Trilateral Cooperation Secretariat

TER

Trilateral Economic Report

2011-2020

中国社会科学院世界经济与政治研究所
Institute of World Economics and Politics, CASS

JCER
Japan Center for Economic Research

KIEP Korea Institute for International Economic Policy

CAICT 中国信通院

RIETI
Research Institute of Economy, Trade & Industry, IAA

KISDI

Chapter 8' and 9's references may be included in previous chapters.

TCS, 2022
Trilateral Cooperation Secretariat

S-Tower 20th FL, 82 Saemunan-ro, Jongno-gu, Seoul, Korea 03185

ISBN(hardcover): 979-11-88016-90-7 (93320)
ISBN(eBook): 979-11-88016-89-1 (95320)

Printed in the Republic of Korea

OU Boqian

Secretary-General
Trilateral Cooperation Secretariat

Sustainable Economic Cooperation for Common Prosperity

I am pleased to present the *Trilateral Economic Report 2011-2020*, an annual flagship report of the Trilateral Cooperation Secretariat (TCS). Joined by six prominent think-tanks in China, Japan and the Republic of Korea, this Report reviews economic cooperation among the three countries in the past 10 years and showcases the joint efforts the three countries made at national, regional, and global levels to realize the economic goals enshrined in the *Trilateral Cooperation VISION 2020* adopted at the 3rd Trilateral Summit Meeting in 2010.

The COVID-19 pandemic has been accelerating digital transformation and digital capabilities, elevating the digital economy to play a significant role with impact in our everyday life. In 2020, the volume of digital economy output in China, Japan and the ROK reached USD 5,356.5 billion, USD 2,476.9 billion and USD 847.8 billion, respectively, with the combined accounting for 26.7% of the world's total. In the respective countries, the digital economy makes up more than half of the ROK's Gross Domestic Product (GDP), and over 30% of both China and Japan's GDP. In light of these trends, this Report aims to clarify the socio-economic implications of digital transformation and highlight Trilateral Cooperation on digitalization-related economic issues.

The Report also takes stock of the achievements in the past decade and provides insights into the cooperation in the next 10 years, with a view to spurring the efforts of our region to achieve common prosperity.

From 2011 to 2020, Trilateral Cooperation witnessed remarkable progress in the economic field: the three countries' combined share of the world's total GDP increased significantly from 18.5% to 25.3%; the share of global outward Foreign Direct Investment (FDI) surged from 13% to 37.9%; and the GDP per capita grew by an average of 3.7% per annum.

Working on promoting common prosperity, Trilateral Cooperation enjoyed a steady increase in the intra-regional trade volume from USD 0.7 trillion in 2011 to its peak of USD 1.2 trillion in 2020; the intra-regional trade ratio reached 28.4%, and the share of world merchandise exports increased by 21.2%.

A coordinated and efficient transport and logistics system among the three countries was further developed. The three countries rank among the best in connecting with the global liner shipping network, being placed 1st (China), 3rd (ROK) and 11th (Japan). The average growth rate of container port throughput remained at 4.8% annually over the decade, with 294.9 million TEUs of containers handled in ports in 2020.

Trilateral Cooperation in science and innovation improved research capacity and strengthened the competitiveness of the industrial technologies. The three countries are the top sources of international patent applications, accounting for 61.4% of the world's total and enjoying annual growth of 6.7%.

It is my sincere hope that this Report could be an informative source to better understand Trilateral Cooperation in the economic field, particularly in the digital economy. I concur with the *Trilateral Cooperation Vision for the Next Decade* that stronger Trilateral Cooperation serves the common interests of our countries and peoples, and will contribute significantly to the lasting peace and common prosperity of the region and beyond in the coming decade.

ZHANG Yuyan

Director-General
Institute of World Economics and Politics,
Chinese Academy of Social Sciences

In the second decade of this century, China-Japan-ROK cooperation has made positive progress. In particular, in 2019, the Trilateral Summit Meeting reached the "Trilateral Cooperation Vision for the Next Decade", which provided new guidelines for deepening cooperation among the three countries. Entering the third decade of this century, while continuing to deepen cooperation, China, Japan and the ROK also face a series of common challenges. The COVID-19 is still spreading, geopolitical risks are rising, and the tide of anti-globalization is intensifying. All of these have put forward new requirements for cooperation among the three countries. In this context, it is very necessary and timely for the Trilateral Cooperation Secretariat to organize research institutions from the three countries to review the economic cooperation between the three countries in the past ten years and draw suggestions for cooperation among the countries in the future. It is believed that the publication of the report can provide a reference for the three countries to further strengthen cooperation.

I am very pleased that the Institute of World Economics and Politics (IWEP) participated in the composition of the report as one of the research institutions. The Institute of World Economics and Politics, established in 1964, is one of the research institutes for international studies under the Chinese Academy of Social Sciences (CASS). The Institute is mainly engaged in research in the fields of world economy, international politics, global governance, and national security. It is one of the most influential think tanks in the fields of China's economic policies, international economic policies, and China's diplomatic policies.

The Institute of World Economics and Politics have maintained extensive academic communication and cooperation with relevant research institutions in many countries and regions around the world. In the future, we would like to strengthen cooperation with the Trilateral Cooperation Secretariat, and also hope to strengthen communications with research institutions in Japan and South Korea under the platform of the Trilateral Cooperation Secretariat, so as to contribute to promoting China-Japan-ROK cooperation.

IWATA Kazumasa

President
Japan Center for Economic Research

RCEP was a great achievement of Asia-Pacific regional integration in a gradual, but steady Asian way. For the first time, China, Japan and the ROK have been brought together under the same umbrella of regional architecture. Certainly, it will serve to establish a high-quality C-K-J FTA and nurture trilateral cooperation in achieving digital and green transformation.

Now the world economy faces high inflation caused by a number of factors; namely, excess demand triggered by expansionary fiscal and monetary policy, supply disruptions due to new variants of Covid-19 and the US-China rivalry of techno-nationalism, greenflation reflecting the shortage of new investment in fossil fuel and the upswing of a new super-cycle in commodities with the last peak recorded in 2008.

Russia's invasion of Ukraine implied the start of a new era, the "Second Cold War", involving more direct conflicts than the previous one. It is urgent that Russia ends its use of military force, thereby securing national sovereignty and territorial integrity in Ukraine.

The Ukraine crisis added to the momentum toward stagflation. Shortage of oil, natural gas and foods arising from economic sanctions pushed up energy, metal and food prices, and at the same time, lowered growth rates.

According to JCER's assessment of its impact on Japan's economy, the growth rate will be pushed down by 0.5%, while inflation raised by 0.7% in FY2022. Under the risk scenario, Japan's growth rate will become negative in FY2023.

It is important to achieve green and digital growth, relying on renewable and hydrogen energy coupled with efficient use of big data and AI. Promoting Data Free Flow with Trust and mutual sharing of data based on the principle of data portability and interoperability of networks is desirable, by expanding the regional framework such as the CPTPP and the Data Economy Partnership Arrangement.

KIM Heungchong

President
Korea Institute for International Economic Policy

In commemoration of economic cooperation and development in three nations over the past decade, I would like to express my great pleasure in publishing the *Trilateral Economic Report 2011-2020*. The idea of establishing a body for cooperation between the three countries began to circulate in the 1990s, following which Korean President Lee Myung-bak proposed the creation of a permanent secretariat at the 2nd Trilateral Summit. The three leaders at the time officially agreed upon the idea by signing the Agreement on the Establishment of the Trilateral Cooperation Secretariat, and adopted the Trilateral Cooperation Vision 2020 at the 3rd Trilateral Summit in 2010. In September 2011, the Trilateral Cooperation Secretariat was established in Seoul, South Korea. Over the years, the Korea Institute for International Economic Policy (KIEP) has been fortunate to play a pivotal role in developing and disseminating the ideas of the trilateral talk entity.

KIEP is a public research institute established in 1990 to conduct studies, research, and analyses of global economic issues, guiding the nation toward effective international economic policies. In particular, KIEP maintains close cooperation with the TCS, and holds economic cooperation among China, Japan, and Korea as one of its major research areas.

In this volume of the *Trilateral Economic Report 2011–2020*, KIEP was tasked with drafting the section "Korea's Macro and Micro Economic Performance" within the report. Overviewing macroeconomic growth in Korea, together with its FTA policy and currency swap cooperation with China and Japan, it reviews Korea's industrial development and cooperation with China and Japan in Bio and Healthcare, Software, and Cultural Content. We also illustrate Korea's GVC participation and supply chain connectivity with China and Japan in the bilateral trade of intermediate goods (materials, parts and equipment) of the manufacturing sector. Policy recommendations include facilitating service trade liberalization through the resumption of the CJK FTA, establishing a new inter-governmental consultative body to discuss trilateral supply chain cooperation, and strengthening the "CJK Centrality" of the TCS in the institutional cooperation context regarding the RCEP Secretariat. I would like to convey my sincere gratitude to Dr. KIM Gyupan and Dr. HEO Jaichul for their contributions, and of course the invaluable insights contributed by our partners in the other sections of the report.

I hope that this publication will serve to share our visions and policy proposals for trilateral economic cooperation with a wider readership and contribute to the stability and prosperity of Northeast Asia in our fast-changing global environment.

WANG Zhiqin

Vice-President
China Academy of Information and Communications Technology

On behalf of the China Academy of Information and Communications Technology (CAICT), I would like to congratulate the successful publication of the *Trilateral Economic Report 2011-2020*. At the same time, I am honored that our institute could work together with the Trilateral Cooperation Secretariat (TCS) and all the research institutes in China, Japan, and the ROK to make joint efforts for the report.

In 2010, the leaders of China, Japan, and the ROK adopted the *Trilateral Cooperation VISION 2020* at the 3rd Trilateral Summit, listing the economy as one of the five major areas of cooperation. At present, the global economy is facing multiple opportunities and challenges. As the emerging economic form after the agricultural and industrial economies, the digital economy is growing against the developing challenges and leading the global economy to recovery. Under the historical and international background above, for the first time, the *Trilateral Economic Report 2011-2020* reviews both the economy and digital economy cooperation between China, Japan, and the ROK in the last decade, and provides suggestions for the future trilateral cooperation. The publication of the report is just at the right time.

CAICT is the only industrial innovation platform in China's ICT sector that can bridge the entire chain from new technology research, standards development, experimental verification, testing & certification to industrial promotion. Furthermore, our institute has played an essential role in promoting the leap-forward development of China's communication industry, and the innovation & application of the information technology industry. In recent years, with a view to adapting to the new eco-social backdrop and requirements, we have conducted in-depth research and proactive planning in the fields of 4G/5G/6G, industrial Internet, smart manufacturing, mobile Internet, Internet of Things (IoT), Internet of Vehicles (IoV), cloud computing, big data, blockchain, artificial intelligence, future network, virtual reality/augmented reality (VR/AR), intelligent hardware, and cyber and information security.

At the same time, we have made efforts to strengthen research innovation and continue to make breakthroughs in digital economy research. Our main research results in the digital economy, such as the framework and measurement of the digital economy, digital transformation, data as a factor of production, etc., continuously support China's strategic policies. Moreover, our main reports, like *China's Digital Economy Development Report, A New Vision of the Global Digital Economy and Report on Data Valuelization and Data Factor Market Development,* have been widely cited internationally and domestically.

As a cooperative research institute of the report, CAICT is honored to undertake in-depth research and writing on the development of China's digital economy, the review of digital economic cooperation between China, Japan, and the ROK, and suggestions for future collaboration among the three countries. We hope to have more in-depth cooperation with Japan and the ROK in related fields in the future. We also hope that China, Japan, and the ROK can work together to achieve more cooperation results in the economy, especially in the field of the digital economy.

WATANABE Tetsuya

Vice President
Research Institute of Economy, Trade and Industry
Visiting Professor
Graduate School of Public Policy, the University of Tokyo

Digital transformation is one of the most urgent policy agenda in every country to promote economic vitality and enrich people's life.

Prime Minister Kishida announced as his main pillar of the economic policies, the concept of "New Capitalism" where the government, industries and various stakeholders in society jointly make efforts to achieve virtuous cycle of "growth and distribution". The administration expects digital transformation to accelerate this cycle. Japanese companies also put digital transformation of their business management and operations at the core of their future strategies in the Post-Pandemic environment. During the Pandemic, remote work has been gradually penetrated in the Japanese corporate culture and a new "work-life balance" taking advantage of digital technology is attracting young generation's attention.

Prime Minister Kishida also promotes "Digital Garden City State Concept". The basic idea of "Digital Garden City" is to solve the problems in local communities and revitalize regions thus realize bottom up growth from the region by using digital technology. The government, in collaboration with local governments, will develop digital infrastructure, foster digital human resource and implement digital technology to fully realize benefits for every people in every corner in Japan.

RIETI (Research Institute of Economy, Trade and Industry), as the knowledge hub to connect various stakeholders including government, industries and academia, has been conducting a wide range of activities to diffuse best practices of business digital transformation and providing policy recommendations.

International cooperation and learning best practices from each other is very important in this context.

I am pleased my colleague, Mr. Koichi Iwamoto, Research Associate of RIETI, contributed by writing an excellent paper on "Current Status and Future Prospects of Digitization in Japan and Policy Recommendations".

I commend the Trilateral Cooperation Secretariat's efforts to facilitate cooperation and deepen ties among Japan, China and the Republic of Korea. I look forward to furthering our collaboration in various policy areas.

KWON Ho-Yeol

President

Korea Information Society Development Institute

The digital economy, which refers to a broad range of economic activities through the effective use of information and communication technology (ICT), has led to Korea's economic growth in the last two decades. This study aims to assess the achievements of the Korean digital economy, including the new industries, export, and employment in the ICT industry. The rapid economic expansion that Korea has experienced in the past decade was connected closely with the production and adoption of digital intensive goods and services.

As we approach an exit from the COVID-19 crisis, we look forward to a new era of 'digital transformation,' where the adoption of digital technologies supports the creation of ideas, helps people achieve potential, and improves lives. It is time that we focus on sound and agile policy measures that can sustain economic growth and social prosperity. Many countries worldwide are pursuing digitalization strategies to promote growth and resolve social problems.

The Korean government carried out the "Digital New Deal" project, including a large-scale investment and infrastructure construction in the ICT sector. Other countries, including China and Japan, are pursuing similar strategies to enhance digital capabilities at the national level. Based on the analysis results, we suggest policy tasks for the long-term, stable growth of the digital economy of Korea. From its nature, digital policies encompass a diverse range of social and economic interventions, including human capital investment and institutions. Increased communication and collaboration among the three countries – Korea, China, and Japan – will help achieve those policy goals.

Since its foundation in 1985 as a research organization specializing in information and communications technology (ICT) policies, the Korea Information Society Development Institute (KISDI) has conducted extensive research on the industry trends, digital transformation, and the emerging society. I thank Trilateral Cooperation Secretariat for providing an excellent opportunity to study digital cooperation among the three global digital powerhouses -Korea, China, and Japan. I also look forward to continued collaboration between the two institutions in the future.

CONTENTS

List of Figures

Chapter 1 - The Review of Trilateral Statistics

Chapter 2 - Economic Performance of China

Chapter 3 - Economic Performance of Japan

Chapter 4 - Economic Performance of the Republic of Korea

Chapter 7 - The Digital Economy of Korea and the Digital New Deal of Korea

Abbreviation

AFTA	ASEAN Free Trade Area
AI	Artificial Intelligence
AMRO	ASEAN+3 Macroeconomic Research Office
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
ASEAN+3	Association of Southeast Asian Nations, China, Japan and the ROK
CAGR	Compound Annual Growth Rate
CAICT	China Academy of Information and Communications Technology
CASS	Chinese Academy of Social Sciences
CDO	Chief Data Officer
CHY	Chinese Yuan
CI	Composite Index
CIO	Chief Information Officer
CJK	China, Japan, Republic of Korea
CMIM	Chiang Mai Initiative Multilateralization
CPI	Consumer Price Index
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
DWT	Dead Weight Tonnage
EFTA	European Free Trade Association
EPA	Economic Partnership Agreement
ESM	European Stability Mechanism
ETF	Exchange-Traded Funds
EU	European Union
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
FY	Fiscal Year
GAFA	Google, Apple, Facebook, and Amazon

GATT	General Agreement on Tariff and Trade
GDP	Gross Domestic Product
GII	Global Innovation Index
GPM	General-Purpose Machinery
GPT	General-Purpose Technology
GT	Gross Tonnage
GVC	Global Value Chain
HS	Harmonized System
ICT	Information and Communication Technology
IEC	International Electrotechnical Commission
ILO	International Labour Organization
IMF	International Monetary Fund
IoT	Internet of Things
IPR	Intellectual Property Rights
ISO	International Organization for Standardization
IT	Informaion Technology
JCER	Japan Center for Economic Research
JPY/JP¥	Japanese Yen
J-REITs	Japan Real Estate Investment Trusts
KC FTA	Korea-China Free Trade Agreement
KIEP	Korea Institute for International Economic Policy
KISDI	Korea Information Society Development Institute
KRW	Korean Won
LSCI	Liner Shipping Connectivity Index
MOU	Memorandum of Understanding
NAFA	North American Framework Agreement
NAFTA	North American Free Trade Agreement
NMI	New Miyazawa Initiative
OECD	Organisation for Economic Co-operatioin and Development

OFDI	Outward Foreign Direct Investment
OSS	Open Source Software
PCT	Patent Cooperation Treaty
PPI	Producer Price Index
QQE	Quantitative and Qualitative Monetary Easing
R&D	Research and Development
RCEP	Regional Comprehensive Economic Partnership
RIETI	Research Institute of Economy, Trade and Industry
RMB	Ren Min Bi
ROK	Republic of Korea
SCC	Supply Chain Connectivity
SMEs	Small and Medium-sized Enterprises
STEM	Science, Technology, Engineering, and Math
SW	Software
TCS	Trilateral Cooperation Secretariat
TEU	Twenty-foot Equivalent Unit
TFP	Total Factor Productivity
TiVA	Trade in Value Added
TRQ	Tariff Rate Quotas
UAE	United Arab Emirates
UNCTAD	United Nations Conference on Trade and Development
USD/ US$	United States Dollar
VUIs	Voice User Interfaces
WIPO	World Intellectual Property Organization
WPT	Wireless Power Transfer
WTO	World Trade Organization
YCC	Yield-Curve Control
y-o-y	Year on year

Chapter

1

The Review of Trilateral Statistics

Trilateral Cooperation Secretariat

Organization: Trilateral Cooperation Secretariat (TCS)

Authors:

LI Nianwei, Economic Affairs Officer, Trilateral Cooperation Secretariat (TCS)

SAKAI Marina, Economic Affairs Officer, Trilateral Cooperation Secretariat (TCS)

KIM Heejin, Economic Affairs Officer, Trilateral Cooperation Secretariat (TCS)

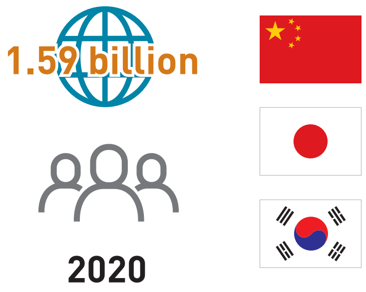
HAO Nan, Political Affairs Officer, Trilateral Cooperation Secretariat (TCS)

Contents

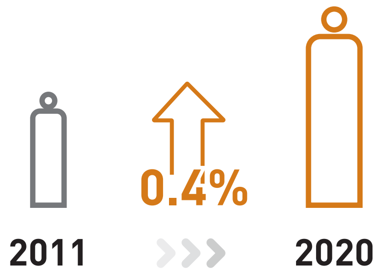
Chapter 1 - The Review of Trilateral Statistics

1.1. Total and Urban Population

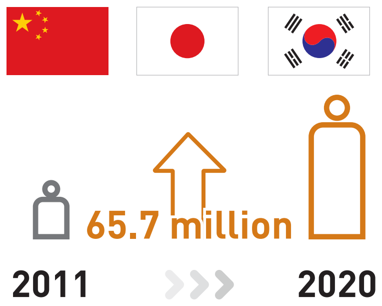
The total CJK population has reached **1.59 billion** in 2020.



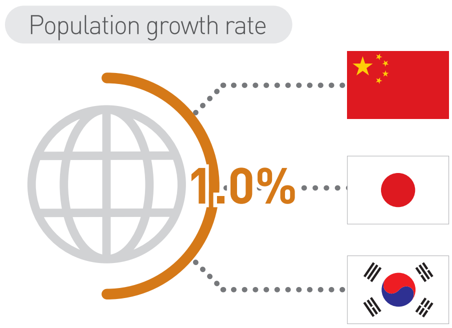
The average population growth rate in 2011–2020 is **0.4% per year**.



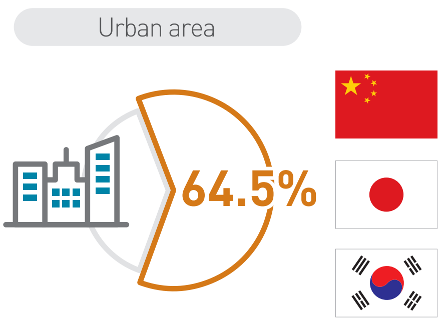
The CJK population has increased by **65.7million** in 10 years.



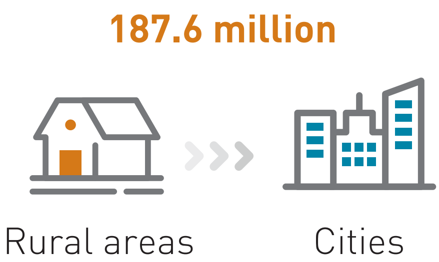
The population growth rate of CJK is below half of the world: 1.0% per year.



In the three countries, **64.5% of people live in the cities**.



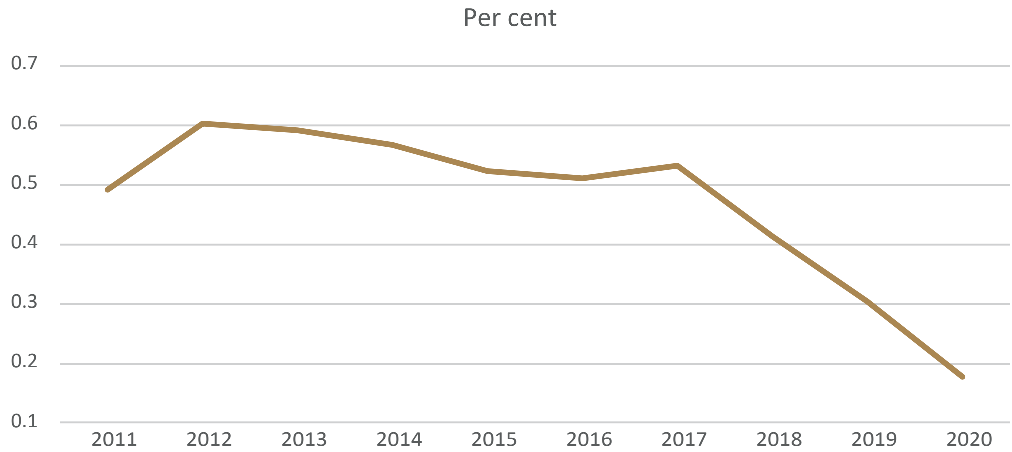
From 2011 to 2020, more than 187.6 million people moved from rural areas to cities.



Slowdown of population growth in China, Japan, and the Republic of Korea

The steady slowdown in world population growth, occurring since the late 1980s, continued in 2020. In 2020, the population of three countries reached 1.59 billion. However, the growth is much slower than the world average, and the annual growth rate is only 0.4% in the last decade. Meanwhile, the urbanization process accelerated, with 64.5% of the population living in the city currently. In the last 10 years, 187.6 million people moved to urban areas.

Figure 1 Annual growth rate of CJK population



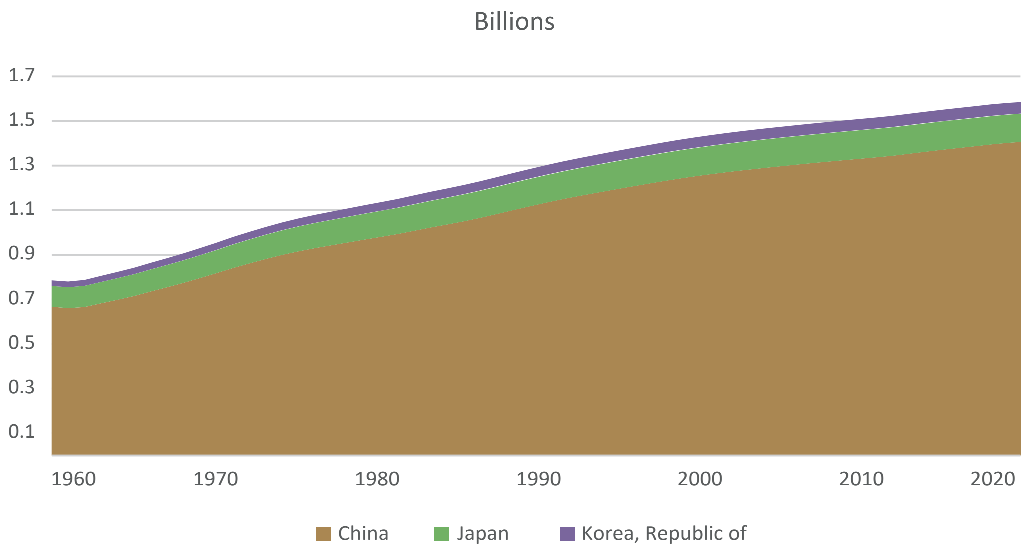
Driving factors for future population growth

Over the last 10 years, the world population has increased by 757.9 million people, and 8.7% of these people live in China, Japan, and the Republic of Korea. In the next 30 years, global population is projected to grow by 1.9 billion people. However, the population of these three countries alone is projected to decrease by 33.5 million. The total CJK population is projected to experience a decline after 2030.

Concepts and definitions

As of July 1 of a given year, the population estimates and projections reported in this chapter represent the population present in an economy (including residents, migrants, and refugees; UN DESA, 2019a, 2019b). The figures for years 2020–2050 are based on the medium fertility variant projection. The projections assume that the average fertility rate of the world will decline from 2.5 births per woman in 2019 to 2.2 in 2050. The United Nations also produce other projection variants. Their outcome is highly dependent on the path of future fertility (UN DESA, 2019b). These projections were made in 2019, and the effects of the COVID-19 pandemic are currently unknown (UN DESA, 2021). Urban population is defined as the population living in urban areas according to the criteria used by each country or territory (UN DESA, 2018, 2019c).

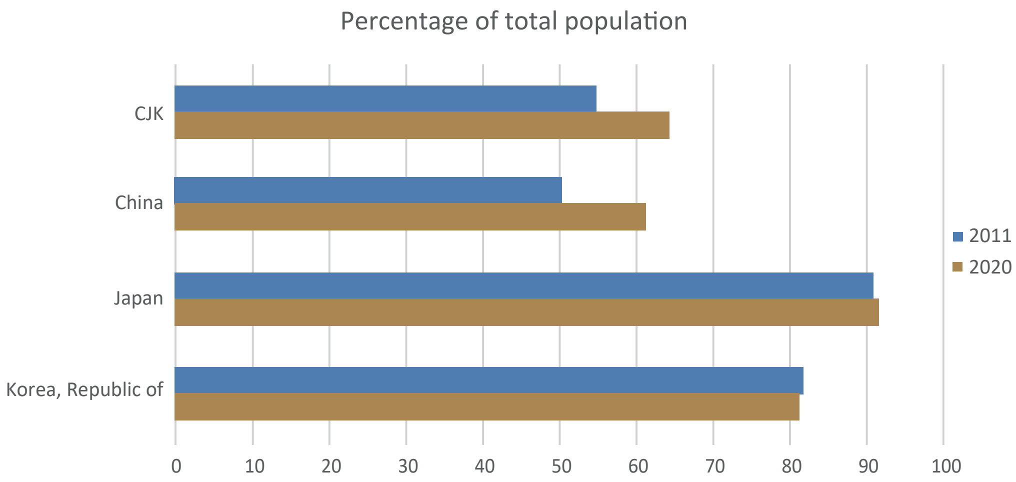
Figure 2 Population of China, Japan, and the Republic of Korea



Urbanization continues

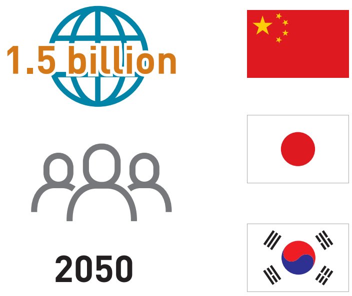
In the three countries, a growing proportion of the population lives in cities. In 2011, 55.0% lived in urban areas. By 2020, the share of urban population increased to 64.5%. Further urbanization in East Asian regions has been relatively modest. Urbanization levels in this region are already comparable to the level of other developed economies.

Figure 3 Share of urban population in total population



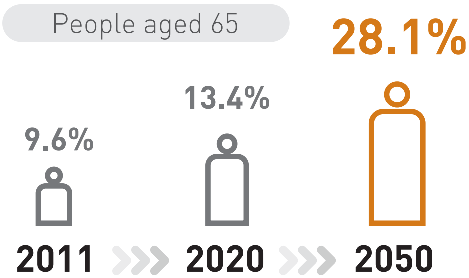
1.2. Age Structure

By 2050, there will be **1.5 billion** people living in CJK.

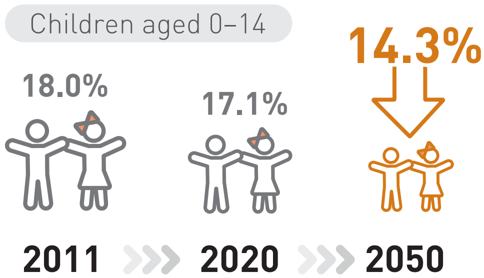


The population aged 65 years and over reached **212.8 million** in 2020. The aging population annual growth rate in 10 years reached **3.8%**.

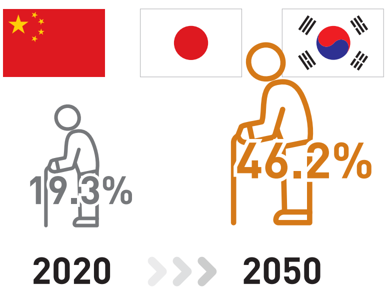
The proportion of people aged 65 and above increased from **9.6%** in 2011 to **13.4%** in 2020 and **28.1% in 2050**.



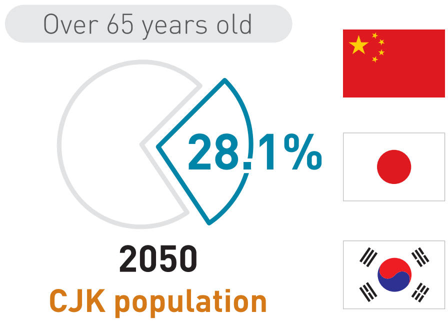
The proportion of children aged 0–14 fell from **18.0%** in 2011 to **17.1%** in 2020 and **14.3% in 2050**.



The old-age dependency ratio in the three countries is forecast to increase from **19.3%** in 2020 to **46.2% in 2050**.



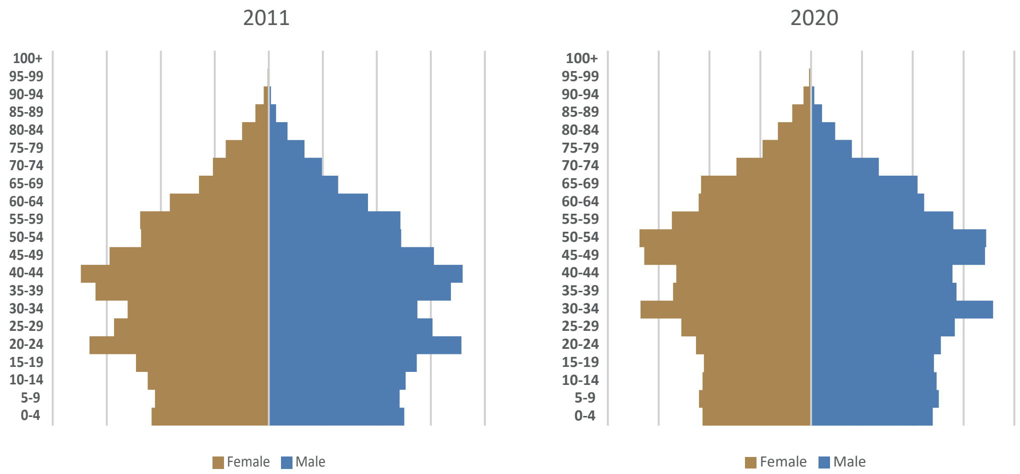
In 2050, 28.1% of the **CJK population** will be over 65 years old.



Population aging in China, Japan, and the ROK

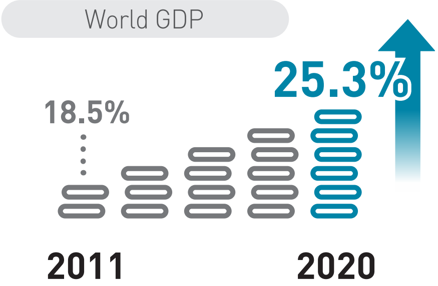
By 2050, there will be 1.5 billion people living in China, Japan, and the Republic of Korea. Among them, 423.3 million citizens will be aged 65 years old and above. The proportion of people above 65 years of age increased from 9.6% in 2011 to 13.4% in 2020 and will be 28.1% in 2050. However, the proportion of children aged 0–14 fell from 18.0% in 2011 to 17.1% in 2020. Population aging in the three countries brings both challenges and opportunities. Women are the majority for the older age group, whereas the majority of children are boys. In 2020, 48.9% of the CJK population was female.

Figure 4 Population pyramids

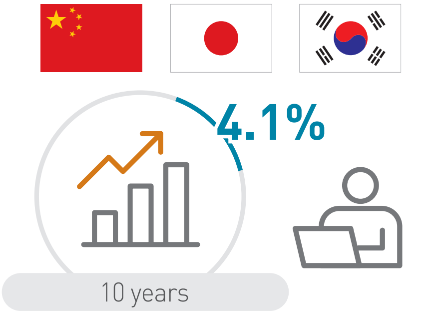


1.3. Gross Domestic Product and Foreign Direct Investment

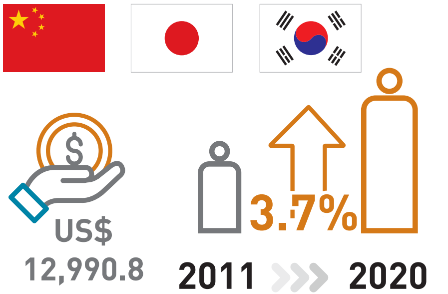
The CJK economies account for **25.3%** of the world GDP in 2020, a significant increase from **18.5%** in 2011.



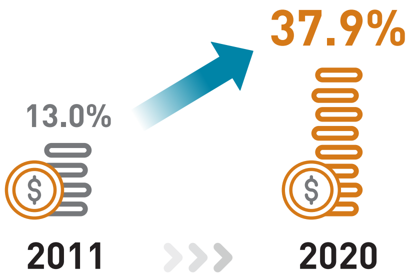
The average growth rate of the CJK economy is up to **4.1%** in the past 10 years.



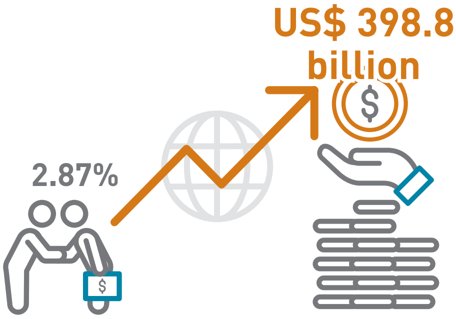
CJK's real GDP per capita is **US$ 12,990.8** in 2020. The average growth rate reaches **3.7%** from 2011 to 2020.



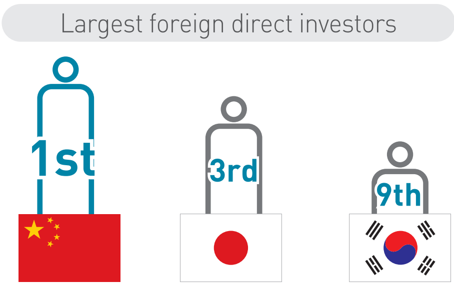
The three countries' share in global outward FDI reached a record high of **37.9%** in 2020, compared to **13.0%** in 2011.



The annual average FDI outflow increased by **2.87%**. The maximum value is US$ **398.8 billion** in 2019.



China, Japan, and the Republic of Korea (ROK) are the world's **1st**, **3rd**, and **9th** largest foreign direct investors in 2020.

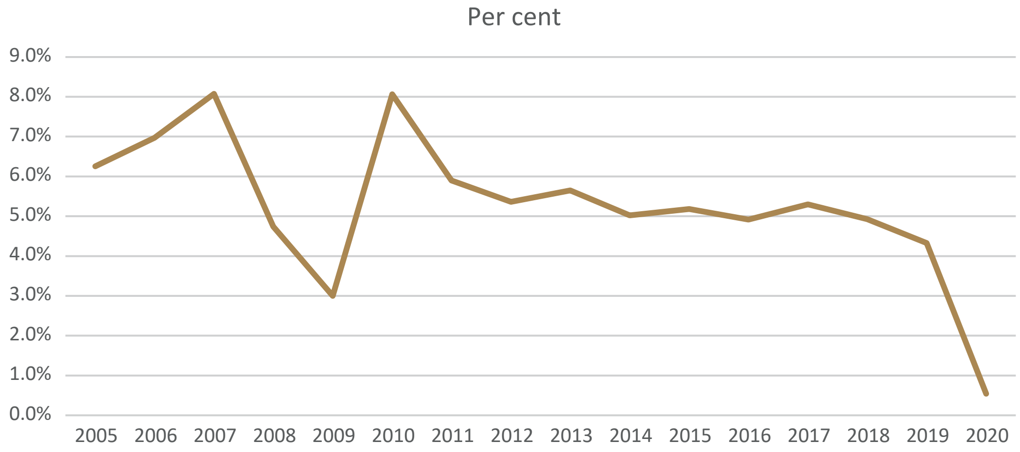


Trend in the CJK economy

The three countries' real GDP growth slipped to 0.54% in 2020 during the onset of the COVID-19 pandemic. However, the average real GDP growth between 2011 and 2020 reached 4.1%, higher than the world growth rate of 2.0%.

The real GDP per capita increased by 0.7% in 2020. Large differences in the GDP per capita growth rate persist throughout the world. In the past 10 years, CJK's average growth rate of GDP per capita reached 3.7%, higher than the world average growth rate of 1.0%.

Figure 5 CJK real gross domestic product, annual growth rate



World's main foreign direct investors

The overall trend in FDI inflows of CJK was on the rise since 2011, and the amount reached US$ 168.9 billion in 2020, accounting for 17% of world total inflows. The average annual outflow increased annually by 2.9%, with the maximum value of US$ 398.8 billion in 2019.

The three countries' FDI outflows accounted for 37.9% of the world total in 2020. It is much higher than 13.0% in 2011. China, Japan, and the ROK are the world's 1st, 3rd, and 9th largest foreign direct investors. Outward stocks of GDP reached 22.7% in 2020, compared to 10.1% from 10 years ago.

Figure 6 CJK foreign direct investment outflows

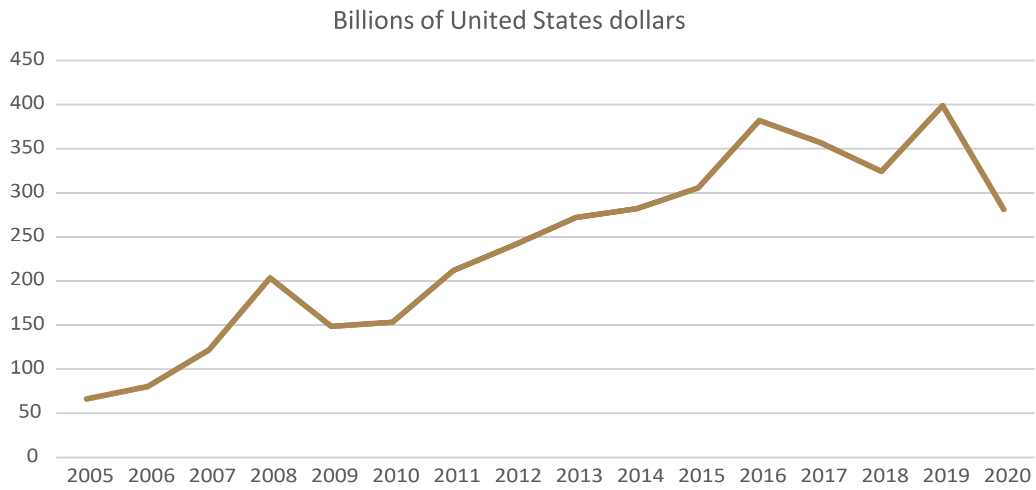
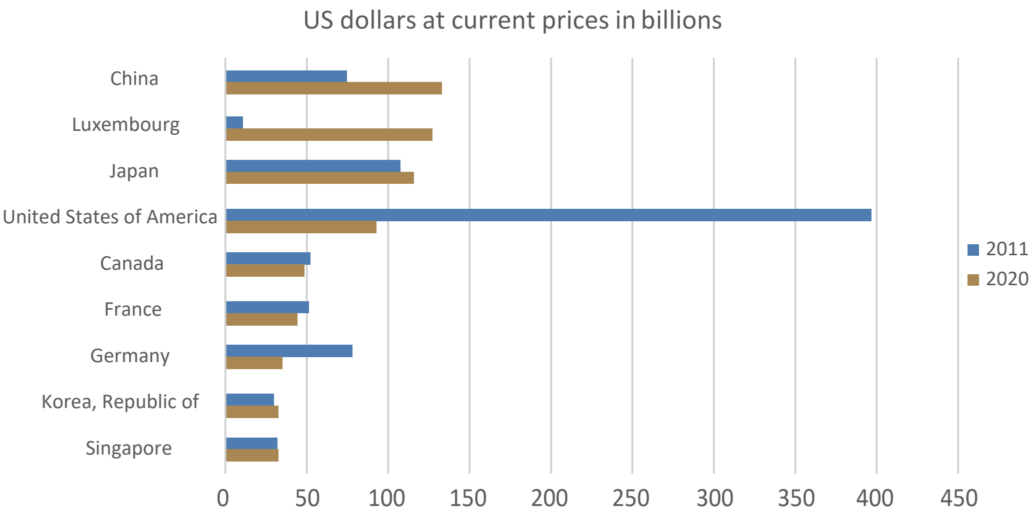
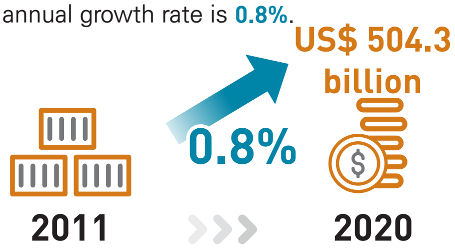


Figure 7 Top 10 sources of foreign direct investment in 2011 & 2020

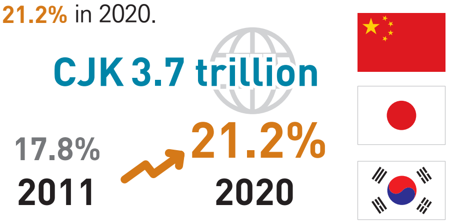


1.4. Total Merchandise Trade

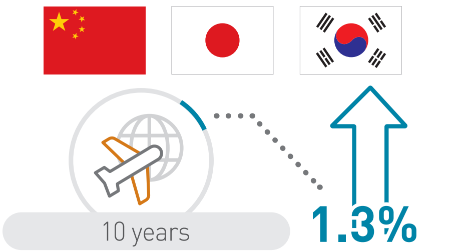
From 2011 to 2020, the CJK merchandise trade increased by **US$ 504.3 billion**. The annual growth rate is **0.8%**.



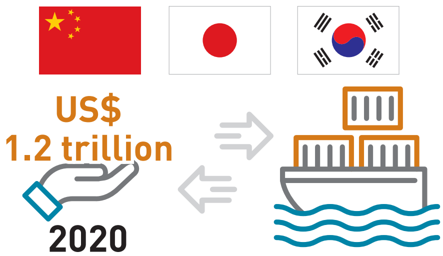
The value of CJK merchandise exports is **US$ 3.7 trillion**, and the share of world export increased from **17.8%** in 2011 to **21.2%** in 2020.



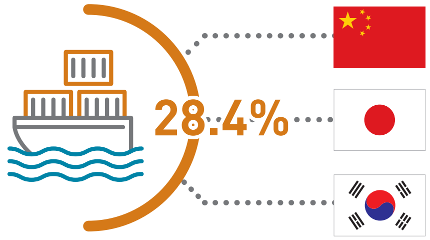
The annual growth rate of CJK merchandise exports reached **1.3%** in the past 10 years.



The total trade volume among China, Japan, and the ROK was **US$ 1.2 trillion** in 2020.

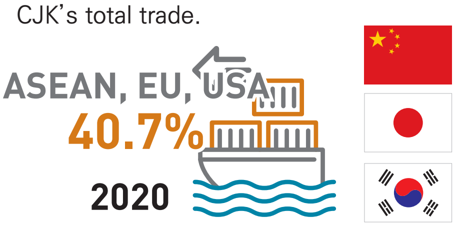


Specifically, **28.4%** of CJK's trade in 2020 is intra-regional.

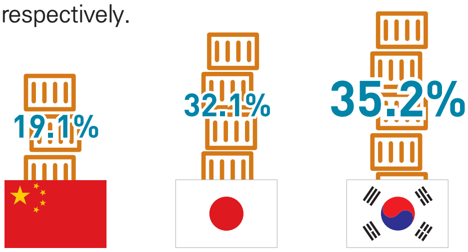


The volume of CJK merchandise exports and imports fluctuated in the past 10 years, but kept a growth trend. 2018 marked the highest export volume, whereas 2020 marked the highest import volume.

The top 3 trading partners in 2020 are **ASEAN**, the **EU**, and the **United States of America**, which amounted to **40.7%** of CJK's total trade.



China, Japan, and the ROK's regional trade shares are **19.1%**, **32.1%**, and **35.2%**, respectively.

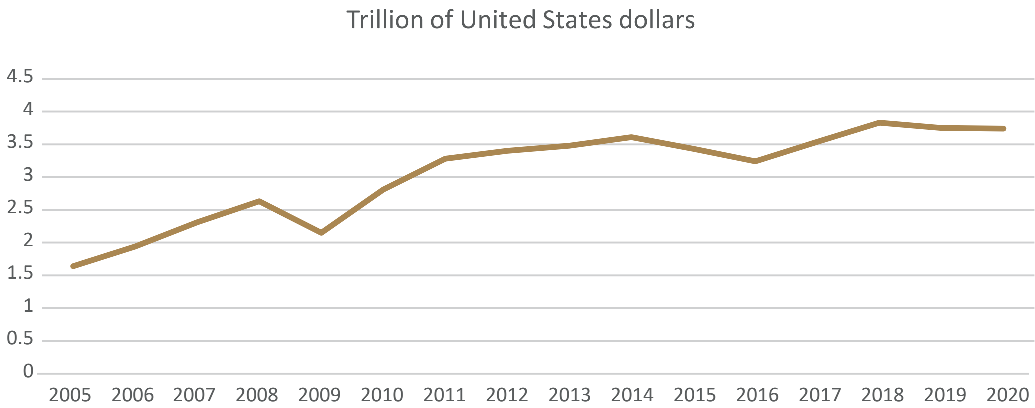


10-year trade growth

In 2020, the growth of the three countries' merchandise trade reached US$ 504.3 billion, with its annual growth rate in the past 10 years marking 0.8%. These countries' share of the world total trade in merchandise was 19.4% amounting to US$ 6.9 trillion. The average growth rate of export reached 1.3%.

The three countries focused on merchandise export. In 2020, these countries' goods exports to the world totaled US$ 3.7 trillion, accounted for 32.2% of CJK GDP.

Figure 8 CJK merchandise exports, yearly

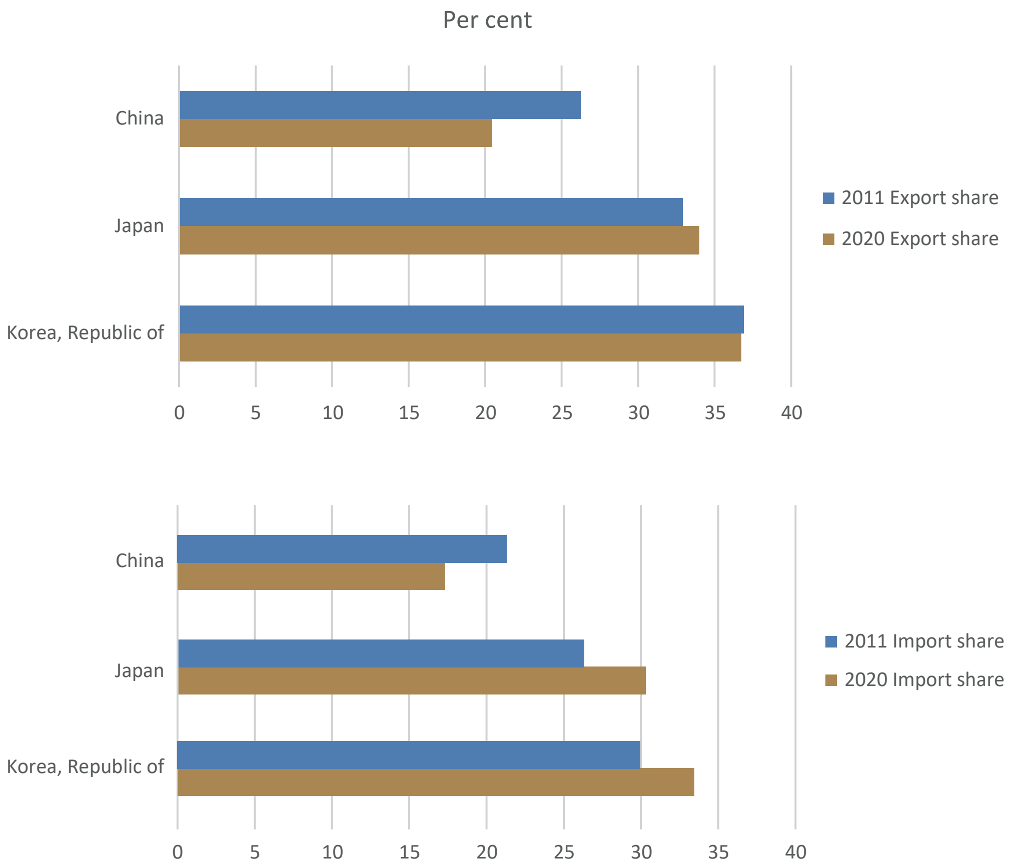


Close trade partners

The world's large flows of merchandise trade run between the three countries. In 2020, China, Japan, and the ROK's trade – exports and imports – totaled US$1.2 trillion. This is larger than the United States' trade with Mexico and Canada (US$1.07 trillion). The intra-regional trade in Asia kept increasing, from 55.6% in 2011 to 58.5% in 2020.

In 2020, ASEAN shipped most of their exports to the three countries (US$ 456.2 billion), and the United States of America sourced most of its imports from the three countries.

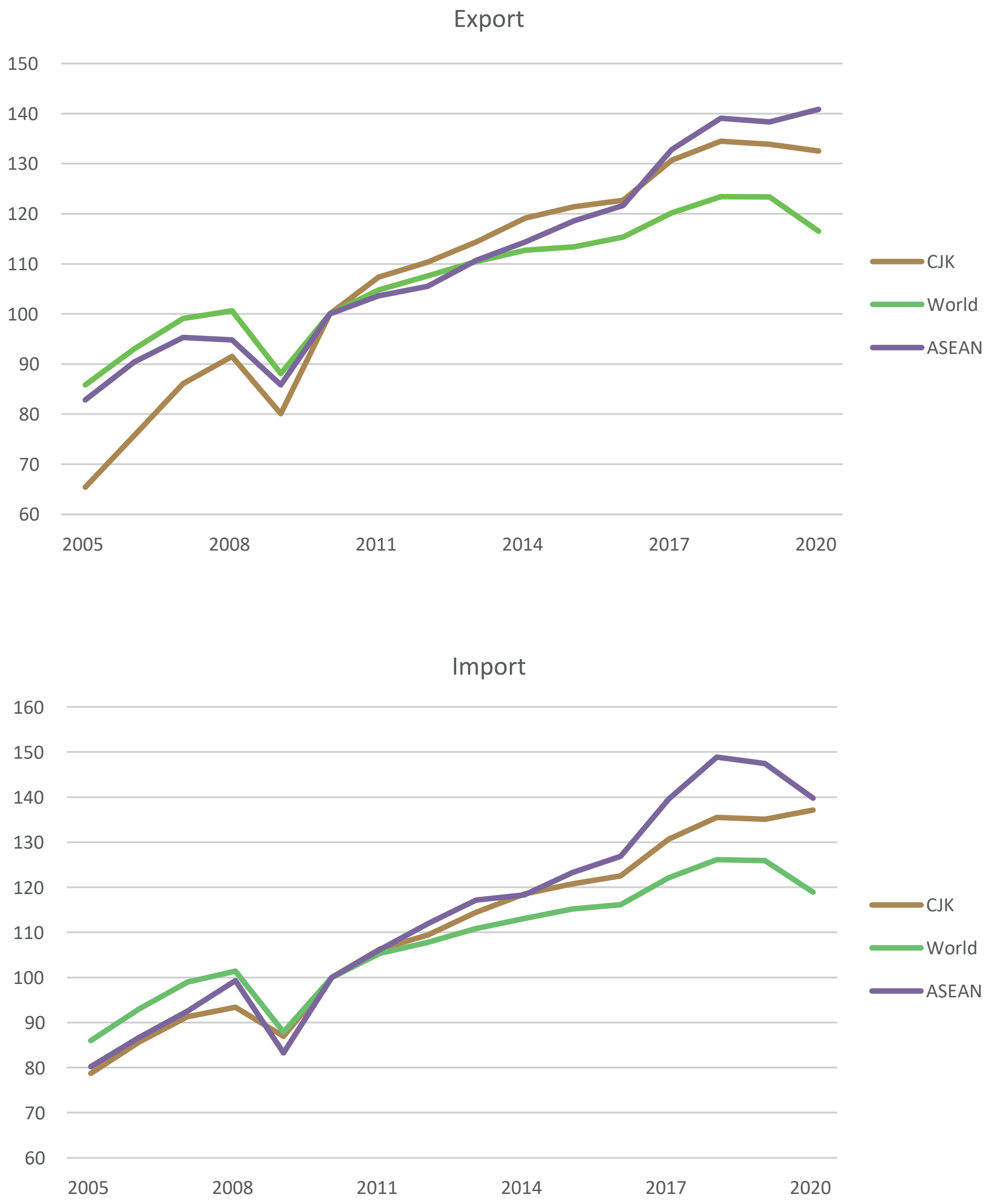
Figure 9 CJK regional export and import share



How important is the trade for CJK?

