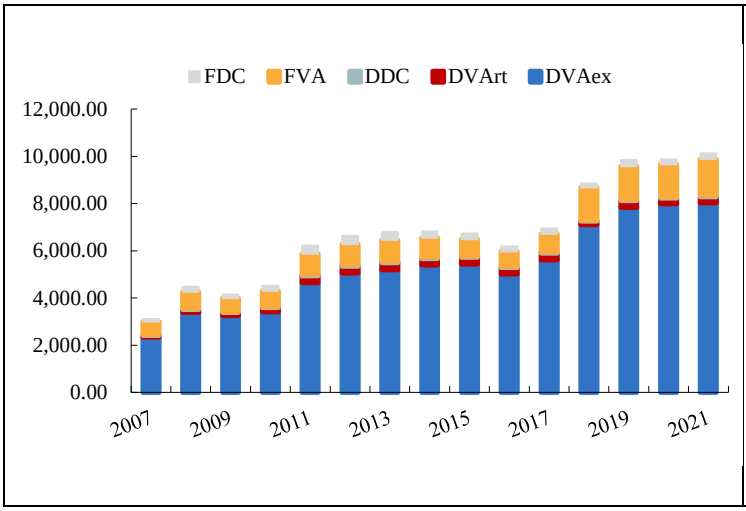
C12 Basic metals and fabricated metal

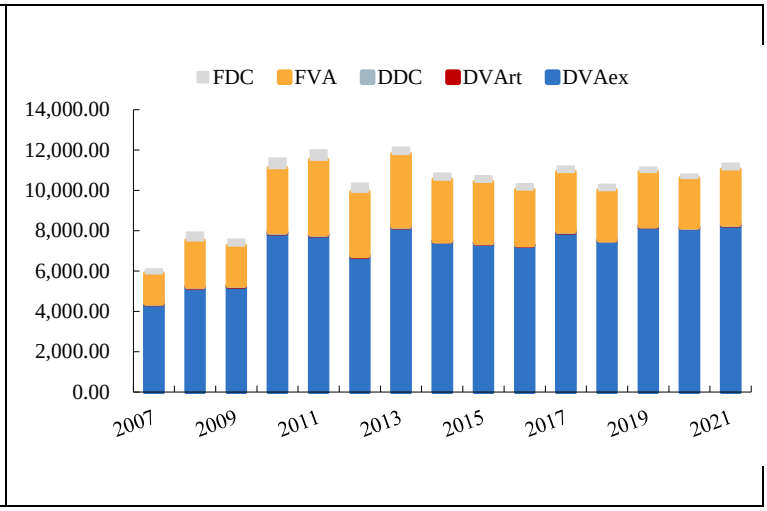




Data source: ADB-MRIO2022

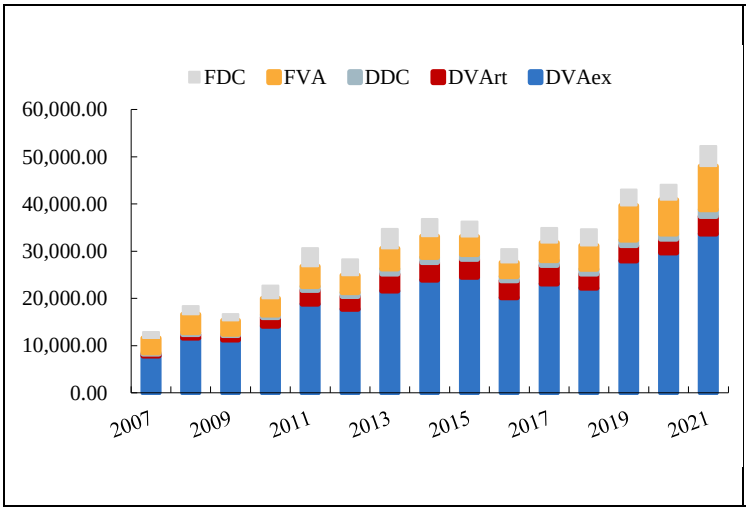
C13 Machinery

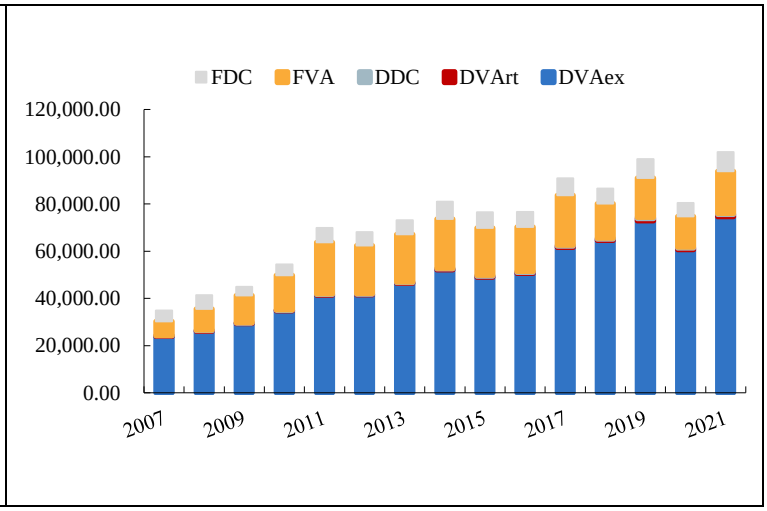