In 2020, the merchandise trade (% of GDP) in the three countries were reported at 31.6% (China), 25.2% (Japan), and 59.8 % (the ROK). The volume of CJK merchandise exports and imports fluctuated in the past 10 years, but kept a growth trend. 2018 marked the highest export volume, whereas 2020 marked the highest import volume .

Figure 10 Volume index of exports and imports 2010=100

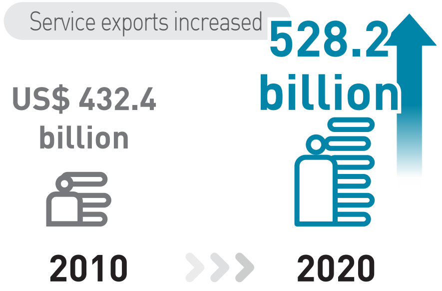


Concepts and definitions

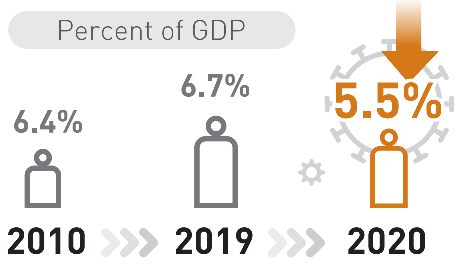
Intra-trade is the trade between economies belonging to the same group, whereas extra-trade is the trade of economies of the same group with all economies outside the group. Extra-trade represents the difference between a group's total trade and intra-trade. In theory, exports from economy A to economy B should equal to imports of economy B from economy A recorded FOB. However, in practice, the values of both flows often vary. The reasons for these trade asymmetries include the following: different times of recording, different treatments of transit trade, underreporting, measurement errors, and mis-pricing or mis-invoicing. The exports to (or imports from) all economies of the world do not always exactly add up to total exports (or imports). The difference is caused by ship stores, bunkers, and other exports of minor importance.

1.5. Total Trade in Services

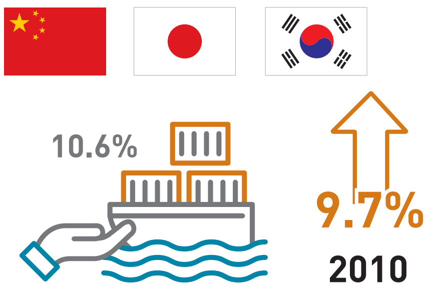
Service exports increased from **US$ 432.4 billion** in 2010 to **528.2 billion** in 2020.



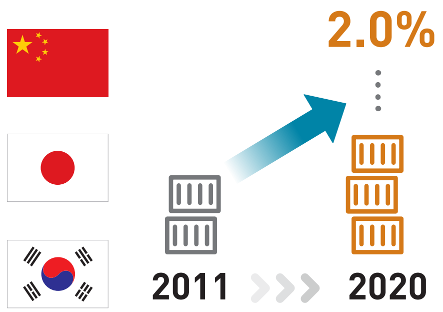
Trilateral trade in services accounted for **6.4%** of GDP in 2010, but increased to **6.7%** in 2019. It was heavily hit by the pandemic and thus dropped to **5.5%** in 2020.



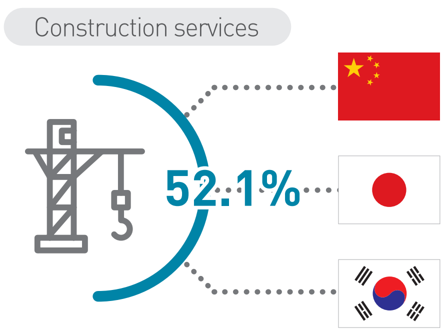
China, Japan, and the ROK supplied **10.6%** of international trade services in 2020, a rise from **9.7%** in 2010.



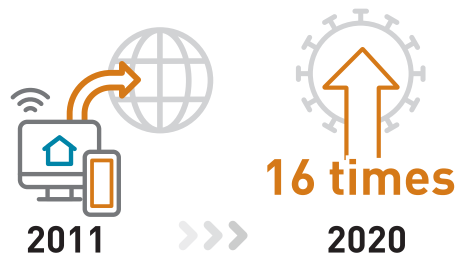
The three countries' export of services grew on average **2.0%** each year from 2011 to 2020.



Specifically, **52.1%** of construction services exports in 2020 came from CJK.



Exports in telecommunications, computer, and information services in 2020 are **16 times** larger than those in 2011 and continued to grow during the pandemic.



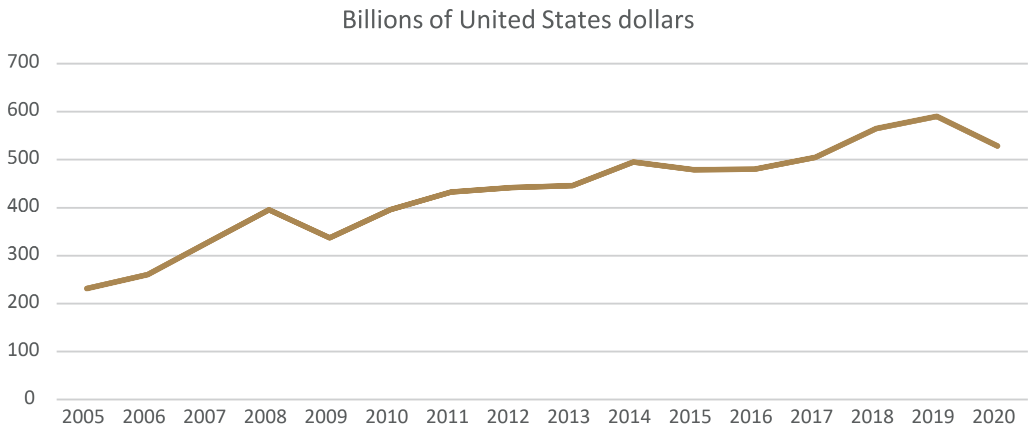
10 years growth

The three countries' service export maintained rapid growth in the past 10 years. Export in services was valued at US$ 528.2 billion, representing 5.5% of CJK GDP and 6.8% of three countries' world trade in both goods and services. Services exports of China, Japan, and the ROK recorded 18.5%, 15.5%, and 36.5% of their GDP, respectively. The three countries, for which international tourism is important, saw their tourism services exports considerably drop by 62.8% in 2020.

Concepts and definitions

In this chapter, in accordance with the concepts of the balance of payments (International Monetary Fund, 2009) and national accounts (United Nations et al., 2009), services are understood as a result of a production activity that changes the conditions of consuming units or facilitates the exchange of products or financial assets. International trade in services occur when a service is supplied in any of the following modes: from one economy to another (i.e., services cross the border), within an economy to service a consumer of another economy (i.e., consumer crosses the border), or through the presence of natural persons of one economy in another economy (i.e., supplier crosses the border) (United Nations et al., 2012). Trade-in-services figures are jointly compiled by UNCTAD and WTO, in cooperation with ITC and UNSD. Seasonal adjustments are based on UNCTAD secretariat calculations using X-11.

Figure 11 CJK services exports, annually



Leading services exports

With US$ 528.2 billion worth of services sold internationally in 2020, China, Japan, and the ROK remained the world's leading exporters, maintaining a 10.6% share of the global market. Specifically, 10 years ago, they only accounted for 9.7% of the global market, and 6.4% of CJK GDP in 2011.

Figure 12 Services exporters, 2020

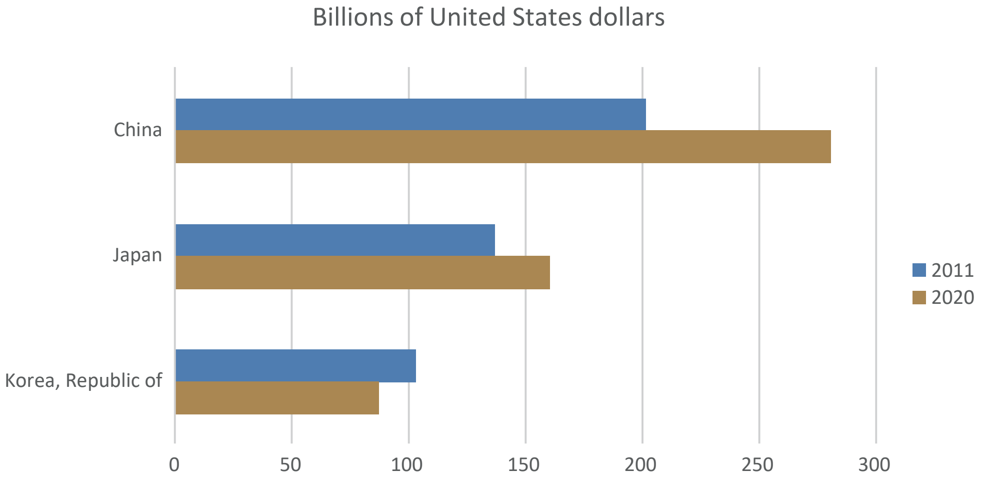
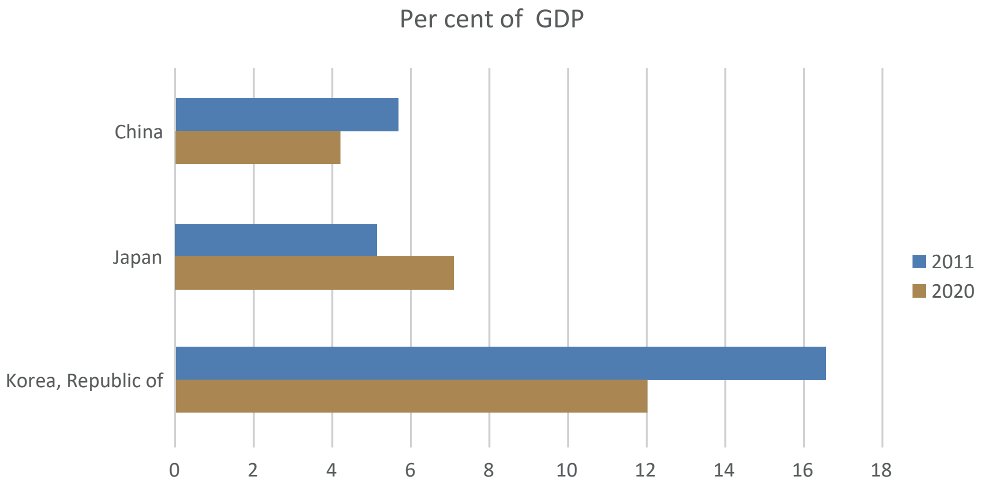


Figure 13 Trade in service



Regional trends over 10 years

From 2011 to 2020, global services trade enjoyed growth across the main services categories on all continents. The three countries registered solid gains in telecommunications and computer services. They play a significant role in all service export categories, accounting for 52.1% of the global exports of construction; 15.7% of the charges for the use of intellectual property; 9.4% of telecommunications, computer, and information in 2020 (an increase of 32.1% on a yearly basis); and 13.5% of maintenance and repair services (an increase of 36.7% annually).

Figure 14 Structure of services exports, 2020

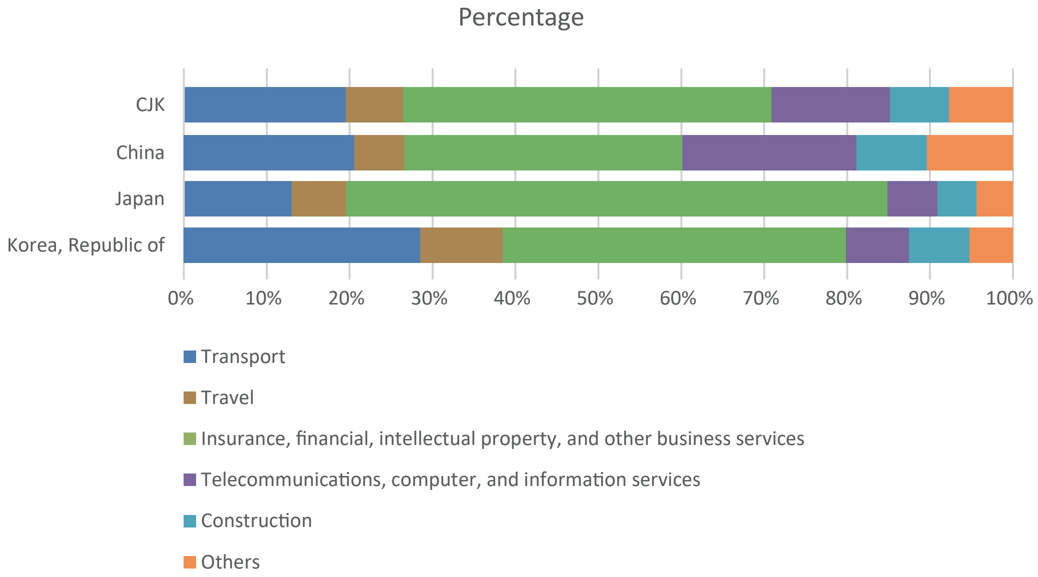
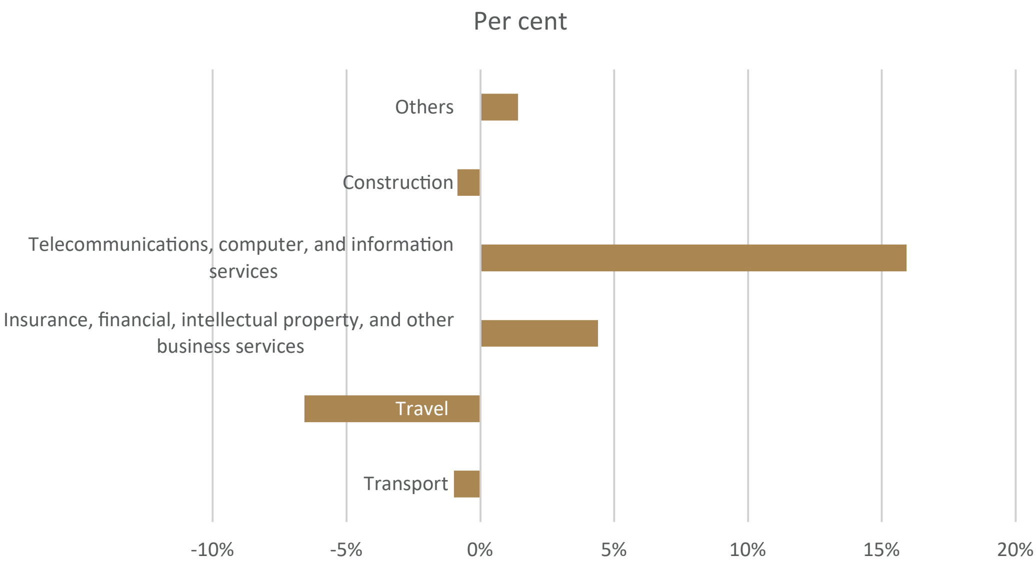


Figure 15 Annual growth rate of services exports, 2020

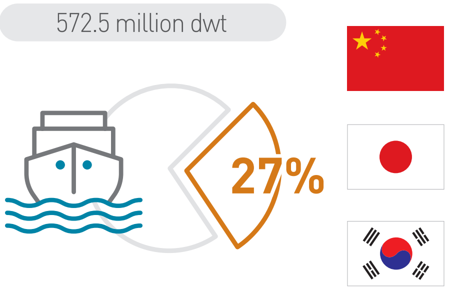


Concepts and definitions

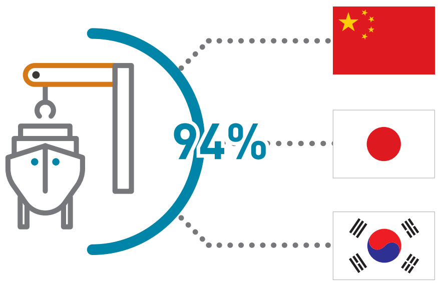
The breakdown by service category in this section has been obtained from the division of services in the balance of payment statistics, known as the 2010 Extended Balance of Payments Services Classification (EBOPS 2010) (United Nations et al., 2012). For the correspondence to the EBOPS 2010 categories and to the main groups presented in UNCTADstat, see Annex 6.2. The presented trade-in-services figures are jointly compiled by UNCTAD and WTO, in cooperation with ITC and UNSD.

1.6. Maritime Transport

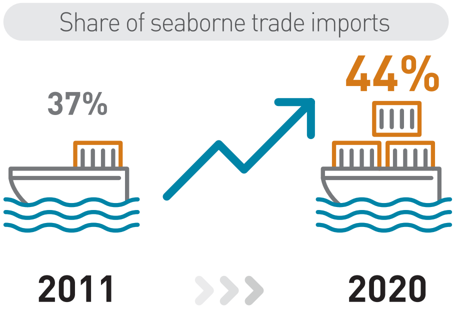
China, Japan, and the ROK's commercial fleet grew to 572.5 million dwt in 2020, accounting for **27%** of the world fleet.



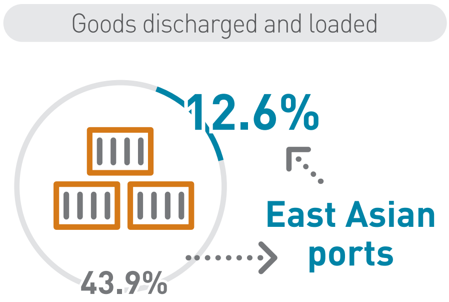
94% of the global shipbuilding occurred in China, the ROK, and Japan in 2020.



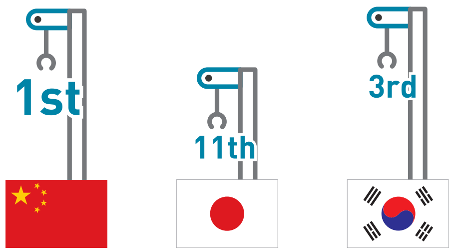
East Asia's share of seaborne trade imports rose from **37%** in 2011 to **44%** in 2020.



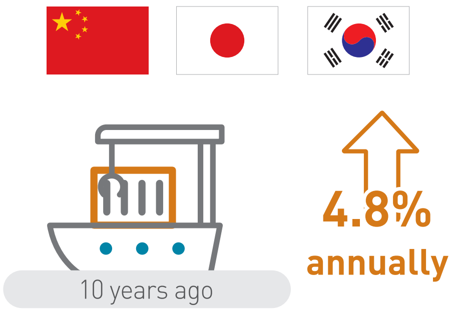
43.9% of all goods discharged and **12.6%** of all goods loaded were in East Asian ports.



China, Japan, and the ROK were the economies best connected to the global liner shipping network, ranked **1st**, **11th**, and **3rd** in 2020.



CJK container port throughput increased to **4.8% annually** in a decade.



Shipbuilding, fleet ownership, and seaborne trade

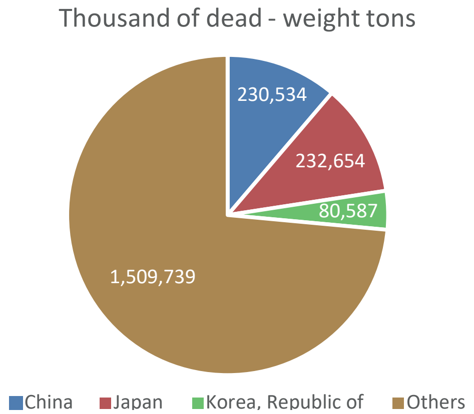
In 2020, global shipbuilding was concentrated in China, Japan, and the ROK. These three economies accounted for 94% of shipbuilding in terms of gross tonnage. These countries combined accounted for 27.1% of world fleet tonnage. China held a market share of 12%, followed by Japan (11%) and the ROK (4%).

The volume of maritime trade exports by East Asia increased by 4% annually from 2011 to 2020 and reached 1.3 billion metric tons. The predominance of East Asia as a leading maritime freight area continued unabated. In 2020, East Asian ports, loaded around 1.3 billion metric tons of goods, amounting to over 12.6% of the total goods loaded in ports worldwide. About 4.7 billion tons, which is equivalent to 43.9% of the total goods discharged worldwide, were received by East Asian ports in 2020.

Concepts and definitions

The unit dead-weight tons (dwt) is used to indicate the cargo-carrying capacity of a ship, while gross tons (gt) reflect its size. The latter is relevant to measure shipbuilding and recycling activities, while the former is used to capture the capacity to transport cargo. The presented statistics on fleet registration (the flag of a ship), shipbuilding, and recycling cover all commercial ships of 100 gt and higher. The market share for ownership only covers larger ships of 1000 gt and higher, as the true ownership is not always known for smaller vessels.

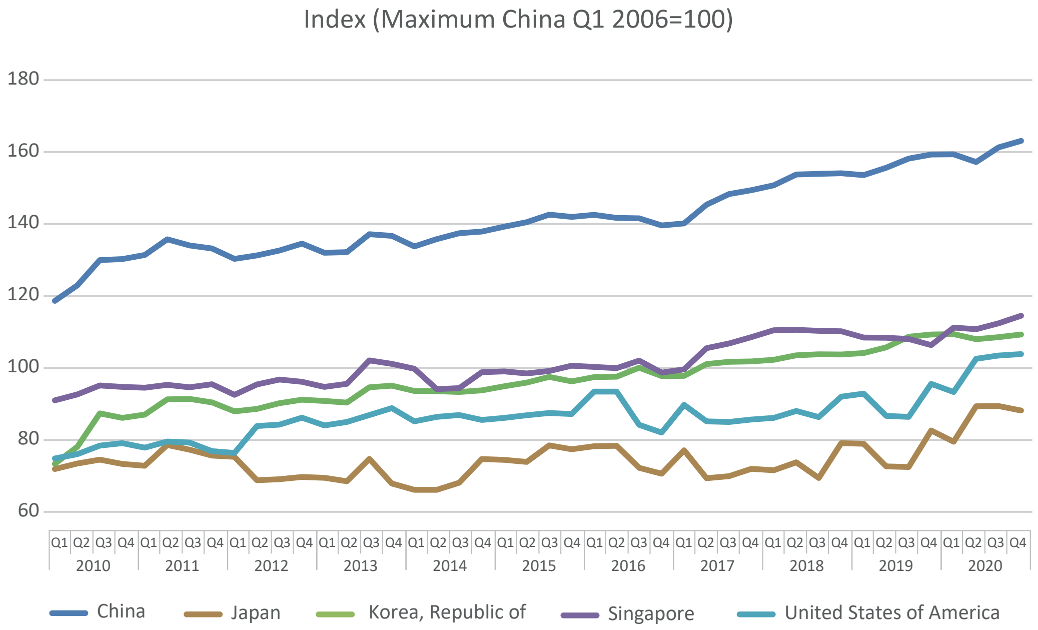
Figure 16 Fleet market by region of beneficial ownership, 2020



China, Japan, and the ROK's liner shipping connectivity worldwide

China, Japan, and the ROK were the economies best connected to the global liner shipping network. As measured by the LSCI, they respectively ranked 1st, 11th, and 3rd in 2020. Bilateral connectivity is the highest within continents, rather than between continents.

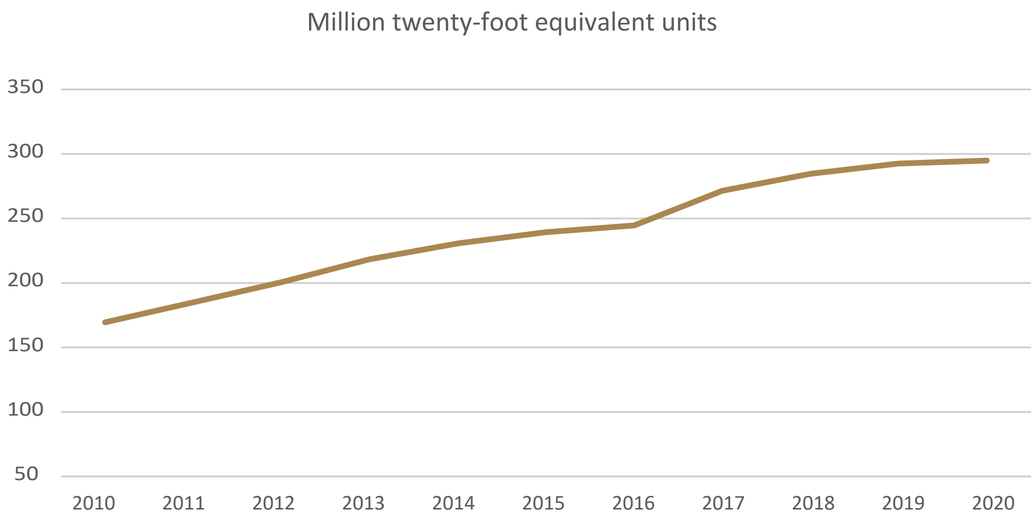
Figure 17 Liner shipping connectivity index



Port container traffic

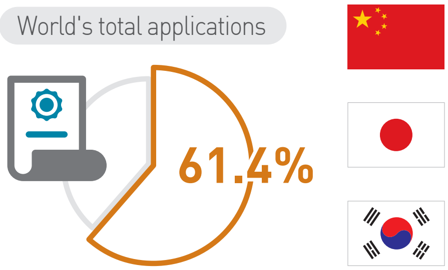
In 2020, 294.9 million TEUs of containers were handled in ports in the three countries. Trilateral container port throughput increased by 4.8% annually between 2011 and 2020. CJK's leading role as a global maritime freight loading and unloading center and their high liner shipping connectivity are mirrored in the region's high contribution to container port throughput, accounting for 39% of the world port container traffic.

Figure 18 CJK container port throughput

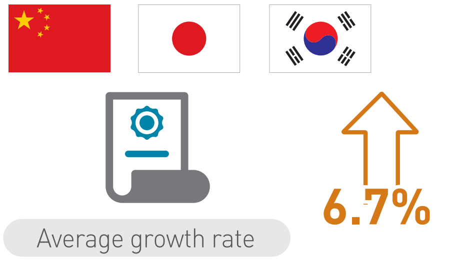


1.7. Intellectual Property

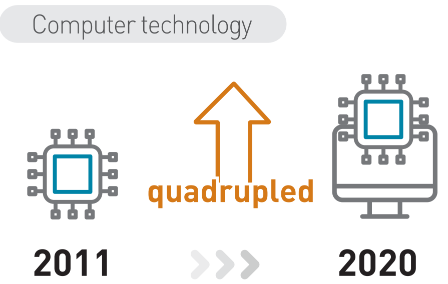
China, Japan, and the ROK are the top source of international patent applications, accounting for **61.4%** of the world's total applications in 2020.



In the past 10 years, the three countries maintained the momentum of rapid growth in patent application, and the average growth rate reached **6.7%**.

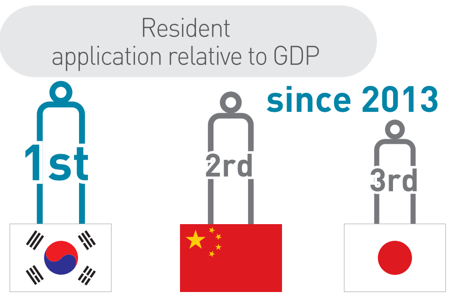


The cases of computer technology patent publications in 2020 have **quadrupled** since 2011.

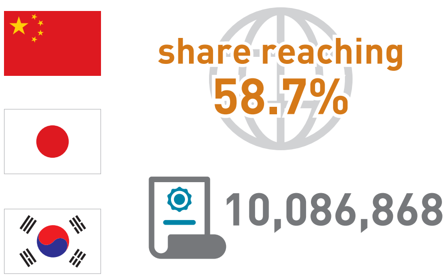


Among the top 10 PCT **applicants firms**, **8** are from China, Japan, and the ROK.

China (**2nd**), Japan (**3rd**), and the ROK (**1st**) are the top three countries in resident application relative to GDP **since 2013**.



CJK filed 10,086,868 trademark applications, with its **share reaching 58.7%** of the world in 2020 (10 years ago, it was 28.1%).



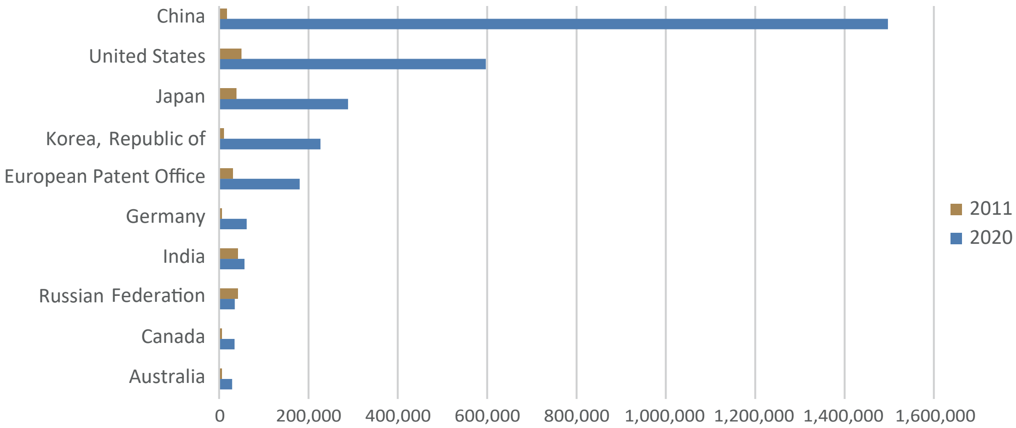
World innovation center

In 2020, China (1st), Japan (3rd), and the ROK (4th) remained the largest users of WIPO's PCT system. The number of filed applications reached 2,012,390, accounting for 61.4% of the global total. China's Huawei Technologies remained the top applicant of PCT international applications in 2020, followed by Mitsubishi Electric of Japan and LG Electronics from the ROK. Among the top 10 users, 8 were located in CJK.

CJK are the top three countries of resident applications relative to GDP. With 8,249 resident patent applications per unit of USD 100 billion GDP, the ROK continued to be the country that files the most patent applications in 2020. China (5,845) recorded the second highest ratio, followed by Japan (4,696). They have been the top three ranking countries since 2013.

> Concepts and definitions
>
> The PCT is an international treaty, which makes it possible to seek patent protection for an invention simultaneously in a large number of countries by filing a single "international" patent application, rather than filing several separate national or regional patent applications. The Madrid system is the primary international system for facilitating the registration of trademarks in multiple jurisdictions worldwide. Its legal basis is the multilateral treaty Madrid Agreement Concerning the International Registration of Marks of 1891, as well as the Protocol Relating to the Madrid Agreement (1989).

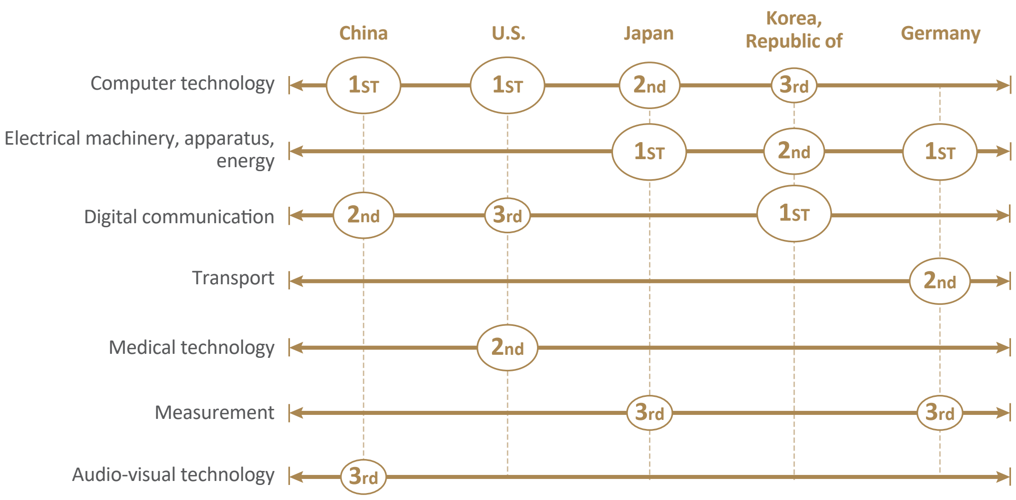
Figure 19 Patent applications for the top 10 offices, 2020



Fields of technology

In 2020, the three countries owned the largest number of patent publication (208,128) in computer technology, accounting for 64.5% of the world total in the area. They have kept a 14.7% annual growth rate in the last 10 years. This is followed by electrical machinery, apparatus, energy (134,393, growth rate of 7.3%), and measurement (126,085, growth rate of 12.4%). Applicants from China filed more applications in the field of computer technology. For Japan, the top technology field was electrical machinery. Applicants from the ROK filed intensively for patents related to digital communication.

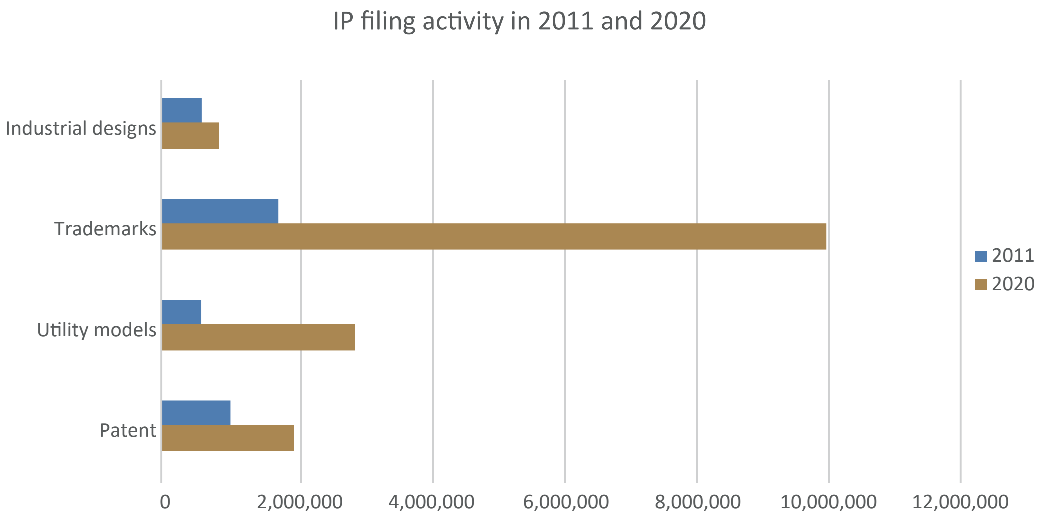
Figure 20 Top technical fields in PCT applications



Trademark and industrial design

In 2020, China, Japan, and the ROK recorded a strong growth in trademark application. Specifically, 10,086,868 applications were filed, and its global share was 58.7% (in contrast to 28.1% 10 years ago). The annual growth rate reached 19%. In industrial design, China, Japan, and the ROK rank 1st, 3rd, and 7th, respectively. Similarly, the three countries maintained an annual growth rate of 3.6%, accounting for 62.9% of the total industrial design applications in 2020.

Figure 21 Total CJK applications and growth in applications



Chapter

2

Economic Performance of China

中国社会科学院世界经济与政治研究所
Institute of World Economics and Politics,CASS

Organization: Institute of World Economics and Politics, Chinese Academy of Social Sciences

Authors:

ZHANG Yuyan, Senior Fellow, Director of Institute of World Economics and Politics (IWEP), Chinese Academy of Social Sciences (CASS)

SONG Jin, Senior Fellow, Institute of World Economics and Politics (IWEP),

Chinese Academy of Social Sciences (CASS)

XIONG Aizong, Senior Research Fellow, Institute of World Economics and Politics (IWEP), Chinese Academy of Social Sciences (CASS)

Contents

Chapter 2 - Economic Performance of China

2.1 Macroeconomics

2.1.1 Economic growth

Since the Reform and Opening-up in 1978, China's rapid economic growth has become a miracle of world economic growth. From 1978 to 2010, the average economic growth rate reached 10%. 2010 was the last year that China's economic growth rate exceeded 10%. From 2011 to 2020, after China's economy experienced rapid growth, the economic growth rate gradually declined. It has steadily declined since then, to 9.6% in 2011, 7.9% in 2012, 6.8% in 2016, and 6.0% in 2019. An economic growth level of more than 6% is still incredibly good in the world's major economies. The contribution rate of China's economy to world economic growth is more than 30% every year. Affected by the severe impact of COVID-19, China's economic growth in 2020 dropped to 2.3%, making it the only major economy in the world to achieve positive economic growth, which fully demonstrates the resilience of the Chinese economy. On average, from 2011 to 2020, the average growth rate of China's economy was still as high as 6.8%.

Figure 1 China's economic growth rate

(unit: %)

Source: China Statistical Yearbook.

Although the economic growth rate has slowed down, China's economic volume is still growing rapidly. In 2011, China's gross domestic product (GDP) was RMB48.8 trillion; in 2013, it was close to RMB60 trillion; in 2016, it reached RMB74.6 trillion; in 2018, it exceeded RMB90 trillion; and in 2020, it exceeded RMB100 trillion. Calculated at current prices, China's economic volume in 2020 is 276 times that of 1978 and 2.5 times that of 2010. China's economy has grown rapidly, and its proportion in the world's total economy has continued to increase. According to the International Monetary Fund statistics, the proportion of China's total economic output in the world's total economic output exceeded 10% for the first time in 2011, reaching 10.2%, and it further rose to 17.5% in 2020. The proportion of China's total economic output in the world's total economic output in 2020 has reached 18.3%.

At the same time, China's per capita GDP has grown substantially. In 2011, China's per capita GDP was RMB36,000. It rose to RMB72,000 in 2020, doubling the per capita GDP in 2011. If converted to US dollars, since 2019, China's per capita GDP has exceeded US$10,000, gradually approaching the world's average per capita GDP. According to the World Bank classification, China is currently an upper-middle-income country.

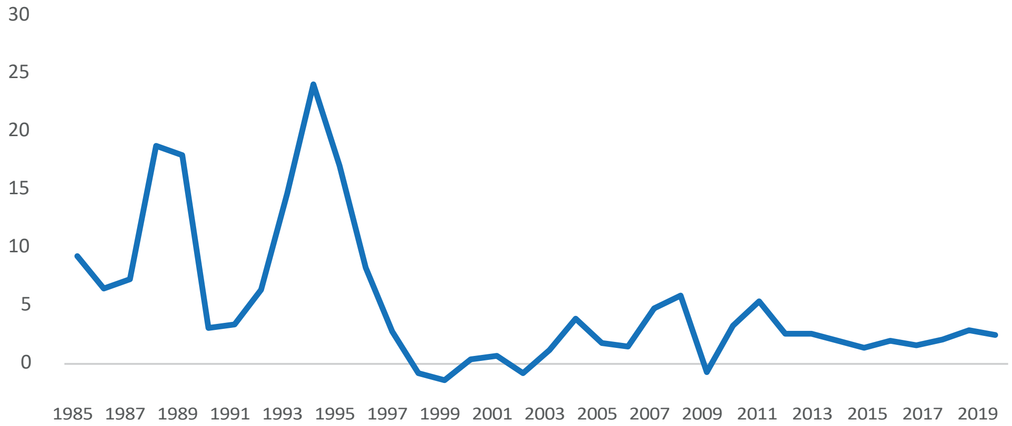
Further, China's per capita income has also grown steadily. In 2020, China's per capita disposable income was more than RMB32,000. After deducting price factors' influence, the average annual growth rate of residents' per capita disposable income from 2011 to 2020 was 7.2%, and the cumulative growth rate in the past ten years was 100.8%.[1]

2.1.2 Price

From 2011 to 2020, China's price level has remained stable. Compared with the previous sharp fluctuations, from 2011 to 2020, the year-on-year growth rate of China's consumer price index (inflation rate) remained at 2%-3% in most years, showing the improvement of China's macroeconomic management. In general, except for China's high inflation rate in 2011, China's inflation rate was maintained at a low level in other years, and deflation risks appeared in some years. The inflation trend in China from 2011 to 2020 can be divided into three stages.

Figure 2 Year-on-year growth of China's consumer price index

(unit: %)



Source: China Statistical Yearbook.

The first stage is from 2011 to 2012. After the global financial crisis outbreak in 2008, global inflation fell sharply, and China also fell into deflation in 2009. However, driven by stimulation policies, China's economy rebounded in the first half of 2009. In July 2011, China's CPI increased by 6.5% annually, hitting a 37-month high. In 2011, the annual CPI growth reached 5.4%, and the year became the second-highest year since 1997 except 2008. After July 2011, the growth rate of China's CPI gradually dropped, but it was still as high as 4.5% in January 2012 and gradually dropped to below 2% in the second half of 2012. The annual CPI growth in 2012, in general, was still 2.6%. After entering 2013, the growth rate of China's CPI rebounded again, exceeding 3% for several months, and remained at 2.6% for the entire year.

The second stage is from 2014 to 2018. During this period, China's inflation rate was generally low. In 2014 and 2016, China's CPI increased by 2% on average, and in 2018, it was 2.1%, both well below China's official inflation target. In 2015 and 2017, the annual CPI growth rate was only 1.4% and 1.6%, and there are even concerns that China faces the risk of deflation. On the one hand, the slowdown in CPI growth is due to the decline in the level of economic growth, and on the other hand, it could be attributed to the continuous decline in producer price index (PPI). Since March 2012, affected by the decline in energy and raw material prices brought by the cyclical downturn in the global economy, China's PPI has experienced negative growth, showing the problem of excess capacity in the Chinese economy. In 2015, China proposed supply-side structural reforms, especially the policy of 'three eliminations, one reduction, and one supplement.'[2] The strict control over capacity expansion and the clean-up of existing capacity has reversed the continuous negative growth of PPI. Since September 2016, China's PPI has resumed growth. In February 2017, the PPI annual growth rate reached 7.8%, but it has since fallen sharply again, falling to 0.9% in December 2018.

The third stage is from 2019 to 2020. After a brief decline in China's inflation rate from the end of 2018 to the beginning of 2019, China's CPI growth rate rose rapidly starting from March 2019, driven by pork's rise in food prices. In February 2020, pork prices in China rose by up to 135.2% annually. It pushed food prices up by more than 20% year on year. In January 2020, China's CPI increased by annually 5.4%, which is the highest value since 2012. After that, China's inflation rate also dropped rapidly with the sharp drop in food prices. In November 2020, China's CPI even fell by an annual 0.5%. China's year-on-year CPI growth rate also slowed to 2.5% in 2020 from 2.9% in 2019.

2.1.3 Employment

From 2011 to 2020, the employment situation in China remained stable in general. From 2011 to 2015, the registered urban unemployment rate in China remained at 4.1%. After 2016, it decreased to 3.6% in 2019. Due to the impact of the COVID-19, it rose to 4.2% in 2020. The registered unemployed population increased slowly. It was below 9.3 million from 2011 to 2013, rose to 9.66 million in 2015 and 9.82 million in 2016. In 2020, the number of registered unemployment exceeded 10 million. To reflect the state of China's labour market more accurately, China officially released the surveyed urban unemployment rate in 2018. China's observed unemployment rate was 4.9% in 2018, slightly higher than the registered unemployment rate and 5.2% in 2019. But it was still slightly below the government's target, which was 5.5%. Affected by the COVID-19, the surveyed unemployment rate in China rose rapidly to 6.2% in February 2020. Since then, it declined slowly and recovered to 5.2% by the end of 2020.

Employment in China exceeded 760 million in 2010. It rose to 763.49 million in 2014 and declined slightly to about 750 million in 2020. The decrease from 2014 to 2020 was approximately 13 million. Much of the decline in total employment comes from a decline in the economically active population.[3] In 2018, China's economically active population peaked at 800 million, and in 2020 it fell to 783 million, decreasing by 17 million. From 2011 to 2020, more than 10 million new jobs were created in China's cities and towns each year. From 2013 to 2019, the number of newly created jobs exceeded 13 million. Under the enormous pressure of economic slowdown, in 2020, there were still 11.86 million new jobs in China's cities and towns, far exceeding the employment target set by the Chinese government.

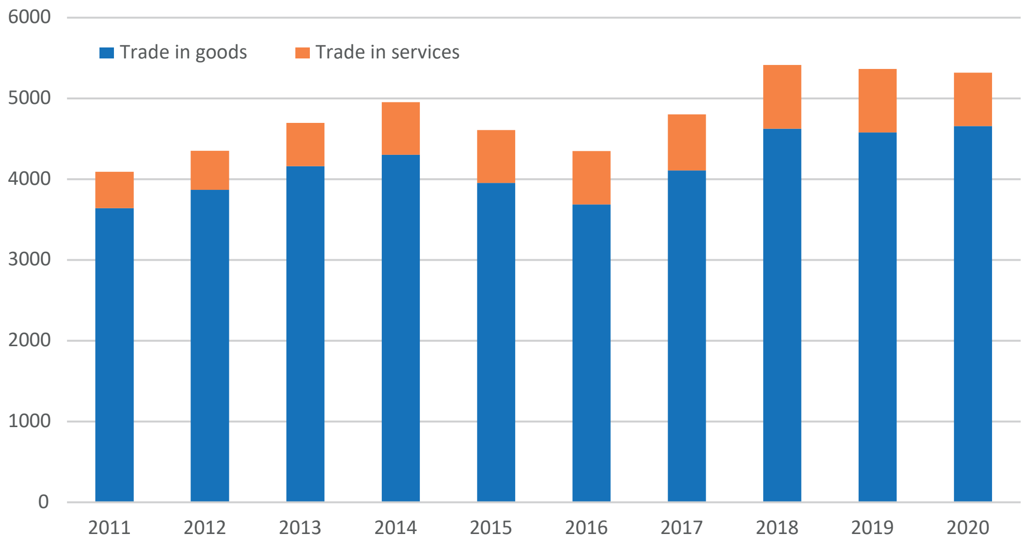
2.1.4 Foreign trade

China's foreign trade has achieved rapid development. From 2011 to 2020, China's total import and export of goods increased from US$3.64 trillion to US$4.66 trillion, an increase of 27.8%. In 2013, China became the world's largest trading country. Its total trade volume in goods exceeded US$4 trillion for the first time and further rose to US$4.3 trillion in 2014. However, affected by factors such as the slowdown in world economic growth, the sharp decline in global trade, and the rise in trade protectionism, the trade volume in goods declined in 2015 and 2016, and in 2016 it lost its status as the number one trader. In 2017, China regained its number one position in total trade in goods globally. In 2017 and 2018, China's trade in goods increased by 11.4% and 12.5%, respectively, and the trade volume climbed by over US$4.5 trillion. In 2019, in the circumstance of the sluggish world economic growth and intensified international economic and trade frictions, the volume of China's trade in goods dropped slightly by 1%. In 2020, despite the severe impact of the COVID-19, the volume of China's trade in goods hit a record high. China presented as the only major economy to achieve growth in trade in goods.

Compared with trade in goods, the volume of China's trade in services was small but growing rapidly. In 2011, the volume of China's trade in services exceeded US$400 billion for the first time, and then exceeded US$500 billion in 2013, exceeded US$650 billion in 2014, and approached US$800 billion in 2018. In 2019 and 2020, the volume of China's trade in services declined. Especially under the impact of the pandemic, the scale of China's trade in services fell by 15.7% to US$660 billion in 2020. In general, since 2014, China has been the world's second-largest trader in services.

Figure 3 China's trade in goods and services (2011–2020)

(unit: US$1 billion)



Source: China Statistical Yearbook and Ministry of Commerce of China.

Japan and South Korea are important trading partners of China. From 2011 to 2020, the scale of bilateral trade in goods between China and Japan remained stable but declined slightly. In 2011, the bilateral trade in goods between China and Japan exceeded US$340 billion, reaching the highest level in history. It dropped for a few years after that. Especially in 2015 and 2016, affected by the global economic environment and bilateral political relationship, bilateral trade volume between China and Japan dropped to around US$270 billion. However, since 2017, the scale of bilateral trade has risen to more than US$300 billion. The bilateral trade in goods between China and South Korea has steadily increased. The volume of trade in goods between China and South Korea was US$245.63 billion in 2011 and reached US$313.43 billion in 2018. It declined in 2019 and 2020 but remained above US$280 billion. From the perspective of trade share, although the proportion of China-Japan bilateral trade in China's total trade in goods continues to decline, it still reached 6.8% in 2020. Likewise, the proportion of China-Korea bilateral trade in China's total trade in goods reached 6.1% in 2020.

2.1.5 Inward foreign direct investment

China is one of the most important destinations for global investment. From 2011 to 2020, the foreign direct investment attracted by China grew steadily, and China has gradually become the world's second-largest foreign investment country. In 2010, the scale of China's actual utilized foreign direct investment exceeded US$100 billion for the first time, and in 2015 it exceeded US$120 billion. In 2020, despite the impact of the COVID-19, foreign direct investment attracted by China still reached a record high of US$144.37 billion. The growth rate was 4.5% compared with 2019, and it served as the highest growth rate since 2016. The proportion of foreign direct investment that China attracts is also rising. According to the United Nations Conference on Trade and Development (UNCTAD) statistics, in 2011, the foreign direct investment attracted by China accounted for 7.7% of global foreign direct investment, and in 2020 this proportion rose to 15%.

Japan and South Korea are important countries that deliver foreign direct investment to China. In 2004 and 2005, South Korea and Japan's foreign direct investment accounted for more than 10% of China's foreign direct investment. But then the proportion of investment from the two countries declined. In 2012, Japan's actual foreign direct investment in China reached US$7.35 billion, a record high, accounting for 6.6% of total foreign direct investment in China. In 2020, foreign investment from Japan dropped to US$3.37 billion, accounting for 2.3% of total foreign direct investment in China. South Korea's FDI to China has maintained a growing trend. The investment scale reached US$5.54 billion in 2019, which doubled the amount in 2011. But it dropped to US$3.61 billion in 2020, and its share in China's total FDI dropped to 2.5%.

2.1.6 Outward foreign direct investment

China's influence in global foreign direct investment continues to expand. In 2013, China's foreign direct investment exceeded US$100 billion for the first time and has since grown steadily, reaching a record US$196.15 billion in 2016, a year-on-year increase of 34.7%. However, China's foreign direct investment has declined to some extent since then, falling to US$136.91 billion in 2019. Despite this, from 2016 to 2019, China's foreign direct investment continuously accounted for more than 10% of the world's total, ranking as the world's second-largest foreign investor. In 2020, although influenced by the pandemic, China's foreign direct investment rose to US$153.71 billion with a year-on-year increase of 12.3%, accounting for 20.2% of the world's total. This made it the world's largest foreign investor. By the end of 2020, China's accumulated foreign direct investment reached US$2.58 trillion, only next to the United States and the Netherlands.[4]

In 2020, China's foreign investment covered 188 countries and regions worldwide. More than 80% of the countries (regions) in the world receive Chinese investment. However, the investment from China to Japan and South Korea is small. In 2011, China's direct investment in Japan was US$210 million, and it has grown steadily since then, reaching US$670 million in 2019 and slightly falling to US$487 million in 2020. As of 2020, China's accumulated OFDI to Japan was US$4.2 billion. Comparatively, China's direct investment in South Korea exceeds its investment in Japan. In 2011, China's investment in South Korea was US$340 million. It peaked at US$1.32 billion in 2015, accompanied by the investment level being higher than US$1 billion in 2016 and 2018. However, in 2019 and 2020, China's investment in South Korea dropped sharply, to US$56.18 million and US$140 million, respectively. As of 2020, China's accumulated foreign direct investment in South Korea was US$7.05 billion.

2.1.7 Balance of payments

From 2011 to 2020, China's international payments gradually recovered to balance. After joining the World Trade Organization (WTO), China's pace of opening to the outside world has been further accelerated, and the scale of international payments has grown rapidly. It maintained a 'double surplus' situation for many consecutive years. After 2011, although the total size of China's international payments still grew steadily, the structure and scale of the balance of payments have changed. One outstanding performance is that the current account surplus has narrowed, and the non-reserve financial account[5] surplus and deficit appeared alternately. In 2011, China's current account surplus fell to US$136.1 billion and has grown since then. In 2015, the surplus rose again to US$293 billion but has been reduced sharply compared to 2008. In 2018, China's current account surplus narrowed to US$24.1 billion. In 2020, China's current account surplus widened to US$248.8 billion from US$102.9 billion of the previous year, but still in a reasonable range. The non-reserve financial account has maintained a surplus for a long time before 2012. In 2014 and the two years after that, the financial account deficit showed up temporarily. From 2017 to 2019, the surplus resumed, though the size of the surplus narrowed. In 2020, the financial account turned again into a deficit. Driven by the balance of payments surplus, China's foreign exchange reserves reached the highest value at US$3.84 trillion in 2014. The scale declined gradually after that. In 2020, the reserve remained at US$3.22 trillion.

2.1.8 RMB exchange rate

From 2010 to 2020, the reform of the RMB exchange rate system continued to advance. Since July 2010, the RMB has maintained a slow appreciation trend against the US dollar.

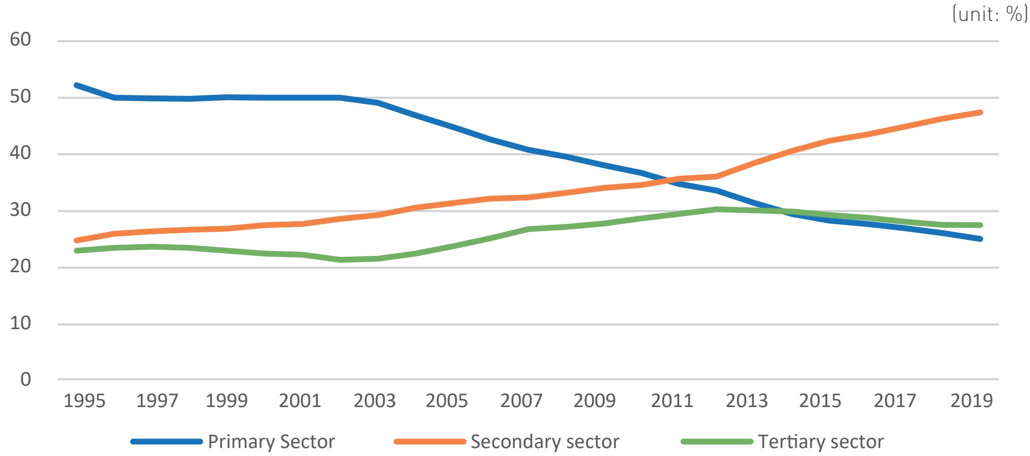
During this period, the People's Bank of China continued to expand the floating range of the RMB against the US dollar in the foreign exchange market. In April 2012, the exchange rate of RMB against the US dollar was relaxed to 1%. In March 2014, the exchange rate was further raised to 2%. In August 2015, the People's Bank of China further adjusted the formation mechanism of the RMB-USD central parity regime, and established the "closing rate & rate change against a basket of currencies" mechanism. The RMB exchange rate became more market-oriented. Since then, the exchange rate of RMB against the US dollar has fluctuated in both directions. In May 2017, in order to moderately hedge against pro-cyclical fluctuations in market sentiment, the People's Bank of China adjusted the quotation model of the RMB-USD central parity rate from the original "closing rate & rate change against a basket of currencies" to "closing rate & rate change against a basket of currencies & counter-cycle factor." In October 2020, the People's Bank of China announced that the counter-cycle factor was phased out from the RMB-USD central parity quotation model. It improved the transparency, benchmarking, and effectiveness of the way the central parity was formed. In general, after years of market-oriented reforms, the flexibility of the RMB exchange rate has been continuously enhanced.

2.2 Microeconomics

2.2.1 Industrial structure

From 2011 to 2020, China's economy underwent a significant transformation of its industrial structure, which profoundly impacts economic growth. Since the Reform and Opening-up, China has experienced two significant industrial structural transformations. At the end of the 1990s, China's economy developed rapidly from the primary sector to the secondary sector dominated. The labour force transferred from the primary sector provided large-scale cheap and low-skilled workers for the manufacturing industry. In China's manufacturing sector, the number of employees have more than doubled from 63 million in 1980 to 148.5 million in 2013. The employment share of the manufacturing industry rose from 13.3% to 19.3%. Around 2013, China's economy transitioned from the secondary sector to the tertiary sector. This transformation could be observed in two aspects: economic share and employment share. First, the output and added value of the tertiary sector surpassed that of the secondary sector in 2012, becoming an essential pillar sector of the Chinese economy. Looking into the decade before 2010, it is easy to find that the contribution rate of the added value of secondary production was higher than 50% in the 2000s. It kept a continuous decreasing trend since 2010. In 2019, the contribution rate of the secondary sector dropped to 36.8%, within which the manufacturing sector accounted for 30.8%. At the same time, the proportion of the GDP contribution of the tertiary sector was the same as that of the secondary sector in 2012, and it significantly exceeded that of the secondary sector since 2013. The gap between sectors continued to widen in subsequent years. Secondly, from the perspective of employment, the employment and employment share of the secondary sector, especially the manufacturing sector, faced a decline simultaneously, and the employment share of the tertiary sector continuously increased. The number of employed people in the secondary sector reached a peak of 232 million in 2012, accounting for 30.4% of total employment. It has been declining since then. The number of employees in manufacturing dropped from 148.5 million in 2013 to 136 million in 2017, with a drop of 12.5 million over the four years. The share fell from 19.3% in 2013 to 17.5% in 2017.[6] The International Labour Organization (ILO) pointed out that, while there were still many jobs in the manufacturing sector, China's manufacturing employment share fell by 5% between 2014 and 2018. The economic share and employment indicators show that the Chinese economy has entered a transitional stage from the secondary to the tertiary sector.

Figure 4 Changes in employment share of different industries in China



Source: China Statistical Yearbook.

With the rapid development of international trade in recent years, the competition in the global product provision market has become increasingly fierce. Some Chinese enterprises with low added value, high energy consumption, lack of core competitiveness, and advanced technology are gradually pressed out of the market for not maintaining a profit. The profit space for quite a number of left-over enterprises is also shrinking, and their comparative advantage in international trade is weakened. Labour-intensive production has begun to move outward from China. Taking the textile and apparel industry as an example, although within this industry, China is still the most important exporter of final consumer goods and intermediate inputs, a large scale of production has been shifted to the places where labour cost is lower, for example, Southeast Asia, South Asia, and Africa. From 2007 to 2018, the proportion of garment industry exports in Southeast Asia, except for China and South Asian countries, increased from 9.7% to 13.5%. The growth rate has been increasing significantly and may further accelerate. The development of China's manufacturing industry among various industries faces greater challenges. After 2018, the US-China trade frictions have intensified, the international political landscape has become complex and volatile, and the uncertainty of the world economic growth prospects has increased. COVID-19 has further worked as a large shock to the global value chain.

2.2.2 Demographics

Changes in China's population structure include two aspects: the age profile and education profile. In terms of age profile, due to the receding of the impact of the baby boom and the consequence of China's family planning policy adopted in the 1980s, the absolute number of China's labour supply began to decline in 2010, the proportion of the working-age population declined, and the ageing became increasingly serious. In terms of education profile, due to higher education expansion policy since the beginning of this century, Chinese university graduates increased from 850,000 in 1999 to 4.5 million in 2007 and further increased to 6.4 million in 2013. Education at the high school level has also expanded rapidly, primarily through the development of vocational education. As a consequence of both reasons mentioned above, the supply of high-skilled labour in China has risen significantly. Table 1 presents the labour force composition at different representative time points in China. It is clear to find the following characteristics.

Table 1 | Basic characteristics of China's working-age population

	2002	2007	2013	2018
Proportion of working-age population (%)	72.2	66.9	68.6	63.7
Age group (weighted, %)				
16-25 years old	21.9	21.6	19.6	15.8
26-35 years old	18.9	20.3	19.4	22.1
36-45 years old	26.2	27.1	26.2	22.7
46-55 years old	27.5	23.4	25.3	32.0
56 years old and above	5.6	7.7	9.5	7.4
Education level (weighted, %)				
Middle school and below	58.6	64.2	54.6	51.0
High school and TVET at the high school level	26.0	20.1	22.8	23.2
Two-year tertiary school	10.2	9.5	11.2	12.0
College and above	5.2	6.1	11.4	13.7

Source: Calculated by the author based on Chinese Household Income Project Survey (CHIPS) data.

From 2002 to 2007, China's working-age population tends to be younger. The proportion of the two age groups between 26 and 45 increased, while the age group 46 to 55 decreased significantly. After 2007, the average age of the labour force went up. The proportion of the three age groups under 45 declined between 2007 and 2013. Between 2013 and 2018, the proportion of the age group 16-25 and age group 36-45 fell sharply, while the proportion of the age group 46-55 rose rapidly by 6.7 percentage points. From 1995 to 2002, the average education level of the working-age population increased significantly. The proportion of the labour force with middle school education and below decreased considerably, and the labour force with high school education and above increased rapidly. From 2002 to 2007, the education level of the labour force dropped significantly. The proportion of the labour force with middle school education and below increased by nearly six percentage points. It reflected that the rapid development of low-skilled employment opportunities had a diversion effect on the students' decision on whether to continue higher education. After 2007, the education level of the labour force showed significant improvement. The proportion of the labour force with middle school education and below decreased year by year, while the proportion of labour force with high school education and above, especially college level and above, increased rapidly. In 2018, the proportion of the labour force with middle school education and below dropped to 51%. Compared with 2007, the decrease was 13.2%. At the same time, the proportion of the labour force with a college degree and above increased to 13.7%. Compared to 2013, the increase was 7.6 percentage points.

2.2.3 Labour market

Since the beginning of this century, the Chinese government has continuously relaxed the migration limitation under its household registration system. The reforms significantly improved the mobility of the Chinese labour force and the efficiency of labour allocation. However, in the second decade of this century, the dividend released by the reforms has gradually diminished. The reason is as follows. In the first decade of this century, many workers migrated from rural areas to cities and towns. It enlarged the 'activated' labour force, instead of individuals staying in rural areas as 'implicit unemployed workers'. But the scale of rural to urban migration dropped significantly after 2010. Migrating rural workers was 12.5 million in 2010. It fell to 10.6 million in 2011 and 5 million in 2014 and has been hovering around 2.8 million since 2016. Migrant workers from rural to urban areas have been an essential source of low-skilled labour supply for China's manufacturing sector. The decline in the size of the migrant workforce has brought about the tightening of the supply of low-skilled workers needed by manufacturing. At the same time, under the government's policy target of 'benefiting people's livelihood,' China's system construction has been continuously improved, and the protection of vulnerable groups has been rapidly strengthened.

In 2008, China issued the 'Labour Contract Law'; in 2012, the central government revised the 'Labour Contract Law' and significantly formalized the employment relationship. In 2011, the 'Social Insurance Law' was promulgated and implemented, which stipulated the insurance participation requirements, contribution methods, and benefit levels of various social insurances. It unavoidably increased the labour cost of enterprises. In the same year, the rapid increase in minimum wages standard was observed across regions. According to the Ministry of Human Resources and Social Security of China, in 2011, 24 provinces in China raised their minimum wage standard, with an average increase rate of 22%. The rise in the minimum wage standard directly increased the cost of hiring low-skilled labour for manufacturing enterprises, thus hitting them strongly. In 2012, the 'Special Regulations on Labour Protection for Female Employees' was promulgated and implemented, which required maternal leave for female employees, and reduced the willingness of some enterprises to hire female employees of childbearing age. The improvement of the system reflects the great progress of China's social development, but it also objectively increases the production cost of enterprises rapidly.

2.2.4 Labour productivity

Using average hourly earnings to measure labour productivity, the changes in labour productivity in various industries in China at a representative time point reflect two essential characteristics (Table 2). First, although the income gap between industries is still relatively notable, the income of each industry is constantly increasing, revealing the differences in industry productivity. The income of 'mining' and 'production and supply of electricity, heat, gas, and water' in the secondary sector is significantly higher than that of 'construction' and 'manufacturing.' The income of the 'financial industry', 'scientific research and technical services' in the tertiary sector is significantly higher than that of 'wholesale and retail' and 'accommodation, catering, and service industries'. Second, from a structural point of view, the tertiary sector may become the driving force of China's average labour productivity. In the second decade of this century, the labour productivity of the secondary sector rose limitedly, but the labour productivity of some industries in the tertiary sector has increased significantly. From 2002 to 2007, the average income growth rate of the secondary sector (17.91%) was significantly lower than that of the primary sector (20.65%) but slightly higher than that of the tertiary sector (16.41%). Within the secondary sector, the average annual growth rate of the manufacturing industry was 16.15%. During the same period, within the tertiary sector, the industry with the lowest income growth is the 'scientific research and technical service industry', as well as the 'education, culture, sports, entertainment, health, and social work industry'. Their annual average growth rate was both lower than 15%. The level recorded the lowest industry-level growth rate across the whole society. However, from 2013 to 2018, the average income growth of the tertiary sector was faster than that of the secondary sector. The 'manufacturing' and 'construction' industries in the secondary sector and the 'social service industry', 'transportation', 'warehousing and postal industries' in the tertiary sector were among the industries with the lowest income growth in the whole society, and the industry with the fastest income growth was the 'scientific research and technical service' in the tertiary sector. The 'scientific research and technical service' industry had an average annual income growth rate of 16.57%, followed by 'education, culture, sports, entertainment, health, and social work', whose average annual income growth rate was 13.92%. These reflect the rapid increase in labour productivity in scientific research and education industries.

Table 2 | Income in different industries in each survey year

Average hourly earnings (RMB)	2002	2007	2013	2018
Primary sector	2.63	5.35	5.15	6.63
Agriculture, forestry, animal husbandry, and fishery	2.63	5.35	5.15	6.63
Secondary sector	4.21	7.98	15.01	22.44
Mining	4.01	9.07	16.34	26.96
Manufacturing	4.12	7.44	13.64	20.17
Production and supply of electricity, heat, gas, and water	7.05	14.03	18.50	26.85
Construction	3.73	8.14	16.77	24.59
Tertiary sector	5.72	10.41	16.32	24.49
Transportation, warehousing, and postal industry	5.80	10.37	18.13	26.08
Wholesale, retail, accommodation, and catering industry	3.76	8.36	12.74	19.57
Real estate	6.37	15.48	18.70	29.65
Social service industry	4.14	9.28	16.75	22.99
Education, culture, sports, entertainment, health, and social work	7.47	13.00	17.57	29.80
Scientific research and technical service	8.76	13.73	20.62	37.70
Financial industry	7.39	15.11	23.76	36.50
Public administration, social security, and organization	7.03	13.10	17.69	25.92

Source: Calculated by the author based on Chinese Household Income Project Survey (CHIPS) data.

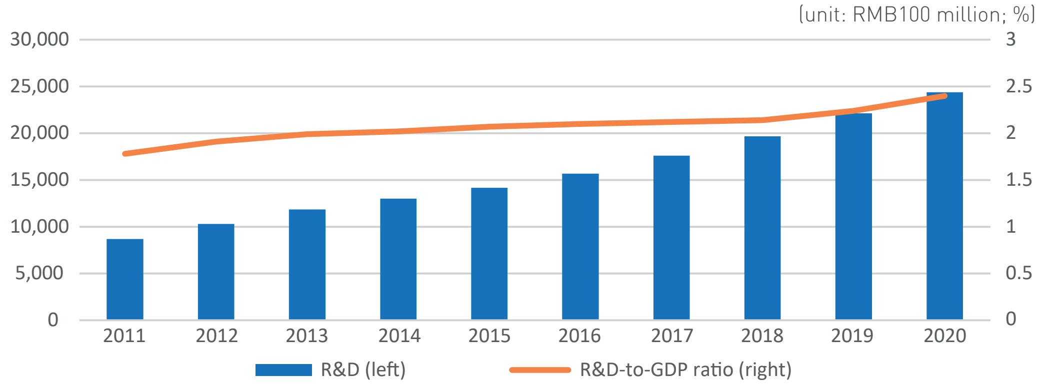
Changes in productivity across industries have brought significant changes in China's economic growth rate. In the first decade of this century, China's economic development benefited from intra-sectoral development and inter-sectoral adjustment. On the one hand, the secondary sector developed rapidly, and the economy rapidly realized industrialization. Within industries, the efficiency of agricultural production and manufacturing (or 'intra-sectoral' productivity) was continuously increased, and the annual average growth rate of the per capita output of the manufacturing industry was

9.4%. On the other hand, if compared horizontally, the agricultural sector with lower productivity was shrinking, while the secondary sector with higher productivity was expanding. Structural adjustment has brought continuous improvement to the average productivity of society. It could be called 'inter-sectoral' development. In the process of rapid economic development, the poverty reduction of the rural population and the reduction of the urban-rural income gap has been achieved. Comparatively, in the second decade of this century, the industrial structure was evolving differently. The main difference was that the contribution of structural adjustment played a more significant role. In the overall labour productivity improvement from 1978 to 2015, the improvement of labour productivity of the industries played a more vital role. From 2004 to 2015, the contribution of structural change effects increased, and labour force's transferring to industries with faster labour productivity improvement played more important role.[7] In the future, in addition to the benefits of industrial structural adjustment, the development of e-commerce and other technologies could benefit the productivity of the tertiary sector and play a role in improving industrial productivity.

2.2.5 R&D and innovation

China's R&D investment increased continuously in the observed period. From 2011 to 2020, China's R&D investment maintained a steady growth trend. In 2012, the R&D investment exceeded RMB1 trillion for the first time, increasing 23% compared with 2010. In 2016, China's R&D investment exceeded RMB1.5 trillion, and the annual growth rate has remained above 10%. In 2019, China's R&D investment exceeded RMB2 trillion. In 2020, even in the face of a sharp drop in economic growth, the R&D investment was close to RMB2.5 trillion, ranking the second in the world in terms of total R&D investment. Basic research funds accounted for 6.01%, and enterprises' R&D expenditure accounted for 76.6%. The ratio of R&D expenditure to GDP has been further increased. In 2011, China's R&D expenditure ratio to GDP was 1.78%. In 2014, it exceeded 2% for the first time. In 2020, it reached 2.4%, an increase of 0.16 percentage points compared with 2019, and marked the new highest increase rate in the recent 11 years. From an international comparison view, China's R&D investment intensity has gradually approached the average level of OECD countries. At the same time, the total amount of human resources for science and technology in China has also increased significantly. In 2011, the full-time equivalent of Chinese R&D personnel was 2.883 million per year, and in 2020 it reached 5.235 million per year, with an increased rate of 81.6%.

Figure 5 China's R&D investment



Source: China Statistical Yearbook

With the support of continuous R&D investment, China's scientific and technological innovation capabilities have been significantly improved. According to the Global Innovation Index (GII) released by the World Intellectual Property Organization, China's Global Innovation Index in 2011 was 46.4, ranking 29th. In 2020, China's global innovation index reached 53.3, ranking 14th globally. It placed at the top among 37 upper-middle-income economies and the fourth among 17 economies in Southeast Asia, East Asia, and Oceania. In 2020, the number of international patent application cases under the Patent Cooperation Treaty (PCT) framework of the World Intellectual Property Organization reached 68,720 for China. The increasing rate was 16.1%, ranked first in the world for two consecutive years, and accounted for 24.9% of the world's total. In terms of patent applications by enterprises, in 2020, Huawei Technologies became the largest applicant for the fourth consecutive year, with 5,464 PCT application cases. In addition, BOE technology, OPPO, ZTE, Ping An technology are also Chinese companies with a large number of patent applications.[8]

2.2.6 Business environment

China attaches immense importance to the business environment. In 2015, the Fifth Plenary Session of the 18th Central Committee of the Communist Party of China proposed to improve the business environment by promoting legalization, internationalization, and facilitation. In October 2019, the State Council of China issued the Regulations on Optimizing the Business Environment and put forward specific requirements for optimizing the business environment in five aspects. These include protection of market entities, market environment, government services, supervision and law enforcement, and legal protection. In October 2019, the Fourth Plenary Session of the 19th Central Committee of the Communist Party of China proposed further deepening the reform of 'streamline administration and delegate power, improve regulation, and upgrade services', especially to deepen the reform of the administrative approval system. At the end of 2019, the Central Committee of the Communist Party of China and the State Council issued the Opinions on Accelerating the Improvement of the Socialist Market Economic System in the New Era, proposing to 'continue to optimize government services with the construction of a first-class business environment', and 'accelerate the development of marketized, law-ruled, and internationalized business environment'.

China has fully implemented the market access negative list system to attract foreign investment further. In October 2015, the State Council of China issued the Opinions on Implementing the Negative List System for Market Access. It proposed to pilot the negative list system for market access in some regions. In December 2018, China's National Development and Reform Commission and the Ministry of Commerce issued the

'Market Access Negative List (2018 Edition)', marking the full implementation of the market access negative list system in China. The number of items on the negative list for foreign investment access decreases yearly. The number of items on the encouragement list for foreigners is constantly increasing. In January 2020, the 'Foreign Investment Law of the People's Republic of China' was officially implemented, which is another important measure for China to create a first-class business environment through legalization.

Driven by this, China's business environment has been continuously optimized. According to the Doing Business 2011 released by the World Bank, China's business environment ranked 79th among 183 countries globally, and the ranking has continued to improve since then. According to the Doing Business 2020, China ranks 31st among 190 economies in the world in terms of business environment and has been rated as one of the ten economies with the greatest improvement in business environment in the world for two years. Among them, the performance of the contract execution, the acquisition of electricity, establishment of a business, property registration, and other indicators were outstanding, especially the execution of the contract ranks in the Top 5. The continuous optimization of the business environment has enabled the rapid development of Chinese market entities. According to the Research Report on the Development Vitality of China's Market Entities (2011–2020), the number of newly registered market entities in China in 2011 was 4.587 million. Despite the impact of multiple factors, such as the pandemic's, China's newly registered market entities in 2020 still reached 23.577 million, which is 5.14 times the number in 2011.[1] In 2020, the total number of market entities in China was about 140 million, and the overall activity of market players remains around 70%. Many new market players have become essential carriers for absorbing employment, promoting growth, and stimulating innovation.

1 Fang Xiaodan, 'National Resident Income Doubled Compared to 2010, Resident Consumption Expenditure Recovered Steadily', National Bureau of Statistics of China, http://www.stats.gov.cn/xxgk/jd/sjjd2020/202101/t20210119_1812623.html?ivk_sa=1024320u, January 19, 2021.

2 'Three cuts, one reduction, and one supplement' refers to cutting overcapacity, reducing excess inventory, deleveraging, lowering costs, and strengthening areas of weakness.

3 'Economically active population' refers to the population aged 16 and above who can work, participate in, or require participating in social and economic activities.

4 Ministry of Commerce of the People's Republic of China, National Bureau of Statistics and State Administration of Foreign Exchange, 2020 Statistical Bulletin of China's Outward Foreign Direct Investment, China Commerce and Trade Press, September 2021.

5 The non-reserve financial account refers to the part of the financial account excluding reserve assets, including direct investment, portfolio investment, financial derivatives, and other investment.

6 Lawrence, R. Z., 2020, 'China, Like the US, Faces Challenges in Achieving Inclusive Growth through Manufacturing', China & World Economy, Vol. 28, Issue 2, pp. 3-17.

7 WIPO. Innovation Perseveres: International Patent Filings via WIPO Continued to Grow in 2020 Despite COVID-19 Pandemic. Geneva, March 2, 2021.

8 Chinese Academy of International Trade and Economic Cooperation and Tianyancha. Research Report on the development vitality of China's market players from 2011 to 2020, Oct 18, 2021.

Chapter

3

Economic Performance of Japan

Organization: Japan Center for Economic Research

Author:

SAITO Jun, Senior Research Fellow, Japan Center for Economic Research (JCER)

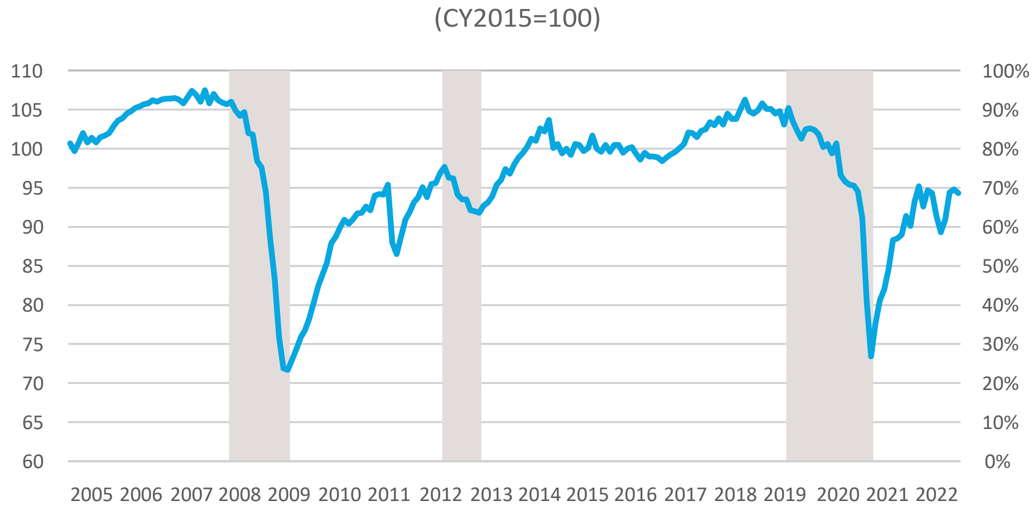
Contents

Chapter 3 - Economic Performance of Japan

3.1 Performance of the Domestic Economy

In terms of the business cycles that have been identified, the period between 2011 and 2020 consists of five different phases: an expansionary phase that started in March 2009 and lasted until March 2012; a recessionary phase between March and November 2012; an expansionary phase from November 2012 to October 2018; a recessionary phase from October 2018 to May 2020; and an expansionary phase since May 2020. The phases can be confirmed in Figure 1, which shows the Composite Index (CI) of business conditions.

Figure 1 Composite index

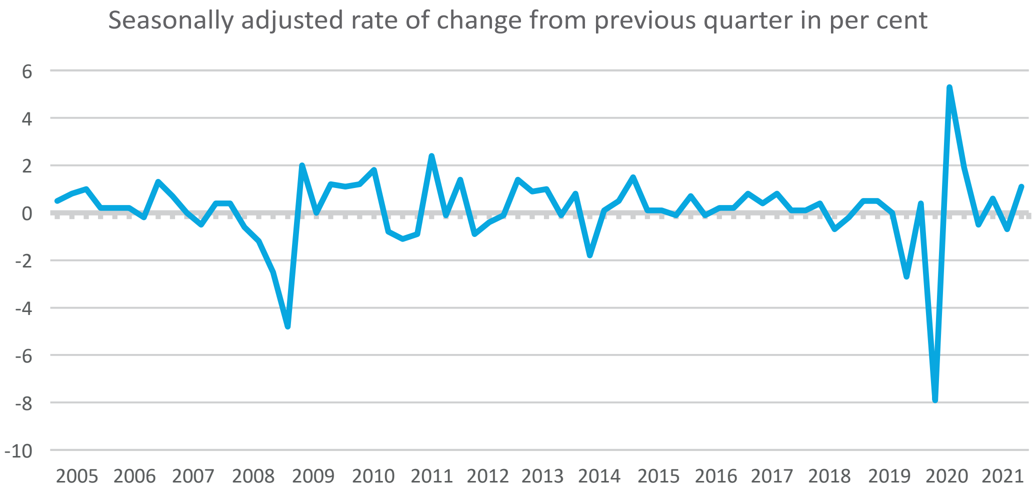


Source: Cabinet Office, Indexes of Business Conditions
Note: Shadowed parts indicate recessionary phases.

3.1.1 Expansionary phase between March 2009 and March 2012

An expansionary phase began in March 2009 as the global economy started to show signs of recovery from the global financial and economic crisis, which was initiated by the emergence of the subprime mortgage problem in the United States in 2007 and was deepened by the collapse of the Lehman Brothers in 2008. As Figure 2 shows, real GDP started to show growth since late 2009. The main contribution to the positive real GDP growth during 2010 came from the recovery in exports owing to the concerted efforts by the authorities and the consequent recovery of the global economy. Meanwhile, private consumption and other components of private demand showed only a modest increase.

Figure 2 Real GDP growth rates



Source: Cabinet Office, Quarterly Estimates of GDP.

The recovery was interrupted by the Great East-Japan Earthquake that hit the Tohoku region and the surrounding areas in March 2011. The disaster that resulted from the earthquakes, tsunamis, and the nuclear disaster not only took the lives of 15,900 people and left 2,523 missing (as of 1 March 2022) but also ruined the daily lives of many families by destroying the capital and residential stocks, and social infrastructure in the region (damage was estimated to be around 16.9 trillion yen). The Earthquake also greatly impacted the other regions because of the planned power blackouts, rumours of radioactive contamination, and supply chain disruption. For example, when the operation of an electronics producing plant in the disaster-stricken area stopped and production of micro-computers for vehicles came to a halt, car production in other parts of Japan and the United States came to a standstill.

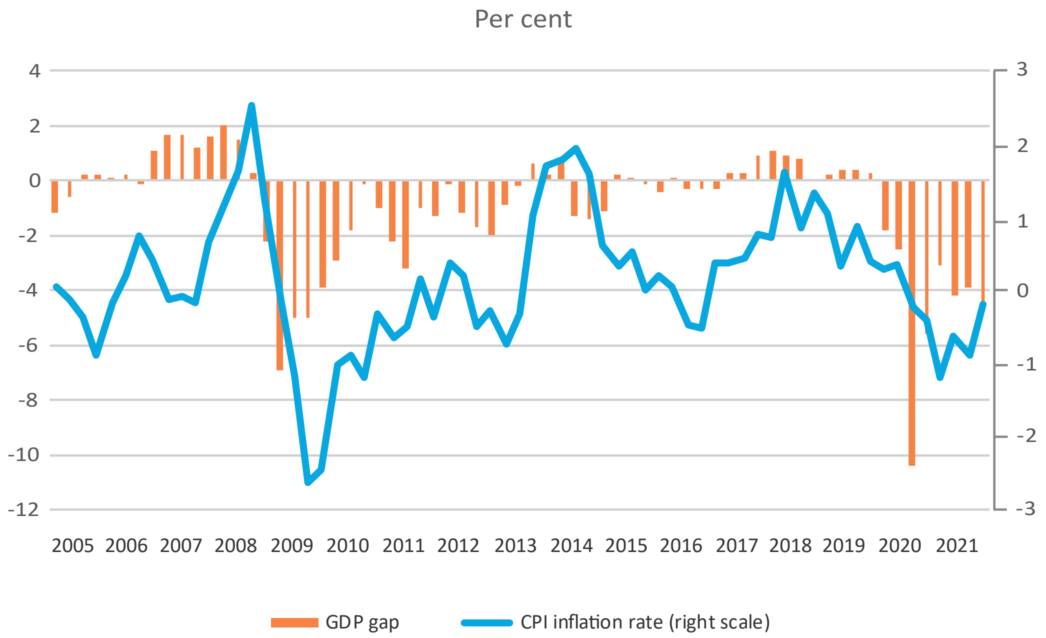
3.1.2 Recessionary phase between March 2012 and November 2012

The Great East-Japan Earthquake had an acute macroeconomic impact on industrial production and trade in Japan. However, it did not last long enough to lead the whole economy to a recession because of the reconstruction efforts that started immediately. However, the appreciation of the yen that gained momentum during the global financial and economic crisis was further accentuated by the Earthquake. Together with the decline in exports due to the slowing down of the European economy that continued to be affected by the sovereign debt problem, the Japanese economy went into recession in March 2012.

In the background of the recession coming from the external factors was the Japanese economy's macroeconomic problem, namely the lack of strength in private demand, particularly in private consumption. The share of private consumption in GDP was 57.7 per cent in 2012, compared to the share of exports in the same year of 14.4 per cent. If private consumption were able to grow more strongly, it could have absorbed the sluggishness of exports. However, because of its weakness, the economy was left vulnerable to the developments in external factors and to the appreciation of the yen.

The consequences of the slow growth in real GDP became evident in the sustained fall in aggregate prices, or deflation, as Figure 3 shows. Deflation had become apparent in the mid-1990s after the bubble economy burst. Still, it started to show signs of improvement in the mid-2000s when sustained expansion led the negative GDP gap (the difference between the actual real GDP and the potential GDP) to disappear. However, the return of the negative GDP gap after the global financial and economic crisis led to the reemergence of deflation. Because of the poor economic prospects, pessimistic views prevailed in the financial sector. The Nikkei stock price index fell close to the lowest level reached after the bubble economy burst in 2003.

Figure 3 GDP gap and CPI



Source: Cabinet Office, Estimates of GDP Gap and Potential GDP Growth Rate; and Ministry of Internal Affairs and Communications, Consumer Price Index.

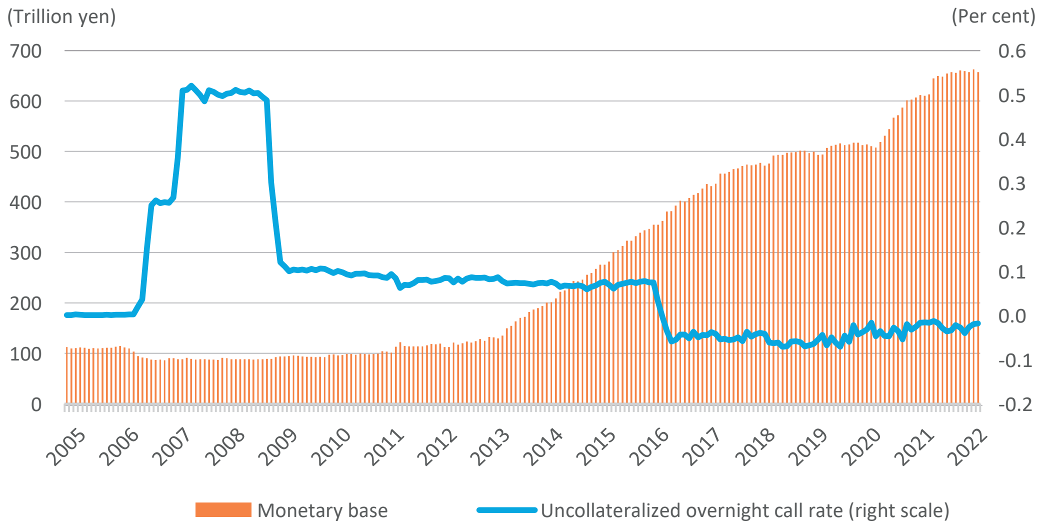
Note: GDP gap is in ratio to potential GDP. CPI Inflation rate is the rate of change of the headline CPI, excluding the direct impact of consumption tax rate changes.

3.1.3 Expansionary phase between November 2012 and October 2018

Abenomics was introduced in December 2012 to address deflation and the economy's weakness, and put the economy back on a sustained growth path. It was a reorientation of the economic policies that had failed to strengthen the economy until then. The three arrows of Abenomics consisted of (a) a bold monetary policy, (b) a flexible fiscal policy, and (c) growth strategies to promote private investment. Expectations of positive outcomes of the policy package were high so that stock prices started to rise, and the exchange rate started to depreciate immediately after its announcement.

Abenomics brought a sharp change to the monetary policy framework. The inflation targeting framework was introduced in January 2013, when the inflation target was set at 2 per cent in terms of the consumer price index (CPI). Quantitative and Qualitative Monetary Easing (QQE) was introduced in April 2013 to achieve the inflation target within two years. It was an unconventional monetary policy that changed the operational target from the policy rate (uncollateralized overnight call rate), which already had reached zero, to the monetary base and committed to double the monetary base within two years by doubling the holdings of long-term bonds and ETFs (exchange-traded funds) and increasing the purchase of J-REITs (Japan real estate investment trusts). It also strengthened forward guidance by committing to maintain QQE until the inflation target is achieved. As a result of the QQE, the monetary base started to rise significantly, as Figure 4 shows.

Figure 4 Monetary base and uncollateralized overnight call rate



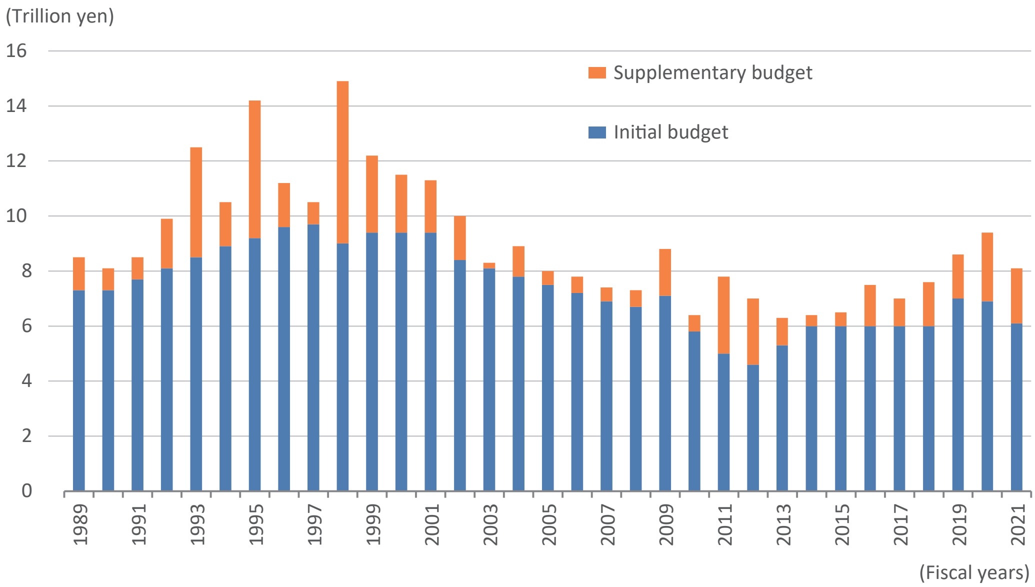
Source: Bank of Japan, Short-term Money Market Rates and Monetary Base.

The lack of progress towards achieving the inflation target led the Bank of Japan to modify the initial framework of the QQE by a series of actions. QQE was expanded in October 2014 by raising the pace of expanding the monetary base and the pace of purchase of government bonds, ETFs, and J-REITs accordingly. In January 2016, QQE was combined with a negative interest policy that applied a negative interest rate of 0.1 per cent to a segment of the financial institutions' current account balance at the Bank of Japan. As Figure 4 shows, the uncollateralized overnight call rate has turned negative since its introduction.

Furthermore, in September 2016, QQE was combined with a yield-curve control (YCC) that introduced a target for the long-term interest rate to be around zero in addition to the negative interest rate policy. QQE with YCC also modified forward guidance by introducing an overshooting commitment: it announced its commitment to maintaining the monetary policy stance until the observed CPI inflation rate reached 2 per cent.

Fiscal policy also shifted to a more expansionary stance by expanding the budget appropriation for public works, which had been declining since the early 2000s. As Figure 5 shows, the budget for public works was increased in the initial budgets for the fiscal years. It was also expanded by supplementary budgets, which were formulated in response to the government's stimulus packages: five stimulus packages were introduced between January 2013 and December 2019.

Figure 5 Budget appropriation for public works



Source: Ministry of Finance, Budgets.

Since the increase in budgets relied heavily on government bond issues, long-term government debt in total also increased. To maintain the sustainability of the fiscal situation, the government also pursued the objective of fiscal consolidation. The consumption tax rate was raised from 5 to 8 per cent in April 2014 and from 8 to 10 per cent in October 2019 (after being postponed twice) to reduce the government's primary deficit (central and local governments combined). When the latter took place, a reduced rate of 8 per cent was also introduced to alleviate the impact of the tax rate hike on the consumers.

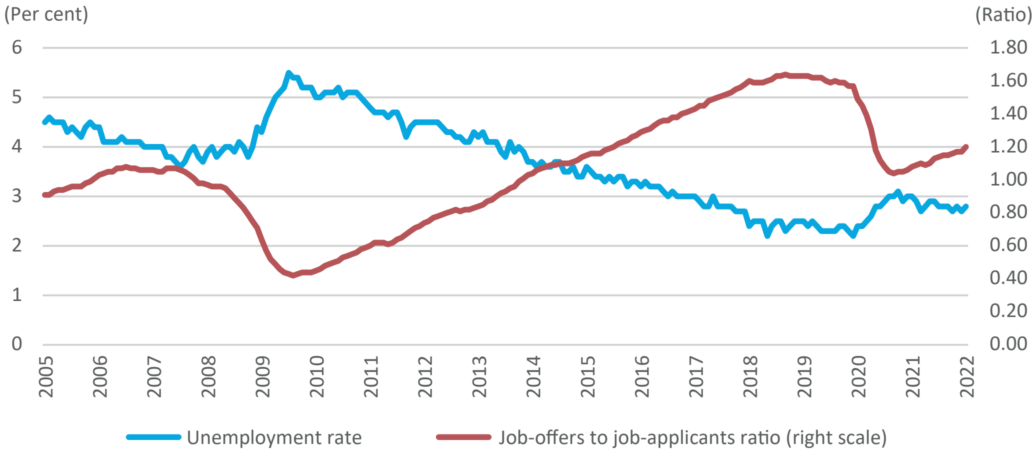
Structural policies included in Abenomics' growth strategies also led to changes in the institutional arrangement in various areas. They included reduction of the corporate tax rate, the introduction of corporate and stewardship codes, improvement of women's role in the society, creation of new residential status to accommodate further acceptance of foreign workers, reform of electricity and gas retail markets, and the introduction of new economic partnership agreements (EPAs) with the trading partners.

In recent years, EPAs that became effective include the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP, or TPP-11) in December 2018, the Japan-EU EPA in February 2019, the Japan-UK EPA in January 2021, and Regional Comprehensive Economic Partnership (RCEP) in January 2022. Japan-US Trade Agreement and Japan-US Digital Trade Agreement also became effective in January 2020.

These policies achieved a prolonged expansionary phase from November 2012 to October 2018, which became the second-longest expansionary phase in the post-war period (the longest expansionary phase took place in the 2000s). The labour force increased during the period despite the shrinking population because of the increase in the labour force participation rates of females and the elderly. However, employment during the period grew at a stronger rate.

As a result, the job-offers to job-applicants ratio continued to rise, and the unemployment rate continued to fall. As Figure 6 shows, the job-offers to job-applicants ratio rose to 1.68 in December 2018 (the highest since November 1973), and the unemployment rate fell to 2.2 per cent in December 2019 (the lowest since October 1992). The economy faced a labour shortage by the end of the expansionary phase.

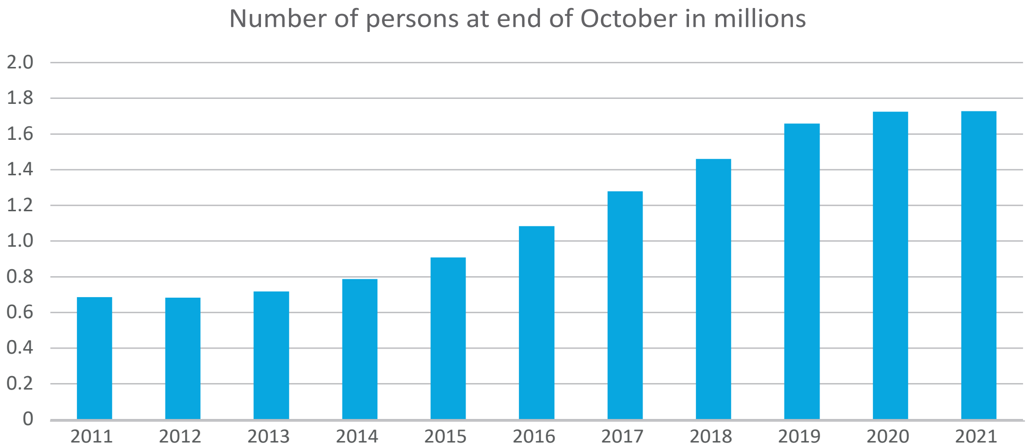
Figure 6 Unemployment rate and job-offers to job-applicants ratio



Source: Ministry of Internal Affairs and Communications, Labor Force Survey; and Ministry of Health, Labour and Welfare, Monthly Labour Survey.

An increase in foreign workers partly offset the shortage of workers. As Figure 7 shows, the rate of increase of foreign workers picked up under Abenomics. Japan's policy on foreign workers had been somewhat restrictive, and priority was given to the highly skilled. However, it was gradually relaxed, and in April 2019, new residential status was created to allow more less-skilled workers to work in Japan.

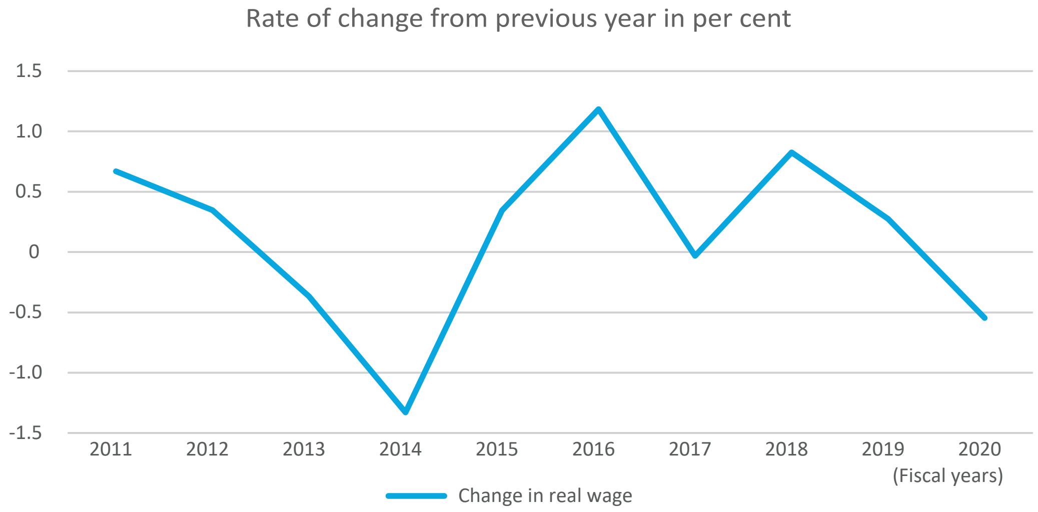
Figure 7 Foreign workers working in Japan



Source: Ministry of Health, Labour and Welfare, Employment Situation of Foreign Workers.

As Figure 8 shows, the average wage per worker failed to rise sustainably despite the shortage of labour. It resulted from an increasing share of non-regular workers who were working for a lower wage, and from the cautious attitude of the employers against raising the wages of the regular workers. The lack of increase in wages was one of the reasons why deflation failed to be resolved even after almost six years of economic expansion.

Figure 8 Changes in real wage



Source: Author's estimates using data from Cabinet Office, Annual Report on National Accounts; and Ministry of Internal Affairs and Communications, Labour Force Survey.

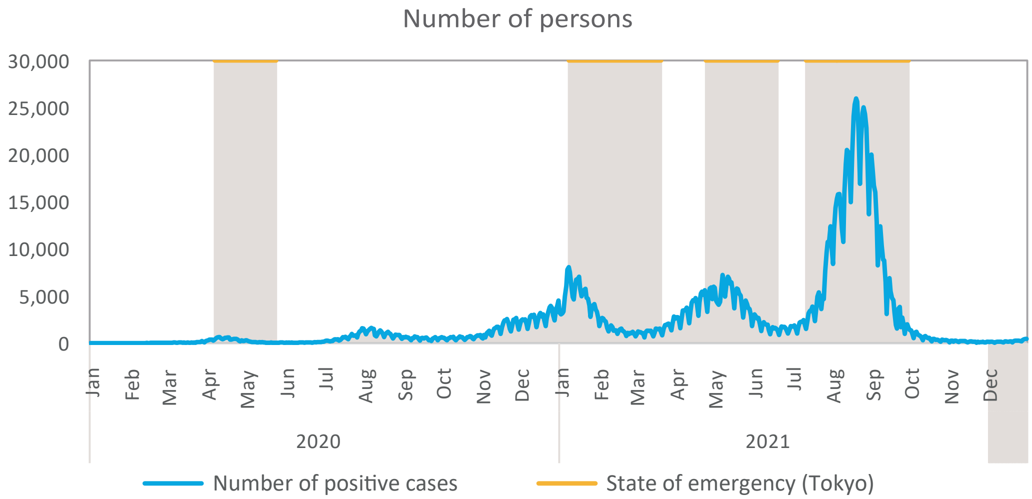
Note: Real wage is defined as compensation of employees deflated by private consumption deflator and divided by the number of employees.

3.1.4 Recessionary phase between October 2018 and May 2020

The economy entered a recessionary phase in October 2018. The main reason for the recession was the weakening of exports. It was due to the slowdown of the global economy resulting from the growing uncertainty created by Brexit and the US-China trade friction. However, initially, the recession was a mild one. It turned to a steep decline when the spread of the COVID-19 turned into a pandemic.

The spread of COVID-19 started in January 2020. The waves of infections during that period and thereafter are shown in Figure 9. The rise in the number of positive cases and deaths led the government to declare a state of emergency in April. People were requested to wear masks, avoid three Cs (closed spaces, crowded places, and close contact settings), and stay home. Businesses were requested to shorten business hours and refrain from offering alcohol, events were requested to be postponed, and offices were requested to raise the share of remote working to 70 per cent of the workforce. The measures introduced in Japan were less restrictive than those imposed in other countries. However, they were enough to slow down the spread and allow the state of emergency to be lifted in late May.

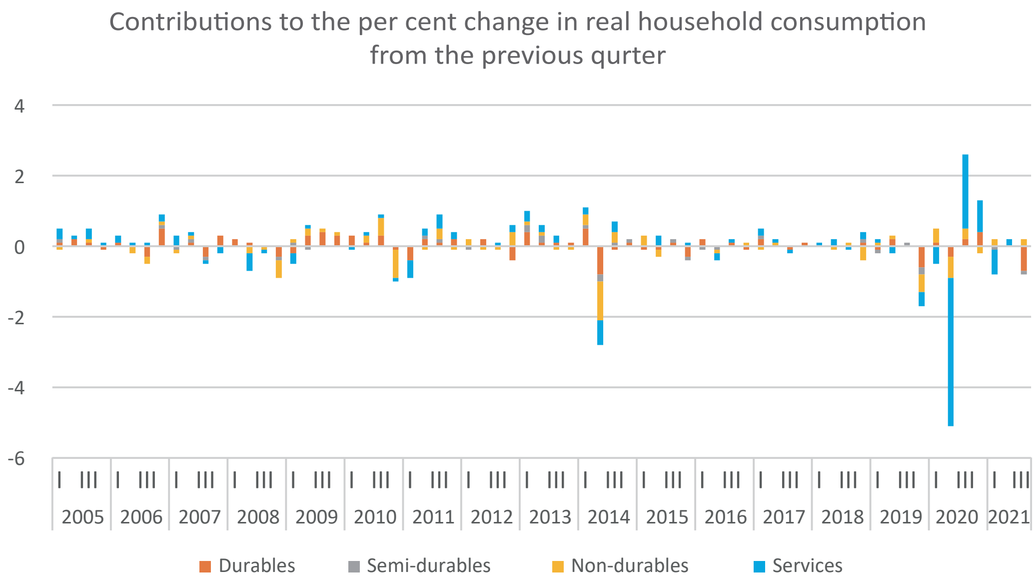
Figure 9 Number of positive cases of COVID-19



Source: Ministry of Health, Labour and Welfare, Latest Information on COVID-19.
Note: The shadowed parts show the period when the state of emergency was declared in Tokyo.

However, the reduction in the demand for services due to the fall in the mobility of the people and the reduction in the supply of services due to the closures of restaurants, hotels, and recreational facilities led to a steep drop in real GDP in the April-June quarter of 2020. As Figure 10 shows, it was extraordinary in that the drop was due to the drop in private consumption, especially that of services.

Figure 10 Household consumption

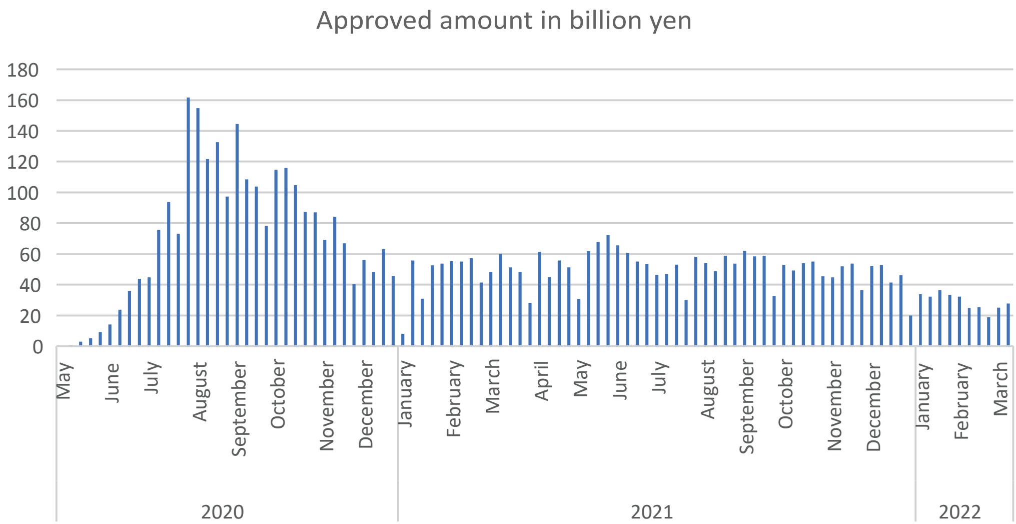


Source: Cabinet Office, Quarterly Estimates of GDP.

The drop in real GDP led to an adjustment in the labour market. There was a steep reduction in overtime working hours, reduction in bonuses, reduction in new job offers, and reduction in the employment of non-regular workers. However, it did not reduce regular workers or steeply increase unemployment rate.

Unemployment rose only modestly from 2.2 per cent in December 2019 to 3.1 per cent in October 2020 (Figure 6). It owed much to the lifetime employment system that was in place in Japan. The steep increase in workers on leave absorbed the gap between the need to adjust the workforce and to respect lifetime employment. Maintaining employment by increasing the number of workers on leave, who were entitled to receive at least a portion of their wages, was supported by the subsidies provided by the government through its employment adjustment subsidies program, as Figure 11 shows.

Figure 11 Employment adjustment subsidies program



Source: Ministry of Health, Labour and Welfare, Employment Adjustment Subsidies Program.

3.1.5 Expansionary phase since May 2020

After the steep drop in real GDP in the April-June quarter of 2020, real GDP started to show a recovery. In terms of business cycles, it has been identified tentatively that an expansionary phase has started to take place in May 2020.

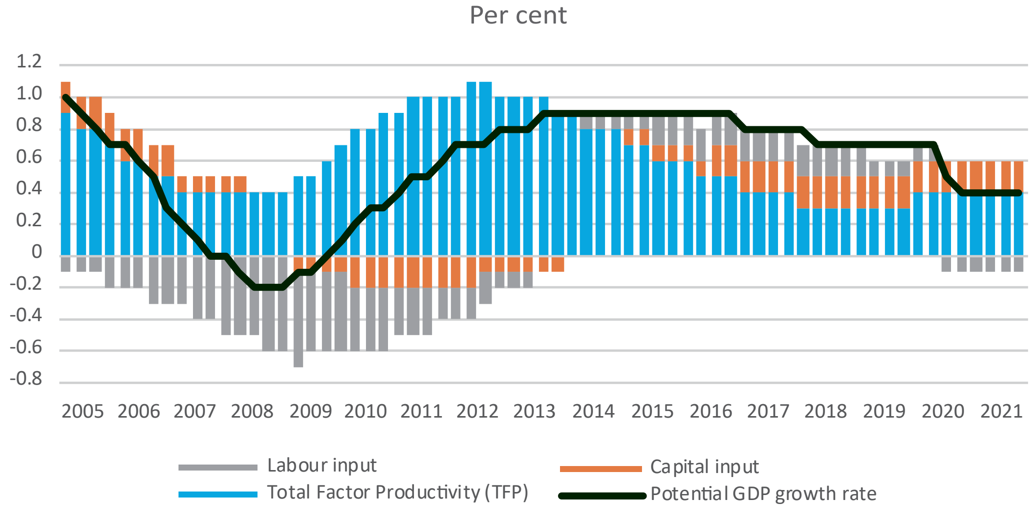
Since March 2020, the Bank of Japan has introduced measures to support firms' financing and maintain financial markets' stability. Measures include purchasing the necessary amount of long-term government bonds to maintain a long-term interest rate at around zero, actively purchasing ETFs and J-REITs, and introducing the Special Program to Support Financing in Response to COVID-19. Fiscal policy also responded to the COVID-19 pandemic by introducing three policy packages and four supplementary budgets in FY2020 and FY2021. It included measures to make cash transfers to households, to provide subsidies to businesses, and to introduce interest-free and collateral-free loans.

However, the pace of recovery remained modest. At the end of 2021, real GDP still had not recovered the previous peak achieved in the January-March quarter of 2020. The recovery was also frequently disturbed by the drops in economic activity that resulted from the state of emergency that had been declared three times in 2021: in January, April, and July 2021 (Figure 9).

3.1.6 Potential GDP growth rate during the period

Figure 12 shows the potential GDP growth rate during the period. After showing some fluctuations due to the global financial and economic crisis, the potential GDP growth rate gradually fell to 0.4 per cent by the end of 2021. The main factors contributing to the decline were labour input that returned negative in 2020 and the gradual decline in total factor productivity.

Figure 12 Potential GDP growth rate and contributing factors



Source: Cabinet Office, GDP Gap and Potential GDP Growth Rate.

The decline in labour input is due to the ageing and shrinking of the population. The peak of population in Japan was reached in 2008 at 128.1 million, and the population has been shrinking since then. The decline in population between October 2008 and October 2020 was 1.9 million or 1.5 per cent. At the same time, the share of the population aged 65 years old or over, which was 22.1 per cent in October 2008, rose to 28.6 per cent by October 2020.

The decline in the contribution of total factor productivity also reflected the impact of the ageing and shrinking of the population that changed the underlying conditions of the existing economic system. The potential to innovate and the efficiency of the system were affected by the demographic change.

Because of the need to secure the sustainability of the fiscal and social security systems, introducing measures to overcome the negative consequences of the ageing and shrinking population and to reverse the declining trend of the potential growth rate are urgently needed.