Data source: ADB-MRIO2022

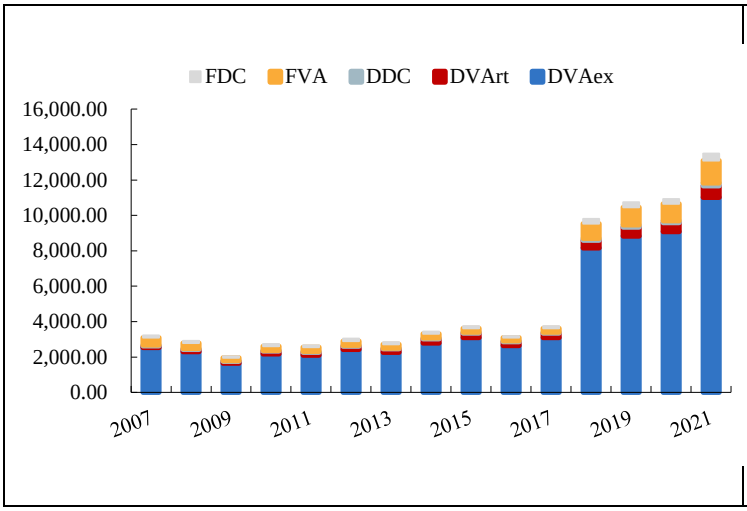
C14 Electrical and optical equipment

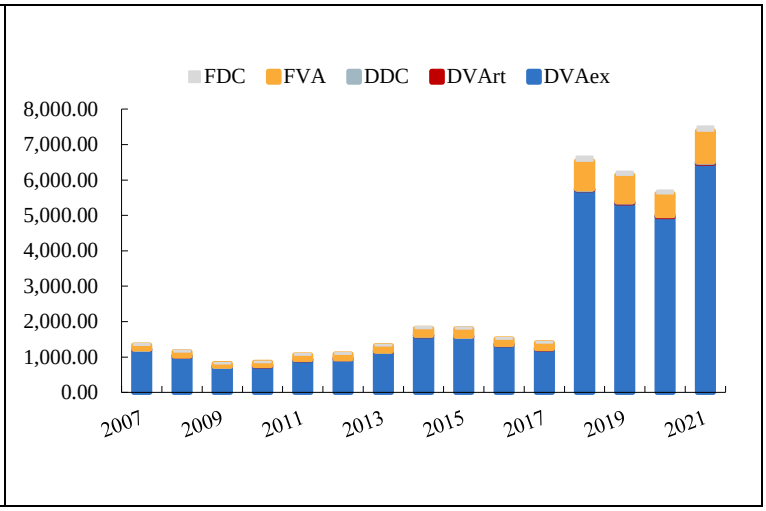




Data source: ADB-MRIO2022

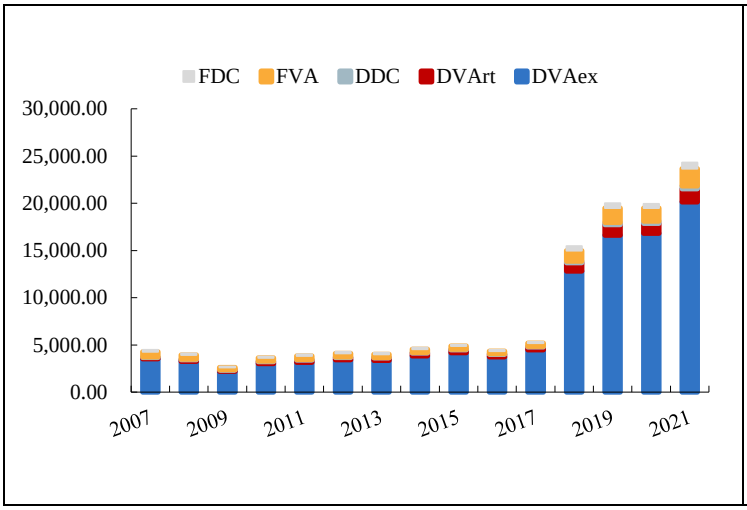
C30 Renting of M&Eq and other business activities