3.2 Performance of the External Sector

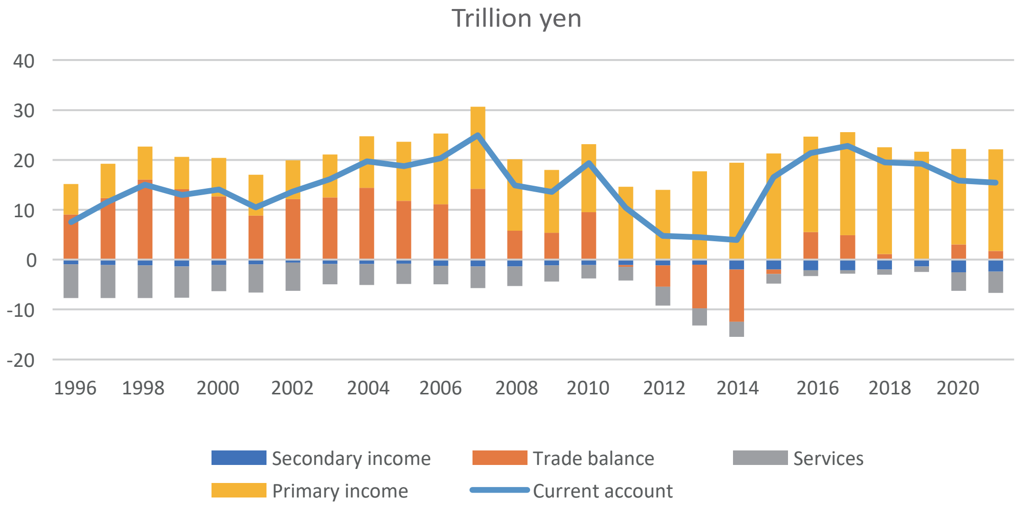
As mentioned above, the macroeconomic performance of the Japanese economy depended heavily on the developments in its exports. Even though the share of exports in GDP was only 17.4 per cent just before the pandemic in 2019, large swings in the rate of change enabled exports to contribute to real GDP growth rate significantly. Furthermore, since private consumption and other components of the private demand only had a limited positive contribution to growth, the development in exports dominated the changes in real GDP.

3.2.1 Balance of payments

The balance in the trade account, which records transactions of goods, have dramatically changed between 2011 and 2020.

As Figure 13 shows, trade account recorded a large surplus in the 2000s. However, due to the Great East-Japan Earthquake and the increase in imports of energy resources that resulted from the shut-down of nuclear power generation plants, trade account turned into a deficit in 2011. It stayed in deficit until 2015 because of the high oil prices. After 2016, trade account returned to surplus. However, it has become smaller than those recorded in the 2000s.

Figure 13 Current account balance and its components



Source: Ministry of Finance and Bank of Japan, Balance of Payments.

Along with the surplus in trade account, the deficit in the services account was also a traditional pattern of Japan's balance of payments. However, a deficit in the services account showed a decline in the 2010s. It was primarily due to the growing surpluses in the travel account that resulted from a rapid increase in inbound tourists: tourists to

Japan increased by more than fivefold from 6.2 million in 2011 to 31.9 million in 2019. The government's target for inbound tourists was to achieve 40 million by 2020, inclusive of the expected impact of the 2020 Tokyo Olympics and Paralympic Games. However, the outbreak of the COVID-19 pandemic prevented the target from being achieved, reducing its number to only 4.1 million in 2020 and 0.2 million in 2021.

Another factor that contributed to reducing the deficit in the services account was the increase in the receipt of the charges for the use of intellectual property. A steady increase in production by the Japanese affiliates operating abroad has contributed to growing payments of these charges to their parent firms.

The current account could have turned into a deficit since the trade account reduced its surplus and the services account was still in deficit. However, it did not because of the large net receipt of primary income from abroad. Net receipt of primary income started to grow in the early 2000s, and the pace picked up in the 2010s. An increase in primary income reflected the growth of Japan's net foreign assets, but the depreciation of the yen has also contributed to its increase in recent years.

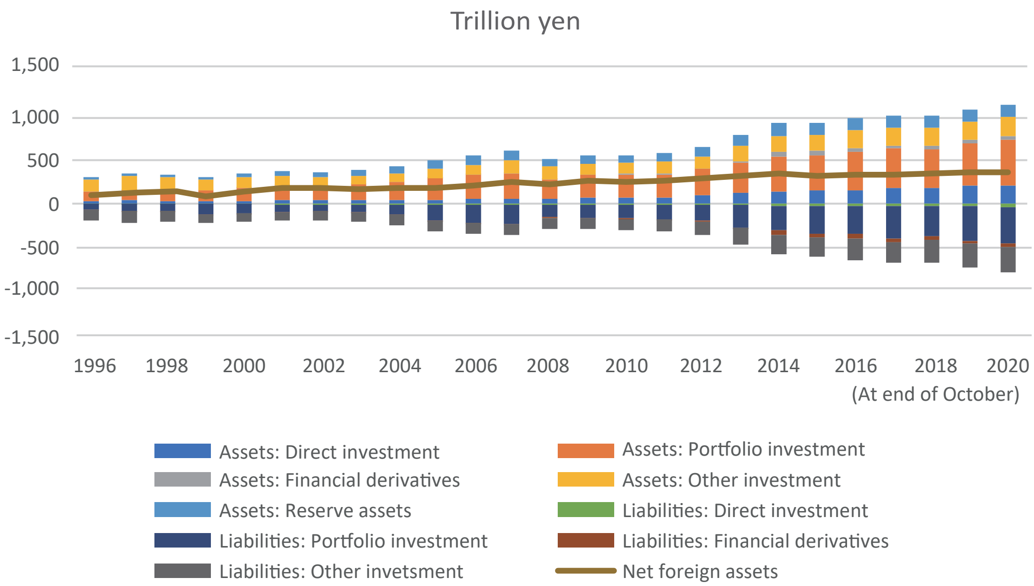
Since compensation of employees earned abroad is limited in Japan, the main sources of the growth in receipt of primary income were increased portfolio investment income and direct investment income. The former reflected the increase in the returns to the portfolio investment, while the latter was due to the rise in dividends payments and retained earnings of the Japanese affiliates.

As a result of the large net receipt of primary income, the current account maintained its surplus, which has generally continued since the late 1960s (exceptions were a number of years in the 1970s that suffered from the two oil crises).

3.2.2 International investment position

A surplus in the current account implies a net outflow of capital in the financial account (the net balance of the capital account is limited in Japan). The accumulated flow of capital between Japan and the rest of the world is reflected in the stock data on the international investment position shown in Figure 14.

Figure 14 Foreign assets and liabilities



Source: Ministry of Finance, International Investment Position.

Both foreign assets and foreign liabilities have increased since the global financial and economic crisis in 2008. An increase in foreign assets was due to the increase in portfolio investment. Increases in other investment, direct investment, and reserve assets also made contributions. Compared to these, the increase in financial derivatives was limited. An increase in foreign liabilities was a result of an increase in portfolio investment. An increase in other investment also contributed. On the other hand, increases in foreign direct investment and financial derivatives were limited.

The changes in foreign assets and foreign liabilities partly reflect the changes in the valuation of existing assets and liabilities due to exchange rate fluctuations and changes in stock and bond prices. However, the difference between foreign assets and foreign liabilities, or the net foreign assets, is determined primarily by the current account balance.

With the long history of current account surplus in the background, Japan's net foreign assets have been increasing: net foreign assets in 2020 amounted to 357 trillion yen, the largest in the world. As it was previously mentioned, the large amount of net foreign assets was also the reason why Japan was able to receive a large amount of primary income from abroad.

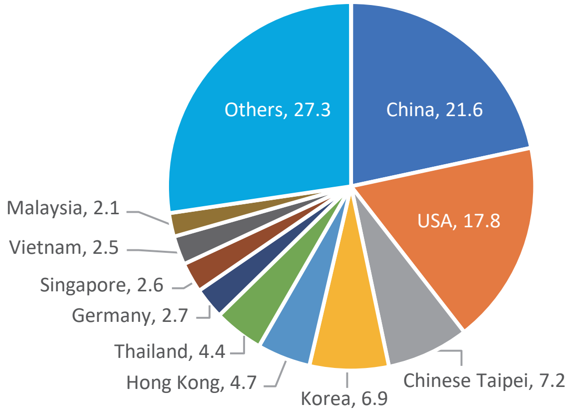
3.3 Economic Relationship with China and Korea

In terms of Japan's economic relationship with other economies, China and Korea have been among the most important economies in trade in goods and other current transactions, capital transactions, and flow of people.

3.3.1 Exports and imports of goods

As Figure 15 shows, China was the largest and Korea the fourth largest destination of Japan's exports in 2021.

Figure 15 Exports by destination (2021)

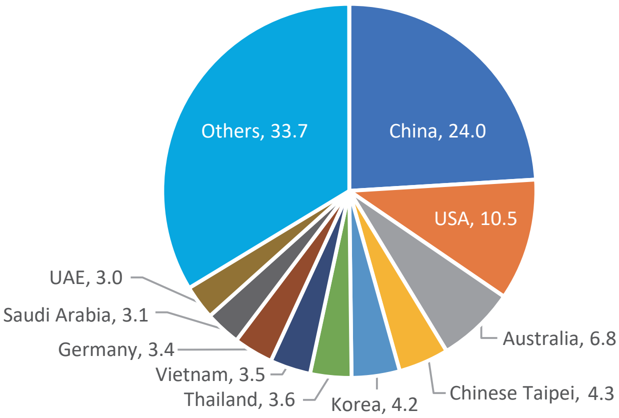


Source: Ministry of Finance, Trade Statistics

The exports to China have increased from 19.7 per cent in 2011 to 21.6 per cent in 2021. It has had either the largest or the second-largest share among the destination of Japan's exports since 2001. The share of exports to Korea fell slightly from 8.0 per cent in 2011 to 6.9 per cent in 2021. It had the third-largest share among the destination of Japan's exports between 2000 and 2020.

As Figure 16 shows, China was the largest and Korea the fifth-largest source of Japan's imports in 2021.

Figure 16 Imports by source (2021)



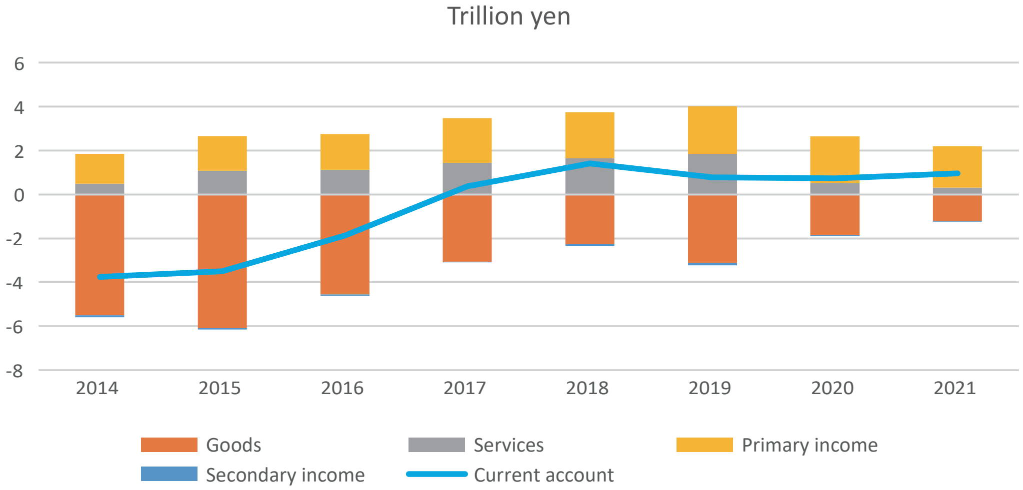
Source: Ministry of Finance, Trade Statistics.

The imports from China have increased from 21.5 per cent in 2011 to 24.0 per cent in 2021. It has had the largest share in Japan's imports since 2000. The imports from Korea have fallen slightly from 4.7 per cent in 2011 to 4.2 per cent in 2021. It has had the fourth or the fifth largest share among the source of Japan's imports since 2015.

3.3.2 Current transactions

As a result of exports and imports of goods, the trade account with China had been in deficit until recently. However, as Figure 17 shows, the gradual decline in the trade deficit, combined with the surplus in services and in primary income account, has led the current account balance to turn into a surplus since 2017.

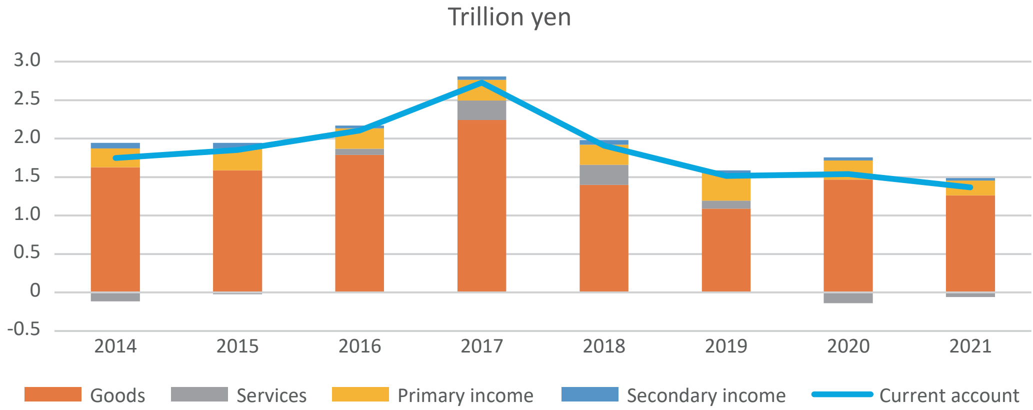
Figure 17 Current account balance with China



Source: Ministry of Finance and Bank of Japan, Balance of Payments.

The trade account with Korea has been recording a surplus, as Figure 18 shows. In addition, there was a surplus in the primary income account. Both have contributed to the current account surplus recorded in recent years.

Figure 18 Current account balance with Korea

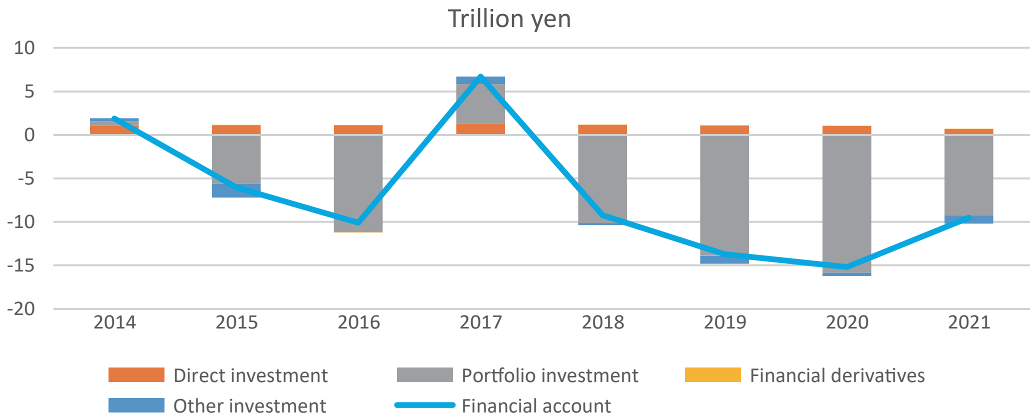


Source: Ministry of Finance and Bank of Japan, Balance of Payments.

3.3.3 Capital transactions

In terms of the financial account with China, direct investment has been showing a net outflow in recent years. However, as Figure 19 shows, there has been a large net inflow of portfolio investment since 2018. As a result, a large net inflow has been recorded in the financial account since 2018.

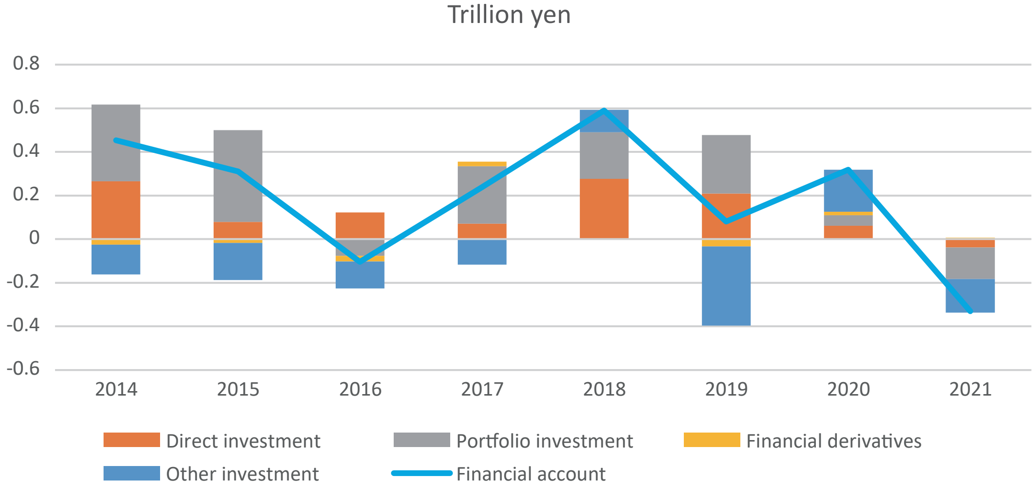
Figure 19 Financial account balance with China



Source: Ministry of Finance and Bank of Japan, Balance of Payments.
Note: Negative value indicates increase in net liabilities (net inflow of capital).

The financial account with Korea has been showing fluctuations despite the net outflow of direct investment. As Figure 20 shows, it is due to the large swings in the portfolio and other investment.

Figure 20 Financial account balance with Korea

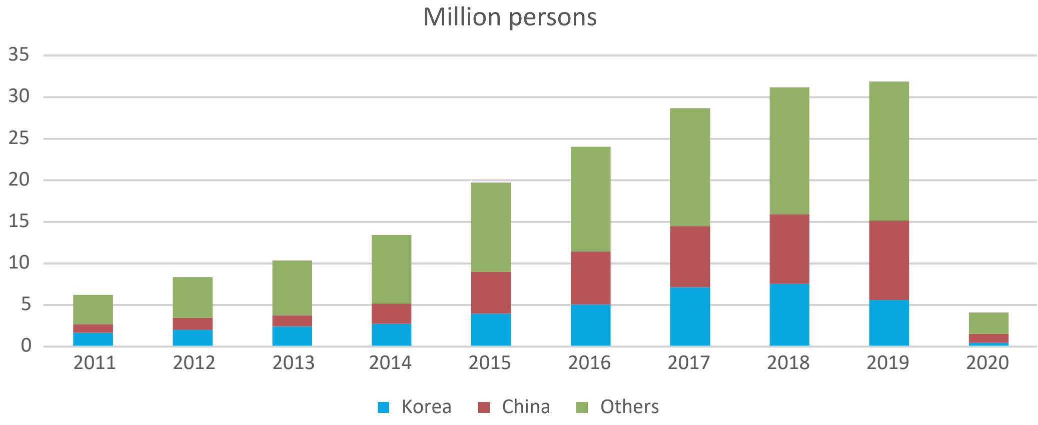


Source: Ministry of Finance and Bank of Japan, Balance of Payments.
Note: Negative value indicates increase in net liabilities (net inflow of capital).

3.3.4 Flow of people

Inbound tourists have been increasing in recent years, as Figure 21 shows. However, it fell dramatically in 2020 when the pandemic of COVID-19 restricted the mobility of the people. In 2019, China and Korea were the first and second-largest economies where the tourists to Japan came from: the share of China was 30.1 per cent, and that of Korea was 17.5 per cent.

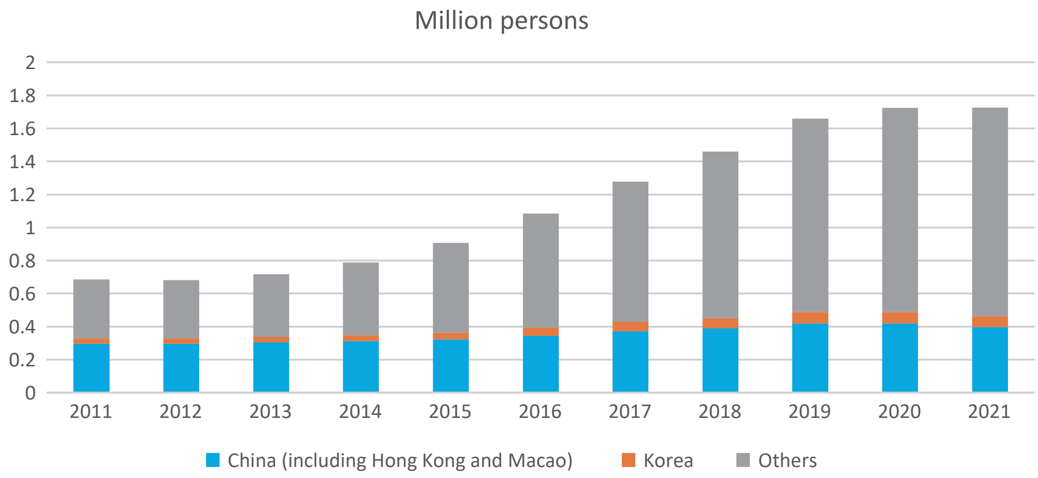
Figure 21 Inbound tourists from China and Korea



Source: Ministry of Land, Infrastructure, Transport and Tourism, Number of Inbound and Outbound Travelers.

With the labour shortage at the background, the stock of foreign workers in Japan continued to increase as Figure 22 shows. Composition of the foreign workers shows that there has been a rapid increase of foreign workers from economies other than China and Korea in recent years. However, the shares of the foreign workers form China and Korea are still large, with China being the second largest with 397 thousand persons (23.1 per cent) and Korea being the fifth largest with 67.6 thousand persons (3.9 per cent) in October 2021.

Figure 22 Foreign workers from China and Korea



Source: Ministry of Health, Labour and Welfare. Employment Situation of Foreign Workers.

3.3.5 Growing interdependence among China, Japan, and Korea

The growth of Japan's trade with China and Korea resulted from the liberalization of trade and investment made in these economies and the rapid economic growth and development that followed. Such an environment also stimulated capital flows and the movement of people among the economies.

The growing interdependence among the three economies was initially driven by Japan's foreign direct investment that established global value chains among the Asian economies. The evolution of the global value chain and the role played by Japan will be discussed in the next section.

3.4 Establishment of Global Value Chains in Asia

Global value chains have developed rapidly since the 1980s. More and more firms are participating in a chain of production process that spans across borders. As a result, economies around the globe have become deeply interdependent.

A global value chain can be defined as a production process of a final good or service whose production process is unbundled to various stages allocated to different economies. At each stage, some value is added to the intermediate goods and services produced at the previous stage so that the final good or service incorporates value produced in different economies (Antràs, 2021). The term is like that of a global supply chain but is different in that a global value chain focuses on the chain of value added at each stage of the production process rather than the movement of the products themselves.

As the definition suggests, for an economy to be involved in a global value chain, commitment to free trade and investment is necessary in addition to its attractiveness in terms of the endowment of factors of production, size of the domestic market, proximity in distance, and reliability of the institutional arrangements (World Bank, 2020). Because these conditions were satisfied in Asia, the region established global value chains among its economies.

3.4.1 Japan's foreign direct investment

When global value chains were established in Asia, the main driving force was the foreign direct investment (FDI) by the Japanese firms in the region.

FDI is an investment made by a parent firm in a home economy to establish a long-term relationship with a firm in a host economy by purchasing more than 10 per cent of the voting right of the firm and making it its affiliate. By exerting a considerable influence on the affiliate, the parent firm can design the affiliate's procurement and sales so that the profitability of the whole production process can be maximised.

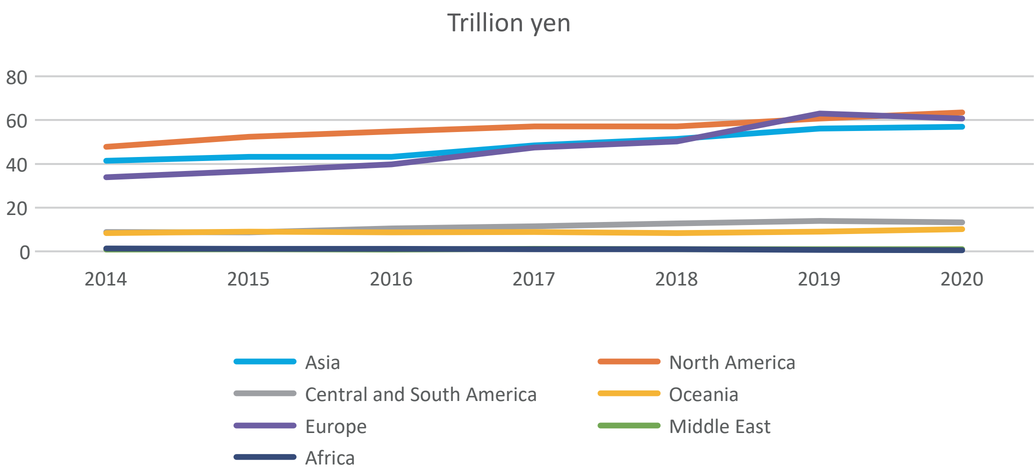
Japan's FDI started to grow in its ratio to GDP in the 1980s. Before then, FDI focused on North America and Central and South America, in addition to Asia, to reach a larger market, secure natural resources, and benefit from lower labour costs. In terms of industries, commerce, mining, chemical products, and textiles attracted much investment.

The situation changed when trade friction with the United States intensified in early 1980s and when Plaza Accord in 1985 initiated a steep appreciation of the exchange rate of the yen. FDI to North America by the transportation equipment industry increased in order to produce within the region instead of exporting them to the region. With strong purchasing power of the yen at the background, FDI by the finance and insurance, and real estate industries to North America and Europe also increased.

At the same time, to overcome the loss of competitiveness of the Japanese exports due to the appreciation of the yen, FDI to shift production sites from Japan to Asia started to increase. An example of this case was the electrical machinery industry—the start of the global value chains that were gradually established among Japan and other Asian economies.

The recent trend in the outstanding stock of FDI is shown in Figure 23. It shows that the outstanding stock of FDI is still concentrated in North America, Europe, and Asia.

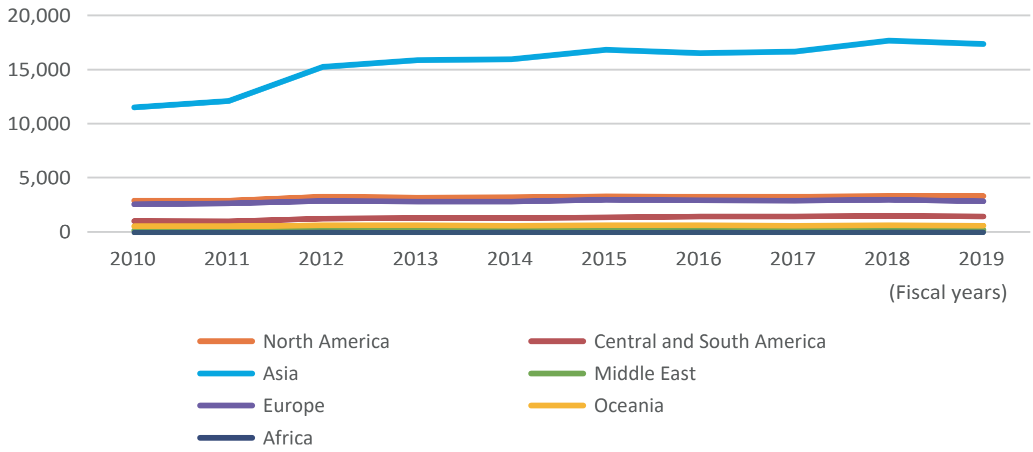
Figure 23 Outstanding stock of FDI by region



Source: Ministry of Finance, Regional Direct Investment Position.
Note: Data based on BPM6 is available only for the period after 2014.

As Figure 24 shows, Asia has attracted the largest number of affiliates by hosting approximately 70 per cent of the total in terms of the number of affiliates by region. It suggests that affiliates in Asia involve a smaller FDI than those in other regions.

Figure 24 Number of Japanese affiliates by region



Source: Ministry of Economy, Trade and Industry, Basic Survey on Overseas Business Activities.
Note: Latest data available is for 2019.

3.4.2 Various types of affiliates

The Japanese firms made FDI to achieve several different objectives. Established affiliates had different features in terms of procurement and sales corresponding to each of the objectives (what follows is a modified version of the classification suggested by Baldwin and Okubo, 2012).

First, some FDI was made to natural resource-rich economies to secure the supply of natural resources scarce in Japan. As a result, most natural resources produced by the affiliate were sold to Japan while relying upon most of the procurement to the host economy or economies other than Japan. This kind of affiliate can be named the 'resource securing' type.

Second, some FDI was made to produce final goods in the host economy so that it could sell its products in the market of the host economy. This way could save the transportation cost and the tariff that would have to be paid if they were exported from

Japan. The production in the host economy could be done by using intermediate goods and services supplied either by the firms in Japan or by the local suppliers. The affiliates procuring from Japan could be called the 'local assembling' type, while those from local suppliers could be called the 'pure localising' type.

Third, some FDI established production sites in the host economy to make use of the low production cost available locally.

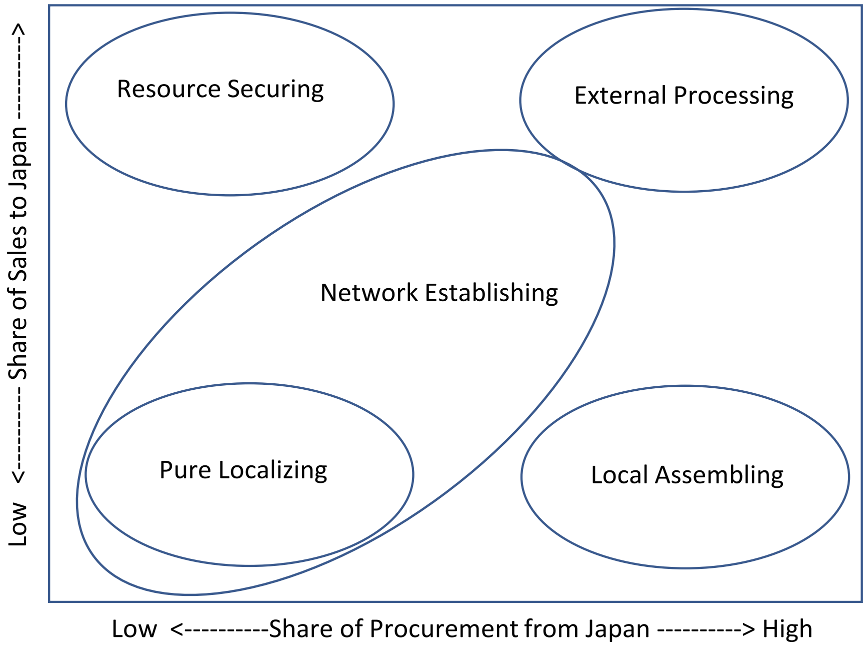
Among the affiliates that belong to this case, some engaged only in assembling the product in the host economy: almost all intermediate goods were imported from Japan, and virtually all products were exported to Japan. This kind of affiliate could be called the 'external processing' type.

Other affiliates engaged in production by using intermediate goods produced locally or imported from other economies (including Japan). Their products were also sold locally or exported to other economies (including Japan). Since they were a part of a network of firms, such affiliates could be called the 'network establishing' type.

Among the five types of affiliates described above, some pure-localising types may not qualify as a global value chain if procurement and sales are confined within a single economy (the host economy). Others will qualify as a global value chain if their production involves more than two economies. That is particularly the case for affiliates of a network-establishing type whose production may involve more than two economies on both the procurement and sales sides.

Figure 25 shows the relationship between the distinct types of affiliates. The five types outlined above are identified in a plane defined by the share of procurement from Japan on the horizontal axis and the share of sales to Japan on the vertical axis.

Figure 25 Various types of Japanese affiliates



Source: Author's modified version of the classification suggested by Baldwin and Okubo (2012).

The resource-securing type with almost no procurement from Japan and almost all of its products sold to Japan is shown in the top left-hand corner, while the local-assembling type with almost all procured from Japan and almost none sold to Japan is located at the bottom right-hand corner. The pure-localising type with almost none procured from Japan and almost none sold to Japan is placed at the bottom left-hand corner, and the external-processing type with almost all of the procurement is from Japan and almost all sold to Japan is shown in the top right-hand corner.

Finally, the network-establishing type with procurement from and sales to a mixture of economies is located at the centre of the plane and the bottom left-hand corner. The bottom left-hand corner is included because low procurement from and low sales to Japan do not necessarily mean high procurement and high sales to the host economy. It may involve procurement from and sales to a third economy, which could be the case if it is engaged in a global value chain.

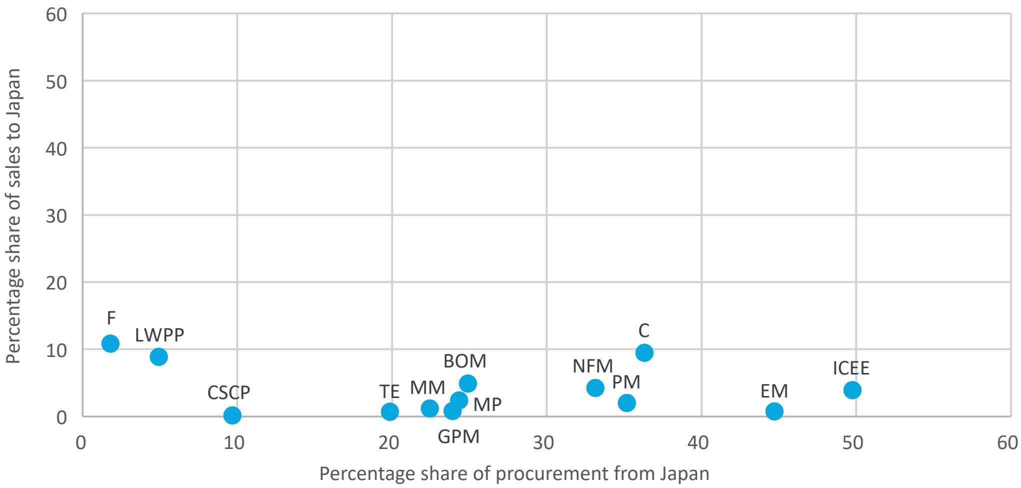
3.4.3 Differences in the types of affiliates by regions

The similarities and the differences in the types of affiliates in different regions can be distinguished by the data on the Japanese affiliates. The data used below is for Japanese affiliates in different manufacturing sectors operating in North America, Europe, and Asia in 2019. The location of the average profile of affiliates in each of the industries is plotted on a plane similar to that in Figure 23.

North America

The average profile of affiliates in North America is shown in Figure 26. It shows that all industries in North America sell less than 11 per cent of their products to Japan. There are also many with less than 25 per cent of intermediate goods purchased from Japan among those industries. Most of them could be identified as being close to the pure-localising type.

Figure 26 Procurement and sales of Japanese affiliates in North America (2019)



Source: Ministry of Economy, Trade and Industry, 50th Basic Survey on Overseas Business Activities (September 2020).
Note: The Survey asked about the situation of the Japanese affiliates in FY2019.

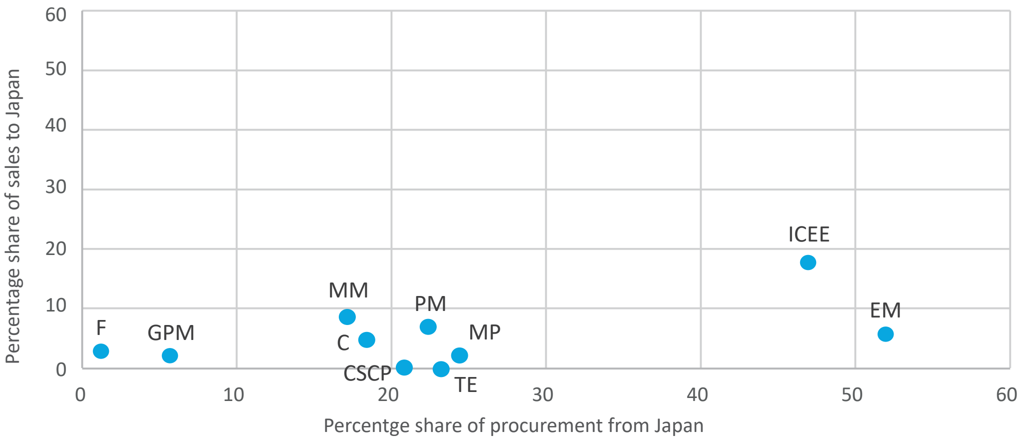
An exception is the transportation equipment industry (TE), which sells a significant part (nearly 50 per cent) of its sales to a third economy in the region. The industry seems to have made use of the North American Free Trade Agreement (NAFTA) effective at that time to establish a global value chain in the region. The TE should be regarded as having features of a network-establishing type.

Of the remaining industries, the information and communication electronics equipment industry (ICEE) and electrical machinery industry (EM) purchase around 40 to 50 per cent of their intermediate goods and services from Japan, and the chemical industry (C), non-ferrous metal industry (NFM), and production machinery industry (PM) purchase around 30-40 per cent of their intermediate goods and services from Japan. These industries have features somewhere between the pure-localising and the local-assembling types.

Europe

Affiliates in Europe are somewhat like those in North America. Except for some industries, they are close to the pure-localising type. Figure 27 shows that, in this region, all sectors sold less than 10 per cent of their products to Japan. Among them, most industries purchased less than 25 per cent of their products from Japan.

Figure 27 Procurement and sales of Japanese affiliates in Europe (2019)



Source: Ministry of Economy, Trade and Industry, 50th Basic Survey on Overseas Business Activities (September 2020).
Note: The Survey asked about the situation of the Japanese affiliates in FY2019.

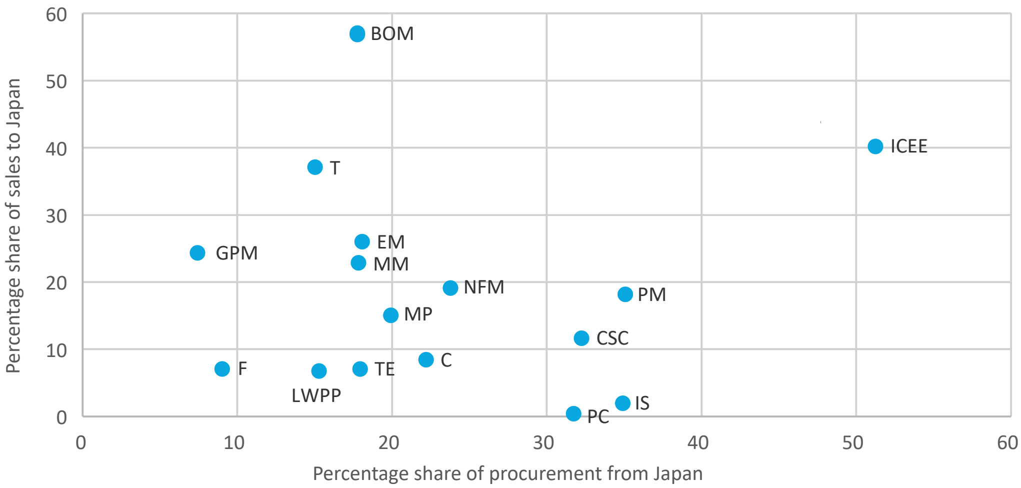
The exceptions are the ceramic, stone, and clay products industry (CSCP) and transportation equipment industry (TE), with high procurement from (more than 70 per cent) and high sales to (40 to 50 per cent) a third economy in the region. They seem to be using the single market arrangement of the European Union (EU). In that sense, these two industries should be considered the network-establishing type.

The remaining information and communication electronics equipment industry (ICEE) and electric machinery industry (EM) purchase around 50 per cent of their intermediate goods and services from Japan. These industries should be considered somewhere between the pure-localising and the local-assembling types.

Asia

Compared to the affiliates in the above two regions, those in Asia show more variety in their types. As Figure 28 shows, the food industry (F), lumber, wood, paper, and pulp industry (LWPP), transportation equipment industry (TE), and chemical industry (C) have low procurement from and low sales to Japan. Most of them could be close to a pure-localising type.

Figure 28 Procurement and sales of Japanese affiliates in Asia (2019)



Source: Ministry of Economy, Trade and Industry, 50th Basic Survey on Overseas Business Activities (September 2020).
Note: The Survey asked about the situation of the Japanese affiliates in FY2019.

An exception is the transportation equipment industry (TE) which has high sales to a third economy in the region (about 40 per cent). It should be considered a network-establishing type making use of the ASEAN Free Trade Area (AFTA).

The petroleum and coal industry (PC) and iron and steel industry (IS) have low sales to Japan but purchase 30 to 40 per cent of their intermediate goods and services from Japan, so they lie somewhere between the pure-localising and the local-processing types. On the other hand, the general-purpose machinery (GPM) industry has low procurement from Japan but sells about 25 per cent to Japan and is somewhere between the pure-localising and resource-securing types.

The remaining industries include the textiles industry (T), business-oriented machinery industry (BOM), miscellaneous manufacturing industry (MM), electrical machinery industry (EM), metal products industry (MP), non-ferrous metals industry (NFM), ceramic, stone, and cray industry (CSC), production machinery industry (PM), and information and communication electronics equipment industry (ICEE). These industries can be identified as being the network-establishing type: these industries purchase 10-60 per cent of the inputs from Japan and sell 10-60 per cent of their products to Japan.

Summary

The above observations suggest that the main motivation for creating affiliates by Japanese FDI in North America and Europe seems to be in securing the market for their product by producing them locally instead of exporting their product to the market. An important exception is the transportation equipment industry, whose motivation seems to lie in using the free trade arrangement in the region and organising production to minimise the cost.

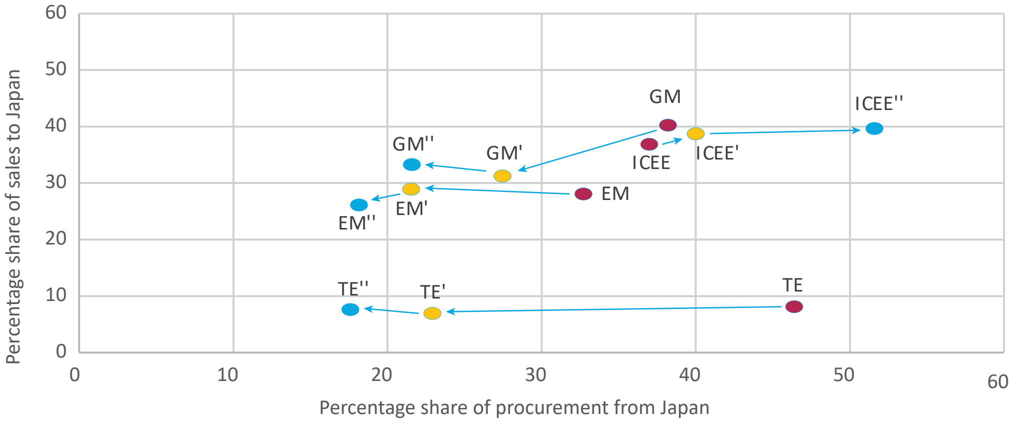
In the case of Asia, the primary motivation for the establishment of affiliates seems to be in establishing global values chains to make use of the low production cost in the host economy, considering the free trade arrangement in the region. A significant part of their procurement comes from a third economy, and a significant part of their products are sold to a third economy.

3.4.4 Changes taking place in the long-term

Over the years, these features of the affiliates have changed. That is especially the case for the affiliates in Asia.

Figure 29 shows the changes that have taken place between 2001, 2011, and 2019 for the main processing and assembling manufacturing industries such as general machinery (GE), electric machinery (EM), information and communication electronics equipment (ICEE), and transportation equipment (TE) industries. It shows that all industries have been stable in terms of the shares of their sales to Japan. However, all industries, except for the information and communication electronics equipment industry (ICEE), showed a significant decline in the share of procurement from Japan. In contrast, the information and communication equipment industry (ICEE) has increased its procurement from Japan and moved towards the pure-processing type.

Figure 29 Changes in procurement and sales of affiliates in Asia (2001-2011-2019)



Source: Ministry of Economy, Trade and Industry, Basic Survey on Overseas Business Activities.
Note: The two arrows for each industry show the movement from 2001 to 2011 and from 2011 to 2019.

The changes suggest that, for some industries, intermediate goods had become available in the host economy and other economies in the region so that they became less dependent on the supply from Japan. It reflected the rapid economic development and the expansion of supporting industries in the economies of the region that led to the strengthening of the competitiveness of their products.

3.5 Impact of Global Value Chains on Trade in Value Added

Establishing global value chains by FDI has affected Japan's exports and imports through several channels.

First, they replaced exports from Japan. An example is the FDI by the transportation equipment industry, which established affiliates in the economy where Japan used to export cars. The products produced in the host economy replaced the exports made from Japan. It would also be the case when FDI by the electrical machinery industry established a value chain that produced at the host economy and exported its products to a third economy, replacing Japan's exports to those economies.

Second, they increased Japan's imports of goods produced by the Japanese affiliates abroad. That is especially the case for FDI to Asia by the information and communication electronics equipment industry, where production sites were established to make use of the low production cost in the host economy and sell their products to Japan.

Third, they increased Japan's exports of intermediate goods. It would be the case for FDI by the information and communication electronics equipment industry, where the affiliates purchased a significant part of their intermediate goods from Japan.

The reduction of exports and increased imports suggested by the first two channels can reduce Japan's GDP. It raised a concern in Japan that shifting production sites abroad by FDI would lead to a hollowing out of the Japanese economy, containing industrial production and reducing employment opportunities. On the other hand, an increase in exports by the third channel could offset, at least partially, the negative consequences of the first two impacts. From this respect, it was argued that production by affiliates abroad and domestic production could be considered complements rather than substitutes.

These three impacts created a challenge in understanding the effects of FDI on GDP. For example, the increase in imports of goods produced abroad by Japanese affiliates might reduce Japanese value added production. However, the imported goods may include value added produced in Japan by using Japanese products as their intermediate goods. Similarly, an increase in exports of goods produced in Japan might increase the value added in Japan. However, the exported goods may be produced using intermediate goods produced abroad and include value added in a foreign economy. Furthermore, to complicate the matter, those intermediate goods imported from abroad may include value added produced in Japan if they used Japanese intermediate goods.

This new situation created by the development of the global value chains indicated the need for information about the ultimate source of value added in international trade. Data on Trade in Value Added (TiVA) has been developed to respond to this request. TiVA is based on Inter-Country Input Output tables, enabling the researchers to look at the input and output relationships of goods and services across countries. Sources of value added incorporated in exports and imports can be tracked using the tables (OECD, 2021).

3.5.1 Japan's participation in global value chains

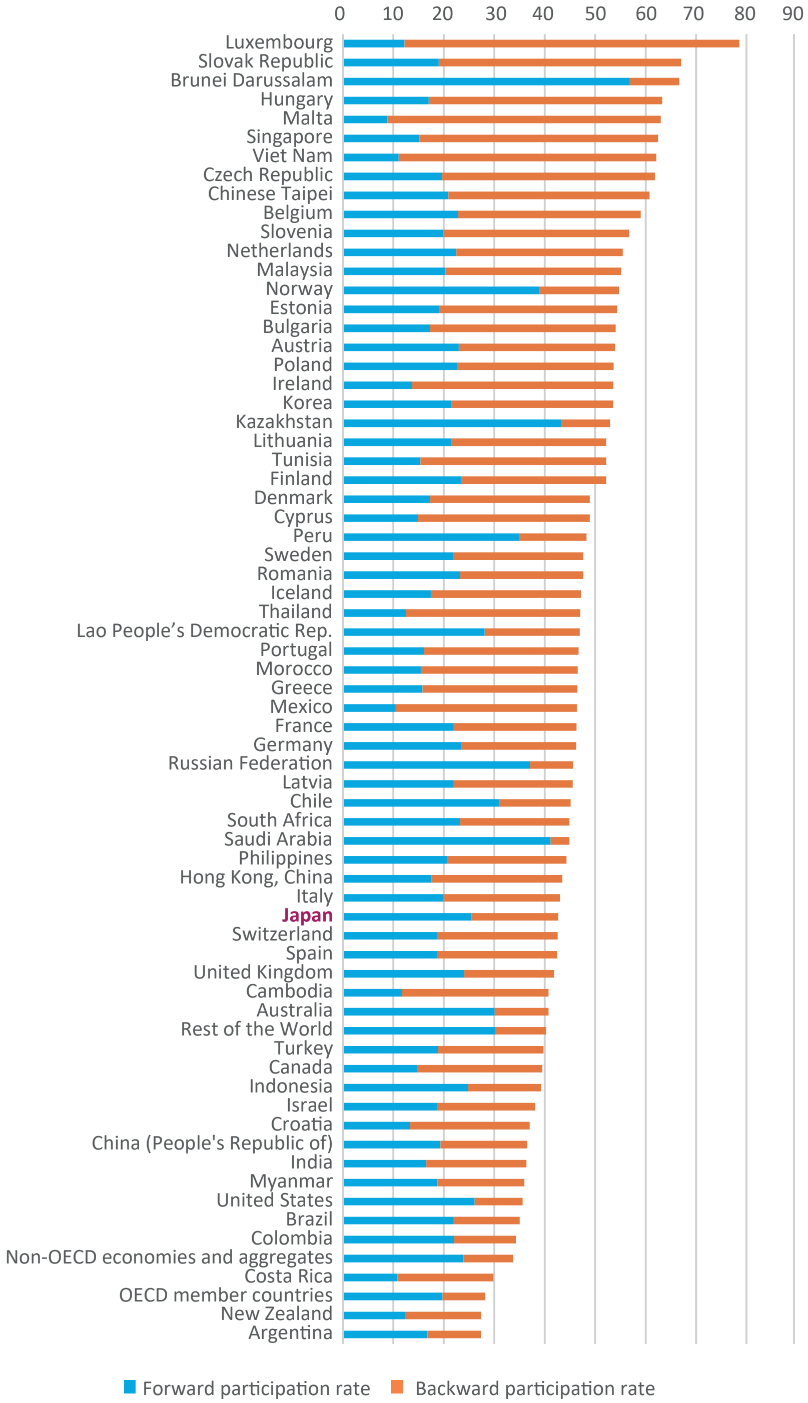
The extent of Japan's involvement in the global value chains can be confirmed by the global value chain (GVC) participation index calculated from the TiVA database. It is defined as a sum of two indices, the backward participation index and the forward participation index.

The backward participation index of an economy A is the ratio to its gross exports of the value added produced by other economies incorporated in the gross exports. It reflects the contribution of the parts of the global values chain that lies in the upstream of economy A. It shows how other economies have contributed to the gross exports of the economy A through imports of their products by economy A.

The forward participation index of an economy A is the ratio to its gross exports of the value added produced in economy A incorporated in other economies' gross exports. It reflects the contribution of the economy A to the economies that lie in the downstream of the global value chain. It shows how economy A has contributed in gross exports of other economies by exporting intermediate goods and services to these economies.

Figure 30 shows the GVC participation index for 66 economies (including all OECD, European Union, ASEAN, and G20 economies); Japan is among the lower half of the economies covered by TiVA. It partly reflects the fact that large economies tend to have low values because of their large domestic economy. It is the case for such economies as China, the United States, and Japan.

Figure 30 GVC participation index (2018)

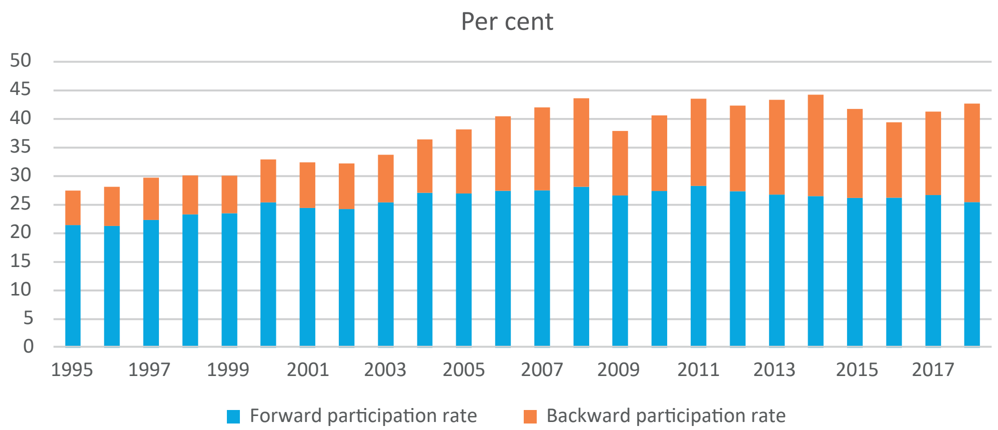


Source: Organisation for Economic Co-operation and Development, Trade in Value Added.
Note: The latest data available is for 2018.

The composition of the GVC participation index shows that Japan has a relatively high forward participation index and a relatively low backward participation index. It suggests that, within the global value chain, Japan is more in charge of exporting intermediate goods and services to the downstream than contributing in importing goods and services from the upstream of the global value chains.

The global value chain has constantly been developing, and Japan's position within the global value chain has also changed over the years. This can be confirmed by Figure 31, which shows the changes in the GVC participation index between 1995 and 2018. It rose until 2008, when the global financial and economic crisis broke out. After the crisis, it has remained broadly flat: both backward and forward participating indices have become stable.

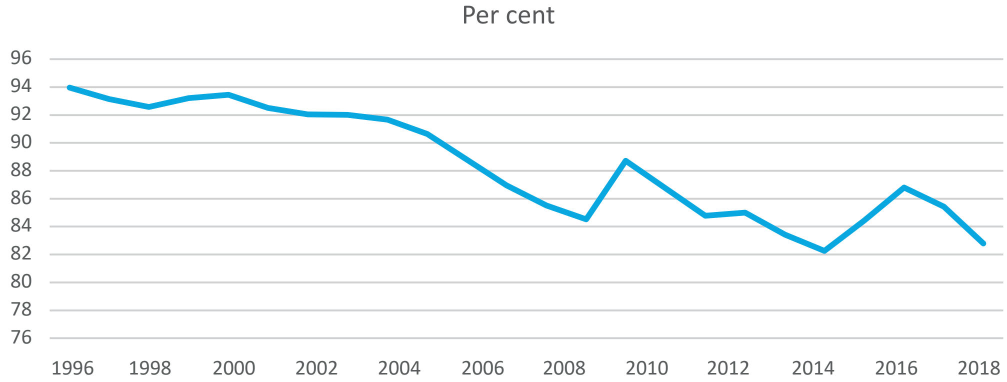
Figure 31 Japan's GVC participation index (1995-2018)



Source: Organisation for Economic Co-operation and Development, Trade in Value Added.
Note: The latest data available is for 2018.

Figure 32 shows the share of the value added produced domestically in Japan's gross exports. The share was close to 95 per cent in 1995. However, the share of the value added produced domestically has gradually fallen over the period. In 2018, it was only 83 per cent. It implies that Japan's exports incorporate less value added produced domestically, and more value added produced in foreign economies.

Figure 32 Share of domestic production of value added in Japan's gross exports



Source: Organisation for Economic Co-operation and Development, Trade in Value Added.
Note: The latest data available is for 2018.

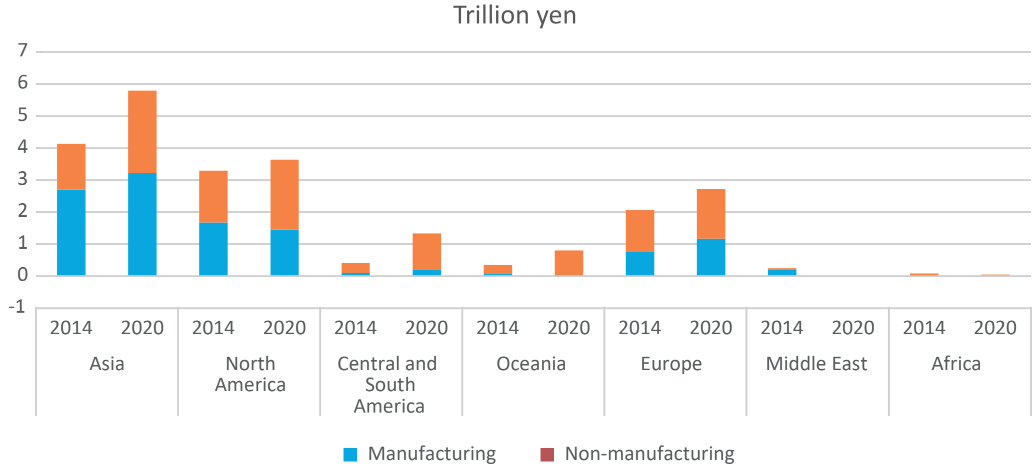
3.5.2 Direct investment income received from affiliates

The increasing share of value added produced by foreign economies in Japan's gross exports may reflect the changes in the competitiveness of goods traded in favour of the foreign economies. This is consistent with the fact that some affiliates in Asia have reduced their procurement from Japan and turned to local suppliers, as confirmed above.

However, if Japanese affiliates are deeply involved in the global value chain and benefit from improving the regional economy through procurement and sales, they should be enjoying higher returns.

As mentioned in the previous section on Japan's macroeconomic performance, primary income receipts from abroad increased in recent years. The increase in the direct investment income earned by the foreign affiliates was one of the contributing factors. Figure 33 shows that direct investment income receipts from Asia, North America, and Europe have increased between 2014 and 2020. In the case of Asia, income from both the manufacturing sector and the non-manufacturing sector has been increasing.

Figure 33 Japan's receipt of FDI income by regions



Source: Ministry of Finance, Reginal Balance of Payments.
Note: Data based on BPM6 is available only for the period after 2014.

It shows that Japan's participation in the global value chain is changing gradually from being one of the producers in the chain to one of the investors. It is increasingly earning income not by adding value domestically but by receiving investing income from the affiliates. In terms of the development stage of the balance of payments, Japan can be seen to be moving gradually from an 'immature creditor economy' to a 'mature creditor economy'.

3.6 Relationship with China and Korea through Global Value Chains

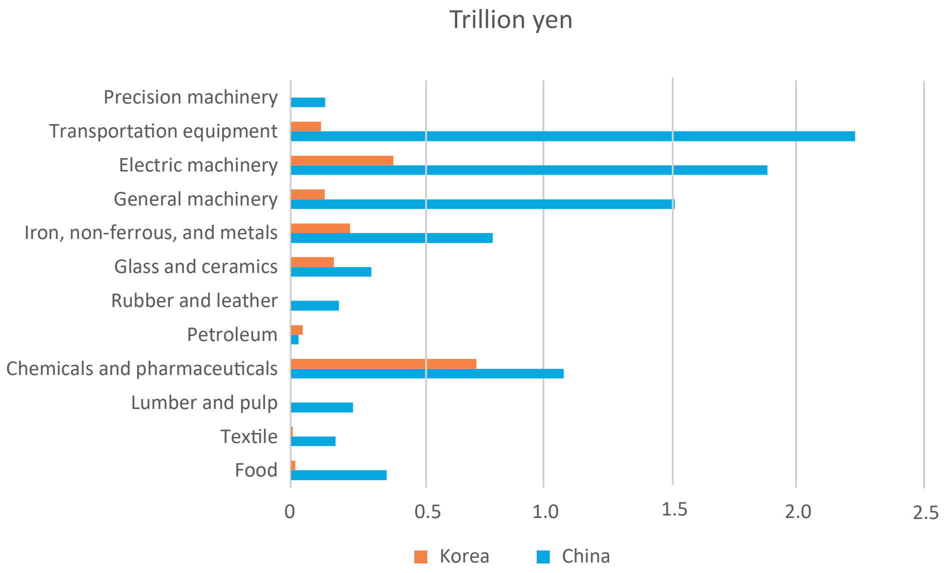
China and Korea have been the main destinations of FDI by Japan. They were the critical economies in establishing global value chains in the region. It is especially the case for the FDI in the manufacturing sector.

3.6.1 Outstanding stock of FDI

At end-2020, the outstanding stock of FDI in China was the 2nd largest, and Korea was the 10th largest for Japan. As for FDI in the manufacturing sector, China was the 2nd largest and Korea the 12th largest, whereas, in the non-manufacturing sector, China was the 6th and Korea the 11th largest.

Outstanding stocks of Japanese FDI in the manufacturing sector at end-2020 is shown in Figure 34. In the manufacturing sector, industries with large FDI stock in China were the transportation equipment, electrical machinery, and general machinery industries. Manufacturing industries with large FDI stock in Korea were chemical and pharmaceuticals, electrical machinery, iron, non-ferrous, and metal industries. The FDI to China and Korea in these industries have contributed to establishing the global value chain in the region.

Figure 34 Outstanding stocks of Japanese FDI by manufacturing industries (end-2020)



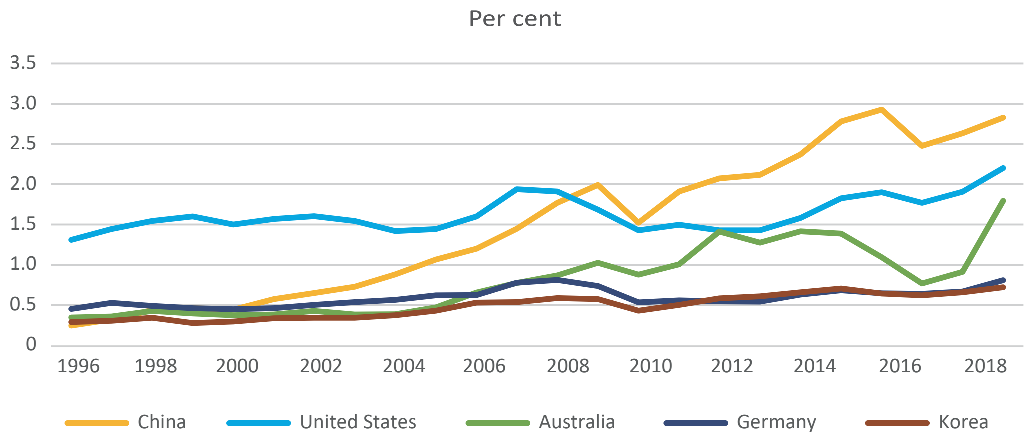
Source: Ministry of Finance, Outward Direct Investment Position (Breakdown by Industry and Region).

Note: Values for Korea in lumber and pulp, rubber and leather, and precision machinery industries were not available due to the smallness of the number of reporting firms.

3.6.2 Share of value added produced in China and Korea in Japan's gross exports

As a result of the established global value chain, the share of value added produced in China and Korea in Japan's gross exports has become increasingly large, as Figure 35 shows. In 2018, China's share was the largest among the foreign economies at 2.8 per cent, and Korea's share was 5th largest at 0.7 per cent. In the case of China, the share has been rising rapidly since the early 2000s. It has been one of the reasons why the share of value added produced in foreign economies in Japan's gross exports had increased over the period.

Figure 35 Share of foreign value added in Japan's gross exports

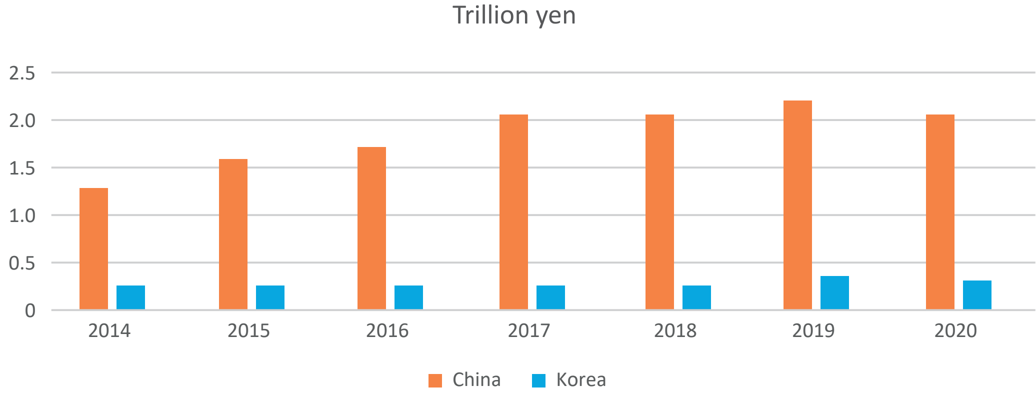


Source: Organisation for Economic Co-operation and Development, Trade in Value Added.
Note: The latest data is for 2018

3.6.3 Direct investment income receipts

As Figure 36 shows, FDI income received from China and Korea has been increasing. FDI income received from China was the 2nd largest, and from Korea was the 10th largest in 2020.

Figure 36 Japan's direct investment income receipts from China and Korea



Source: Ministry of Finance, Regional Balance of Payments.

The increase in the contribution of China and other economies in the value added incorporated in Japan's gross exports and the increase in foreign investment income received from these economies show how Japan is deeply involved in global value chains and how these economies are increasingly strengthening their competitiveness.

Reference

Antràs, Pol (2020). "Conceptual Aspects of Global Value Chains." *The World Bank Economic Review,* 34(3), 551-574.

Baldwin, Richard, & Okubo, Toshihiro (2014). "Networked FDI: Sales and sourcing patterns of Japanese foreign affiliates." *The World Economy,* 37(8), 1051-1080.

OECD (2021). *Guide to OECD's Trade in Value Added Indicators: 2021 edition.* Organisation for Economic Co-operation and Development.

World Bank (2020). *World Development Report 2020: Trading for development in the age of global value chains.* World Bank.

Chapter

4

Economic Performance of the Republic of Korea

Korea Institute for International Economic Policy

Organization: Korea Institute for International Economic Policy

Authors:

KIM Gyu-Pan, Senior Research Fellow, Japan and East Asia Team, Korea Institute for International Economic Policy(KIEP)

HEO Jaichul, Associate Research Fellow, China Region and Strategy Team, Korea Institute for International Economic Policy (KIEP)

Contents

Chapter 4 - Economic Performance of the Republic of Korea

4.1 Korea's Macroeconomic Performance

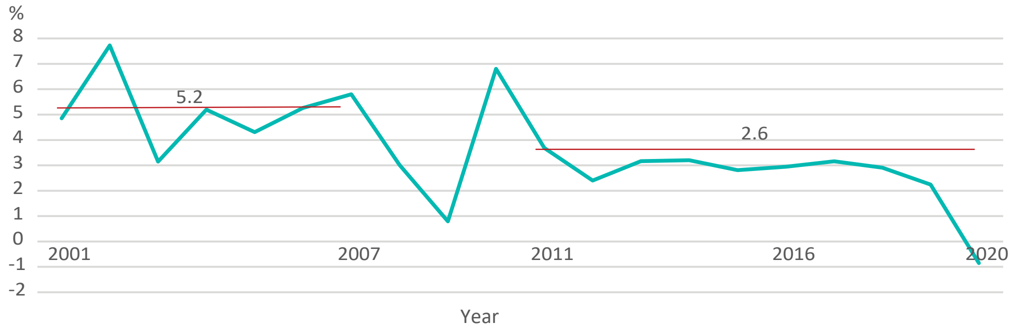
This paper consisted of three Chapters. Chapter 1 presented Korea's macroeconomic development based on the macroeconomic indicators such as GDP, employment and wage, inflation, and trade policy focused on FTA policy in East Asia such as Korea-China FTA, RCEP, and international cooperation in foreign exchange markets such as bilateral local currency swap and CMIM (Chiang Mai Initiative Multilateralization). Chapter 2 reviewed Korea's industrial development in the bio-industry, software industry, cultural content industry, and CJK cooperation under the institutional framework of the trilateral governmental consultative body and the trade flow with China and Japan in each sector. These three industries, along with e-commerce, were pointed out as areas in which cooperation among CJK countries is necessary to advance the industrial structure of the three countries at the "Joint Declaration for Peace and Cooperation in Northeast Asia" in the Sixth CJK Trilateral Summit held in 2015. Finally, Chapter 3 analysed the GVC (Global Value Chain) participation of Korean industry with OECD TiVA (Trade in Value-Added) indicators and the SCC (Supply Chain Connectivity) issues focused on the import of intermediate goods such as materials, parts, and equipment from China and Japan.

4.1.1 Economic growth: potential GDP and real GDP

Korea's average annual real GDP growth rate for ten years from 2011 to 2020 was 2.6%, significantly lower than the average annual growth rate of 5.2% from 2001 to 2007 before the global financial crisis (see Figure 1-1). These results suggest that the Korean economy has moved out of the high economic growth stage since the 2010s. The Korean economy entering the low-growth stage in the mid- to long-term can be explained by lowering of the potential GDP. Figure 1-2 shows that the annual potential growth rate, which reached

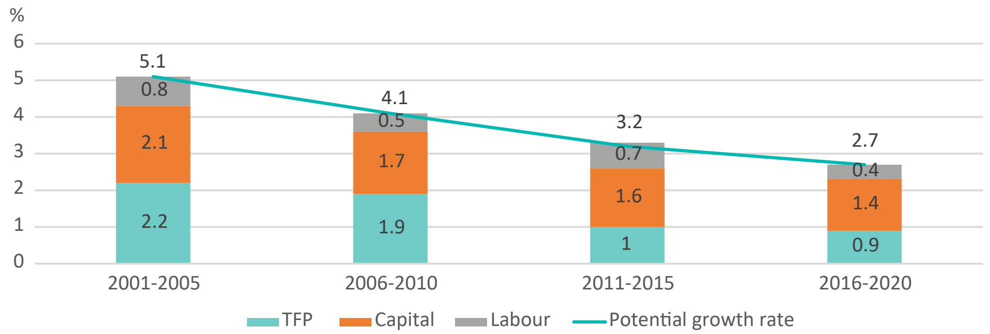
5.1% in the early 2000s, fell to the 3.2% range in the early 2010s and was estimated to have fallen to 2.7% from 2016 to 2020. The decline in the potential growth rate of the Korean economy after 2011 resulted from a decrease in TFP (total factor productivity) and a slowdown in capital accumulation at the same time. In the Korean economy, the decline in TFP is caused by low labour productivity in the service industry and inefficient resource allocation due to excessive market regulation. The slowdown in capital accumulation was because the industrial structure had matured. Compared to before, corporate investment did not increase as uncertainties in the global economy such as the global financial crisis, European fiscal crisis, Brexit, and the COVID-19 increased. Moreover, after 2020, the downward pressure on labour factors is expected to increase due to the rapid ageing of the population structure and the decrease in the working-age population.

Figure 1-1 Real GDP growth



Source: Bank of Korea.

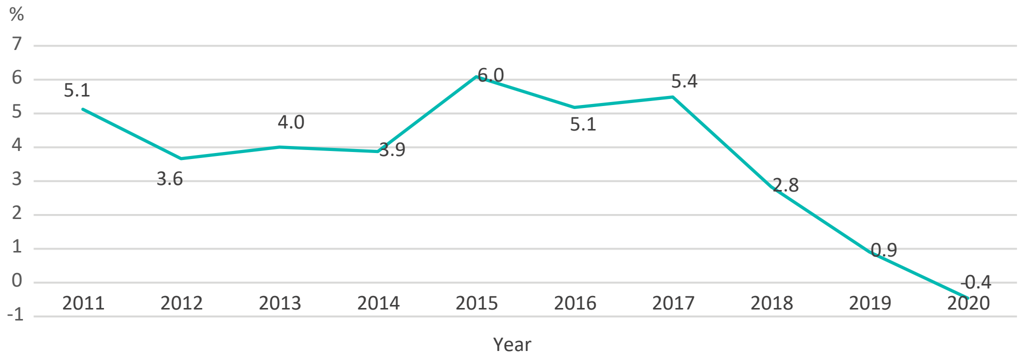
Figure 1-2 Contribution by factor of potential growth rate



Source: Ji, J., Kim, D., & Kwon, J. (2019), Bank of Korea. p. 35.

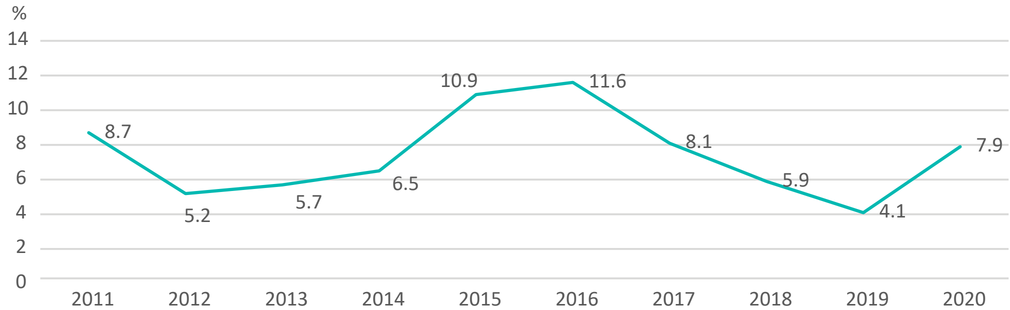
Meanwhile, the decline in household income and accumulation of household debt can be pointed out as other factors that have constrained Korea's potential economic growth since the 2010s. The disposable income of Korean households increased from KRW 1,136 trillion in 2011 to KRW 1,546 trillion in 2020. However, as shown in Figure 1-3, the annual growth rate peaked at 6.1% in 2015 and started to fall, recording a decrease of 0.5% in 2020. However, household debt exceeded KRW 1,000 trillion in 2013 and expanded to KRW 1,862 trillion in 2020. Figure 1-4 shows that its annual growth rate gradually decreased after peaking at 11.6% in 2016. However, it was again recorded at 7.9% in 2020. As a result, as shown in Figure 1-5, the ratio of household debt to household disposable income has risen from 153% in 2011 to over 200% in 2020.

Figure 1-3 Gross national disposable income (y-o-y growth rate)



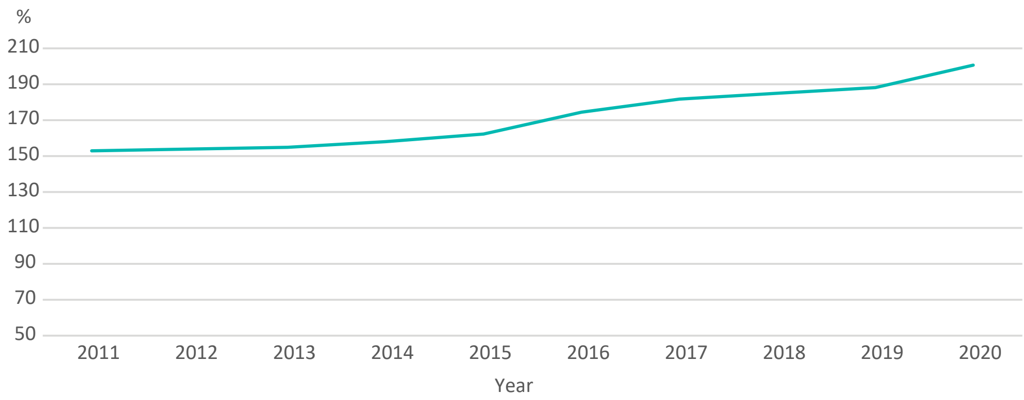
Source: Bank of Korea.

Figure 1-4 Household credit (y-o-y growth rate)



Source: Bank of Korea.

Figure 1-5 Ratio of household debt to household disposable income

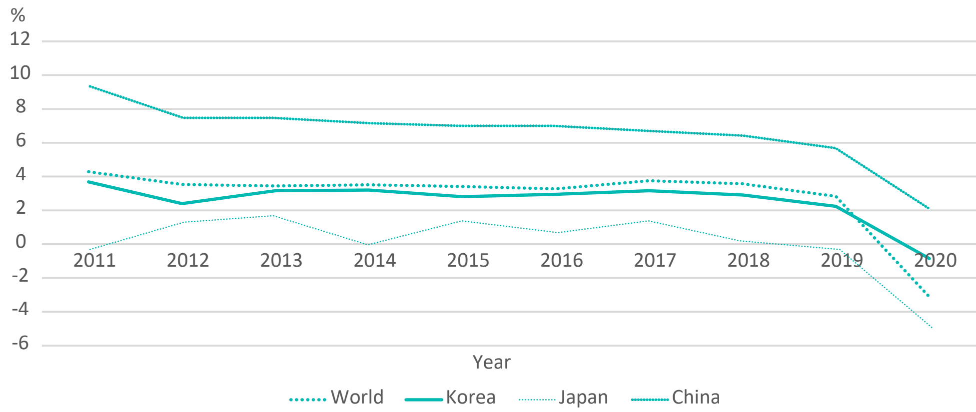


Source: OECD, National Accounts (https://www.oecd.org/sdd/na/).

As shown in Figure 1-6, compared to the world economy, the performance of the Korean economy since 2011 was not so pessimistic. Although the 2008 global financial crisis hit the Korean economy as well, compared to Japan, Korea achieved an economic growth rate of 0.8%, which can be considered to have overcome the global financial crisis well. However, in 2020, the Korean economy witnessed a negative GDP growth of 0.9 per cent in real terms for the first time since the decrease of 5.1 per cent during the 1997 Asian financial crisis due to sagging consumption and exports following the spread of COVID-19.

As a result of achieving an average annual real GDP growth rate of 2.6% since 2011, Korea's real gross domestic product (GDP) in 2020 amounted to USD 1,638 billion from 1,253 billion in 2011. China's GDP jumped from USD 7,492 billion in 2011 to USD 14,866 billion in 2020, while in the case of Japan, it decreased from USD 6,233 billion in 2011 to USD 5,045 billion in 2020. Comparing Japan and Korea in terms of per capita GDP, the gap was doubled in 2011 at USD 48,761 in Japan and USD 25,100 in Korea, but in 2020, it decreased by 1.3 times to USD 40,088 in Japan and USD 31,638 in Korea.

Figure 1-6 Comparison of domestic real GDP growth in Korea, China and Japan



Source: IMF, World Economic Outlook Database.

4.1.2 Stability of domestic economy

1 Employment and Wage

In the 2010s, the European fiscal crisis overlapped, and the employment situation in Korea was also affected, but from 2012 onwards, it started to recover. The proportion of the working-age population aged 15 to 64 in the total population has declined since 2016. However, among the population aged 15 and over, the working-age population who is willing to provide labour force has increased by an average of 1.2% since 2011, and the number of employed persons has also increased by an average of 340,000 per year since 2011(see Table 1-1 and Table 1-2). This can be attributed to the increased participation of women in the Korean labour market. As a result, the unemployment rate in the Korean labour market was able to maintain a stable level with an annual average of 3.6% from 2011 to 2020. However, the youth unemployment rate between 15 and 29 was more than double the overall unemployment rate. It started at 7.6% in 2011, rose to 9.8% in 2017, and has not improved significantly.

Table 1-1 Korea's demographic structure

	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population	Ten thousands	4,993.7	5,020.0	5,042.9	5,074.7	5,101.5	5,121.8	5,136.2	5,158.5	5,176.5	5,183.6
0-14, age	"	777.1	757.7	739.2	721.4	703.0	686.5	672.4	659.5	644.8	630.6
Working Age Population (15-64)	"	3,665.0	3,685.6	3,701.4	3,725.6	3,744.4	3,759.6	3,757.2	3,762.4	3,762.8	3,737.9
65-, age	"	551.5	576.7	602.3	627.7	654.1	675.7	706.6	736.6	768.9	815.2
Working Age Rate	%	73.4	73.4	73.4	73.4	73.4	73.4	73.2	72.9	72.7	72.1
Ageing Rate	%	11.0	11.5	11.9	12.4	12.8	13.2	13.8	14.3	14.9	15.7

Source: OECD Population (https://data.oecd.org/pop/population.htm).

Table 1-2 Employment-related indicators

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Economically-Active Population	ten thousand persons	2510	2550	2587	2654	2691	2742	2775	2790	2819	2801
Rate of growth	%	1.4	1.6	1.5	2.6	1.4	1.0	1.2	0.5	1.0	-0.6
Participation Rate	"	61.1	61.3	61.5	62.4	62.6	62.9	63.2	63.1	63.3	62.5
Employed Persons	ten thousand persons	2424	2468	2507	2560	2594	2,641	2,672	2,682	2,712	2,690
Change	"	41.5	43.7	38.6	53.3	34.0	23.1	31.6	9.7	30.1	-21.8
Unemployment Rate	%	3.4	3.2	3.1	3.5	3.6	3.7	3.7	3.8	3.8	4.0
(15 to 29 years old)	"	7.6	7.5	8	9	9.2	9.8	9.8	9.5	8.9	9.0
Employment Rate	"	59.1	59.4	59.5	60.2	60.3	60.6	60.8	60.7	60.9	60.1
(15 to 64 years old)	"	63.9	64.3	64.6	65.6	65.9	66.1	66.6	66.6	66.8	65.9

Source: Bank of Korea.

From 2012 to before the COVID-19 pandemic, nominal wages of Korean employees increased at an average annual rate of 3.9%, and real wages increased at an average annual rate of 2.6%. In the Korean labour market, labour productivity, evaluated as the ratio of real value added to working hours, fluctuated every year along with economic fluctuations, centring on an average annual growth rate of 2.1%. The average annual growth rate of unit labour costs (non-farm basis), evaluated as the ratio of a nominal hourly wage to labour productivity, was 2.0%, which can also be considered a stable trend (see Table 1-3).

Table 1-3 | Wage indicators

(Growth rate, %)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Nominal Wage[1)]	1	5.3	3.9	2.5	3.5	3.8	3.3	5.3	3.4	1.1
Real Wage[2)]	-2.9	3.1	2.5	1.3	2.7	2.8	1.3	3.7	3	0.5
Nominal Hourly Wage[3)]	1.2	6.6	4.9	3.3	2.7	5.1	5.2	6.8	3.9	2.6
Labour Productivity[4)]	1.8	1.3	2.3	1.4	-0.1	3.1	3.9	4.5	1.6	1.7
Unit Labour Costs[5)]	-0.6	5.2	2.5	1.9	2.8	2	1.3	2.2	2.2	0.9

Notes: 1) Based on businesses employing at least one regular employee, non-farm basis.
2) Nominal wage/CPI.
3) Nominal wage/hours worked.
4) Real gross added value/(total employed persons x hours worked), non-farm basis.
5) Nominal hourly wage/labour productivity

Source: Ministry of Employment and Labor, Statistics Korea, Bank of Korea.

2 Inflation

Looking at the inflation trend, which is a representative indicator of the stability of the domestic economy, the consumer price index in Korea has shown a stable trend at an average annual rate of 1.5% since 2011 (see Table 1-4). Korea's inflation structure was characterised by a mechanism that disseminated international raw material prices into producer and consumer price indices, such as domestic petroleum products, processed foods, and services. In the 2010s, it can be said that the Korean economy entered an era of low inflation in line with a low growth rate.

Table 1-4 CPI inflation and core inflation

(Growth rate, %)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Producer price index	6.7	0.7	-1.6	-0.5	-4	-1.8	3.5	1.9	0	-0.5
Consumer price index	4	2.2	1.3	1.3	0.7	1	1.9	1.5	0.4	0.5
CPI Excluding food and energy[1]	2.6	1.6	1.5	1.7	2.4	1.9	1.5	1.2	0.7	0.4

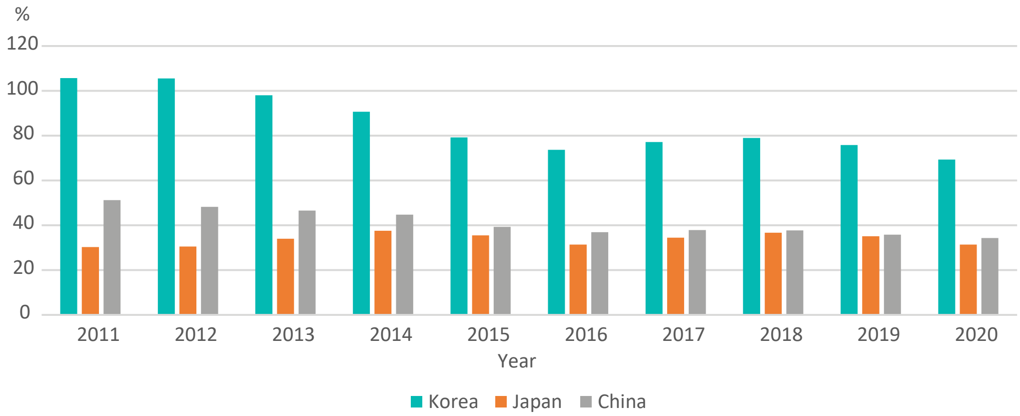
Notes: 1) Stripping out food (apart from alcoholic beverages) and energy from the CPI
Source: Bank of Korea

4.1.3 FTA policy

1 Trade structure and FTA policy

A characteristic of Korea's trade structure is highly dependent on foreign economies. Looking at the Ratio of Dependence on Foreign Economy, measured as the ratio of trade amount to nominal GDP, Korea exceeded 100% in 2011. It fell to 70% in 2020, but it was still twice as high as about 30% in Japan and about 30~50% in China (see Figure 1-7).

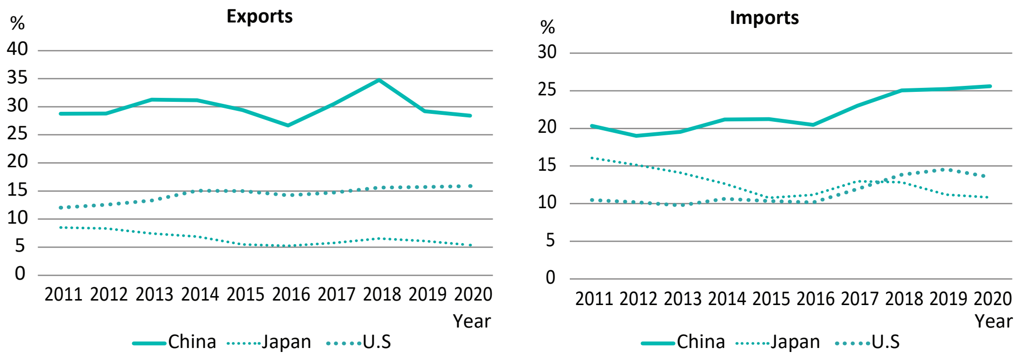
Figure 1-7 Ratio of dependence on foreign economy[1]



Note 1) (Exports of goods and services + Imports of goods and services)/nominal GDP x 100
Source: OECD.

Korea's largest trading partner country was China. China's share of Korea's total exports soared from 28.8% in 2011 to 34.8% in 2018 and maintained at 28% in 2020 (see Figure 1-8). In the case of the United States, Korea's second trading partner country, the share of exports gradually increased from 12.1% in 2011 to 15.9% in 2020. However, Korea's exports to Japan peaked at 21.6% in 1989, declined in the 1990s, and fell from the 8% level to the 5% level in the 2010s.

Figure 1-8 Major partner's share in Korea's exports and imports



Source: Korea International Trade Association, K-stat (https://stat.kita.net).

Korea has been a member of the Organization for Economic Cooperation and Development (OECD) since December 1996. In the 2000s, Korea promoted the FTA policy for regional economic cooperation. The Korean government expected that the conclusion of an FTA could have a positive impact in two major ways. First, as trade barriers such as tariffs and non-tariffs are alleviated, the entry of critical products into overseas markets is activated, leading to an increase in global competitiveness of companies, and the importation of a wider variety of items at lower prices than before, thereby enhancing the welfare of domestic consumers. Second, concluding an FTA can provide an opportunity to improve related domestic systems by introducing global trade norms. In other words, the Korean government emphasised that it is essential to actively promote FTAs for sustainable economic development because it is an open trade country that is very dependent on the external economy.

As of February 2022, Korea has 18 Free Trade Agreements (FTAs) with the U.S., European Union, ASEAN, U.K., Australia, Canada, Central America (Partial), etc. Since the Korea-Chile FTA took effect in 2004, Korea has built an FTA network centred on major markets. Furthermore, to maximise the effect of the FTA, it has pursued a comprehensive FTA that includes global standard rules in the sectors such as services trade, investment, government procurement, intellectual property rights, and technical standards, as well as tariff elimination in the products trade sector (see Table 1-5).

Table 1-5 | Current status of Korea's FTA (entered into force), as of Feb. 2022

<table>
<tr><th>Counterpart</th><th>Date of negotiation start</th><th>Date of signature</th><th>Date of enforcement</th></tr>
<tr><td>Chile</td><td>Dec. 1999</td><td>Feb. 2003</td><td>Apr. 2004</td></tr>
<tr><td>Singapore</td><td>Jan. 2004</td><td>Aug. 2005</td><td>Mar. 2006</td></tr>
<tr><td>EFTA[1)]</td><td>Jan. 2005</td><td>Dec. 2005</td><td>Sep. 2006</td></tr>
<tr><td rowspan="3">ASEAN</td><td rowspan="3">Feb. 2005</td><td>Aug. 2006
(Commodity Trade Agreement)</td><td>Jun. 2007</td></tr>
<tr><td>Nov. 2007
(Service Trade Agreement)</td><td>May 2009</td></tr>
<tr><td>Jun. 2009
(Investment Agreement)</td><td>Sep. 2009</td></tr>
<tr><td>India</td><td>Mar. 2006</td><td>Aug. 2009</td><td>Jan. 2010</td></tr>
<tr><td>EU</td><td>May 2007</td><td>Oct. 2010</td><td>Dec. 2015</td></tr>
<tr><td>Peru</td><td>Mar. 2009</td><td>Mar. 2011</td><td>Aug. 2011</td></tr>
<tr><td rowspan="2">U.S.</td><td>Jun. 2006</td><td>Jun. 2007</td><td>Mar. 2012</td></tr>
<tr><td>Jan. 2018
(Amendment)</td><td>Sep. 2018</td><td>Jan. 2019</td></tr>
<tr><td rowspan="2">Turkey</td><td rowspan="2">Apr. 2010</td><td>Aug. 2012
(Commodity Trade Agreement)</td><td>May 2013</td></tr>
<tr><td>Feb. 2015
(Service & Investment Agreement)</td><td>Aug. 2018</td></tr>
<tr><td>Australia</td><td>May 2009</td><td>Apr. 2014</td><td>Dec. 2014</td></tr>
<tr><td>Canada</td><td>July 2005</td><td>Sep. 2014</td><td>Jan. 2015</td></tr>
</table>

Counterpart	Date of negotiation start	Date of signature	Date of enforcement
China	May 2012	Jun. 2015	Dec. 2015
New Zealand	Jun. 2009	Mar. 2015	Dec. 2015
Vietnam	Aug. 2012	Mar. 2015	Dec. 2015
Colombia	Dec. 2009	Feb. 2013	July 2016
Central America 5 Countries[2]	Jun. 2015	Feb. 2018	Mar. 2021
UK	Feb. 2017	Aug. 2019	Jan. 2021
RCEP	Nov. 2012	Nov. 2020	Feb. 2022

1) EFTA: Switzerland, Norway, Iceland, Liechtenstein
2) Panama, Costa Rica, Honduras, El Salvador, Nicaragua
Source: Ministry of Foreign Affairs, FTA Powerhouse KOREA (https://www.fta.go.kr/main/).

However, in the East Asian region, Korea, China, and Japan declared the start of negotiations for the CJK FTA in November 2012, and formal negotiations were held 16 times from March 2013 to November 2019, but the agreement was not yet successful. In the case of the bilateral FTA negotiations between Korea and Japan, the first round of negotiations began in December 2003. Still, the fifth round of negotiations in November 2004 was not reached, and negotiations did not resume after that. Instead, Korea and China signed a bilateral 'Korea-China FTA' in June 2015 after 14 negotiations since May 2012, and the KC FTA came into effect in December 2015. The Regional Comprehensive Economic Partnership (RCEP), which was successfully concluded in November 2020 after eight years of negotiations from November 2012, is significant because it is the first mega FTA in which Korea, China, and Japan participate. Finally, Japan initiated the conclusion of the CPTPP (Comprehensive and Progressive Agreement for Trans-Pacific Partnership) negotiations on behalf of the United States in March 2018, and Korea, China, the UK, Thailand, and Taiwan are currently reviewing or applying for CPTPP membership.

In the following, considering that the CJK FTA has not yet been concluded, the contents of the KC FTA and RCEP will be reviewed.

2 Korea-China FTA (KC FTA)

The Korea–China free trade agreement (KC FTA) came into force on December 1, 2015. Table 1-6 shows Korea and China's tariff concession under the KC FTA. It shows the tariff elimination staging categories in the FTA for Chinese and Korean originating products, respectively. There are 12,232 items in Korea's tariff concessions schedule, while there are 8,194 items in the Chinese case. They correspond to the ten-digit product codes (in the case of China, eight-digit) of the Harmonized System (HS). There are eight major categories, which are described briefly below. First, products assigned to 'Immediate' indicate that their customs duties are eliminated when the agreement enters into force. Staging category '5 year' indicates that tariffs are removed in five equal annual stages beginning on the date of the agreement's entry into force and are completely removed on January 1 of year 5. Staging categories '10 year', '15 year', and '20 year' are analogously defined. Tariffs on some items are only partially reduced and listed under 'Partial'. 'TRQ' (tariff rate quotas) means a pre-determined quantity of a product, for example, some agricultural products to be imported at lower import duty rates (in-quota duty) than the duty rate normally applicable to that product. Lastly, 'Exception' products are completely excluded from tariff concessions or negotiations in the KC FTA. Korea and China promised to eliminate tariffs on 92.1% and 90.6% of total items through the KC FTA. However, these tariff elimination rates refer to those within 20 years after the agreement entered into force, and the rates within ten years will be lowered to 79.2% in Korea and 71.3% in China (see Table 1-6).

Table 1-6 Tariff concession under Korea-China FTA

(Millions USD, %)

Category	Korea's concessions to China				China's concessions to Korea			
	Number of products[1]	ratio	Imports Amount from China (2012)	ratio	Number of products[1]	ratio	Imports Amount from Korea (2012)	ratio
Immediate	6,108	49.9	41,853	51.8	1,649	20.1	73,372	44.0
(duty-free)	1,983	16.2	33,811	41.9	691	8.4	64,658	38.8
(with customs duty)	4,125	33.7	8,042	10.0	958	11.7	8,714	5.2
5 years	1,433	11.7	3,098	3.8	1679	20.5	5,830	3.5
10 years	2,149	17.6	17,330	21.5	2518	30.7	31,250	18.7
15 years	1,106	9.0	7,951	9.8	1108	13.5	21,917	13.1
20 years	476	3.9	3,406	4.2	474	5.8	9,375	5.6
Partial	87	0.7	2,276	2.8	129	1.6	10,014	6.0
TRQ	21	0.2	569	0.7	-	-	-	-
Exception	852	6.9	4,286	5.3	637	7.8	14,994	9.0
Total	12,232	100	80,769	100	8,194	100	166,752	100

Note: The number of products indicates the number of 10 digits (in the case of China, eight-digit) tariff lines on HS 2012. Source: Ministry of Trade, Industry and Energy. Korea-China FTA (https://www.fta.go.kr//cn/doc/2/).

According to KIEP (2019), it was not clear that Korea's trade with China was activated after the KC FTA took effect. Korea's exports to China increased only 0.1% on an annual average after the KC FTA went into effect. The share of China in Korea's total exports decreased slightly from 25.8% to 25.6% in the same period (see Table 1-7). Even looking at the import performance of 'preferred' tariff reduction products under the tariff concession schedule of the KC FTA, the growth rate was lower than that of non-preferred products for Korea and China (see Table 1-8).

| Table 1-7 | Comparison of Korea's trade with China before and after the KC FTA

(US dollars, millions: Annual average, %)

	Counterpart of Exports			Counterpart of Imports		
	China	World	Share of China	China	World	Share of China
Before KC FTA (2013-2015)	142,760	410,257	25.8	87,795	404,738	17.8
After KC FTA (2016-2018)	142,904	415,193	25.6	97,106	376,175	20.5
Increase	143	4,936		9,311	▼28,563	
Growth rate	0.1	1.2	▼0.2%p	10.6	▼7.1%	2.7%p

Source: Bae, C. K., and Chung, M. C. (2019). KIEP.

| Table 1-8 | Imports of 'preferred' products for Korea and China

(US dollars, millions: Annual average, %)

		Number of products1)	Imports amount		growth rate
			annual average of 2013-2015	annual average of 2016-2018	
Korea's imports from China	preferred products	4,140	532	560	5.2
	non-preferred products	1,065	346	411	19.0
China's imports from Korea	preferred products	4,539	1,005	841	▼16.3%
	non-preferred products	666	819	959	17.1

Note 1) The number of preferential products was counted based on the six-digit items of the HS code rather than according to the tariff lines of ten-digit (China, eight-digit) items negotiated under the KC FTA.

Source: KIEP (2019).

3 RCEP

Table 1-9 shows the tariff concession of Korea and China under RCEP negotiations which concluded in November 2020. The tariff elimination staging categories in the table are the same as Table 1-6 of KC FTA. Comparing the tariff concession schedules of Korea and China under the KC FTA with those under the RCEP, there is little difference between the two. The tariff liberalisation rate, which refers to the ratio of the number of tariff lines for which tariffs are eliminated within ten years after the RCEP agreement goes into effect, is 77.3% for Korea and 79.3% for China. Within 20 years after the RCEP agreement came into force, the tariff liberalisation rate was 87.1% for Korea and 83.7% for China.

Table 1-9 | Tariff concession of Korea and China under RCEP

(Millions USD, %)

Category	Korea's concessions to China				China's concessions to Korea			
	Number of products[1]	ratio	Imports Amount from China[2]	ratio	Number of products[1]	ratio	Imports Amount from Korea[2]	ratio
Immediate	6,166	50.4	39,465	48.2	3,198	38.6	84,177	48.2
(50% reduction)	7	0.1	768	0.9	3	0.0	779	0.4
(10% reduction)	1	0.0	5	0.0	-	-		0.0
10 years	3,293	26.9	17,537	21.4	3,395	41.0	34,434	19.7
(reduction from 6 year to 10 year)	2	0.0	1,443	1.8	2	0.0	18,461	10.6
15 years	1,048	8.6	10,063	12.3	255	3.1	4,303	2.5
(20% reduction from 15 year to 20 year)	123	1.0	277	0.3	81	1.0	2,852	1.6
20 years	20	0.2	7	0.0	268	3.2	3,983	2.3
Exception	1,583	12.9	12,353	15.1	1075	13.0	25,748	14.7
Total	12,243	100	81,918	100	8,277	100	174,737	100

Note 1) Number of products indicates the ten-digit product codes of the 2012 HS, while in the case of China, eight-digit.
2) Imports amount is the average for 2012 and 2013

Source: KIEP et al. (2021).

Under the RCEP, Korea's tariff concession rate for Japan is 82.9% based on the number of tariff lines and 76.0% based on the average imports in 2012 and 2013. Japan's concession rate for Korea is 83.0% based on the number of tariff lines and 78.0% based on imports. These number indicates the tariff liberalisation rate within 20 years after the RCEP agreement goes into effect (see Table 1-10).

Table 1-10 Tariff concession of Korea and Japan under RCEP

(Millions USD, %)

Category	Korea's concessions to Japan				Japan's concessions to Korea			
	Number of products[1)]	ratio	Imports Amount from Japan[2)]	ratio	Number of products[1)]	ratio	Imports Amount from Korea[2)]	ratio
Immediate	5,069	41.4	23,841	38.3	5,993	65.9	24,946	67.0
(with customs duty)	3,113	25.4	701	1.1	2,309	25.4	622	1.7
(duty-free)	1,956	16.0	23,141	37.2	3,684	40.5	24,324	65.3
10 years	3,965	32.4	16,929	27.2	775	8.5	2,848	7.6
15 years	655	5.3	2,926	4.7	778	8.6	1,137	3.1
15 years (non-linear reduction)	14	0.1	653	1.1	-	-	-	-
20 years	364	3.0	660	1.1	2	0	114	0.3
20 years (non-linear reduction)	91	0.7	2,267	3.6	-	-	-	-
reduction by products[3)]	-	-	-	-	51	0.6	0	0.0
Exception	2,085	17.0	14,916	24.0	1,492	16.4	8,203	22.0
Total	12,243	100	62,194	100	9,091	100	37,249	100

Note 1) Number of products indicates the ten-digit (in the case of Japan, nine-digit) product codes of the HS 2012.
2) Imports amount is the average for 2012 and 2013
3) Tariff reduction schedule is different by products

Source: KIEP et al. (2021).

The tariff liberalisation rate within ten years after the entry into force of the RCEP will be lowered to 73.8% in Korea and 74.4% in Japan based on the number of tariff lines. The ratio of immediate tariff elimination in Korea is 41.4% based on the tariff lines and 38.3% based on the import value. In comparison, the ratio in Japan is 65.9% and 67.0%, respectively, on the same basis. The difference in immediate tariff concessions between Korea and Japan is that Japan eliminated some tariffs through WTO negotiations ahead of Korea. The ratio in Japan includes items that are already free from tariff customs.

4.1.4 Currency swap cooperation

1 Expansion of the current account surplus

The Korean economy, which emerged from the global financial crisis in 2008, has been expanding its current account surplus since 2011 despite the deterioration of the external economic environment, such as the European fiscal crisis in 2010. Korea's current account surplus increased from about $16.6 billion in 2011, soared to $105.1 billion in 2015, and decreased slightly. Still, even in 2020, when the COVID-19 pandemic was prevalent, it achieved an unprecedented, superior performance of $75.9 billion (See Table 1-11). The trade surplus, especially the goods account surplus, played a role in helping the Korean economy enlarge a current account surplus. Table 1-11 shows that the Korean economy was not getting out of a chronic services account deficit, but a goods account surplus was filling the deficit.

Table 1-11 | Current account

(US Dollar, Millions)

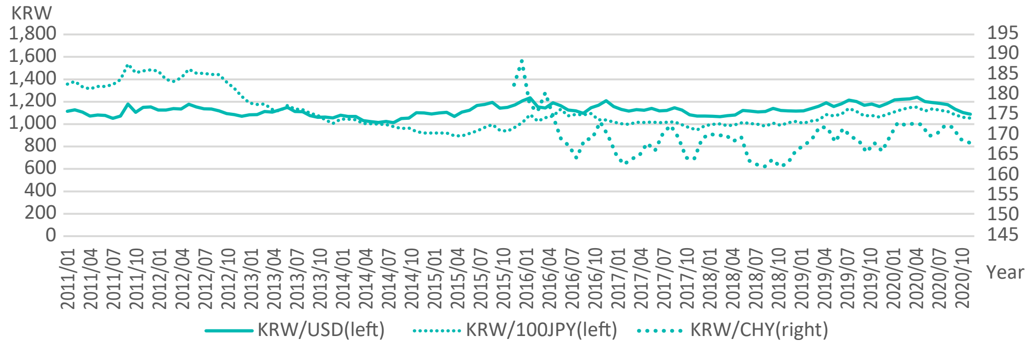
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Current Account	27,951	16,638	48,791	77,259	83,030	105,119	97,924	75,231	77,467	59,676	75,902
Goods	47,932	28,014	48,589	80,259	86,145	120,275	116,462	113,593	110,087	79,812	80,605
Services	-13,973	-12,057	-5,058	-6,329	-3,290	-14,626	-17,338	-36,734	-29,369	-26,845	-14,670
Primary Income	-693	5,396	10,733	7,518	5,159	4,455	4,567	5,337	4,902	12,856	13,487
Secondary Income	-5,317	-4,716	-5,474	-4,189	-4,985	-4,985	-5,767	-6,965	-8,153	-6,147	-3,519

Source: Bank of Korea.

2 Foreign exchange market

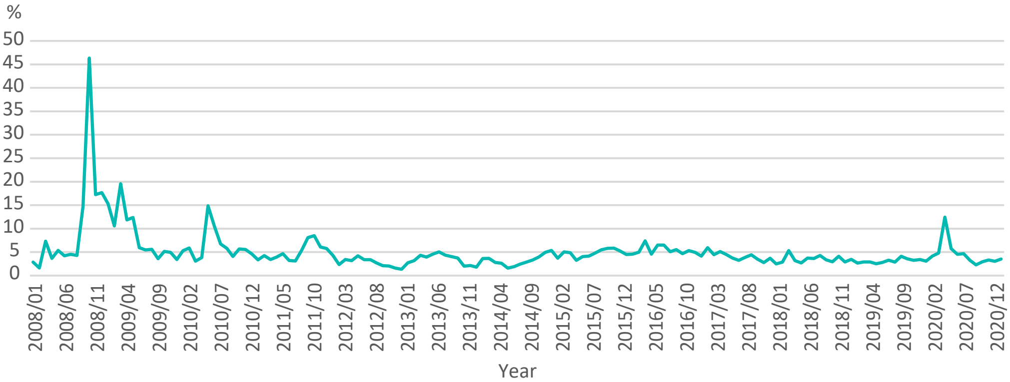
The Korean government experienced the Asian financial crisis in 1997 and the global financial crisis in 2008. It regarded exchange rate stability as the most important economic policy goal. The stability of the foreign exchange market can be evaluated as driving the growth of Korea's economy, as revealed by the expansion of the current account surplus since 2011. From January 2011 to December 2020, the average monthly KRW/USD exchange rate fluctuated between 1,013 won in August 2011, and 1,239 won in May 2020. In May 2020, the KRW/USD exchange rate soared to 1,239 won, the highest level since the global financial crisis in 2008. Excluding that point, as shown in Figure 1-9, the KRW/USD exchange rate has been stable since 2011. Figure 1-10 shows day-to-day volatility in KRW/USD exchange rate. Immediately after the global financial crisis in 2018, the KRW/USD exchange rate fluctuated on an average of 18.4 won per day from September 2018 to May 2009. However, the average daily change from January 2011 to December 2019, before the outbreak of the COVID-19 pandemic, was only 3.9 won.

Figure 1-9 Korean won exchange rates (monthly average rates)



Source: Bank of Korea.

Figure 1-10 USD/KRW exchange rate volatility:day-to-day[1)]



Note 1) Averages of the absolute value of the day closing rate minus the previous day's closing rate.
Source: Bank of Korea.

3 Currency swap

The Bank of Korea worked diligently to strengthen its network of bilateral currency swap agreements with other central banks in consideration of the significance of currency swaps to financial stability as a form of secondary foreign exchange reserves. In other words, in the 2008 global financial crisis, many emerging countries experienced a shortage of foreign currency liquidity despite the continued expansion of their foreign exchange reserves. Therefore, to prepare for situations such as the global financial crisis, the Bank of Korea recognised the importance of bilateral currency swaps as a regional multi-layered financial safety net other than foreign exchange reserves (Bank of Korea 2016, pp. 268~283).

Table 1-12 shows the status of Korea's currency swap agreement as of the end of 2020. The countries with which Korea has bilateral currency swap agreements are the USA, Canada, China, Switzerland, Indonesia, Australia, Malaysia, and UAE, and CMIM is the only multilateral currency swap. Korea's bilateral currency swap with China, Japan, and the CMIM agreement will be reviewed in the following.

Table 1-12 | Current status of Korea's currency swap agreements

<table>
<tr><th>Type</th><th>Counterpart</th><th>Maximum Amount
(USD basis[1])</th><th>Most Recent Signing/Extension</th><th>Maturity</th></tr>
<tr><td rowspan="12">Local currency swap</td><td>USA</td><td>USD 60 billion</td><td>Dec. 2020</td><td>Sep. 2021</td></tr>
<tr><td>Canada</td><td>No Maximum amount</td><td>Nov. 2017</td><td>Unspecified</td></tr>
<tr><td rowspan="2">Switzerland</td><td>CHF 10 billion/KRW 11.2 trillion</td><td rowspan="2">Feb. 2018</td><td rowspan="2">Mar. 2021</td></tr>
<tr><td>(about USD 10.6 billion)</td></tr>
<tr><td rowspan="2">China</td><td>CHY 400 billion/KRW 70 trillion</td><td rowspan="2">Oct. 2020</td><td rowspan="2">Oct. 2025</td></tr>
<tr><td>(about USD 59 billion)</td></tr>
<tr><td rowspan="2">Indonesia</td><td>IDR 115 trillion/KRW 10.7 trillion</td><td rowspan="2">Mar. 2020</td><td rowspan="2">Mar. 2023</td></tr>
<tr><td>(about USD 10 billion)</td></tr>
<tr><td rowspan="2">Australia</td><td>AUD 12 billion/KRW 9.6 trillion</td><td rowspan="2">Feb. 2020</td><td rowspan="2">Feb. 2023</td></tr>
<tr><td>(about USD 8.1 billion)</td></tr>
<tr><td rowspan="2">Malaysia</td><td>MYR 15 billion/KRW 5 trillion</td><td rowspan="2">Feb. 2020</td><td rowspan="2">Feb. 2023</td></tr>
<tr><td>(about USD 4.7 billion)</td></tr>
</table>

Type	Counterpart	Maximum Amount (USD basis[1])	Most Recent Signing/Extension	Maturity
Local currency swap	UAE	AED 20 billion/KRW 6.1 trillion (about USD 5.4 billion)	Apr. 2019	Apr. 2022
U.S. dollar swaps	CMIM	USD 38.4 billion[2]	Jul. 2014	-

Note. 1) Based on the exchange rates when the initial currency swap agreements or extensions were concluded.
2) The total amount of CMIM is 240 billion dollars, and Korea's contribution and the maximum amount it can draw is 38.4 billion dollars (16%).

Source: Bank of Korea (2021). 2020 Annual Report. p. 63.

(1) China

The Korea-China currency swap was first signed at USD 2 billion in 2002, then gradually expanded to USD 4 billion in 2005, USD 30 billion in 2008, and USD 56 billion in 2011. In October 2017, the Bank of Korea extended the currency swap agreement with China, adhering to the principle of separating economic from political concerns amid the growing geopolitical risks in Northeast Asia due to North Korea's nuclear tests and the THAAD-related dispute between Korea and China.

In October 2020, the Bank of Korea renewed its currency swap arrangement with the People's Bank of China by increasing the volume and period of that agreement. The volume of the swap agreement was increased from 360 billion CHY/64 trillion KRW to 400 billion CHY/70 trillion KRW, and the period was extended from three years to five years. This move strengthened the safety net to facilitate trade with China, one of Korea's main trading partners, even in times of global financial market instability and reduced the uncertainty associated with maturity (Bank of Korea, 2021, p. 62.).

(2) Japan

The Korea-Japan currency swap started as a USD 5 billion swap agreement according to the New Miyazawa Initiative (NMI) proposed by Japan in October 1998, right after the Asian financial crisis in 1997. In July 2001, according to the CMI agreement, the central banks of both countries signed a USD 2 billion local currency/USD currency swap, which was expanded to USD 10 billion in February 2006 when it was integrated with the existing NMI currency swap.