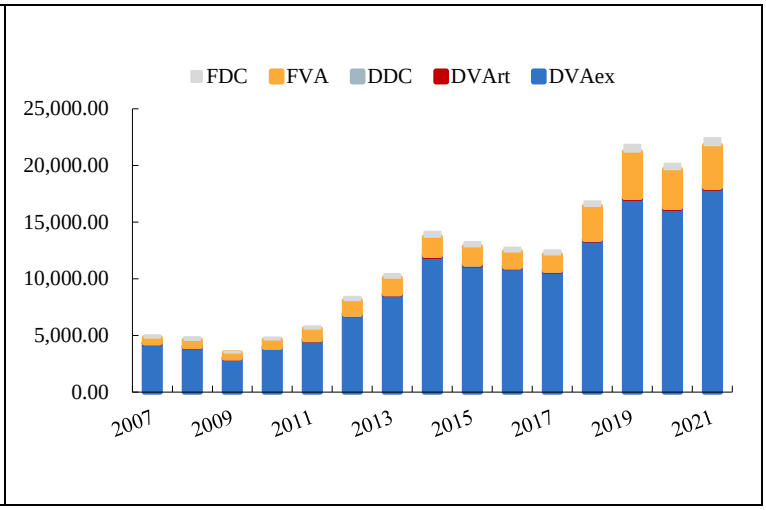




Data source: ADB-MRIO2022

All Services

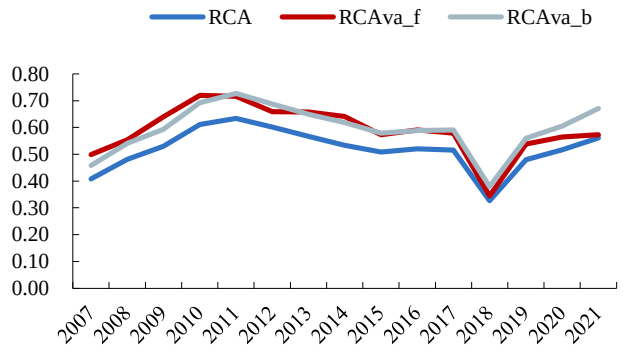


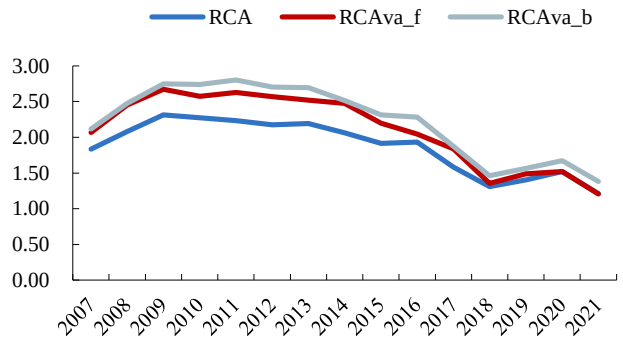


Data source: ADB-MRIO2022

2. Decomposition of RCA in important industry, China (left) and Korea (right), millions USD

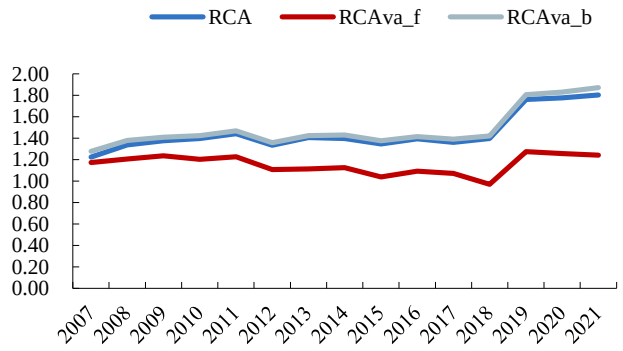
C15 Transport equipment

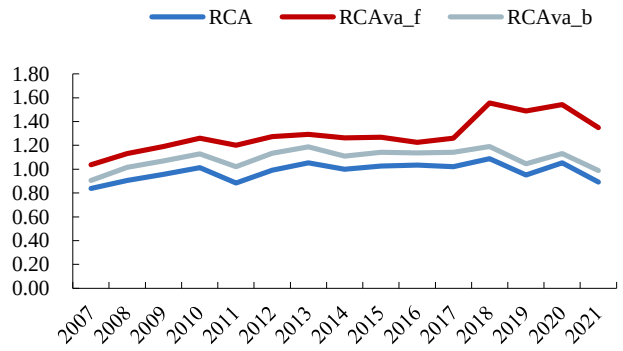