Meanwhile, in 2005, Korea and Japan signed a KRW/JPY bilateral currency swap agreement worth USD 3 billion, separate from the CMI currency swap. In December 2008, the bilateral currency swap was expanded to a value of USD 20 billion for preparing for a global financial crisis. After that, when the global financial market recovered stability, the swap agreement was returned to the original USD 3 billion in April 2010. Furthermore, in October 2011, as the European financial crisis spread around the world, Korea and Japan agreed to temporarily expand the current currency swap, equivalent to USD 13 billion, to USD 70 billion for one year. After that, as Korea's sovereign credit rating was upgraded and foreign exchange reserves increased, the agreement to expand the currency swap ended as scheduled in December 2012. Accordingly, the size of the currency swap between Korea and Japan was returned to USD 13 billion. Eventually, in July 2013, the USD 3 billion bilateral currency swap contract expired, and the USD 10 billion CMI currency swap agreement between Korea and Japan expired in February 2015 (Bank of Korea, 2017; pp. 282-283).

(3) CMIM

Chiang Mai Initiative Multilateralization (CMIM) is a regional financial safety net such as the European Stability Mechanism (ESM) and the North American Framework Agreement (NAFA). In May 2005, ASEAN+3 (Korea, China, and Japan) countries agreed to establish the CMI (Chiang Mai Initiative) out of a sense of crisis that they should not rely solely on the IMF and conclude a bilateral currency swap contract based on this. In December 2009, ASEAN+3 countries agreed to convert the bilateral CMI currency swap to the multilateral swap agreement, CMIM. The total amount of CMIM increased to 240 billion, and Korea's contribution and the maximum amount it can draw increased to USD 38.4 billion, in line with the contribution rate of 16%. In April 2011, as a follow-up measure to the CMIM, AMRO (ASEAN+3 Macroeconomic Research Office) was established in Singapore as an independent monitoring organisation to prevent moral hazards and enhance the ability to detect country risks in advance.

4.2 Industrial Development and Cooperation with China and Japan

4.2.1 Development in the bio-industry and cooperation with China and Japan

1 CJK cooperation

The trilateral bio-industry cooperation among Korea, China and Japan was led by the Pan-Yellow Sea Rim Economy and Technology Exchange Meeting held in 2001. The meeting was a director-general level consultative body co-hosted by the Ministry of Commerce of China, the Ministry of Trade, Industry and Energy of Korea, and the Kyushu Bureau of Economy, Trade and Industry of Japan. The Pan-Yellow Sea Rim Economy and Technology Exchange Meeting was held at the Pan-Yellow Sea Business Forum and Pan-Yellow Sea Industrial Complex/Special Zone Cooperation Forum in 2018. In November 2019, in parallel with the 18th trilateral governmental meeting, the Pan-Yellow Sea Business Forum discussed ways to cooperate in the manufacturing of advanced equipment, bio-pharmaceuticals, and eco-friendly energy and new materials industries. Also, at the Korea-China-Japan International Cooperation Complex Construction & Industrial Cooperation Forum, plans for cooperation to create Korea-China-Japan industrial complex were discussed.

Regarding cooperation in the bio-industry, in May 2012, the Korea Biotechnology Industry Organization (Korea BIO), the China Association of Pharmaceutical Commerce, and the Japan Bio-industry Association (JBA) signed an MOU for trilateral business cooperation for the globalisation of the Asian bio-healthcare market. This agreement was part of the KOREA bio-hub construction project carried out by the Korean Ministry of Knowledge Economy (currently the Ministry of Trade, Industry and Energy). It was significant in that the agreement promotes trilateral cooperation in the bio-healthcare industry in Northeast Asia along with the initiation of the Korea-China-Japan FTA negotiations.

2 Development in domestic bio-industry

According to the 2016 revised Korea Standard Industry Classification (KSIC) linked to the Bio-industry Classification Code (KS J 1009), Korea's bio-industry is classified into eight industries: bio-pharmaceutical industry, bio-chemical and bio-energy industry, bio-food industry, bio-environmental industry, bio-medical equipment industry, bio-instrument and bio-equipment industry, bio-resource industry, and bio-service industry. The domestic market size of the bio-industry in Korea, measured by domestic sales, has grown from about KRW 3.6 billion in 2011 to KRW 7.5 billion in 2020, achieving an average annual growth rate of 9.9% (see Table 2-1). In terms of domestic sales, the three industries, bio-pharmaceuticals, bio-chemical and bio-energy products, and bio-foods, accounted for 80% of the total until 2019. Still, in 2020, the share of bio-medical equipment exceeded 10% due to the impact of the COVID-19. Compared to the average annual growth rate of the domestic manufacturing sales was about 1.7%, Korea's bio-industry was enough to be in the spotlight as a new growth industry. From 2011 to 2020, the export growth rate of Korea's bio-industry reached 17.2% (see Table 2-2). In terms of export amount, bio-pharmaceuticals and bio-food accounted for almost 70% of the bio-industry until 2019, but with the COVID-19 in 2020, bio-medical equipment rapidly increased to account for 30% of the export amount of the bio-industry.

Table 2-1 | Trend of domestic sales in Korea's bio-industry by sector

(100 Million KRW, %)

	Biopharmaceutical Industry	Biochemical and Bioenergy Industry1)	Bio-food Industry	Bioenvironmental Industry	Biomedical Equipment Industry	others[2]	Total	growth rate(%)
2011	1,506.3	769.0	1,065.8	106.4	23.7	175.7	3,646.9	
2012	1,577.5	989.2	1,250.3	27.4	24.0	228.6	4,097.0	12.3
2013	1,564.3	371.0	481.1	215.2	32.8	243.1	2,907.4	-29.0
2014	1,528.7	994.6	1,372.1	30.4	35.6	240.4	4,201.8	44.5
2015	1,534.8	1,038.6	1,291.4	30.3	30.8	292.0	4,217.9	0.4
2016	1,599.9	1,195.0	1,193.0	29.0	157.4	455.9	4,630.1	9.8
2017	1,588.2	1,481.1	1,219.9	45.8	164.1	478.2	4,977.3	7.5
2018	1,569.9	1,682.5	1,244.7	56.0	221.1	594.2	5,368.5	7.9
2019	1,618.0	1,735.6	1,581.8	55.1	309.5	817.1	6,117.2	13.9
2020	1,810.9	1,794.1	1,795.0	98.4	887.5	1,090.6	7,476.5	22.2

Note 1) Data before 2016 include Bio-resource Industry.
2) Includes Bio-instrument and Bio-equipment, Bio-resources, and Bio-services. However, data before 2016 exclude the bio-resource industry.

Source: KBIOIS (https://www.kbiois.or.kr/portal/stat/directStatPage.do).

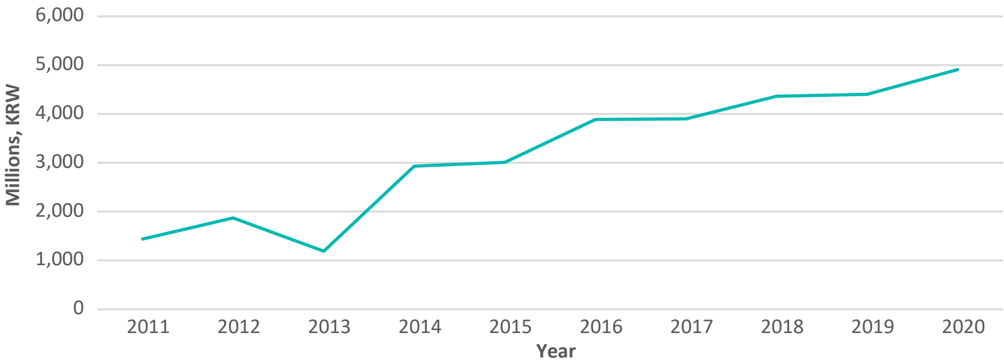
Table 2-2 | Trend of exports in Korea's bio-industry by sector

(100 Million KRW, %)

	Biopharmaceutical Industry	Biochemicaland Bioenergy Industry[1]	Biofood Industry	Bioenvironmental Industry	Biomedical Equipment Industry	others[2]	Total	growth rate(%)
2011	954.4	100.2	1,532.0	2.8	92.6	67.4	2,749.4	
2012	1,131.2	126.0	1,607.7	0.0	99.8	82.8	3,047.5	10.8
2013	927.9	80.0	1,078.2	12.9	37.1	311.4	2,447.5	-19.7
2014	1,342.2	175.6	1,667.2	0.2	118.8	101.2	3,405.2	39.1
2015	1,929.1	181.9	1,926.0	0.3	129.4	119.3	4,286.1	25.9
2016	1,757.7	138.5	1,726.2	0.4	590.3	417.8	4,631.0	8.0
2017	1,916.2	113.4	1,904.3	0.4	613.0	621.2	5,168.4	11.6
2018	1,940.1	109.1	1,856.8	1.6	627.1	703.4	5,238.2	1.4
2019	2,606.6	120.5	2,408.5	0.6	734.3	670.9	6,541.4	24.9
2020	3,251.9	318.2	2,419.6	0.1	2,992.0	1,033.9	10,015.8	53.1

Note: see Note in Table 2-7.
Source: Korea Biotechnology Industry Organization, KBIOIS (https://www.kbiois.or.kr/portal/stat/directStatPage.do).

Figure 2-1 Trend of R&D expenditure in Korea's bio-pharmaceutical industry



Source: Korea Biotechnology Industry Organization, KBIOIS (https://www.kbiois.or.kr/portal/stat/directStatPage.do).

According to the Ministry of Trade, Industry & Energy and Korea Biotechnology Industry Organization (2021, pp. 46~47.), the number of cooperation cases in the bio-pharmaceutical industry in 2020 was 339, accounting for 34.6% of the total bio-industry of 980 cases. Looking at the 980 cooperation cases, the joint R&D contract had the most with 824 cases, followed by licensing 92 cases, technical workforce exchange 40 cases, and joint venture 24 cases. However, considering that the number of cooperation cases with foreign companies, research institutes, and universities was only 40 cases, it can be pointed out that cooperation among Korean, Chinese, and Japanese companies in the bio-industry has not yet started in earnest.

Domestic sales were concentrated among the bio-pharmaceutical products on three items: other veterinary bio-pharmaceuticals, blood products, and vaccines. Exports were focused on one item, therapeutic antibodies, and cytokines (see Table 2-3 and Table 2-4).

| Table 2-3 | Trend of domestic sales in bio-pharmaceutical industry by products

(%, Shares in total)

	2016	2017	2018	2019	2020	Average (2016-2020)
Bio-antibiotics	1.2	1.7	1.7	1.6	1.8	1.6
Vaccines	20.4	24.6	24.8	22.8	23.2	23.2
Hormones	8.2	8.6	10.1	9.9	8.6	9.1
Therapeutic antibodies and cytokines	2.1	3.1	3.9	4.4	4.5	3.6
Blood products	17.5	22.0	23.3	23.9	23.9	22.1
Veterinary biopharmaceuticals	7.1	6.3	6.5	6.5	5.1	6.3
Other veterinary biopharmaceuticals	36.8	23.4	22.8	23.5	24.6	26.2
Others[1)]	6.7	10.4	6.9	7.3	8.2	7.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

Note: Others include Biological low molecular medicine, Cell-based therapeutics, Gene therapeutics, Biological diagnostic products, Enzyme, and live bacteria medicine.

Source: Korea Biotechnology Industry Organization, KBIOIS (https://www.kbiois.or.kr/portal/stat/directStatPage.do).

| Table 2-4 | Trend of exports in bio-pharmaceutical industry by products

(%, Shares in total)

	2016	2017	2018	2019	2020	Average (2016-2020)
Bio-antibiotics	5.1	5.0	5.5	3.9	2.7	4.4
Vaccines	13.2	10.3	11.5	10.0	7.7	10.5
Hormones	5.6	4.2	4.6	3.7	2.9	4.2
Therapeutic antibodies and cytokines	51.6	62.8	58.9	66.1	71.0	62.1
Blood products	5.2	5.2	6.6	5.4	4.8	5.4
Veterinary biopharmaceuticals	1.6	1.5	1.3	1.1	0.8	1.3
Other veterinary biopharmaceuticals	15.7	10.8	11.2	9.3	9.0	11.2
Others[1)]	1.9	0.2	0.2	0.6	1.0	0.8
Total	100.0	100.0	100.0	100.0	100.0	100.0

Note: see Note in Table 2-3.
Source: Korea Biotechnology Industry Organization, KBIOIS (https://www.kbiois.or.kr/portal/stat/directStatPage.do).

Looking at the export partners of Korean bio-pharmaceuticals, the U.S. accounted for the largest share with an average of 17.1% over the five years from 2017 to 2020, but only 0.0% for China and 1.7% for Japan during the same period. In terms of import partners, Japan accounted for only 4.9%, less than half of the U.S.'s 11.4% (see Table 2-5). Meanwhile, in the case of export partners of Korean pharmaceuticals, the annual average share of China and Japan in Korea's total exports during the same period was 6.3% and 7.8%, respectively, not significantly different from that of the U.S. (see Table 2-6). Also, in the case of export partners of Korean medical device, the annual average share of China and Japan in Korea's total exports was 19.1% and 6.8%, respectively, which was not significantly lower than the U.S.'s 17.6% during the same period (see Table 2-7).

Table 2-5 | Trade of bio-pharmaceutical products by major partners

(US Dollar, Millions)

	Trade partner	Unit	2017	2018	2019	2020
Exports	World	Millions USD	1,362	1,808	2,138	4,907
		Share, %	100.0	100.0	100.0	100.0
	China	Millions USD	0	0	2	2
		Share, %	0.0	0.0	0.1	0.0
	Japan	Millions USD	2	11	72	138
		Share, %	0.1	0.6	3.4	2.8
	U.S.	Millions USD	278	373	351	532
		Share, %	20.4	20.6	16.4	10.8
Imports	World	Millions USD	739	1,069	1,466	1,954
		Share, %	100.0	100.0	100.0	100.0
	China	Millions USD	0	0	0	7
		Share, %	0.0	0.0	0.0	0.4
	Japan	Millions USD	55	49	54	78
		Share, %	7.4	4.6	3.7	4.0
	U.S.	Millions USD	61	105	208	263
		Share, %	8.3	9.8	14.2	13.5

Source: Korea International Trade Association, K-stat (https://stat.kita.net).

Table 2-6 | Trade of pharmaceutical products by major partners

(US Dollar, Millions)

	Trade partner	Unit	2017	2018	2019	2020
Exports	World	Millions USD	3,170	3,717	4,101	7,046
		Share, %	100.0	100.0	100.0	100.0
	China	Millions USD	227	251	297	286
		Share, %	7.2	6.8	7.2	4.1
	Japan	Millions USD	275	279	359	442
		Share, %	8.7	7.5	8.8	6.3
	U.S.	Millions USD	335	443	452	665
		Share, %	10.6	11.9	11.0	9.4
Imports	World	Millions USD	5,972	6,948	7,530	8,290
		Share, %	100.0	100.0	100.0	100.0
	China	Millions USD	423	506	517	529
		Share, %	7.1	7.3	6.9	6.4
	Japan	Millions USD	459	462	507	472
		Share, %	7.7	6.6	6.7	5.7
	U.S.	Millions USD	1,088	1,234	1,404	1,493
		Share, %	18.2	17.8	18.6	18.0

Source: Korea International Trade Association, K-stat (https://stat.kita.net).

Table 2-7 | Trade of medical devices by major partners

(US Dollar, Millions)

		Unit	2017	2018	2019	2020
Exports	World	Millions USD	817	922	1,052	1,025
		Share, %	100.0	100.0	100.0	100.0
	China	Millions USD	151.0	169.0	197.0	212.0
		Share, %	18.5	18.3	18.7	20.7
	Japan	Millions USD	54.0	57.0	68.0	82.0
		Share, %	6.6	6.2	6.5	8.0
	U.S.	Millions USD	143.0	171.0	177.0	179.0
		Share, %	17.5	18.5	16.8	17.5

		Unit	2017	2018	2019	2020
Imports	World	Millions USD	1,350	1,459	1,570	1,601
		Share, %	100.0	100.0	100.0	100.0
	China	Millions USD	83.0	91.0	106.0	110.0
		Share, %	6.1	6.2	6.8	6.9
	Japan	Millions USD	69.0	80.0	80.0	79.0
		Share, %	5.1	5.5	5.1	4.9
	U.S.	Millions USD	412.0	441.0	477.0	445.0
		Share, %	30.5	30.2	30.4	27.8

Source: Korea International Trade Association, K-stat (https://stat.kita.net).

4.2.2 Development in the software industry and cooperation with China and Japan

1 CJK cooperation

The IT-DG (Director-Group) OSS Meeting was the trilateral governmental consultative body leading software industry cooperation between China, Japan, and Korea was the IT-DG (Director-Group) OSS Meeting. The trilateral forum facilitated business cooperation among Korea, China and Japan based on the results discovered in the OSS Promotion Forum of each country in Korea, China, and Japan. The Northeast Asia OSS (Open-Source Software) Promotion Forum, organised by the IT-DG OSS Meeting in 2004, played a supporting role in helping IT companies in each country strategically use OSS to accelerate digital transformation and foster global competitiveness. In the case of Korea, under the trilateral forum, Kakao, Naver CLOVA, LG Electronics, Samsung Open-Source Group, and KT participated in the Korean OSS Promotion Forum. The Korean OSS Promotion Forum, like other countries, has established working groups such as WG 1 (Technology Development), WG 2 (Human Resource Development), WG 3 (Standardisation), and WG 4 (Application Promotion).

Table 2-8 shows the performances of the Northeast Asia OSS Promotion Forum, taking the 17th Forum held in Yokohama, Japan, in November 2018 and the 18th Forum held in

Seoul in November 2019 as examples.

Table 2-8 | Recent progress in the Northeast Asia OSS Promotion Forum

Round/Venue	Working Group	Agreement/Activity
18th /Seoul, Korea (Nov. 2019)	WG 1 (Technology Development)	- Development of Open DRIM for distributed resources information management technologies - Development of Linux kernel automated testing tools - Promotion of Linux security project SEED - Development of database assessment project DBT-1
	WG 2 (Human Resources Development)	- Awards for OSS excellence in technology and special contributions - Development of Northeast Asia OSS demonstration curriculum and courseware
	WG 3 (Standardisation)	- Standardisation of Linux input methods and web inter-operability - Standardisation of open-source SW governance framework - Assessment model of maturity and applicability in open-source SW
	WG 4 (Application Promotion)	- Standardisation and establishment of guidelines for open-source SW supply chain - Conducting market research to promote the application and utilization of OSS technology and exchanging the experience in logistics, smart city, and education
17th/ Yokohama, Japan (Nov. 2018)	WG 1 (Technology Development)	- A technical conference was held on July 26th: each member presented research topics and plans
	WG 2 (Human Resources Development)	- Continuous efforts to cultivate high-level human resources - Forming a special legal team network including lawyers, law professors, and software experts to promote license compliance in the OSS ecosystem
	WG 3 (Standardisation)	- Continuing action to develop standards in FOSS supply chain risk management
	WG 4 (Application Promotion)	- Technical support to create and use examples of using open source in various systems - Promotion of professional workforce matching within OSS-related companies in CJK

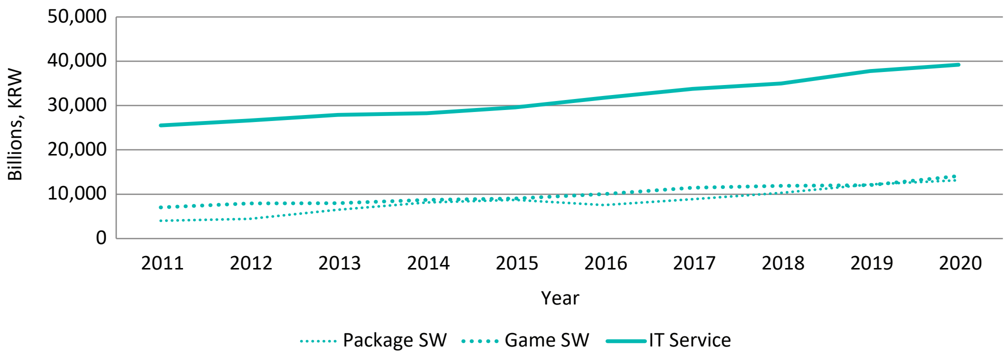
Source: KOPF (https://www.oss.kr/nea_forum)

2 Development in domestic software industry

The largest domestic market in Korea's software industry is IT service, composed of IT Consulting & System Development and IT System Management & Resource Service. The domestic sales of the IT service industry expanded from KRW 25.5 trillion in 2011 to KRW 39.2 trillion in 2020.

The share of the IT service in the total software industry in terms of domestic sales decreased from about 70% in 2011 to 59% in 2020 but maintained three times the size of the package software and game software industries. The domestic market size of Korea's package software industry was only about 4 trillion KRW in 2011, but it grew at an average annual rate of 15.1% to reach 13 trillion KRW in 2020. System SW, such as security and middleware software and application SW, such as industry-specific software, drove the rapid growth of the package SW industry in Korea. The domestic game software industry, which consists of wire online game SW, mobile game SW, PC game SW, video game SW, and arcade game SW, also doubled from 7 trillion KRW in 2011 to 14 trillion KRW in 2020.

Figure 2-2 Growth of domestic markets in software industry



Source: Ministry of Science & ICT, Korea Association for ICT Promotion, Korea Electronics Association (2021), 2020 Information & Communication Technology Survey.

Table 2-9 shows Korea's export performance in the software industry. It is noteworthy that overall software exports in 2011 amounted to only USD 3.89 billion but increased by 3.5 times to USD 14.86 billion in 2020. The industry sector that led the rapid growth of software exports was IT services, and the export value of IT services increased from USD 1.19 billion in 2011 to USD 7.51 billion in 2020. As a result, the share of IT services in total software exports rose from 30.5% in 2011 to 50.6% in 2020. On the other hand, the export value of game software increased from USD 2.38 billion in 2011 to USD 6.4 billion in 2020, but its share fell from 61.0% to 43.1% in the same period. Exports of package SW surged from USD 330 million in 2011 to USD 2.83 billion in 2015 due to a surge in overseas demand for Korean application software. However, the number of exports fell to USD 1 billion a year, and the share in total software exports also fell from 30% to less than 10%.

Table 2-9 | Trend of exports by software industry

(Millions, USD)

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Package SW		330	866	2,105	2,807	2,834	936	1,032	1,044	1,237	946
	System SW	109	116	131	160	229	297	193	194	177	152
	Application SW	221	750	1,974	2,647	2,605	639	839	850	1,060	794
Game SW		2,378	2,639	2,715	2,974	3,215	3,277	5,197	6,235	6,340	6,403
IT Service		1,188	1,546	2,071	2,722	3,221	6,105	6,152	6,317	7,231	7,514
	IT Consulting & System Development	790	1,091	1,429	1,837	2,138	2,345	1,858	1,523	2,067	1,015
	IT System Management & Resource Service	397	454	632	884	980	3,755	4,293	4,792	5,160	6,443
Total		3,897	5,051	6,892	8,503	9,270	10,319	12,381	13,596	14,809	14,862

Source: 1) Ministry of Science & ICT, Korea Association for ICT Promotion, and Korea Electronics Association, 2020 Information & Communication Technology Survey
2) Institute of Information & Communications Technology Planning & Evaluation (IIPE). Monthly Survey of Information & Communication Technology Statistics.

4.2.3 Development in the cultural content industry and cooperation with China and Japan

1 CJK cooperation

The Trilateral Cultural Content Industry Forum was established in 2002 to exchange information on content industry policies and trends in the three countries of China, Japan, and Korea and create business opportunities among the industries of each country. The Forum was held alternately by China, Japan, and Korea since 2002 but was stopped in 2010 and resumed in 2016 according to the agreement of the Trilateral summit in 2015. As a representative of the Korean government, a deputy minister level person from the Ministry of Culture, Sports and Tourism (MCST) participated.

The 10th Forum held in Tokyo, Japan, in June 2017 adopted a joint declaration with the following agreements: (1) establishing a portal site for sharing information on content industry policies and regulations of the three countries, (2) increasing exchanges of cultural works through the content markets of the three countries including film festivals, (3) carrying out public promotions and enlightenment activities through the cooperation among the three countries for the protection of intellectual property rights (IPR).

The 11th Forum held in Tianjin, China, in October 2018 also adopted the following joint declaration: (1) Carrying out joint incubation project of 'Our IPOOL CJK IP Incubation', fostering excellent IP, and ensuring optimal and efficient IP transactions, (2) the establishment of a 'cooperation body for the cooperation and development of cultural content industry in China, Japan, and Korea'. At the 12th Forum held in Busan, Korea, in November 2019, representatives of China, Japan, and Korea signed the joint declaration containing the agreement to promote the above-mentioned trilateral cooperation body.
The 13th Forum was held virtually on November 2020 and adopted a joint declaration with the following agreements: (1) Promotion and use of the cultural content for mutual content distribution in the three countries post COVID-19. (2) Sharing the information

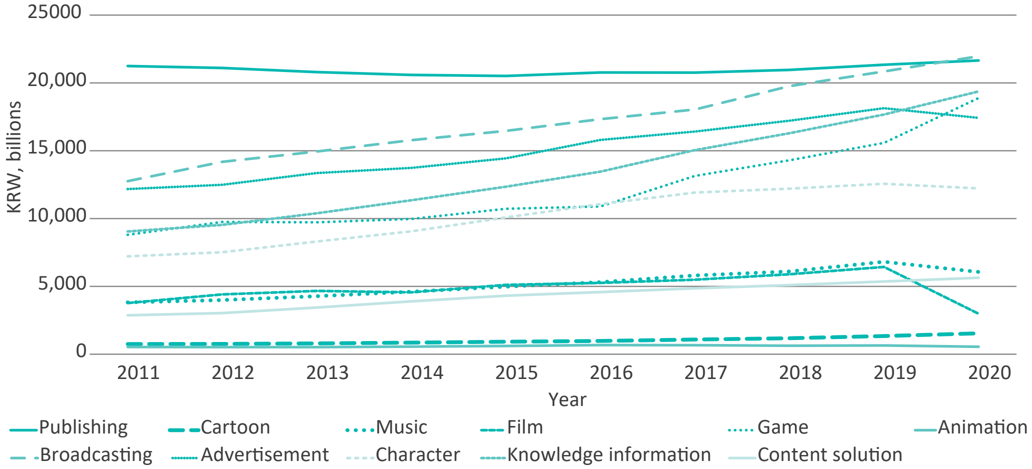
on the existing regulations concerning their respective cultural content industries to clarify the regulations' content and apply them properly. (3) Promotion of support for international collaboration in the cultural content industries of the three countries.

2 Development in the cultural content industry

According to the MCST (Ministry of Culture, Sports and Tourism) of Korea, the content industry consists of 10 sectors, including publishing, cartoon, music, film, game, animation, broadcasting, advertisement, character, knowledge information, and content solution (Ministry of Culture, Sports and Tourism, 2021). The cultural contents industry is a broader concept than the contents industry, but below, the contents industry and the cultural contents industry are not distinguished.

Korea's content industry has developed centred on the three major sectors: publishing, broadcasting, and advertising, and three emerging industries such as games, characters, and knowledge information. Figure 2-3 shows the changes in the domestic market size of the content industry in Korea since 2011. The average annual growth rate of the content industry was 5.0%, and the three major emerging industries, knowledge information, games, and character industries, have changed the landscape of Korea's content industry by achieving an average growth rate of 8.8%, 9.1%, 6.1%, respectively. Of the three major sectors, only the advertising industry achieved an above-average growth rate of 6.3%.

Figure 2-3 Growth of domestic markets in cultural content industry



Note 1) The knowledge information industry refers to e-learning related industries, internet information mediation services, and online information provider services.

2) The content solution industry consists of authoring tools, content protection, mobile solutions, billing/payment, content management system (CMS), and content delivery network (CDN).

Source: Korea Creative Content Agency, Content Industry Statistics.

Table 2-10 shows the export trends of Korea's cultural content industry. Overall, cultural content exports increased more than 2.5 times, from USD 4.3 billion in 2011 to USD 11.9 billion in 2020. It gradually increased from USD 2.3 billion in 2011 to USD 8.2 billion in 2020. However, it is remarkable that the proportion of game content exports out of the total exports was overwhelmingly high. As of 2020, the share of the game in total cultural content exports was the highest at 68.7%, followed by the character with 6.0%, knowledge information at 5.8%, and music at 5.7%.

Table 2-10 Trend of exports by cultural content industry

(Millions, USD)

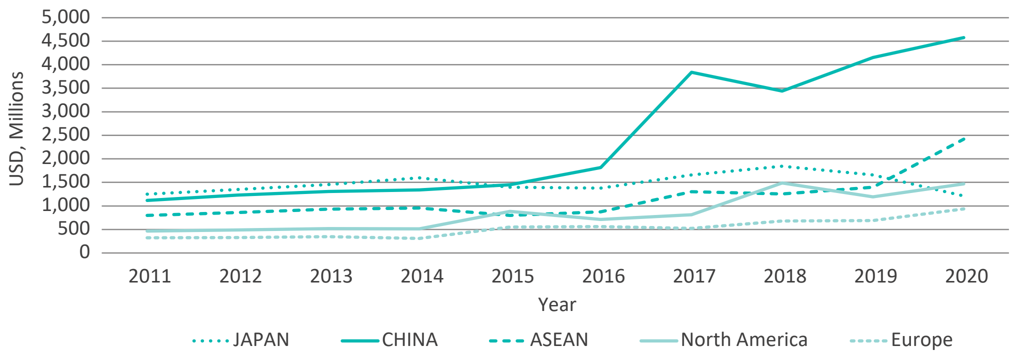
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Publishing	283	245	292	247	223	187	221	249	215	346
Cartoon	17	17	21	26	29	32	35	41	46	63
Music	196	235	277	336	381	443	513	564	756	680

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Film	16	20	37	26	29	44	41	42	38	54
Game	2,378	2,639	2,715	2,974	3,215	3,277	5,923	6,411	6,658	8,194
Animation	116	113	110	116	127	136	145	175	194	135
Broadcasting	222	234	309	336	320	411	362	478	539	693
Advertisement	102	97	103	76	95	110	93	61	139	120
Character	392	416	446	489	551	613	664	745	791	716
Knowledge Information	432	445	457	480	516	566	616	634	650	692
Content solution	146	150	155	168	176	188	202	215	228	233
Total	4,302	4,612	4,923	5,274	5,661	6,008	8,814	9,615	10,254	11,924

Source: Korea Creative Content Agency, Content Industry Statistics.

The characteristics of Korea's cultural content export structure, which were biased toward game exports, developed differently in exports with China and Japan. Figure 2-4 shows the trends of Korea's cultural content exports with major partner areas such as China, Japan, ASEAN, North America, and Europe. Korea's exports of cultural content to China more than quadrupled from USD 1.12 billion in 2011 to USD 4.57 billion in 2020. As of 2020, China's share in Korean cultural content exports was the highest at 39.9%, followed by ASEAN at 21.1%, North America at 12.8%, and Japan at 10.6%.

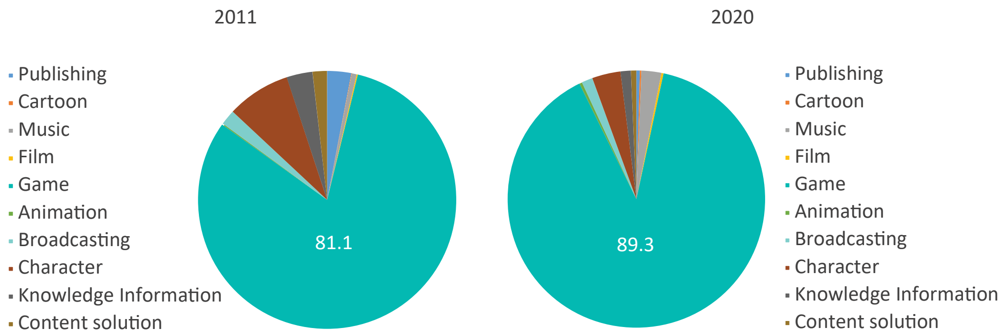
Figure 2-4 Trend of exports in cultural content industry by major partner



Source: Korea Creative Content Agency, Content Industry Statistics.

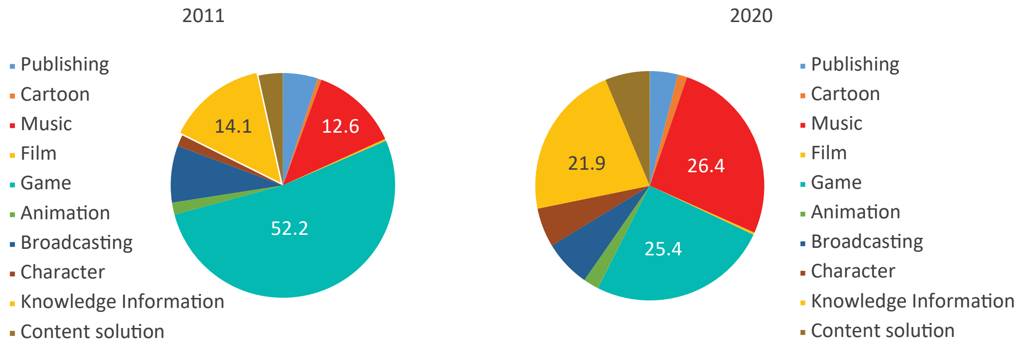
Figures 2-5 and 2-6 show the changes in Korea's cultural content exports by the content industry to China and Japan between 2011 and 2020. The share of content exports to China in Korea's total cultural content exports was 81.1% in 2011 and increased to 89.3% in 2020. Korea's exports of cultural content such as music, films, and knowledge information other than game content were almost frozen. On the other hand, Korea's cultural content exports to Japan increased slightly every year from USD 1.25 billion in 2011 to USD 1.84 billion in 2018 and then decreased to USD 1.21 billion in 2020. Korea's exports to Japan by content industry are diverse compared to China, and the share of the three sectors, namely games, knowledge information, and music, accounted for 70%-80% each year. In the case of music content, Korea exported USD 160 million to Japan in 2011 but nearly doubled to USD 320 million in 2020. As a result, the share of music content in Korea's total content exports to Japan increased significantly from 12.7% in 2011 to 26.4% in 2020.

Figure 2-5 Trend of cultural content exports to China



Source: Korea Creative Content Agency, Content Industry Statistics.

Figure 2-6 Trend of cultural content exports to Japan



Source: Korea Creative Content Agency, Content Industry Statistics.

4.3 Korea's GVC & Supply Chain Connectivity with China and Japan

4.3.1 GVC participation of Korean industry

Table 3-1 shows how much the Korean economy has created domestic added value through exports to China and Japan from 2011 to 2018, just as the number of exports to China and Japan in general trade statistics. Korea created a domestic value-added of USD 391.2 billion through total exports in 2011, and the value-added amount increased to USD 487.4 billion in 2018. The value-added amount created through exports to China and Japan increased from USD 126.5 billion in 2011 to USD 192.7 billion in 2018. When these domestic added values are divided into China and Japan, Korea created a domestic added value of USD 96.1 billion in 2011 through exports to China. The amount increased to USD 163.5 billion in 2018. On the other hand, the domestic added value created by Korea through exports to Japan started to decline after 2015 and decreased from USD 30.4 billion in 2011 to USD 29.2 billion in 2018.

Table 3-1 | Domestic value-added content of gross exports in Korea

		2011	2012	2013	2014	2015	2016	2017	2018
World	US Dollar, Millions	391,251	405,684	435,863	454,375	428,784	419,718	455,706	487,422
China	US Dollar, Millions	96,146	102,117	121,067	132,744	131,667	127,613	143,173	163,469
	Shares in total, %	24.6	25.2	27.8	29.2	30.7	30.4	31.4	33.5
Japan	US Dollar, Millions	30,445	33,907	30,936	31,695	24,213	24,747	25,700	29,254
	Shares in total, %	7.8	8.4	7.1	7.0	5.6	5.9	5.6	6.0
China and Japan	US Dollar, Millions	126590.9	136023.8	152002.2	164438.6	155880	152359.5	168872.5	192722.5
	Shares in total, %	32	34	35	36	36	36	37	40

Source: OECD. Trade in Value Added (https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm).

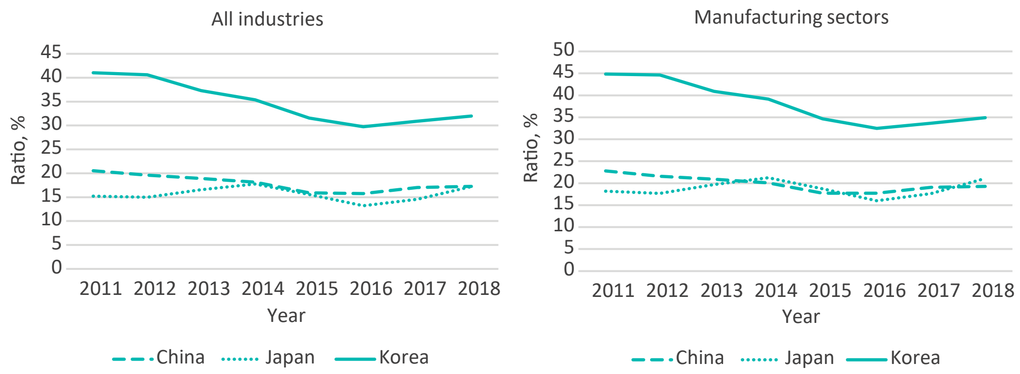
The OECD presents how a country's economy is connected to the global value chains as a GVC participation index. The indicator consists of two components reflecting global production networks' upstream and downstream links. The backward GVC participation index captures how much a country depends on foreign countries for intermediate goods in the upstream production stage. How much foreign value added is included in the country's total exports. On the other hand, the forward GVC participation index indicates to what extent a country's domestic added value is included in a foreign country's total exports, that is, to what extent a country contributes to a foreign country's total exports in the downstream production stage (OECD, 2021).

Figure 3-1 compares Korea's backward participation in GVCs with China and Japan in all industries and manufacturing sectors. The backward GVC participation index is defined as the ratio of foreign value-added embodied in gross exports to total gross exports. Korea's backward participation index gradually decreased from around 40% in 2011 to around 30% in 2018 for all industries and manufacturing sectors, but it was still high compared to China and Japan, which stayed below 20%.

The forward GVC participation index is defined as the ratio of a country's domestic value-added embodied in gross exports of foreign countries to a country's total gross exports.

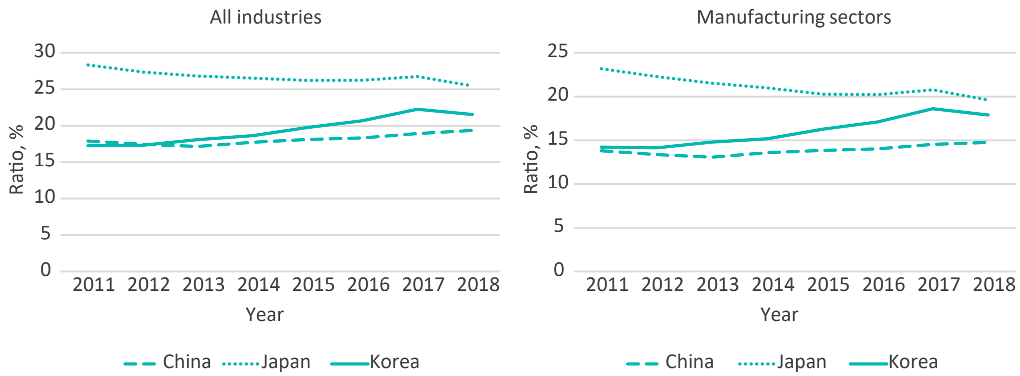
On the other hand, as shown in Figure 3-2, Korea's forward participation in GVCs started at a low level in 2011 compared to Japan, but the gap with Japan narrowed over time. In 2011, Korea's forward GVC participation index for all industries was 17.2%, significantly lower than Japan's 28.3%, but in 2018, the gap was halved to 25.5% for Japan and 21.5% for Korea. In the case of the index for manufacturing sectors, the gap was almost resolved to 19.6% for Japan and 17.9% for Korea in 2018.

Figure 3-1 Trend of backward GVC participation index of Korean industry



Source: OECD. Trade in Value Added (https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm).

Figure 3-2 Trend of forward GVC participation index of Korean industry



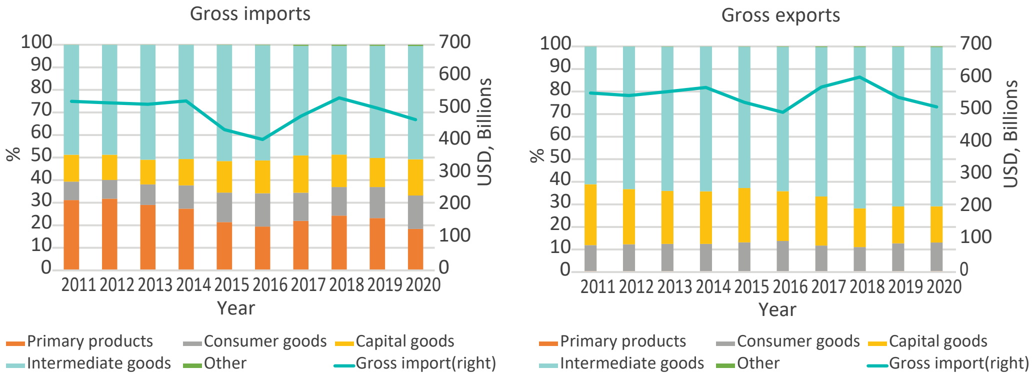
Source: OECD. Trade in Value Added (https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm).

However, Korea's backward and forward GVC participation index only shows the density of the Korean industry's connection to the global value chain but does not show how specifically it related to China and Japan. Korea's supply chain connectivity with China and Japan will be reviewed in the following.

4.3.2 Supply chain connectivity with China and Japan

Looking at Korea's gross import and export statistics by processing stage, it was revealed that, as a resource-poor country, Korea was deeply involved in the global supply chain by importing primary goods, capital goods, and intermediate goods from abroad, processing them, and then exporting intermediate goods abroad. Figure 3-3 shows that the proportion of primary and intermediate goods in Korea's gross imports in 2011 reached 31.2% and 48.7%, respectively, and 18.4% and 50.2% in 2020, respectively. In the case of gross exports by processing stage, intermediate goods and capital goods accounted for 61.0% and 27.0%, respectively, in 2011, and changed to 70.5% and 16.0% in 2020, respectively.

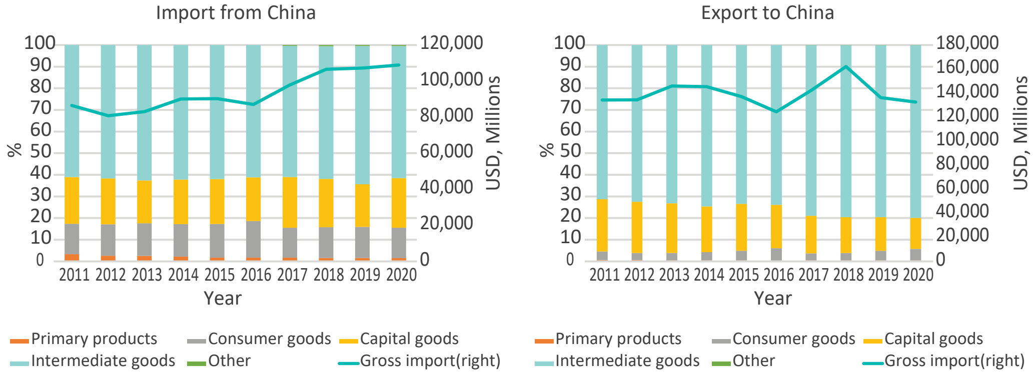
Figure 3-3 Trend of Korea's gross imports and exports by processing stage



Source: Korea International Trade Association, K-stat (https://stat.kita.net).

The above-mentioned structure of Korea's import and export by processing stage was more evident in the triangular trade among Korea, China, and Japan. From 2011 to 2020, capital goods and intermediate goods accounted for 95% of Korea's exports to China, and these two categories of goods accounted for more than 80% of Korea's imports from China. Among Korea's exports to China, the proportion of consumer goods did not change significantly at the 15% level, and imports only accounted for less than 5% (see Figure 3-4).

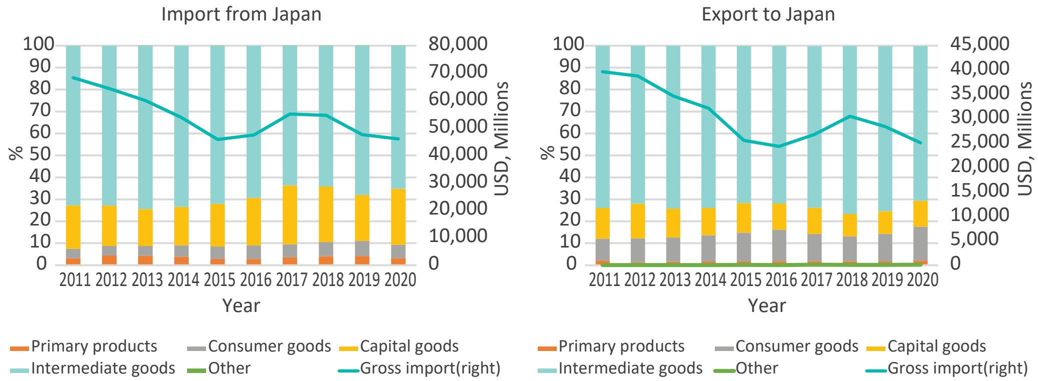
Figure 3-4 Trend of Korea's imports and exports with China by processing stage



Source: Korea International Trade Association, K-stat (https://stat.kita.net).

Meanwhile, looking at the structure of Korea's imports and exports by processing stage with Japan, capital goods and intermediate goods accounted for about 85% of Korea's exports to Japan and about 90% of imports from 2011 to 2020 (see Figure 3-5).

Figure 3-5 Trend of Korea's imports and exports with Japan by processing stage



Source: Korea International Trade Association, K-stat (https://stat.kita.net).

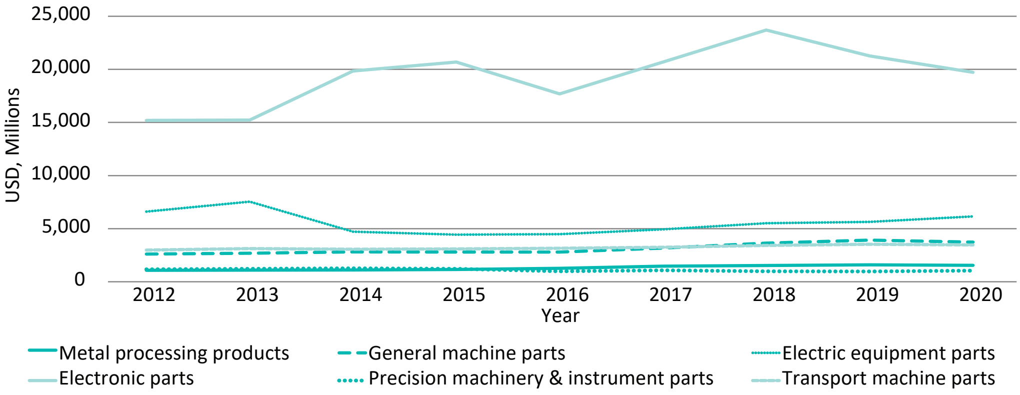
Table 3-2 shows the import trends from China and Japan for intermediate goods, such as materials, parts, and equipment, which were meaningful to Korea in terms of the supply chain linkage among Korea, China, and Japan. Korea's imports of intermediate goods from China increased from USD 46.56 billion in 2012 to USD 54.11 billion in 2020 at an average annual growth rate of 2.2%. Parts led to the increase in imports of intermediate goods from China, and among them, electronic parts accounted for more than half of the parts, and the import growth rate recorded an average annual growth rate of 4.3% (see Figure 3-6).

Table 3-2 | Korea's imports of materials, parts and equipment from China and Japan

	Partners	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average of annual growth rate (%)
Materials	World	67,111	64,599	66,743	58,667	54,776	62,173	65,812	62,045	59,005	-1.3
	China	15,417	15,637	17,582	15,513	14,213	16,361	17,748	16,322	15,116	0.2
	Japan	19,834	16,973	15,443	12,486	12,351	13,060	13,481	12,980	12,248	-5.5
Parts	World	67,111	64,599	66,743	58,667	54,776	62,173	65,812	62,045	59,005	-1.3
	China	29,652	30,909	32,840	33,407	30,382	34,589	38,791	36,927	35,688	2.6
	Japan	18,347	18,133	15,663	14,521	15,607	16,889	16,118	14,720	15,170	-2.1
Equipment	World	19,694	17,693	19,641	18,915	19,012	30,629	26,891	18,174	25,633	6.9
	China	1,490	1,535	1,855	1,803	1,633	1,855	2,097	2,107	3,310	12.0
	Japan	6,457	5,110	4,824	4,639	5,717	9,664	8,495	5,176	6,580	4.7
Total	World	187,299	189,015	193,614	183,547	175,261	203,366	208,023	192,587	197,492	0.9
	China	46,559	48,081	52,276	50,722	46,228	52,804	58,636	55,356	54,114	2.2
	Japan	44,638	40,216	35,929	31,646	33,675	39,614	38,094	32,875	33,998	-2.8

Source: MOTIE (Ministry of Trade, Industry and Energy), sobujang.net.

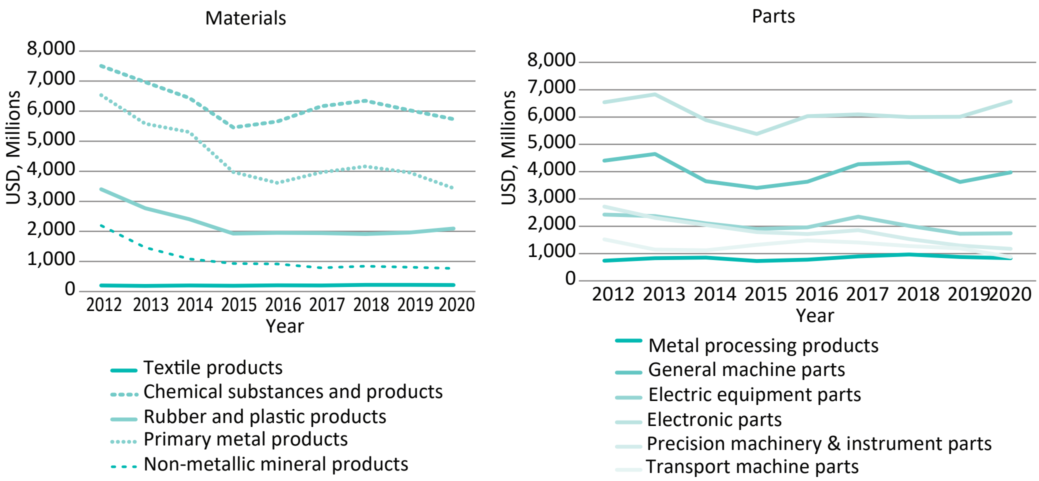
Figure 3-6 Korea's imports of parts from China



Source: MOTIE (Ministry of Trade, Industry and Energy), sobujang.net.

Meanwhile, Korea's imports of intermediate goods such as materials, parts, and equipment from Japan began to decline after peaking at USD 44.64 billion in 2012 and then fell to about USD 34 billion in 2020. The decline in imports of intermediate goods from Japan appeared in all materials and parts. Among them, chemical substance products and primary metal products in the field of materials stood out the most (see Figure 3-7).

Figure 3-7 Korea's imports of materials and parts from Japan



Source: MOTIE (Ministry of Trade, Industry and Energy), sobujang.net.

Chapter

5

China's Digital Economy Shifted from Growth of Scale to Quality-oriented Development in the 10 Years

中国信通院

Organization: China Academy of Information and Communications Technology - the Policy and Economic Research Institute

Authors:

SUN Ke, Professor-level Senior Engineer and Deputy Director, Policy and Economic Research Institute, China Academy of Information and Communications Technology (CAICT)

WANG Mingzhu, Senior Engineer, Policy and Economic Research Institute, China Academy of Information and Communications Technology (CAICT)

JIANG Ying, Engineer, Policy and Economic Research Institute, China Academy of Information and Communications Technology (CAICT)

Contents

Chapter 5 - China's Digital Economy Shifted from Growth of Scale to Quality-oriented Development in the 10 Years

5.1 Digital Economy: Concept and Conceptual Framework

As a new form of economy, the digital economy is based on the key production factors of digital knowledge and information. The digital economy is powered by the core force of digital technology and is realized by a modern information network. In the digital economy, digital technology is deeply integrated with the real economy, driving the economic and social sectors to be increasingly digitized, Internet-based, and intelligent, as well as accelerating the reshaping of the economic development and governance models.

The conceptual framework of the digital economy in China includes the following four parts:

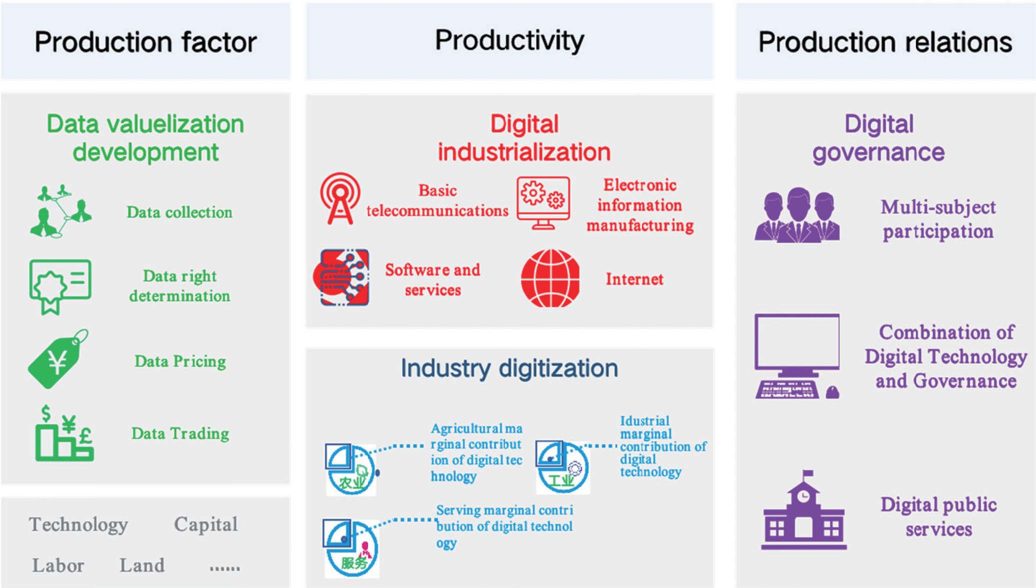
First, digital industrialization. Digital industrialization is reflected in the information and communication industry. This industry plays a leading role in the digital economy, as it provides the technologies, products, services, and solutions for its development. Specifically, the information and communication industry includes electronic information manufacturing, telecommunications, software and IT services, the Internet industry, etc. Digital industrialization takes place in areas such as 5G, integrated circuits, software, artificial intelligence, big data, cloud computing, blockchain and other technologies, products, and services.

Second, industrial digitization. Industrial digitization is a process in which traditional industries introduce digital technology to improve production efficiency and increase output. These increases in output constitute a vital part of the digital economy. To achieve high-quality development, the digital economy focuses not on digitization but on the integration of digital technology and the real economy. Industrial digitization takes place in areas such as industrial Internet, integration of information and industrial sectors, intelligent manufacturing, Internet of Vehicles, platform economy, and other integration-based new industries, new models, and new forms of business.

Third, digital governance. Digital governance is a crucial component of a modern national governance system and modern governance capabilities. In this new governance model, digital technology is used by government departments to establish and improve administrative systems and introduce new methods for government service supervision. The application of digital technology in government affairs helps optimize the institutional systems for administrative decision-making, execution, organization, and supervision. Digital governance includes the innovation of governance models, the use of digital technology to improve the governance system, enhancement of governance capabilities in all respects, etc.

Fourth, data valuelization. Valuelized data is a key production factor in the development of the digital economy. Data can be stored and reused and shows trends of exponential growth and accumulation. It is a fundamental strategic resource for the digitized, Internet-based, and intelligent development of the real economy. Data valuelization occurs in data collection, data standards, data right determination, data labeling, data pricing, data trading, data flow, data protection, etc.

Figure 1 "Framework of Four Orientations" in digital economy



Source: China Academy of Information and Communications Technology (CAICT)

5.2 Changes in the Driving Force of the Digital Economy

In a new era that requires a transition to high-quality development, China continued to promote economic and social development and reform. On the one hand, the digital economy with data as the core production factor developed rapidly in China, enabling the country to liberate better and improve productivity, participate in the global division of labor and cooperation, and achieve technological innovation and high-quality economic development. On the other hand, China released a policy impetus and stimulated the endogenous potential for the development of the digital economy by providing continuous, stable, and sustainable policy support.

5.2.1 The production factors underwent significant changes in the era of the digital economy

1 Data. As a new and key production factor in the digital economy, data runs through the entire process of its development. Data is continuously combined and integrated with other production factors, which can lead to multi-field, multi-dimensional, systematic, and revolutionary breakthroughs in all production factors.

1) Valuelized data will cause traditional production factors such as technology, capital, labor, and land to undergo profound changes, optimization, and reorganization, bolstering the development of the digital economy. The combination of data and traditional production factors have resulted in "new technologies" such as artificial intelligence, "new capitals" such as financial technology, "new labor" such as intelligent robots, "new land" such as digital twins, and "new ideas" such as blockchain. The new combinations and new forms of production factors will continuously bolster the development of the digital economy.

2) Data valuelization directly propels the transformation and upgrading of traditional industries to be digitized, internet-based, and intelligent. The extensive and deep integration of data and traditional industries can generate a prominent multiplying effect, which is of huge value and impetus to economic development. With the use of data, the service sector can explore customer segmentation, risk prevention and control, and credit evaluation. The industrial sector can accelerate the transition to intelligent manufacturing, including intelligent sensing and precision control. The agricultural sector can shift to an intelligent production model that is data-driven. Data, elevated as a production factor, is related to the long-term impetus for economic growth and the future development of China. As a key production factor, valuelized data reflects that with the acceleration of digital transformation, data has generated a prominent multiplying effect in production efficiency and has become a new

production factor most representative of the era.

2 **Technology.** China made continuous efforts to stimulate the supply of technologies and promote the transformation of sci-tech achievements.

1) China actively promotes the pilot project of market-based allocation of technologies, explores innovative and differentiated reforms for such allocation, and facilitates the transformation and industrialization of sci-tech achievements. In addition, all the relevant departments shall accelerate the establishment of high-quality technology transfer institutions and facilitate their professional development to promote the creation of high-quality research achievements and their efficient transformation.

2) The *Guiding Opinions on Improving the Evaluation Mechanism of Scientific and Technological Achievements*, issued by the General Office of the State Council, reformed and improved the rewards system for sci-tech achievements. The measures included in the document facilitated the birth of high-quality sci-tech achievements in the new context, created a favorable environment for innovation, and boosted the deep integration of innovation, industrial, and value chains. According to the *Implementation Opinions on Further Promoting the Construction and Development of Specialized Technology Transfer Institutions in Institutions of Higher Education* jointly issued by the Ministry of Science and Technology and the Ministry of Education, efforts shall be made to promote the establishment of technology transfer institutions in universities with strong innovation capabilities and multiple sci-tech achievements during the 14th Five-Year Plan period. These institutions are built to implement various policies and measures for the transformation of sci-tech achievements and to improve capabilities in transfer and transformation services.

3 **Capital.** China has worked to integrate science & technology and finance, and provide more inclusive, targeted, and market-oriented financial support. The national funds for

manufacturing transformation and upgrading, and for guiding the transformation of sci-tech achievements, among others, were set up. They implement a market mechanism in operation and adopt professional management. They solve financing problems through market means and primarily invest in growing and mature enterprises in the related fields. In terms of special bonds, the Ministry of Science and Technology and the China Development Bank jointly launched special bonds for the industrialization of major sci-tech achievements, intending to promote the deep integration of science & technology and finance, further supporting sci-tech innovation through development finance, and accelerate the transformation and industrialization of several major national sci-tech achievements.

5.2.2 China's policies on the digital economy expanded from a single area to multiple areas

The Chinese government has made continuous efforts to improve the policy and legal systems for the development of the digital economy, attaches great importance to its development, and promotes its gradual rise into a national strategy. Overall, China's digital economy development strategic plan has gone through three stages:

1 First stage: focused on the development of industries and technologies. China has long launched a top-level design specifically for Information and Communications Technology (ICT) and related industries, providing perfect incentives and a suitable environment for industrial development in the areas of finance and taxation, investment and financing, research and development, import and export, talents, intellectual property rights, and market policies. Following the rise of the new generation of ICT, China has also formulated policies for cloud computing, big data, and other technologies and industrial development to guide the development of the industry.

Table 1 | Selected ICT industry development policy documents issued by the Chinese government since 2010

Year of release	Policies and documents
2011	Several Policies for Further Encouraging the Development of the Software Industry and Integrated Circuits Industry
2013	"Broadband China" Strategy and the Implementation Plan
2013	Several Opinions of the State Council on Promoting Information Consumption and Expanding Domestic Demand
2015	Opinions of the State Council on Promoting Innovation and Development in Cloud Computing and Cultivating New Forms of Business in the Information Industry
2015	Outline of Action to Promote the Development of Big Data

2 Second stage: promote digital economy and economic and social integration. China has introduced policies to focus on the integrated development of "Internet plus," "digital economy," and "digital technology" with traditional industries such as agriculture, manufacturing, and services, and is committed to further improving the innovation and productivity of the national economy.

Table 2 | Selected documents on the promotion of the digital economy and economic and social integration issued by the Chinese government since 2010

Year of release	Policies and documents
2015	Guiding Opinions of the State Council on Actively Promoting the "Internet Plus" Action
2016	Guiding Opinions of the State Council on Deepening the Integrated Development of Manufacturing and the Internet
2019	Outline of the Strategy for the Development of Digital Villages
2020	Implementation Plan for Advancing the Digital Transformation Action and Cultivating New Economic Development
2020	Notice on Accelerating the Digital Transformation of State-owned Enterprises

3 Third stage: Improve the national top-level design and policy ecology construction. The policy framework for the development of the digital economy has become clearer. China's national "14th Five-Year" development plan has established a systematic framework for promoting digital development and includes a separate section on "accelerate digital development and build a digital China" to comprehensively guide the development of the digital economy in terms of technology, foundation, application, and environment. Furthermore, the "14th Five-Year Plan" for several sub-sectors also involves content related to the digital economy.

Table 3 | Selected "14th Five-Year Plan" related to the digital economy

Time of release	Name of the Plan
Mar 2021	Outline of the 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives through the Year 2035 of the People's Republic of China
Nov 2021	"14th Five-Year" Information and Communication Industry Development Plan
Dec 2021	"14th Five-Year" National Informatization Plan
Jan 2022	"14th Five-Year" Digital Economy Development Plan

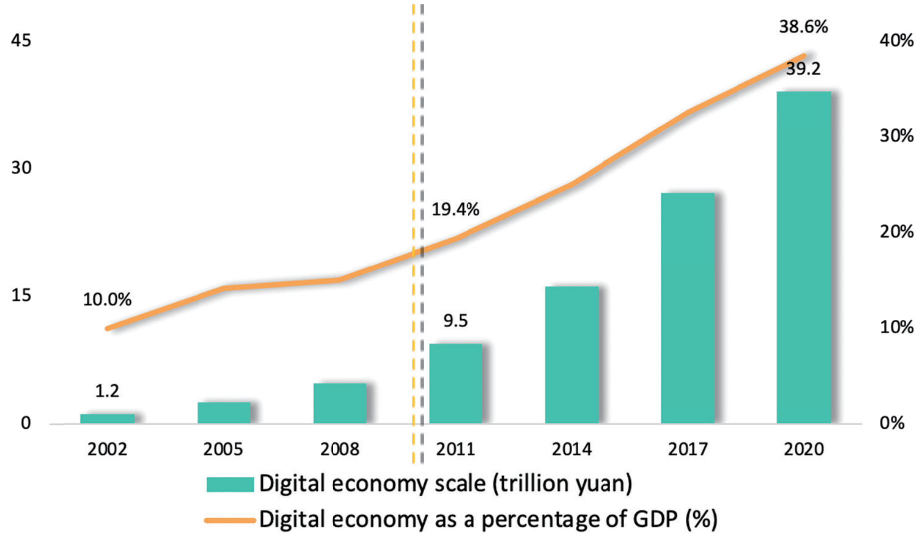
5.3 Changes in the Quality and Efficiency of Development

5.3.1 The overall development of the digital economy

Due to the international environments and domestic factors such as the COVID-19 pandemic and economic and social changes, the development of China's digital economy experienced further improvements in quality and efficiency. Innovations and breakthroughs have been made in e-commerce, online education, telemedicine, online office, and other emerging industries at a higher speed. The digital economy played an increasingly notable role in supporting the macroeconomy.

Between 2002 and 2010, the scale of the digital economy increased, but the digital economy's contribution to the national economy was relatively limited. From 2011 to 2020, the digital economy shifted from scale growth to quality development, and its contribution to the national economy gradually increased. The digital economy has become a primary engine of high-quality economic and social development in China.

Figure 2 The scale of China's digital economy and its proportion to GDP in 2002-2020

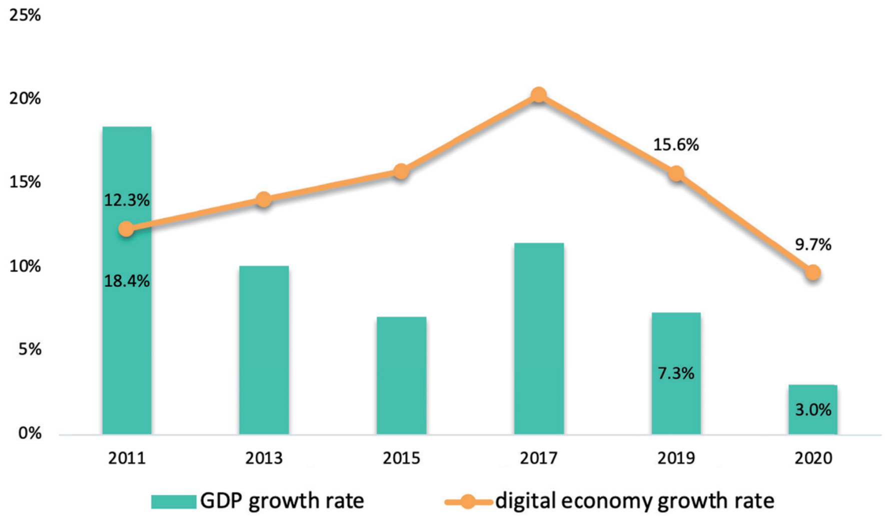


Source: China Academy of Information and Communications Technology (CAICT)

The digital economy is key to economic growth. Over the decade, China's digital economy continued to prosper, with its scale expanding from 9.5 trillion RMB in 2011 to 39.2 trillion RMB in 2020. With the continuous advancement of a new round of sci-tech revolution and industrial transformation, plus the impact of the pandemic, the digital economy has become the most vibrant, innovative, and widely adopted economic form. It is one of the core growth drivers in the national economy.

The digital economy effectively mitigates the economic downturn. From 2011 to 2020, except for some special years, the growth rate of the digital economy was largely maintained at over 12%. Even in 2020, which was heavily affected by COVID-19, China's digital economy still maintained a high growth rate of 9.7%, much higher than the nominal GDP growth rate of about 6.7 percentage points during the same period. The digital economy has become a key impetus for the continuous and stable growth of the national economy and has played an important part in prevention and control of the COVID-19, and the development of economy and society.

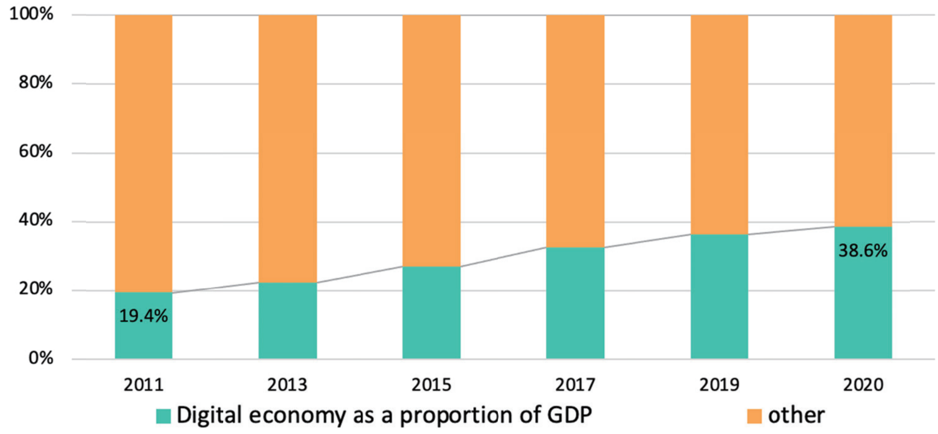
Figure 3 Growth rates of digital economy and GDP in China



Source: China Academy of Information and Communications Technology (CAICT)

The digital economy plays an increasingly prominent role in the national economy. The digital economy takes up an increasingly higher proportion of GDP year by year and occupies an even more critical position in the national economy. From 2011 to 2020, the digital economy share in GDP increased from 19.4% to 38.6% in China, up by 19.2 percentage points in 10 years. The digital economy is becoming increasingly crucial to the development of the national economy.

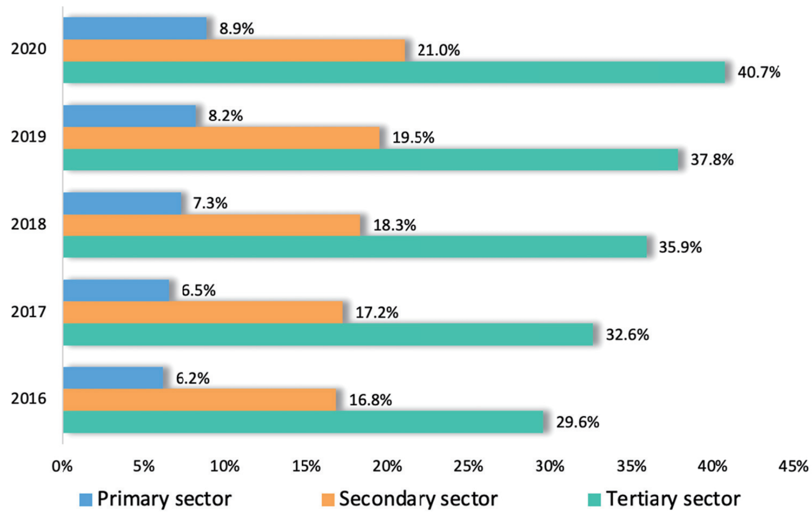
Figure 4 The share of the digital economy in China's GDP



Source: China Academy of Information and Communications Technology (CAICT)

The digital development of the three industries has been further promoted. The digital economy has been increasingly integrated with the three industries. In 2016, the digital economy accounted for 6.2%, 16.8%, and 29.6% of the added value in the sectors of agriculture, industry, and services in China. By 2020, the numbers increased to 8.9%, 21.0%, and 40.7%, respectively. The COVID-19 pandemic has generated a huge demand for the transformation to a digital economy.

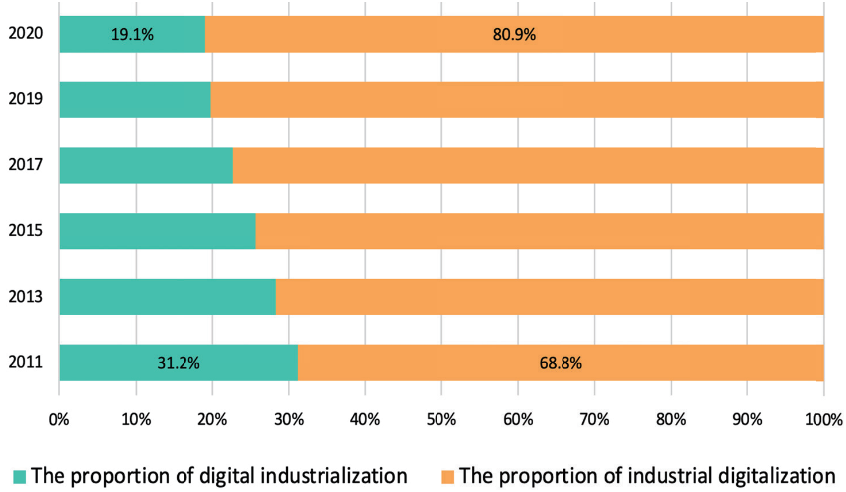
Figure 5 Penetration rate of the digital economy in China



Source: China Academy of Information and Communications Technology (CAICT)

The dominant position of industrial digitization in the internal structure of the digital economy has been further consolidated. Between 2011 and 2020, the proportion of industrial digitization in the digital economy increased from 68.8% to 80.9%, and the contribution of industrial digitization to the digital economy also continued to rise.

Figure 6 The internal structure of the digital economy in China



Source: China Academy of Information and Communications Technology (CAICT)

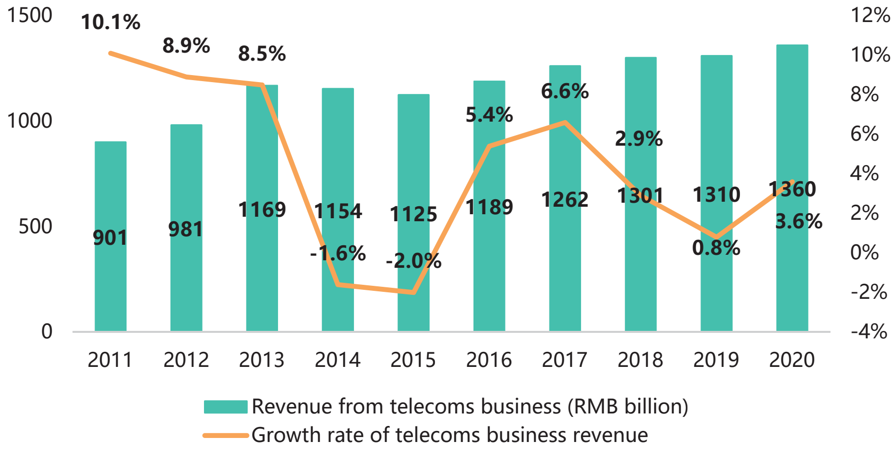
5.3.2 Digital industrialization

The support capacity of digital industrialization is more solid. From 2011 to 2020, the scale of China's digital industrialization grew from 3.0 trillion RMB to 7.5 trillion RMB, and the ICT industry continued to strengthen, providing sufficient digital technology, products, and service support for various industries.

The resilience of the ICT industry has been significantly enhanced. The telecommunications industry and electronic information manufacturing industry continued to develop steadily. The innovation level of the software and information technology service industry, Internet, and related service industries continued to improve.

1 Telecommunications. From 2011 to 2020, China's telecommunications business revenue increased from 901.2 billion RMB to 1,360 billion RMB, with the highest growth rate ever exceeding 10%. A rapid increase in the number of mobile Internet access traffic was seen in 2015-2018, the growth rates of which have exceeded 100% (103%, 124%, 162%, and 189%, respectively), and the number of access traffic has increased from 880 million GB in 2012 to 165.6 billion GB in 2020.

Figure 7 2011-2020 Telecom business revenues in China



Source: Ministry of Industry and Information Technology of the People's Republic of China

The network supply capacity has been continuously enhanced. As of the end of 2020 and 2021, China has built and launched 0.718 and 1.425 million 5G base stations, respectively. The total number of 5G base stations in China accounts for more than 60% of the world's total, with 10.1 5G base stations per 10,000 people. The annual 5G investment was 184.9 billion RMB, accounting for 45.6% of the telecoms fixed asset investment. From 2014 to 2020, the total number of 4G base stations increased from 0.85 to 5.75 million, and the number of 4G subscribers increased from 97 million to 1289 million. More than 300 cities in China have launched the construction of gigabit fiber-optic broadband networks. By the end of 2021, 7.86 million 10G PON ports have been built, with the capacity to cover 300 million households.

The telecommunications industry provides vital support to alleviate the digital divide between urban and rural areas.

1) The level of network coverage in rural and remote areas has been significantly improved. Since 2015, China's central government has allocated a total of over 22 billion RMB in subsidy funds to support the construction of fiber-optic networks in 130,000 administrative villages and the construction of 60,000 rural 4G base stations. As of the end of November 2021, the proportion of existing administrative villages with broadband access in China has increased from less than 70% at the end of 2015 to 100%. The total number of rural broadband access users increased from 41 million in 2012 to 142 million in 2020, and the rural Internet penetration rate reached 59.2%.

2) The cost of using the network in rural areas has been significantly reduced. Basic telecommunications enterprises have continued to offer discounts on basic communication services to rural poverty alleviation households, benefiting more than 28 million households.

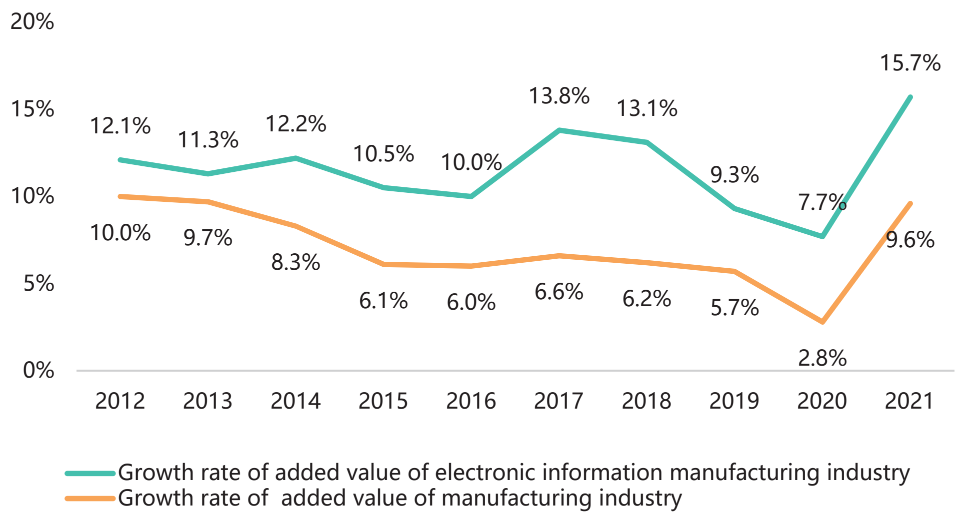
Table 4 | Number of rural broadband access subscribers in China

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020
Number of rural broadband access subscribers (Million)	41	47	49	64	75	94	117	135	142

Source: Ministry of Industry and Information Technology of the People's Republic of China

2 Electronic information manufacturing industry. From 2012 to 2019, China's added value of above-scale electronic information manufacturing experienced steady growth. Due to the impact of COVID-19, the growth rate of the added value of above-scale electronic information manufacturing dropped to 7.7% in 2020 in the short term, and by 2021, the growth rate rebounded to 15.7%.

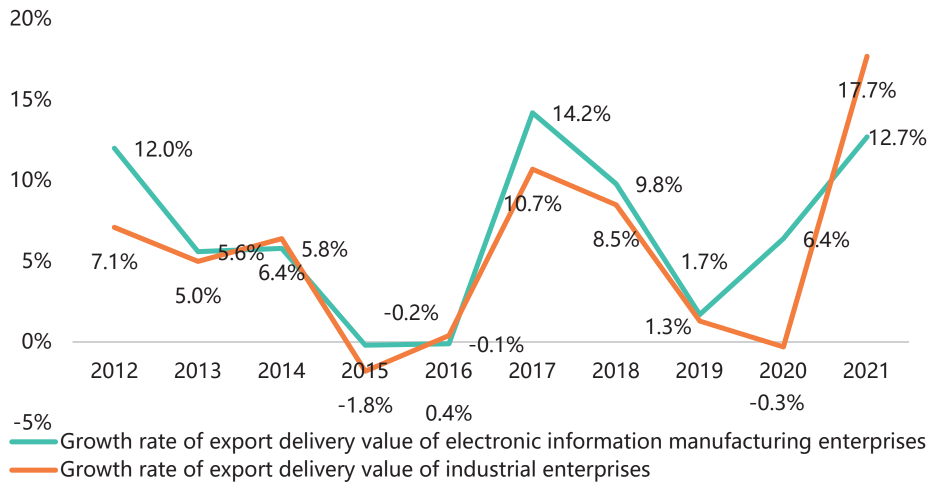
Figure 8 Growth rate of the added value of electronic information manufacturing and the manufacturing industry



Source: Ministry of Industry and Information Technology of the People's Republic of China

The growth rate of the export delivery value of electronic information manufacturing accelerated. From 2012 to 2016, affected by factors such as the international economic situation, the domestic financial market, the real estate market, and the gradual expiration of a series of policies stimulating domestic demand, the growth rate of the export delivery value of above-scale electronic information manufacturing enterprises in China continued to decline, from 12.0 % to -0.1%. In 2017, the growth rate experienced a short-term rise and then a sharp decline. After 2019, the export delivery value of electronic information manufacturing officially entered the stage of recovery.

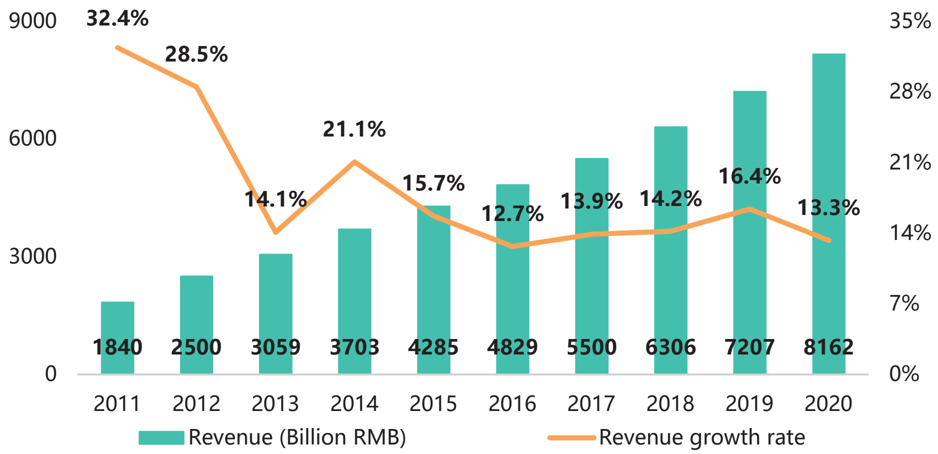
Figure 9 Growth rate of the export delivery value of electronic information manufacturing and industrial enterprises



Source: Ministry of Industry and Information Technology of the People's Republic of China

3 Software and information technology services (hereinafter referred to as the "software industry"). China's software industry is running well, with software business revenue maintaining rapid growth. From 2011 to 2020, China's software business revenue changed from high to steady growth, and the scale has continued to rise, from 1,840 billion RMB in 2011 to 8,161.6 billion RMB in 2020.

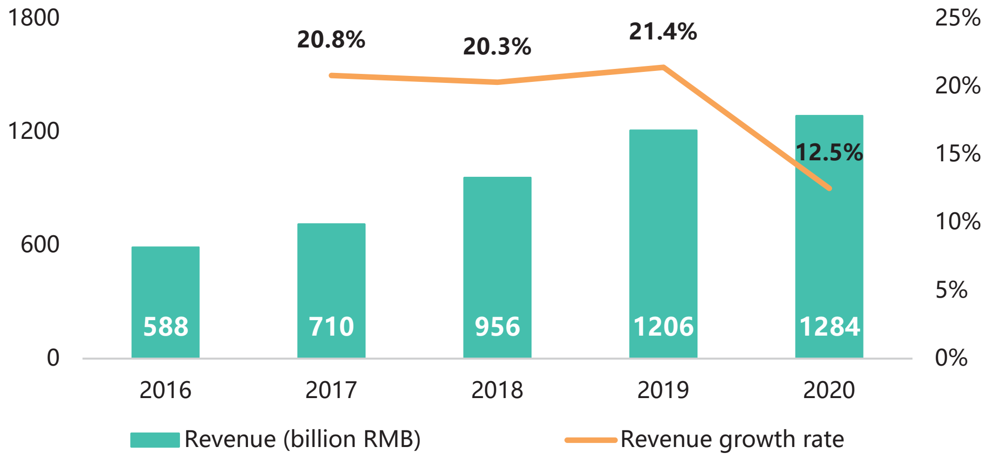
Figure 10 Software and IT services revenue 2011-2020



Source: Ministry of Industry and Information Technology of the People's Republic of China

4 Internet industry. China's Internet business revenue maintains a relatively rapid growth trend. Above-scale Internet and related service enterprises made business revenue of 1,283.8 billion RMB in 2020, more than twice that in 2016, with a compound annual growth rate (CAGR) of about 20%.

Figure 11 Business revenue of internet enterprises above-scale 2016-2020



Source: Ministry of Industry and Information Technology of the People's Republic of China

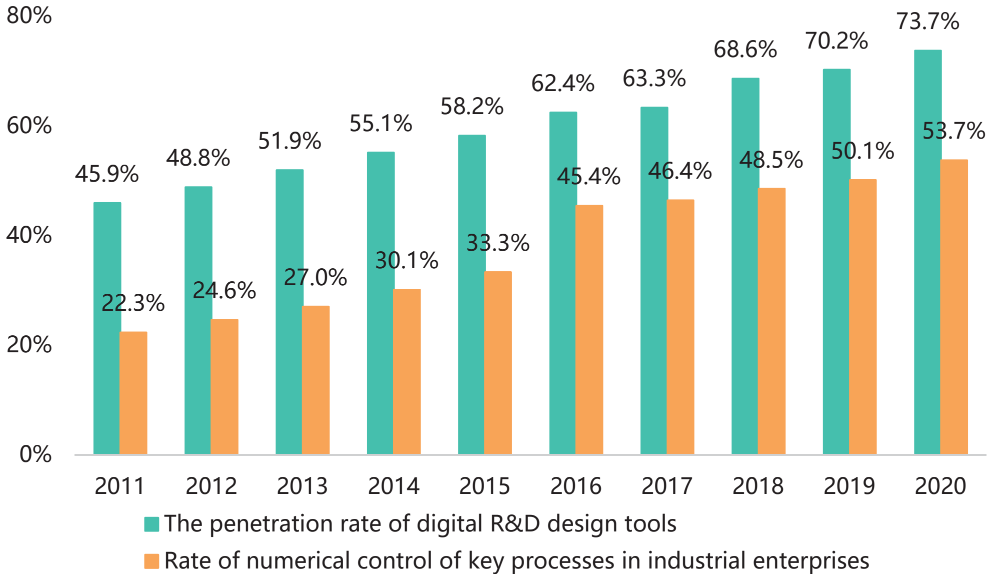
5.3.3 Industrial digitization

From 2011 to 2020, the scale of industrial digitization increased from 6.5 trillion RMB to 31.7 trillion RMB. In the decade, the average annual growth rate of industrial digitization exceeded that of GDP over the same period.

1 **Digital transformation of the manufacturing industry.** Since 2010, the added value of manufacturing in China has ranked first worldwide for 11 consecutive years. From 2012 to 2020, the added value of manufacturing in China as a proportion of that of the world increased from 22.5% to nearly 30%. Key industries such as the photovoltaic (PV) sector, new energy vehicles, home appliances, and smartphones ranked among the top globally, and several high-end brands in communication equipment, high speed rail, and other products have reached the international market.

The numerical control rate in the key processes of key industrial fields increased from 24.6% in 2012 to 52.1% in 2020, and the penetration rate of digital R&D and design tools increased from 48.8% to 73%. Emerging industries such as large-scale customization, intelligent production, Internet-based collaboration, and service-oriented manufacturing achieved fast development.

Figure 12 Progress in the digitization of China's manufacturing industry 2011-2020



Source: Ministry of Industry and Information Technology of the People's Republic of China

2 Digital transformation of the service industry. In 2020, the national online retail sales reached 11 trillion RMB, an increase of about 5.9 trillion RMB over 2011. Digital services such as online healthcare and online office are flourishing, with 298 million and 469 million users, respectively. The integrated application of digital technology significantly reduced transaction costs. The widespread application of technologies such as mobile payment has saved costs on both sides of the transaction on a large scale, helping to activate transactions and improve efficiency. In 2020, the mobile payment business reached 123.2 billion, amounting to 432.16 trillion RMB, a year-on-year increase of 21.48% and 24.50%, respectively. From 2013 to 2020, the CAGR of the mobile payment business reached 72.2%.

Table 5 | Data on digital development in selected service areas

	Online retail sales (Trillion RMB)	Rural e-tail sales (Million RMB)	Mobile payment amount (Trillions RMB)
2011	0.78		
2012	1.31		
2013	1.85		9.6
2014	2.79	18	22.6
2015	3.88	35	108.2
2016	5.16	89	157.6
2017	7.16	124	202.9
2018	9.0	137	277.5
2019	10.63	170	347.1
2020	11.76	179	432.2

Source: National Bureau of Statistics of the People's Republic of China, Ministry of Commerce of the People's Republic of China, People's Bank of the People's Republic of China

3 **Digital transformation of the Agriculture industry.** Digital technology has accelerated its integration with agriculture and rural areas, gradually penetrating all aspects of the agricultural industry. The Internet of Things, Beidou navigation, and satellite remote sensing have been applied on the ground in China's agricultural production bases.

Rural e-commerce. Since 2014, China has implemented a demonstration project of e-commerce in rural areas, as of the end of 2020, a total of 1,258 counties have been assessed as demonstration counties. The proportion of express delivery outlets covering villages and towns reached 97.7%. In 2020, the national online retail sales of agricultural products reached 575 billion RMB, an increase of 37.9% over the previous year. Live e-commerce and social e-commerce are flourishing, and e-commerce has become an important channel for the sale of agricultural products.

Construction of smart agriculture. Since 2017, China has integrated and applied technologies such as the Internet, big data, artificial intelligence, 5G, Beidou navigation, and satellite remote sensing in agriculture. Until now, China has carried out digital agriculture in field cultivation, facility horticulture, livestock and poultry farming, aquaculture, and the construction of big data for the whole industrial chain of 15 key agricultural products, including apples and soybeans. In 2019, the digitization level of China's agricultural production reached 23.8%.

5.3.4 Digital governance

China's social governance model is changing from one-way management to two-way interaction, from offline management to a combination of online and offline management. At present, China has realized digital governance that makes full use of big data, artificial intelligence, the Internet of Things, and other information technology to support scientific decision-making and precise policy-making in social governance.

From the perspective of development stages:

1 **First stage: using new technology to enhance governance.** New-generation digital technologies such as big data and intelligent algorithms help the government innovate governance models, methods, and technologies. With these tools, government departments can make prior assessments, take concerted actions, and achieve scientific governance in the face of complicated problems. At present, digital technology has become the government's best choice to prevent, track, and solve social problems.

1) During the fight against COVID-19, China made full use of digital technologies such as big data, artificial intelligence, and cloud computing to support epidemic monitoring and analysis, virus traceability, prevention and treatment, and resource allocation.

2) China continues to improve its technical countermeasure capabilities. In 2021, a total of 326.5 billion RMB of funds involved in the case, 1.55 billion fraudulent calls, and 1.76 billion fraudulent text messages had been intercepted, 23.37 million people had been prevented from being deceived, and a solid "anti-fraud" has been built.

2 **Second stage: strengthening the governance of digital technologies.** At present, sci-tech innovation capability has become a decisive factor in the competition for comprehensive national strength. China is constantly raising the importance attached to the governance of technology rules, establishing a sound system for the governance of the emerging technology.

1) **The overall technology governance-related framework has been established.** China has released the *Opinions on Strengthening the Ethical Governance of Science and Technology* and the *"14th Five-Year" National Informatization Plan,* etc. established and improved the review mechanism and regulatory legal system for the application of digital technology, made systematic arrangements for the national ethical governance of science and technology, and built an ethical governance system for science and technology.

2) **Artificial intelligence.** China has released documents such as the *Principles for the Governance of New Generation Artificial Intelligence - Developing Responsible Artificial Intelligence, Global Data Security Initiative* and *Code of Ethics for New Generation Artificial Intelligence,* clarifying the framework and action guidelines for AI governance and emphasizing the integration of ethics into the whole life cycle of AI to avoid issues such as prejudice, discrimination, privacy, and information leakage.

3) **Personal privacy protection and algorithmic recommendations.** China has successively issued the *Provisions on the Scope of Necessary Personal Information for Common Types of Mobile Internet Applications* and the *Administrative Provisions on Algorithmic Recommendations for Internet Information Services,* which make provisions for unreasonable applications of algorithms, such as algorithmic discrimination, and "Big data swindling," inducing addiction, to prevent and resolve these issues. The regulations are necessary to prevent and resolve security risks and enhance the level of regulatory capacity.

3 Third stage: promote the modernization of governance systems and capabilities. At present, the legal and policy framework for the development of the digital economy has been formed. The digital market is accelerating its reform and opening up. Digital supervision services have been optimized. Positive progress has been made in the standardization of information technology and cyberspace security, the related discipline development, and the related personnel training. Digital governance capabilities have been significantly enhanced.

1) **Measures of streamlining administration, delegating administrative power, and strengthening supervision were taken to regulate the development of the digital economy.** Important digital economy laws and regulations such as the *Data Security Law* and the *Personal Information Protection Law* were rapidly promulgated. Supervision was implemented at high speed in key areas such as combating monopoly by platforms, data protection, and governance of algorithms. A new supervision system has been formed, effectively regulating the development of the digital economy.

2) **Co-governance by multiple participants reshaped a new model of social governance.** Digital governance has been integrated into the entire process, from urban planning and construction to management. Applying information and digital technology in all aspects of urban governance can boost its rapid modernization.

3) **Government services were optimized to provide higher-quality services for the people in a digital economy**. The construction of a digital government has been accelerated, and multiple government systems have been interconnected. China's "National Integrated Government Service Platform" plays an important role in providing public services. By the end of 2021, the platform has more than 1 billion real-name registered users, covers a total of more than 5.27 million implementation lists of government service items, and has provided identity verification services for local departments more than 2.9 billion times.

5.4 Cooperation Experiences of China, Japan, and the ROK in the Digital Economy

China, Japan, and the ROK are connected by the mountains and seas as well as by some shared history and culture. The three countries have a long cooperation history and a solid cooperation foundation. As the digital economy is increasingly becoming one of the major trends in global development, the three countries deepened their exchanges and cooperation in digital economy-related infrastructure, technology, industries, economy, and culture during the decade between 2011 and 2020. Remarkable results were achieved through such cooperation.

In terms of ICTs and ICT applications, Korea Telecom (KT), China Mobile, and Japan's NTT DoCoMo, as telecommunications operators, strengthened their cooperation in Apps/content, 5G and IoT network technology, artificial intelligence, roaming, and other fields at the Strategic Cooperation Framework Agreement (SCFA) Conference. In 2015, China Mobile, KT, and NTT DoCoMo jointly issued a cooperation statement on developing the 5G technology at the Mobile World Congress held in Barcelona, Spain. Over the past decade, the three companies have commercialized VoLTE roaming and 5G Non-Stand Alone (NSA) roaming through strategic technology cooperation and established an Artificial Intelligence Task Force (TF) to share AI-based best practices in multiple areas such as AI strategy, services, and networks, next-generation artificial intelligence, digital transformation of enterprises, and response to the COVID-19 pandemic.

In terms of international cooperation and standards formulation concerning the digital economy, in April 2013, the China Communications Standards Association (CCSA), the Association of Radio Industries and Businesses (ARIB) of Japan, the Telecommunication Technology Committee (TTC) of Japan, and the Telecommunications Technology Association (TTA) of the ROK jointly participated in the 12th information exchange conference of China, Japan, and the ROK on information and communications standards. A wireless power transfer (WPT) Task Force was established to promote information exchange and cooperation between the three countries in WPT and facilitate the WPT industry's better development. In June 2021, at the 19th Northeast Asia Standards Cooperation Forum, the three countries shared the latest developments in standardization. They discussed their cooperation in standardization in specialized areas such as automatic identification and data collection, cold chain logistics, and advanced manufacturing, as well as their technological cooperation under the ISO/IEC[1] framework. They also reached a consensus on further strengthening pragmatic cooperation in standardization.

In terms of cooperating in industrial digitization, China, Japan, and the ROK have mainly focused on the digital transformation of manufacturing, smart cities, and digital content.

1) **Conducted win-win cooperation in the digitization of manufacturing.** At the China-Japan-Korea Engineering & Technology Conference and the China-Japan-Korea Industries Expo in 2019, the three parties exchanged technological ideas, promoted

sci-tech achievements, and cooperated in industrial and technological innovation in areas such as intelligent manufacturing, high-end equipment, and smart factories. Businesses from the three countries showed their industrial development outcomes in intelligent manufacturing and had some in-depth exchange of ideas through the expo for win-win cooperation.

2) **Jointly improved digital cultural content.** The Trilateral Cultural Content Industry Forum of the three countries has been held for 14 sessions. At the forum, outstanding enterprises engaged in digital content were organized to exchange experiences, discuss content trends, and seek cooperation online. Some of the key areas involved in the forum include online broadcast of performances, flow experience, digital music, and animation. The forum provides a platform for the three countries to discuss the opportunities and paths of cooperation in digital content. The forum also made positive contributions to the pragmatic cooperation between China, Japan, and the ROK.

3) **Shared experiences and strengthened pragmatic cooperation in smart cities.** The virtual seminar of China, Japan, and the ROK on smart cities provides a platform for experts from the three countries to discuss the construction of smart cities. The countries shared and demonstrated their characteristics and experiences so that they could learn from one another and build better smart cities.

Reference

1. China Academy of Information and Communications Technology (CAICT), White Paper on Digital Economy Development in China, 2015 edition-2021 edition, China Academy of Information and Communications Technology.

2. China Academy of Information and Communications Technology (CAICT), White Paper on the New Vision of the Global Digital Economy, 2017 edition-2021 edition, China Aca demy of Information and Communications Technology.

3. China Academy of Information and Communications Technology (CAICT), ICT In-Depth Insights, 2010 edition-2021 edition, China Academy of Information and Communicatio ns Technology.

4. China Academy of Information and Communications Technology (CAICT), Development Report on China's Urban Digital Economy, 2020 edition-2021 edition, Policy and Economics Research Institute of CAICT

1 ISO refers to International Organization for Standardization (ISO), and the IEC refers to International Electrotechnical Commission (IEC).

Chapter

6

Current Status and Future Prospects of Digitization in Japan

RIETI
Research Institute of Economy, Trade & Industry, IAA

Organization: Research Institute of Economy, Trade and Industry

Author:
IWAMOTO Koichi, Research Associate, Research Institute of Economy, Trade and Industry (RIETI)

Contents

Chapter 6 - Current Status and Future Prospects of Digitization in Japan

6.1 Introduction

6.1.1 Definition of the words

Herein, the "digital economy" is defined as "various socioeconomic phenomena caused by the introduction of digital technology." Furthermore, "digital economics" is also defined as "a research area that analyzes such socioeconomic phenomena using economic analytical tools."

The definition of the "digital economy," as agreed among the authors of the three countries, is based on the definition (Note 1) included in the agreement document "G20 Digital Economy Development and Cooperation Initiative" adopted at the G20 Hangzhou Summit in 2016. However, as this report will be open to the public, this definition may be difficult for the general public to understand; thus, it has been simplified herein.

The content of this paper is an analysis using the economic analytical tools of various socioeconomic phenomena that occur due to the introduction of digital technology in Japan.

In this study, specialized economic analysis using advanced economic mathematics, such as analysis via advanced mathematical models and regression analysis using statistical data, is not performed. This is due to the following three reasons:

First, such an analysis complicates the general public's understanding. Second, even if an advanced mathematical model is used, it is seemingly unsuitable for this paper based on its trilateral cooperation theme. Third, statistical analysis is difficult because there is no statistical definition for "digital."

In this paper, two points of digitalization in the telework and manufacturing industries are adopted as the remarkable features of the recent digitization in Japan. These two chapters cite surveys and describe economic trends analytically. By using such a method, consideration is given so that even those who do not have knowledge of economics or digital technology can duly understand.

If many numbers in the questionnaire survey are written in the text, the text will be more difficult for the general public to understand. Therefore, the method of describing the numerical trend analytically was adopted by refraining from using a lot of numbers as much as possible.

6.1.2 Recent trends in Japan

Recently, Japanese people come across articles about digital transformation in various media daily. Deservedly, this phenomenon ought to be regarded as the occurrence of a "digital boom" in contemporary Japan.

It seems that the introduction of digital technology is now at the core of the future strategy of companies considering the development of companies after the coronavirus disease 2019 (COVID-19) pandemic. However, it seems that the awareness of the side-by-side and not-to-miss-the-bus phenomena are working, and these are typical characteristics of Japanese companies.

Seemingly, it is unlikely that the managers of Japanese companies really understand digital technology and promote it with clear goals. Very few companies have a solid and steady management of digital technology.

Germany, a digitally advanced country in Europe, has a strong fear of Google, Apple, Facebook, and Amazon (GAFA). Immediately after 2013, when the "Industrie 4.0" initiative report was announced in Germany, Germans had a national debate on what to do to protect German industry from the threat of GAFA. The conclusion reached is presented as follows:

Originally, Germany is a country where the manufacturing sector is the country's basic core industry. The industry cannot be maintained by only data processing without manufacturing. Even if Germany pursues the same business model as the United States, it cannot compete with the United States, a notion duly understood by the Germans.

Thus, there is no choice but to utilize Germany's advantageous manufacturing technology. Therefore, digitalization in Germany means implementing digital technology in the manufacturing process to increase productivity, as well as in manufactured products to increase added value, differentiate, and increase profits. The Germans arrived at this policy.

Around 2015, many German experts who were discussing this issue agreed on this direction. Once the national consensus was reached on the policy that the country should proceed, Germany did not hesitate. Thereafter, Germany seems to be pushing in that direction. Prof. Dr. Yutaka Matsuo of the University of Tokyo, who is a leading scholar and famous for his research on artificial intelligence (AI) in Japan, has insisted on adopting the same policy in Japan.

However, from a German perspective, it is difficult for Germany to understand in which direction Japan is progressing. Will Japan move toward an industry that only processes data, similar to the United States, or will Japan be based on the manufacturing industry, akin to Germany, and implement digital technology there, or will Japan consider other policies? Unfortunately such deliberations are not held as national discussions in Japan.
If the policy of Japan's future direction is not decided now, digital technology will spread

out and Japan will be unable to concentrate its strengths in any field. Global competition will be comparatively more challenging in the future; thus, if Japan does not concentrate its technological capabilities on one field, it will be difficult for it to survive the fierce global competition.

6.2 Japan Lags Far Behind the World in the Digital Field

The German Academy of Engineering and the German Ministry of Education and Science announced the "Industrie 4.0" project in 2011. In the United States, the years of establishment of each GAFA company are as follows: Amazon 1995, Google 1998, Facebook 2004, and Apple 1976. In May 2016, with the participation of Prime Minister Abe, the "Robot Revolution & Industrial IoT Initiative Council (RRI)" was established as an organization to promote digitization in Japanese industry. The RRI is a counterpart of the German "Industrie 4.0" platform. This Japanese initiative was enshrined approximately five years behind that of Germany and more years behind that of the United States.

However, owing to differences in digital perceptions between large companies and small and medium-sized enterprises (SMEs), and dissimilarities in the perceptions of urban and rural companies, differences in perceptions between companies that deal with international trade goods and are exposed to international competition and companies that target only the domestic market, only a few Japanese companies can compete adequately on the global stage.

The Keidanren "Japan Business Federation" announced the "Society 5.0" concept to promote digitalization in Japanese industries. The concept was taken up by the Japanese government's 5th Science and Technology Basic Plan in January 2016. However, Japan as a whole has fallen behind digitally advanced countries, such as the United States and Germany, in its digitization effort.

One of the reasons is that the managers of Japanese companies are becoming more self-reliant and are unwilling to undertake new challenges. Second, media propaganda has permeated that AI is a scary technology that deprives humans of their jobs (Note 2). Recently, Japanese companies have finally begun to earnestly invest toward the introduction of digital technology because the economy has fallen due to the influence of the COVID-19 pandemic. Japanese companies have clearly understood that digital investment is the only way to get out of the COVID-19 recession.

The introduction of digital technology in Japan is said to be lagging behind compared to digital advanced countries. The reasons are analyzed as follows. The detailed analysis was described in a series of the recent "Information and Communication White Papers of Ministry of Internal Affairs and Communications" and "Economic White Papers of Cabinet Office."

1 Several points have been repeatedly indicated from various existing questionnaire surveys. The two answers, "The managers of Japanese companies do not know what digital is" and "Japanese companies do not have digital human experts," always occupy the top spot of every questionnaire survey.

There are many people who cannot distinguish between the executives of big companies with specialized knowledge of information and communication who have graduated from topmost universities and computer/game geeks.

The lack of Japanese understanding of information and communication technology has facilitated the absence of specialists in the information and communication field who play the role of chief information officer (CIO) and chief data officer (CDO) in Japanese companies. And now, Japanese companies have engendered a situation whereby specialists who understand digital technology in the company are lacking.

2 Owing to the Japanese people's lack of understanding of information and communication technology, many Japanese company managers recognize that digital investment is an avenue to reduce personnel and costs by simply replacing the work performed by humans with machines. It is referred to as a "defensive investment." From the findings of the various questionnaire surveys that have been conducted thus far, this point has been well established.

Certainly, these "defensive investments" are not always denied, but they streamline operations, reduce costs and human input, and do not lead to increased sales.

Even managers of companies who do not understand information and communication technology can easily comprehend the investment of replacing human work with machines. If digital investment is just a human-to-machine alternative, a person may perhaps feel that he does not have to force the investment, he can let low-cost workers do their work same as before, and he does not feel the need to make the work of low-cost people easier.

If a person wants to reduce costs, he should only replace high-paying regular employees with non-regular cheaper workers; rather, he should not need to invest in digital technology. Therefore, it is highly possible that digital investment is delayed.

The mainstream of digital investment by Japanese companies entails "cost and personnel reduction," and this is referred to as "defensive investment." Digital investment in Japan does not follow the direction of "development of new products and/or businesses," which is regarded as "aggressive investment." This tendency of

Japanese companies has been clarified by various surveys in the past, and this situation remains unchanged.

The investment of "cost and personnel reduction" has a small return on investment, and despite the high investment amount, the profit generated is very minimal. Moreover, the employees are skeptical vis-à-vis their job security, and the atmosphere of the company becomes dark. This tendency of Japanese companies is the biggest reason why their digital investment lags globally.

So why is "digital investment that ensues cost reduction and dismisses employees" the mainstream of digital investment in Japan? In Japan, the subcontracting structure called "Keiretsu" is common. Approximately three-quarters of SMEs are said to be under the umbrella of "Keiretsu" of the affiliate big companies.

Small and medium-sized enterprises under the umbrella of "Keiretsu" receive orders from the parent company, and if they produce an ordered fixed amount, the parent company will buy the entire finished product. That is, there is no need to research and develop new technologies or products, and there is no need to carry out sales activities. Such subcontracting SMEs only have production plants. That is, the factory is the company. The parent company always demands cost reduction, but very stable management is possible.

In other words, the lack of progress in digital investment and the existence of a subcontracting structure, that is, "Keiretsu," in Japan have the same roots.

Moreover, for the past 20 years, the added value of Japanese companies as a whole has hardly increased. The gross domestic product (GDP) in the United States and China is on the rise, but Japan's GDP is almost constant and unchanged. That is, as the added value of the large parent companies has not increased, the orders to subcontractors have not increased. Therefore, digital investment by subcontractors will inevitably turn toward "defensive investment."

The entire Japanese economy may be forecasted to shrink because the population is declining and the overall Japanese market tends to shrink. Under these circumstances, if "defensive digital investment" becomes mainstream, the contraction of the Japanese economy will accelerate.

In other words, for Japanese companies to expand their digital investment, they must break away from the subcontracting structure, sell new products, and promote "aggressive digital investment" that develops new business models.

Even if doing nothing to change the strict subcontracting structure other than delivering products to the parent company, just a little effort is required to sell a new product to another new customer. Thus, digital technology must be used in this scenario.

For example, a company's sales were 100 for a long time. If the order from the parent company dropped to 90, but made an "aggressive investment" of digital technology, developed a new product, and 20 new sales are generated, the total sales will be 110. As a result, employees will feel more excited for new business, wages will rise, bonuses will increase, and they will feel happy.

3 In Japan, there are extremely few specialists in the information and communication field among user companies. This point has also been clarified and reported several times in various past questionnaire surveys. This problem is serious.

Regardless of the excellence of the digital talent in the digital supply company, they will be unable to exhibit their talent unless the user company orders the advanced system. If the user company's order is merely to update an old system or build a system that simply replaces human work with a machine, the supplier company must follow the instructions. Over time, the capabilities of the digital talent will decline.

To develop the digital talent, it is necessary to give them difficult jobs. Without such jobs, their talents will only diminish.

Both the user company and the supply-side company will develop only when the user company considers information and communication technology as an important future development technology of the company and regards digital investment as a necessity for the development of the company.

Until now, even if a user company hires excellent information and communication experts, personnel affairs that force the experts to only manage the computer in the narrow computer room have been performed in Japanese companies all over Japan for a long time. As a result of such personnel affairs, the accumulation of excellent information and communication experts in user companies has been delayed.

Even if it suddenly becomes a digital boom in the present, it is difficult to respond for a company to market need. Although a person who is not an information and communication expert has become the CIO and CDO of the company as a result of the conventional “billiard personnel,” he does not know what to do. Recently, a media platform has referred to such people “name-only CIOs.”

As the user company does not have sufficient digital human resources in-house, the company hires mid-career personnel from the outside. However, the hiring side often does not know what digital human resources are, so only programmers and system engineers are hired. Thus, the company faces challenges and is driven into a dead end and confused about what actions to take.