Data source: ADB-MRIO2022

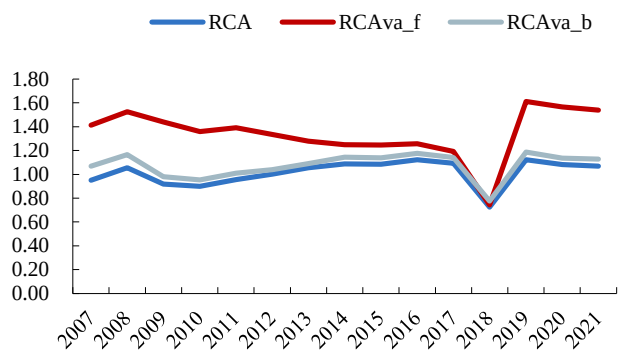
C13 Machinery

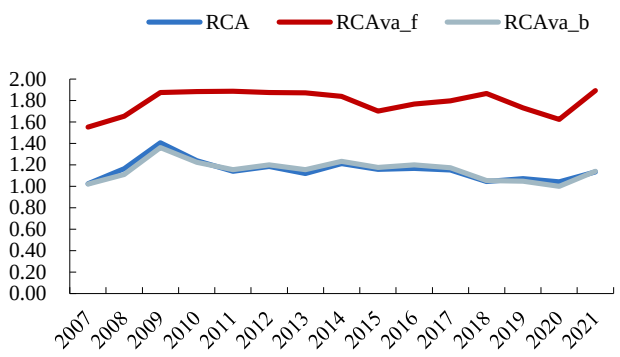




Data source: ADB-MRIO2022

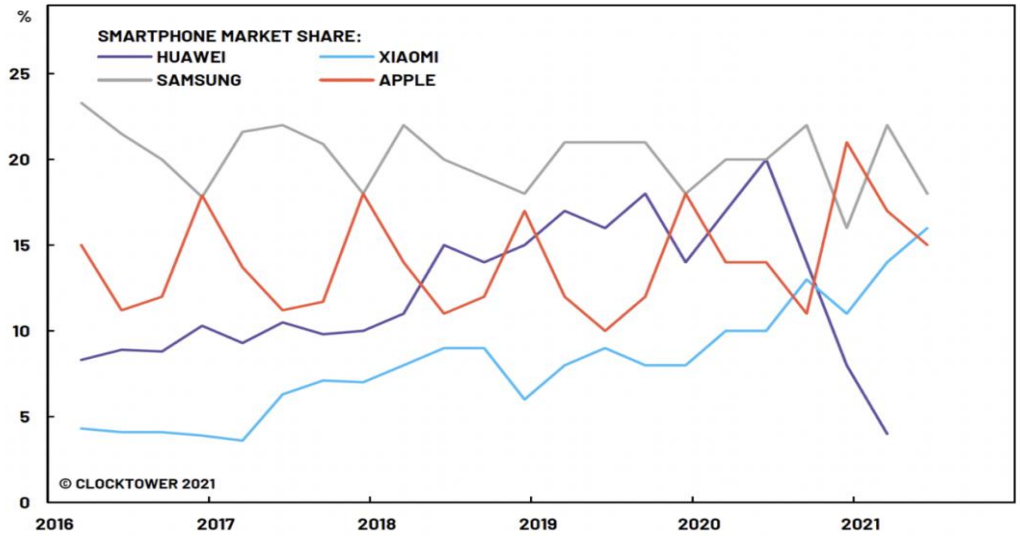
C12 Basic metals and fabricated metal





Data source: ADB-MRIO2022

3. Smartphone market share shows possible competition in future



Source: Clocktower Group, Canalyst