Digitalization is not something that can be done easily in a short period of time.

4 In Japanese companies, there are a few specialists in the digital field, and the management is unfamiliar with digital technology. They work side by side with other companies to introduce digital technology. For the managers of such Japanese companies, it seems that it is almost impossible to understand the situation where a big business is created within a short period of time by using only information and communication technology without resorting to certain concepts, such as GAFA in the United States.

According to the Nomura Research Institute's (2021) "Survey on Digitization of Small and Medium Enterprises," the highest ranking issue for promoting digitization is "Analog culture and values are firmly established."

According to a survey by the Institute for a Global Society (Note 3), 38% of people in their 40s said they did not want to get involved in the introduction of digital technology. That number is prominent compared to other countries worldwide. If the sense of values that Japanese people have do not change, it may be impossible to adequately utilize digital technology.

According to the latest questionnaire survey results (Note 4) published by the Nihon Keizai Shimbun on March 7, 2022, in response to the question, "What is the impact of Internet technology on society?", 27% said it had a positive impact, 22% said it had a bad impact, and 43% had no opinion. There are still few people who think it is favorable, while almost the same number of people do not like it.

6.3 Current Status of Telework in Japan

6.3.1 The situation of telework in Japan, as shown in the questionnaire survey

Humans have no choice but to coexist with COVID-19 for the time being. Moreover, compared to MERS and SARS, the mutation of COVID-19 in recent years is becoming stronger quickly and rapidly, and there is a possibility that more powerful viruses will appear in the future. Thus, we need to prepare for the next new virus.

With the spread of COVID-19 infections, telework is expanding as a major trend in the digitization of the Fourth Industrial Revolution in Japanese companies. The recent trends that can be seen from various questionnaire surveys are presented as follows:

Since the beginning of the COVID-19 pandemic, many questionnaire surveys on telework have been conducted in Japan. Various surveys, such as those targeting a specific field and those focusing on overall trends, were conducted frequently. Therefore, it is possible to grasp the detailed changes in the actual situation of telework in Japan over time (Note 5).

1 In SMEs, the implementation rate of telework is extremely low. The background seems to be that the environment for carrying out telework is unprepared, and the purpose of why teleworking is not clearly indicated by the upper management of the company. In addition, it seems that the work content is unsuitable for telework.

It is assumed that it will be difficult for SMEs to respond even if a worker is suddenly ordered to telework owing to the emergence of COVID-19, due to the lack of a prior preparation of the working environment for telework, .

2 Approximately a third of Japanese companies answer that the labor productivity of their workers has declined in telework. As the telework environment has not been prepared beforehand, it seems that the harmful effects of sudden telework have come out strongly.

3 Nevertheless, there are a certain number of people who support telework and who want to continue telework even after the convergence of COVID-19. They felt that their current way of working was inefficient, but they lacked the opportunity to say it to the company or were powerless to reform the situation.

However, taking the introduction of telework due to COVID-19 as a good opportunity for such people, work style reforms that transform inefficient work styles into efficient systems will be carried out, and it will be possible to work in a comfortable and conducive environment that they have been anticipating for a long time until now. The essence of telework can be asserted to be evident in this scenario.

4 Japanese companies have not "optimized" people's work places thus far. The system adopted was a "mass group method" wherein everyone was gathered in the same place and worked from 9:00 to 17:00 of the same time. Until now, no one wondered that the working style that was prevalent in Japan during the Meiji era was the optimized style that would bring out the best performance for Japanese companies.

Until now, the mechanism in Japan involved mass education of several people to mass-produce average products. Thus far, Japanese people believed that the method was the best.

Japanese companies believed without any doubt till now that the old-fashioned working style brought out the most value of people's abilities and maximized their performance, while Japanese people were believed to have the best working style, even until now. However, COVID-19 raised considerable doubts about such a long-standing old working style.

With the spread of COVID-19, when telework began to be widely adopted in Japan, numerous people, including young people, women, and those engaged in work that could be mostly done without going to a company, supported the flexible working style of telework. Notably, this group of individuals want to continue with this working style, even after the COVID-19 infection rate has begun decreasing.

As time goes by, the number of people who support the flexibility of telework is increasing because they can choose their own working hours and places, rather than commuting long distances every day from home to company and working at a company for a fixed time every day.

However, with the apparent convergence of COVID-19 cases, the harmful effects of telework such as "lack of communication" and "lack of business that requires face-to-face interactions" have become evident; thus, the inclination to transition back to the old working style is increasing on the management side.

With the expansion of COVID-19, telework was forcibly carried out by companies without any prior preparation. Therefore, transitioning back to the old working style as COVID-19 cases converge is increasingly considered. The managements of companies mostly believe that the non-telework, pre-COVID-19 work style is the normal standard.

Although there may have been disadvantages to telework on the one hand, there must have been advantages on the other hand, and there are very few Japanese companies that properly analyze and evaluate the advantages and disadvantages of telework and try to incorporate the advantages. This is rather surprising and regrettable. Surveys that clearly show such attempts or movements are seemingly lacking. It is rather unfortunate that even though we conducted a large-scale telework experiment in connection with COVID-19, no merit was gleaned from it.

6.3.2 Measures necessary for telework to increase productivity

In December 2021, the Japan Productivity Center published the "International Comparison of Labor Productivity 2021." It is analyzed and published annually based on the statistics obtained from the Organization for Economic Cooperation and Development (OECD) (Note 6).

Japan's hourly labor productivity in 2020 is equivalent to 60% of that of the United States, ranking 23rd among 38 OECD member countries. It was 21st in 2019. Japan's per capita labor productivity is at the same level as Eastern Europe and the Baltic countries such as Poland and Estonia, and it ranks 28th out of 38 OECD member countries. It was 26th in 2019. Both are the lowest rankings since 1970.

Considering Japan's manufacturing industry, a sector that many Japanese still believe that Japan has competitiveness, its labor productivity level in 2019, that is, the added value per worker, is 65% of that of the United States. It is ranked 18th among the 31 major countries that are members of the OECD. There is no longer a vestige of "Japan, the manufacturing powerhouse."

As a result of long-term low labor productivity levels, per capita GDP (exchange rate basis, dollar) peaked at the 2nd rank in 2000 and reached the 24th rank of US$ 40,704 in 2021. This is merely two-thirds the value of that of the United States (source; International Monetary Fund).

The problem with Japan's labor productivity is not only that it is low, but that it has hardly grown in the last 20 years. It is referred to as the "lost 20 years of Japan." Prime Minister Kishida has argued that wages have not increased in Japan for the past 20 years, and the biggest reason for this is that labor productivity is low and has not increased. Prime Minister Kishida has set "growth and distribution policy" as the Kishida administration's main economic policy, and his administration has set out to increase labor productivity, grow the economy, and increase the wages of the people as a benefit. Prime Minister Kishida strongly expects that digitalization and decarbonization have the greatest effect. Thus, people refer to this parlance as the "DX and GX strategy of Japan." DX implies digital transformation, while GX means green transformation.

If telework is used appropriately, it will be possible to dramatically increase labor productivity. This is the claim of Prof. Dr. Kotaro Tsuru of Keio University, a leading Japanese labor economist.

In the United States, GAFA is actively introducing telework as the most powerful method for the rapid development of the company in the next era. Most of the employees are targeted for telework. American companies really understand the importance of the core of telework.

They understand that to be highly productive with telework, they need to prepare carefully. Without that preparation in Japan, if an employee suddenly works at home in an environment where the COVID-19 infection has spread, it cannot be successful. Based on the results of the questionnaire survey conducted in Japan, it is unsurprising why the number of respondents who answer that productivity has decreased is approximately one-third of the total.

However, regardless of the amount of money, time, and efforts spent on telework preparation, there is a last existing challenge.

For example, when a new employee joins a company, if he or she teleworks from home all the time, he or she rarely meets other employees or seniors and cannot feel a sense of unity or solidarity as a member of the same company. There is a sense of solidarity created by employees belonging to the same team and doing the same work. However, it is difficult to create it only by telework.

The above-stated points are the last remaining problems that can never be realized by teleworking alone, irrespective of how hard we try.

This problem must be consciously complemented by the company. In other words, instead of teleworking 24 hours a day, 365 days a year, employees can go to the company on a regular basis to solve this problem. In other words, telework can increase productivity by combining it with face-to-face work styles. It may sound rather paradoxical, but Prof. Kotaro Tsuru also argues that this is the key to establishing telework and improving labor productivity.

As mentioned above, to promote and establish telework and improve productivity is very laborious and requires considerable effort. Now that COVID-19 cases seems to be converging, there is a movement to stop teleworking and return back to the old working style in Japan.

However, to increase the productivity of office work of Japanese companies, which are the least labor productive worldwide, and to secure a more comfortable working environment, many labor economics experts believe telework to be the "last ticket" left in Japan.

Japanese companies have done a spectacular experiment with telework during the COVID-19 pandemic. Therefore, in the future, many labor economics experts believe it will be important for Japan to carefully create a working style and environment for telework, while diligently verifying the advantages and disadvantages of telework experiments.

According to the latest questionnaire survey results (Note 3) published by the Nihon Keizai Shimbun on March 7, 2022, in response to the question "Should telework be established?", 54% said it "should be established" and 38% said it "should not be established." Contrary to the intentions of corporate managers, employees are rather inclined toward telework.

6.4 The Situation of the Manufacturing Industry Where Digitalization Is the Most Advanced in Japan

Since the implementation of digital technology in the manufacturing industry began, various proposals and attempts have been made in Japan.

Among them, those that are difficult to put into practical use, those that require investment amounts that are too large to recover, and those that are not realistic have disappeared. Consequently, contemporary Japan can envisage a form that is likely to be put into practical use as a business to make profit. It is classified into following four aspects:

1 Factory production site

Using the following method, the operator can comprehensively grasp the operating status of all the relevant details in the factory in real time. This method facilitates the identification of low productivity and inefficiency points, clarification of the causes via AI, and increment of productivity in all areas of the factory.

a) The operating status of mechanical equipment and production lines can be grasped by extracting electrical signals, sensing with sensors, and image recognition with AI cameras.
b) The movement of human beings is grasped by the AI camera.

c) The movements of raw materials, parts, and semi-finished products are grasped by attaching radio frequency identification tags to them.

For example, Mitsubishi Electric's "e-F@ctory" and Hitachi's "Lumada" systems are intended to be mounted on existing production lines to increase the operating ratio or make machines unstoppable without disorder. In the strong sales of the two system products, the great demand for digital technology that renders production machines unstoppable is evident.

2 Product sales

Currently, average products for average consumers are mass-produced and mass-sold in large quantities. This method is called the mass production and mass sales system. However, with the development of digital technologies that are "faster, have larger capacity, cheaper, and smaller," it will be possible to manufacture and sell products that meet each individual's needs. Thus, the so-called "customization" becomes possible.

Artificial intelligence can read the needs and orientations of each individual from the operating information of each individual's application and the input information to SNS, and the company can carry out marketing that suits each individual.

For example, some sensors are embedded in shoes, and AI grasps the usage status of the shoe. Just before a shoe wears out and becomes unusable, a company can send an alarm to an individual's smartphone that they will soon be unable to wear it and some shoe promotions that meet their individual needs. If the company also includes a slogan, "If you buy this shoe now, you can get it ○% cheaper," most people who receive the message perhaps could buy new shoes.

Moreover, if AI adopts a price customization method that changes the price based on the needs and orientation of the individual, it can be possible for the company to optimize the product price for each individual and achieve the maximum profit.

Now, the customized advertising and sales methods used by some Internet companies will be applicable to all products and all people in a larger and more detailed manner. Digital technology enables the transition from mass production and mass sales to customized production and customized sales.

3 Implementation of digital technology in products

This is a method of implementing digital technology in a product to add new value to it, differentiate it from other companies, and make a profit. For example, an electric signal taken out from an electronic circuit chip in a heavy machine is sent to a satellite, and the operating status of the heavy machine is grasped at the head office. Immediately before the heavy equipment breaks down in a deep mountain or far desert area, a service person rushes to the heavy machine to replace the parts, and the heavy machine continues its functions. If a heavy machine breaks down and becomes stuck in an open pit in the deep mountains or in the far desert, huge losses will occur. This is a system adopted by Komatsu Co.

Sensors are embedded in various parts of the machine tool such that the operating status of the machine tool anywhere in the world is grasped at the head office of Mori Seiki. Co., and just before the jig wears, a service person ventures to replace the parts and the machine tool does not stop. If even one machine tool in the production line breaks down and becomes stuck, the entire factory will be shut down and huge losses will occur.

4 After-sales maintenance

Selling products to earn income is the core business form of current manufacturing companies, but after-sales maintenance is expected to expand as the second largest revenue after sales.

Until now, the manufacturing industry has mainly sold out products. However, currently, when products are widespread and the market is matured, sales amount like before cannot be expected. After-sales maintenance has newly attracted attention as another revenue-generating avenue.

The background to such circumstances is that the technical environment has been set up to make after-sales maintenance a big revenue platform. The method has been established by utilizing digital technology to provide new value to customers and profit for companies.

Till now, after-sales service is conceptualized as, "if the sold product breaks, a service person will rush to replace the parts and repair them." However, companies that have changed the image of after-sales service and built new business models are becoming successful. A company that collects a wide variety of data wins.

The machine product is delivered from production company to user company, while the operating status data are obtained and analyzed via digital technology in real time. Many companies have already developed such services, but it is difficult to increase sales by just providing services for their products. The amount and variety of data that can be collected is the most important factor, and the more various data are collected, the more sophisticated and multifaceted services that can be created through AI and provided to customers.

If one collects data from not only the products sold by one's company but also all other companies' as well as foreign products and analyze them with AI, one can create very high quality services. If Japanese companies do not take on the challenge in this field, they will be subcontractors who only provide data to United States and European companies, and the most robust merit may be taken up by Western companies.

6.5 Government of Japan's Policy in the Digital Field

6.5.1 "Digital Garden City State Concept" promoted by Prime Minister Kishida

In recent years, every time a new Prime Minister emerges, a digital policy representing that administration is adopted. The policy of the previous Prime Minister Suga's era was the establishment of the "Digital Agency," and the policy of the previous Prime Minister Abe's era was the "Smart City Concept." The policy of the current Prime Minister Kishida's era is the "Digital Garden City State Concept," which is described below. (Note 7)

1 Overall picture of policies related to the "Digital Garden City State Concept"

It is the most important pillar of the growth strategy for the realization of "new capitalism," and it presents a new image of the region with convenience and charm, while maintaining the affluence of the region.

Through industry–government–academia collaboration, the Japanese government will solve the problems faced by local governments through digital implementation and realize a fulfilling life in which no one is left behind and everyone can enjoy the benefits of digitalization. The Japanese government aims to revitalize the region by exploiting the individuality of the region, realize bottom-up growth from the region to the whole country, and engender a sustainable economic society.

The Japanese government will proactively develop a common infrastructure, while local governments will promote digital implementation on the premise of effective utilization of these and develop various services according to the actual situation.

a) Development of digital infrastructure

This entails the promotion of the development of digital infrastructures such as 5G and data centers. Under the initiative of the Japanese government, several digital infrastructures, including common ID platform, data linkage platform, and government cloud, have been implemented.

b) Fostering and securing digital human resources

By the end of 2022, the annual plan of promoting the development of digital human resources that are active in the region has been conceptualized. This plan entails the gradual building of a system that can train 250,000 people yearly, increasing to 450,000 people annually by the end of 2024 and 2.3 million people by 2026.

c) Digital implementation to solve local issues

For each field such as transportation, agriculture, industry, medical care, education, and disaster prevention, nationwide efforts to effectively solve regional issues by utilizing digital detailed support are essential. Meanwhile, it will be a hub to promote community development. The management personnel also warrant expansion to 100 regions in Japan.

d) Efforts to prevent anyone from being left behind

This is to ensure that anyone can benefit from digitalization, regardless of age, gender, geographic constraints, and so on, to realize the "no one left behind" mantra in the digital society.

2 Direction of future study

Looking ahead to the future image that the concept is aiming for while listening to the voices of the field in a roundtable discussion, the Japanese government will dig deeper into issues and needs, as well as enhance and deepen related measures, including the regional revitalization measures so far and maturity of efforts in the region. The

Japanese government will also consider how to provide support according to the situation and how to send an easy-to-understand message to the people.

The Japanese government will deepen the measures that should be taken in the medium to long term, including the rapid implementation of services, the promotion of data linkage between sectors, the progress management approach utilizing key performance indicators, and the concrete "Digital Garden City State Concept" that should be implemented. This will be summarized in the spring of 2022.

6.5.2 Trilateral cooperation in the digital field carried out by the Government of Japan

Including the cooperation with China and South Korea in the digital field, all international cooperation projects have wholly stopped due to the spread of the COVID-19 infection since 2020.

The most recent initiative for cooperation with China is the 2019 Japan–China Manufacturing Smart Seminar. The contents are introduced below.

The Ministry of Economy, Trade, and Industry of Japan held the "3rd Japan–China Smart Manufacturing Exchange Seminar" in the Beijing Economic and Technological Development Zone, Beijing, China, on December 20, 2019, together with the Ministry of Industry and Information Technology of China.

This seminar was held based on the 1st Japan–China Industry Ministers' Dialogue, June 10, 2019, held in Tokyo by the Minister of Economy, Trade and Industry, Hiroshige Seko (then) and Minister of Industry and Information Technology, Miao Wei. In this dialogue, both Japan and China reached a common understanding through extensive and deep discussions on concerns such as autonomous driving, smart manufacturing, industrial security, ultra-high-definition television, and business environment improvement. Both Japan and China have agreed to hold the 3rd Japan–China Smart Manufacturing Exchange Seminar within 2019.

The purpose of this seminar was to solve the problems inherent in the shift to smart systems and digitalization, as well as the shortage of human resources that both Japanese and Chinese manufacturing industries face. Therefore, both Japan and China discussed experiences and issues for smart manufacturing solutions, standardization, human resource development, and dissemination to SMEs. Furthermore, both Japan and China deepened discussions and exchanges on the application of new technologies such as AI and the Internet of things (IoT) in smart manufacturing. Both Japan and China agreed to promote public–private exchanges and cooperation in the digital field.

This seminar was held jointly by both Japanese and Chinese organizations. These organizations are the Japan–China Economic Association, the National Research and Development Corporation New Energy and Industrial Technology Development Organization, the Machinery Industry Instruments and Appliances Research Institute, the China Electronics Information Industry Development Institute, and the Beijing Economic and Technological Development Zone Management Committee.

On the day of the seminar, Deputy Director-General Yoji Ueda of the Manufacturing Industry Bureau from the Ministry of Economy, Trade and Industry, Deputy Chairman Rui Hua Wang from the Industrial Communication Department, and so on participated, and from the Japanese side, the Industrial Value Chain Initiative, NEC, Omron, Toshiba, Hitachi, Mitsubishi Electric, Yaskawa Electric, and so on took the stage. From the Chinese side, China Information and Communication Research Institute, China Electronics Technology Standardization Research Institute, Times Electric Co., Ltd., Wari Toki Technology Group, Koten Cloud Technology Development Co., Ltd., and so on were on stage. The participants discussed the status and future direction of each business, application of new technologies, cooperation between industry organizations, and measures for making SMEs smarter.

In addition, the seminar participants took this opportunity to tour the facilities and companies in the Beijing Economic and Technological Development Zone to deepen mutual understanding among the participants.

Cooperation between Japan and South Korea has not been undertaken since 2018.

Regarding the cooperation projects before 2018, many government officials have been replaced due to personnel changes, and accurate information is currently unavailable.

6.6 Conclusion

Robots are machines that replace human manual labor and act as human hands and feet. Artificial intelligence is a system that replaces human brain labor, and because it has the characteristic of having “eyes,” it replaces the labor that humans perform using their eyes and brain.

Till now, robots have been introduced to the field and have replaced manual labor mainly in the manufacturing factory. At the production site in the factory of a major big company, there are merely a few people. The main role of people is to monitor whether the robot is moving normally and to investigate the cause and repair it if the robot does not move as determined in advance.

Artificial intelligence has now been introduced in office work, and eventually, like the production factory sites now, the main role of human beings is to monitor whether AI machines are functioning properly. When an unexpected situation occurs, humans will deal with the trouble. It is envisaged that the same division of roles between machines and humans at the production factory site now will appear as it is in the office work environment.

In Japan, because digitization has been delayed compared to digitally advanced countries, the government and business circles have issued orders to accelerate digitization. In addition, digitalization is the trump card as an economic recovery measure to escape the economic influence of the COVID-19 pandemic, and digital investment is accelerating in contemporary Japan.

Annotation

Note 1)
The definition of "digital economy" included in the agreement document "G20 Digital Economy Development and Cooperation Initiative" at G20 in 2016 is given as follows:

"The digital economy refers to a broad range of economic activities that include using digitized information and knowledge as the key factor of production, modern information networks as an important activity space, and the effective use of information and communication technology (ICT) as an important driver of productivity growth and economic structural optimization. Internet, cloud computing, big data, Internet of Things (IoT), fintech and other new digital technologies are used to collect, store, analyze, and share information digitally and transform social interactions. Digitized, networked and intelligent ICTs enable modern economic activities to be more flexible, agile and smart."

Note 2)

The Japanese mass media highlighted only one aspect of the following paper and touted that artificial intelligence would take away half the jobs of employers.

Frey, C. B., & Osborne, M. A. (2017). The future of employment: how susceptible are jobs to computerization? Oxford University Programme on the Impacts of Future Technology, Technological Forecasting and Social Change, vol. 114, issue C, 254–280 2013.

Frey, C. B., & Osborne, M. A. (2013). The future of employment: how susceptible are jobs to computerization? 1–72, Oxford Press.

Note 3)

The subject of the survey by the Institute for a Global Society was companies with more than 1,000 employees.

Note 4)

Nikkei Research randomly selected men and women over the age of 18 from November to December 2021 and mailed them a questionnaire. Responses were obtained from 1661 people with a recovery rate of 55.4%.

Note 5)

Since the beginning of the COVID-19 infection, the Cabinet Office's "Economic White Paper" has taken up the theme of telework every year, conducted a questionnaire survey, and analyzed the survey results, which are the 2020 and 2021 editions.

https://www5.cao.go.jp/keizai3/whitepaper.html

The Persol Research Institute, a private company research institute on labor issues, regularly conducts a questionnaire survey on telework, "Urgent survey on the impact of new coronavirus countermeasures on telework." The newest survey is the 6th survey published on March 1, 2022.

6th Survey Announced on March 1, 2022
https://rc.persol-group.co.jp/thinktank/data/telework-survey6.html

5th Survey Announced on August 31, 2021
https://rc.persol-group.co.jp/thinktank/data/telework-survey5.html

4th Survey Announced on January 21, 2021
https://rc.persol-group.co.jp/thinktank/data/telework-survey4.html

. . . .

In addition to the questionnaire surveys listed above, there are many surveys conducted by economic organizations, research organizations, think tanks, mass media, and so on, but they are omitted here.

Note 6)
Labor productivity is the value added divided by the number of workers.

Note 7)
On June 7, 2022, Prime Minister Kishida announced the "Grand Design and Implementation Plan for New Capitalism," which is the basic policy of the Kishida administration's future economic policy. The target is to realize a new capitalism with the concepts of "a virtuous cycle of growth and distribution" and "development of a new society after the COVID-19".

The DX strategy and GX strategy described above are described in detail on pages 20-23, and the “Digital Garden City State Concept” is described in detail on pages 26-29.

For the original text, please see the website of the Prime Minister's Office and the Cabinet Secretariat.
https://www.cas.go.jp/jp/seisaku/atarashii_sihonsyugi/pdf/ap2022.pdf

Reference

Cabinet Office, Economic White Papers 2020, 2021.

Ministry of Internal Affairs and Communications, Information and Communication White Papers 2020, 2021.

Nomura Research Institute (2021), "Survey on Digitization of Small and Medium Enterprises 2020", survey commissioned by the Small and Medium Enterprise Agency of Japanese Government, March 2021.

Chapter

7

The Digital Economy of Korea and the Digital New Deal of Korea

Organization: Korea Information Society Development Institute

Authors:

LEE Joonbae, Associate Fellow & Head of the Department of Digital Economy Research, Korea Information Society Development Institute (KISDI)

YOON Sungwook, Associate Research Fellow, Korea Information Society Development Institute (KISDI)

JANG Jaeyoung, Associate Research Fellow, Korea Information Society Development Institute (KISDI)

Contents

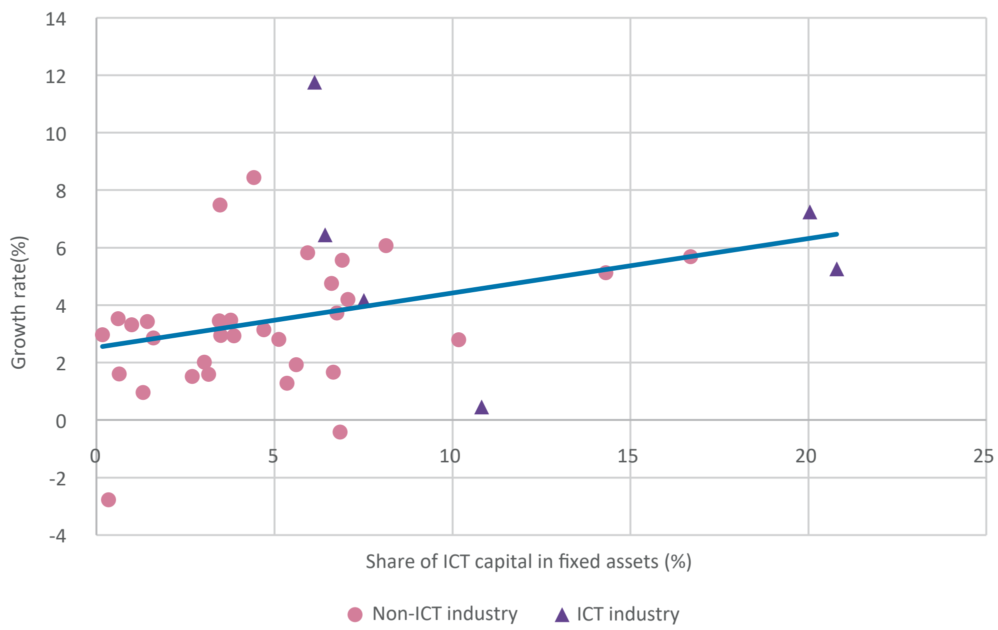
Chapter 7 - The Digital Economy of Korea and the Digital New Deal of Korea

7.1 The Digital Economy of Korea

7.1.1 Value-added and growth

The digital economy has led to Korea's economic growth over the last two decades. Sectors with a significant growth rate recorded in the last two decades are ICT industries, or industries with a considerable share of ICT capital, as shown in figure 1. The GDP share of ICT industries was 5% in 2000, which increased to 11% in 2018. Specifically, Electronic component manufacturing's annual growth rate is 11.75%, IT service and information service's growth rate is 7.24%, and the ICT equipment sector is 6.44%. These industries can be described as manufacturing and service industries that facilitate information processing and communication through their products.

Figure 1 Relationship between industry growth and ICT intensity (2000-2018)



Data: KISDI National Accounts

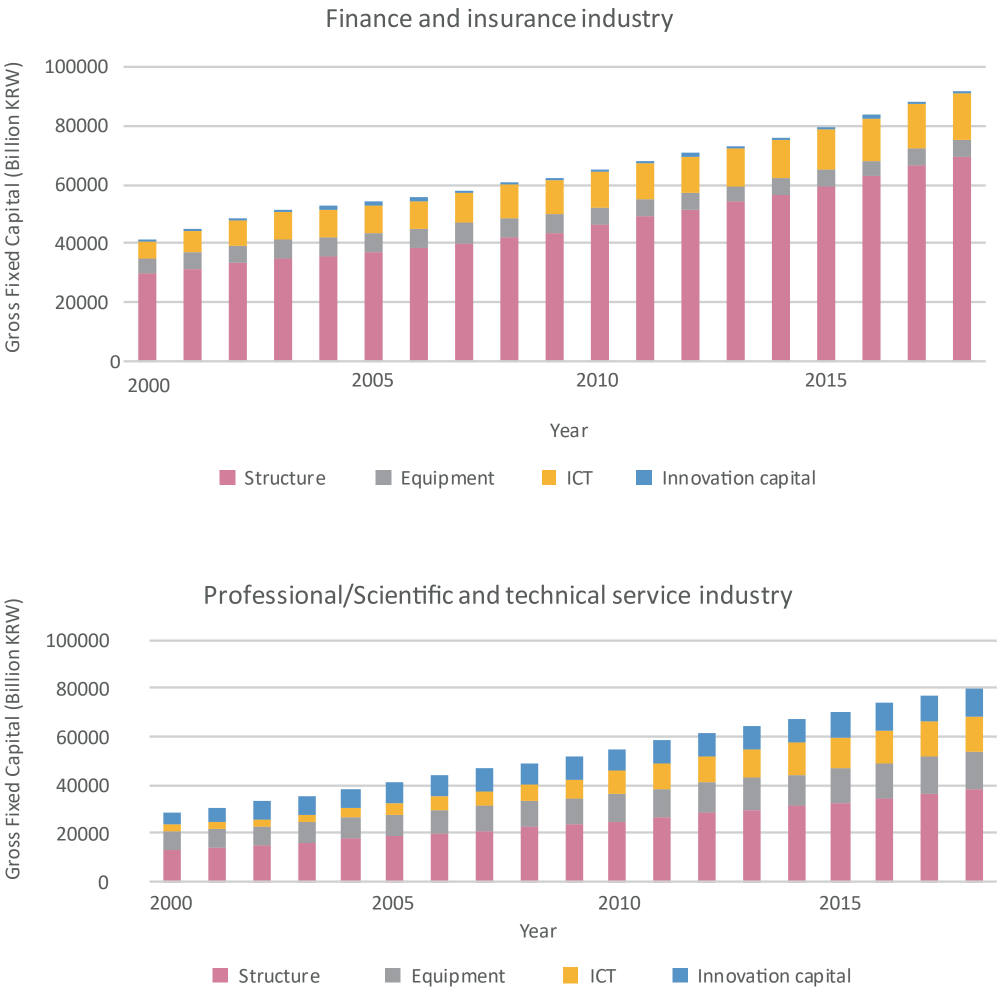
The ICT industry does not necessarily have a significant share of ICT capital. For example, the ICT manufacturing sector relies heavily on equipment and structural capital rather than ICT capital. One of the most popular products in these sectors is an integrated circuit that requires various equipment for testing, manufacturing, packaging, and space.

Figure 2 Semi-conductor plant in Korea

Source: The Korea Times (2021)

With the outstanding growth of ICT sectors during this period, sectors with higher capital intensity also show remarkable growth. For example, the finance and insurance industries and professional, scientific, and technical service industries grow 5.67% and 5.11%, respectively. These sectors experienced considerable digital transformation during this period. ATMs and online banking are now prevalent. Digital payments and fintech have replaced traditional financial transactions. Big data, cloud computing services, and artificial intelligence also play an essential role in innovation and research. Figure 3 shows that ICT capital share in the finance sector increased from 14 % to 17%, and ICT capital share in professional, scientific, and technical service industries increased from 10% to 19%.

Figure 3 Capital composition of the finance and insurance industry and professional scientific and technical service industry



Data: KISDI National Accounts

7.1.2 Investment

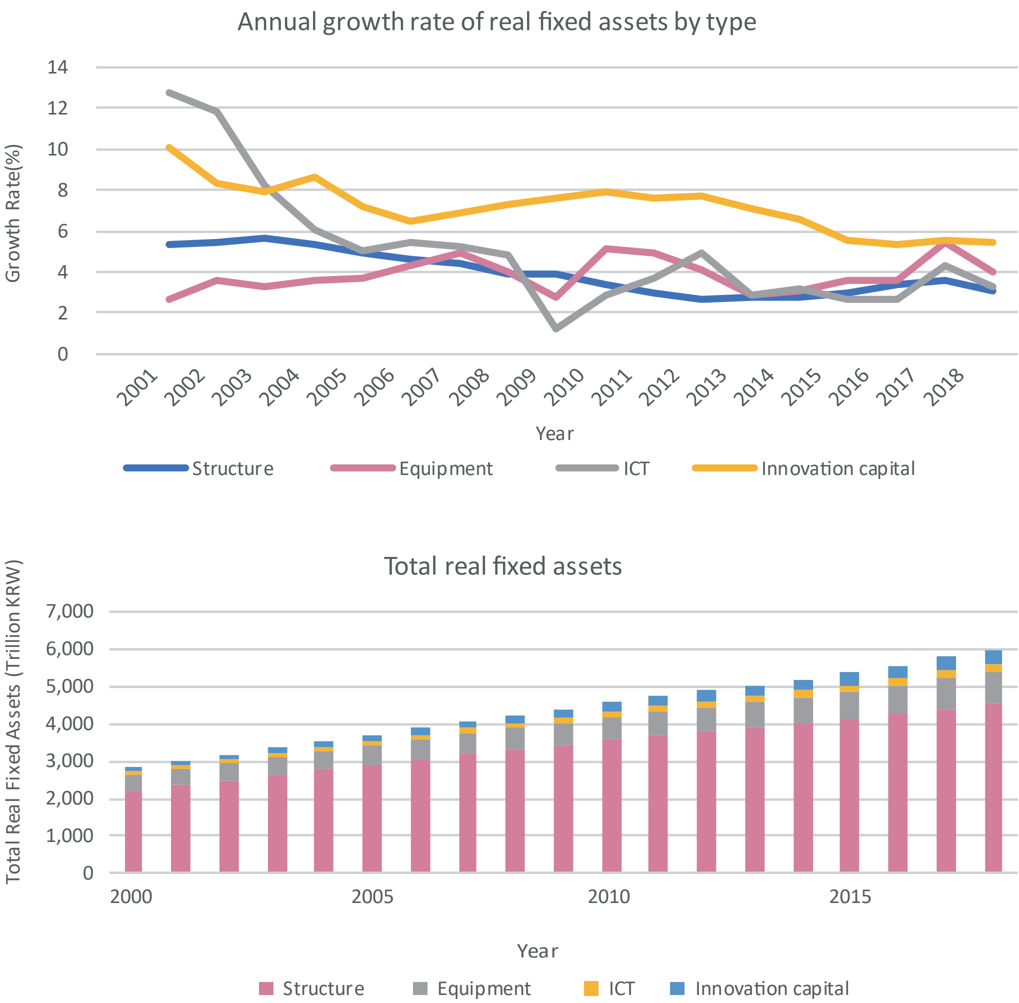
We used Korea Information Society Development Institute (KISDI) national accounts to examine the digital economy more closely. The KISDI classifies fixed assets into four large classes with national accounts data provided by the Bank of Korea: structure, equipment, ICT, and innovation. These classes consisted of 12 lower-level classes. For example, they separated 'Computing and communication equipment from equipment assets and 'Software' from Intellectual property and regarded them as a type of ICT investment. Table 1 summarises these classifications.

Table 1 | KISDI National accounts asset classification

Type of fixed assets	Lower-level type
Structures	Residential structure
	Nonresidential structures
	Nonbuilding structures
Equipment	Transportation equipment
	Other equipment, including industrial equipment
	Nurturing organism
ICT	Computers and peripheral equipment
	Communication equipment
	Analysis equipment
	Software
Innovation	Research and development
	Intellectual property products

As shown in figure 4, the ICT investment growth rate started high in the early 2000s with 13% growth rates and kept declining, but consistently higher than traditional investments (equipment and structure investment). Meanwhile, innovation-related investments, including intellectual property production, grew by 7.17% annually. Because the ICT investment rate is lower than innovation-related investment, the share of ICT assets remains unchanged at 3%, but the share of equipment and structure decreases by 3%.

Figure 4 Real fixed investment by type of fixed assets



7.1.3 Import export statistics

Three Asian economies–Korea, Japan, and China–experienced growth miracles at different times. There is a small consensus that successful industrialisation and export strategies (or policies) contribute to the East Asia Miracle. In the case of Korea, the manufacturing sector played an important role during the '70s and '80s. The major export products during this period were textiles, electronics, and ships. In the early 80s, both the private and public sectors began to pay attention to semi-conductor.

Since 2000, while popular traditional export products, such as textiles, ships, raw materials, and steel, have remained unchanged in the global market, ICT-related products, such as integrated circuits, telephones, and other electronics, have led Korean exports. ICT-related products grew more than twice as fast as non-ICT products. As a result, ICT-related products that accounted for 14% of exports in 2000 now account for more than 37% of exports. During the COVID-19 pandemic, although the economic crisis decreased overall exports, the increased demand for digital products and services from the global market increased ICT product exports. As a result, Korea's economic growth remained the highest among OECD countries.

In addition to the great performance of ICT exports, the import share of ICT products continued to increase but was significantly lower than the trend of exports. This implies that Korea has a comparative advantage in ICT products but relies heavily on other tradable goods, such as agriculture, mineral products, and chemical products.

Figure 5 Exports of ICT and non-ICT products (Korea)

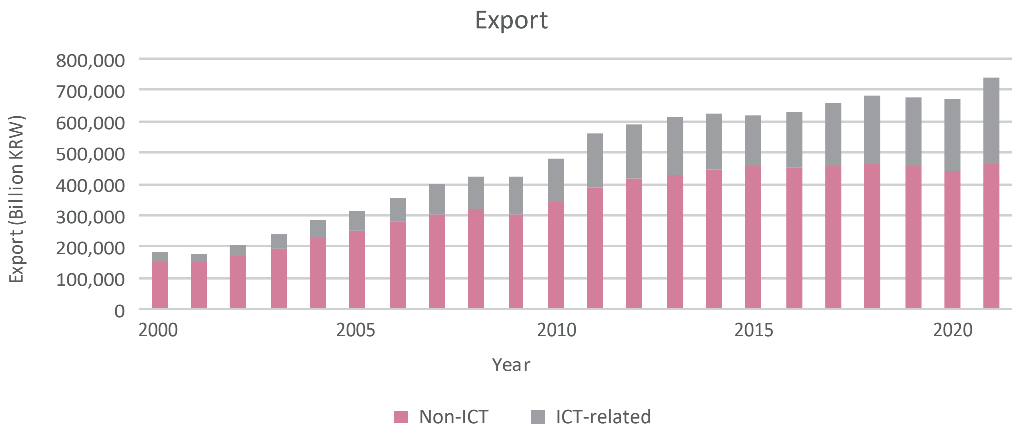
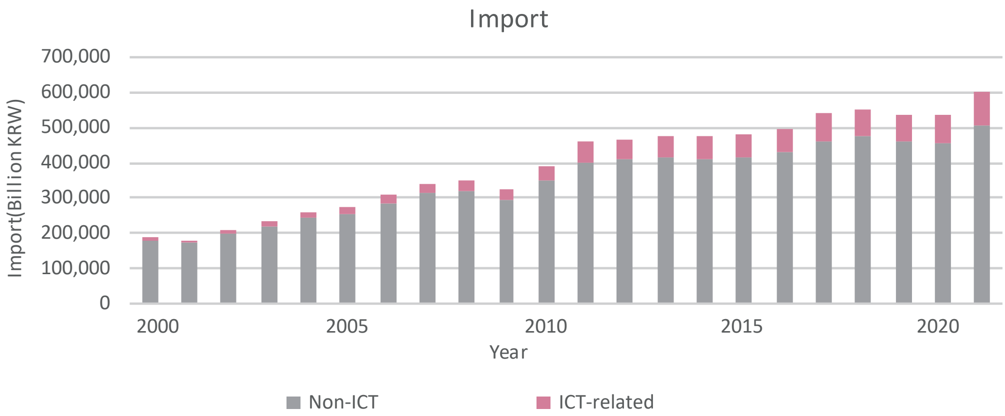


Figure 6 Imports of ICT and non-ICT products (Korea)



Data: Kosis, National Accounts, Information and Communication Technologies

The main export counterpart is China, which accounts for 24.7% of total exports, followed by Vietnam with 9.04%. The main import counterpart is also China, which accounted for 24.6% of total Korean imports. The main imported products are integrated circuits. Specifically, while integrated circuits alone take almost 17% of Korean ICT exports, 43% of them are shipped to China. The interesting pattern that the biggest traded goods are integrated circuits in both countries implies that their relationship is complementary rather than competing in the global market. Therefore, any trade barrier against one has a significant impact on other finished goods such as telephones, electronics, and computers.

7.1.4 Technology adoption

After overcoming the IMF crisis, the Korean government made national efforts to build an ICT infrastructure, starting with the 'Cyber Korea 21' plan announced in March 1999. As a result, Korea could become a leading country in ICT infrastructure construction. The Korean government commercialised 5G, which is the basic infrastructure of the 4th industrial revolution, for the first time in the world. Furthermore, Korea maintains the world's highest level of ICT infrastructure dissemination and accessibility, including the world's first average experienced download speed of fixed broadband connections, the first in percentage of fibre subscriptions in total fixed broadband, and the first in traffic usage per smartphone (cellular + wi-Fi).

Figure 7 Average experienced download speed of fixed broadband connections, 2020-2021 (Steam)

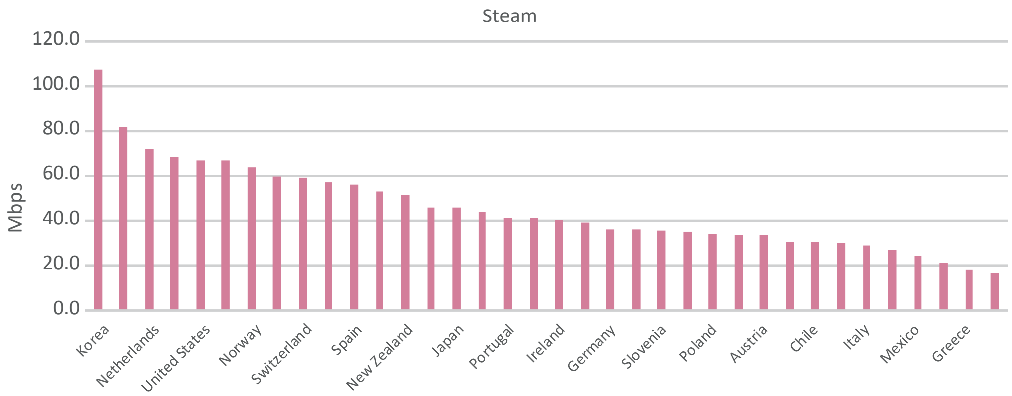
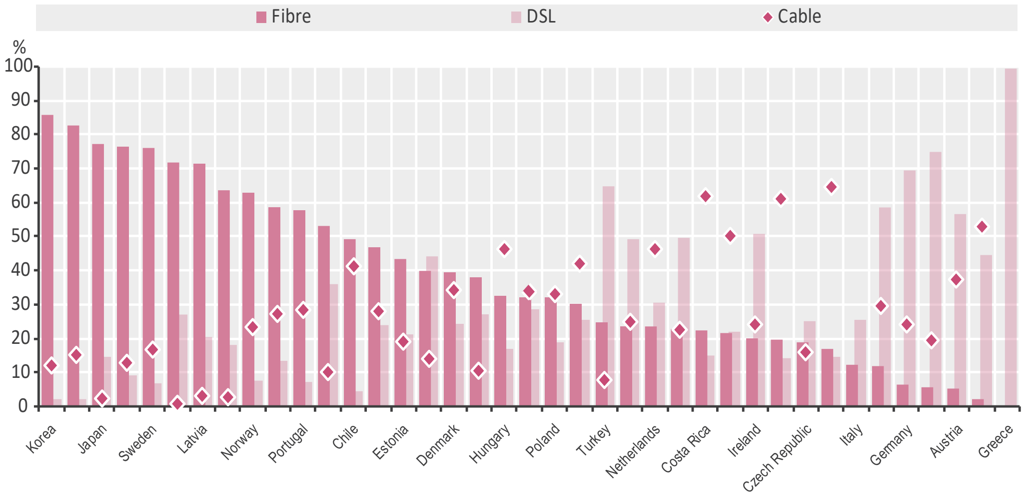
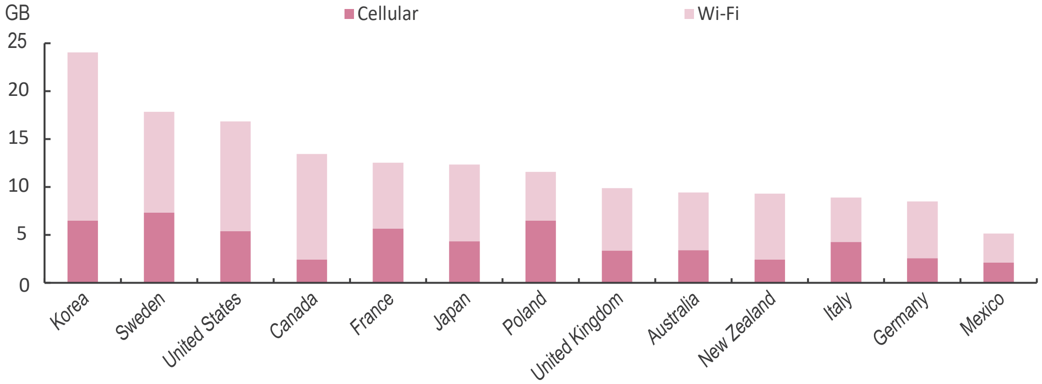


Figure 8 Percentage of fibre, DSL, and cable subscriptions in total fixed broadband, June 2021



Source: (OECD Broadband statistics, [http://oe.cd/broadband])

Figure 9 Total data per mobile broadband user per month, 2018 Outlook 2020, OECD (2020)



Source: Digital Economy Outlook 2020, OECD(2020)

Based on a robust ICT infrastructure, Korea quickly applied ICT general-purpose technologies such as AI and big data to all industries and successfully transformed it into a digital economy. AI talent concentration, which is calculated using the counts of AI talent at the country level vis-à-vis the counts of LinkedIn members in the respective countries, ranks 3rd in the world. Relative AI skill penetration, which compares how prevalent AI skills are in the average occupation in each country against a benchmark (e.g., the global average), controlling for the same set of occupations, ranks 2nd globally.

Figure 10 AI talent concentration (2021)

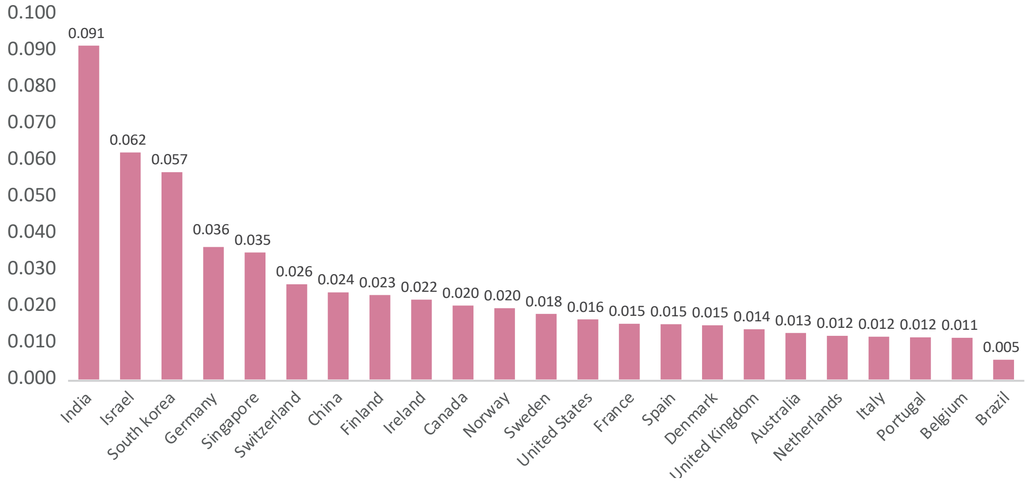
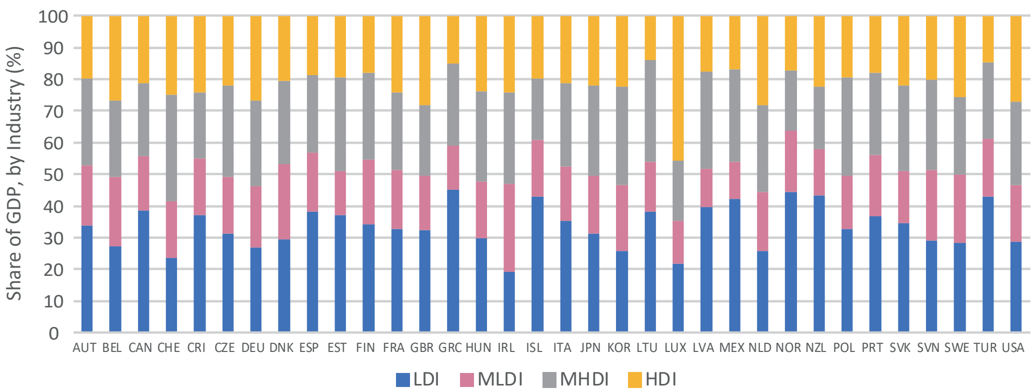


Figure 11 Relative AI skill penetration (2021)

7.1.5 Features of the digital intensive sector

The OECD STAN data provide countries with a detailed level of sectoral gross domestic product (GDP) and employment data by digital intensity. They use various indicators and indexes to classify sectors into four digital intensive categories (high digital intensive (HDI), medium-high (MHDI), medium-low (MLDI), and low (LDI))[1]. Representative examples of the HDI sectors are telecommunications, IT and other information services, finance, and insurance.

Figure 12 Share of GDP by digital intensity



Source: OECD STAN data

In 2017, Luxemburg had the highest share of the HDI sector in GDP among OECD countries. The HDI and MHDI sectors in Korea accounted for approximately 53 % of the GDP and 48 % of the total employment, closely followed by Japan and Germany. Annual GDP growth rates in HDI and MHDI sectors were 3.8% and 5.3% between 2010 and 2017, higher than the 3 % GDP growth rate. Employment growth was remarkably high during this period. 4.75 million people engaged in the HDI sector in 2010. In 2017, 5.35 million people were working in the industry, implying 85 thousand jobs added annually.

| Table 2 | Digital intensity by sector

Sector denomination	ISIC rev.4	Quartile of digital intensity 2001-2003	Quartile of digital intensity: 2013-2015
Agriculture, forestry, fishing	01-03	Low	Low
Mining and quarrying	05-09	Low	Low
Food products, beverages and tobacco	10-12	Low	Low
Textiles, wearing apparel, leather	13-15	Medium-low	Medium-low
Wood and paper products, and printing	16-18	Medium-high	Medium-high
Coke and refined petroleum products	19	Medium-low	Medium-low
Chemicals and chemical products	20	Medium-low	Medium-low
Pharmaceutical products	21	Medium-low	Medium-low
Rubber and plastics products	22-23	Medium-low	Medium-low
Basic metals and fabricated metal products	24-25	Medium-low	Medium-low
Computer, electronic and optical products	26	High	Medium-high
Electrical equipment	27	Medium-high	Medium-high
Machinery and equipment n.e.c.	28	High	Medium-high
Transport equipment	29-30	High	High
Furniture; other manufacturing; repairs of computers	31-33	Medium-high	Medium-high

Sector denomination	ISIC rev.4	Quartile of digital intensity 2001-2003	Quartile of digital intensity: 2013-2015
Electricity, gas, steam and air cond.	35	Low	Low
Water supply; sewerage, waste management	36-39	Low	Low
Construction	41-43	Low	Low
Wholesale and retail trade, repair	45-47	Medium-high	Medium-high
Transportation and storage	49-53	Low	Low
Accomodation and food service activities	55-56	Low	Low
Publishing, audiovisual and broadcasting	58-60	Medium-high	Medium-high
Telecommunications	61	High	High
IT and other information services	62-63	High	High
Finance and insurance	64-66	High	High
Real estate	68	Low	Low
Legal and accounting activities, etc.	69-71	High	High
Scientific research and development	72	Medium-high	High
Advertising and market research; other business activities	73-75	High	High
Administrative and support service activities	77-82	High	High
Public administration and defence	84	Medium-high	Medium-high
Education	85	Medium-low	Medium-low
Human health activities	86	Medium-high	Medium-low
Residential care and social work activities	87-88	Medium-low	Medium-low
Arts, entertainment and recreation	90-93	Medium-low	Medium-high
Other service activities	94-96	Medium-high	High

Note: "High" identifies sectors in the top quartile of the distribution of the values underpinning the "global" taxonomy, "medium-high" the second highest quartile, "medium-low" the second lowest, and "low" the bottom quartile.

Source: Calvino et al.(2018)

7.2 The Digital New Deal of Korea

7.2.1 Background

The Digital New Deal is an ongoing series of ICT sector investments, public infrastructure, and industry development projects publicly funded by the Korean government. Motivated by the New Deal of the United States between 1933 and 1939, its primary focus is on economic recovery from the COVID-19 pandemic and exploring a new growth engine for the Korean economy. The project began in July 2020, with a supplementary budget of 5.4 trillion KRW (4.8 billion USD) approved by the Congress of Korea. Since then, the Digital New Deal plans to invest more than 49 trillion KRW (42 billion USD), spread over five years until 2025. Several ministries, including Internal Affairs, Industry and Resources, Education, Small and Medium Businesses, Welfare, Agriculture, Land and Transportation, are taking part in the Digital New Deal, with the Ministry of Science and ICT taking the leading role as the chair of the multi-ministry convention.

The global economy was hit hard by the COVID-19 pandemic in 2020, as shown by the negative growth rate of 4.9% projected by the IMF in the first half of 2020[2]. The Korean economy was no exception to this trend. Owing to the business closures imposed by the severe lockdown, Korea recorded a -3.2% quarterly growth in the 2nd quarter of 2020. At the same time, the total employment decreased by 0.4 million[3]. The COVID pandemic has also transformed the ordinary lives of many Korean citizens. Remote work spread across the economy, while contactless services took over businesses, such as restaurants, logistics, and entertainment. At this uncertain times, the global demand for digitalisation has reached an ever higher level, as seen by the United States Innovation and Competition Act of 2021 and China's New Infrastructure Construction Policy (2021).

<Excerpts from the USICA of 2021>

Chapter A. Creating Helpful Incentives to Produce Semiconductors (CHIPS)

$49.5 billion allocated over 5 years for a CHIPS for America Fund

Includes $2 billion in legacy chip production, $10.5 billion in Commerce R&D programs

Chapter B. Endless Frontier Act

a bipartisan authorization and funding for innovation, including the National Science Foundation (NSF) and the Department of Energy (DOE)

Chapter D. Securing America's Future Act

Advancing the American AI Act, including rapid pilot, deployment and scale of applied AI capabilities to demonstrate modernization activities and use cases

Cyber Response and Recovery Act, to establish a Response and Recovery Fund by the Department of Homeland Security (DHS)

Chapter F. Competitiveness and Security for Education and Medical Research, Postsecondary STEM pathway grants, Improving access to elementary and secondary computer science education

7.2.2 Features

The Digital New Deal of Korea is part of the Korean New Deal, which, as of 2021, consists of 4 pillars: The Digital New Deal, The Green New Deal, The Human New Deal, and The Regional Balance New Deal. The Korean New Deal is a comprehensive set of projects intended to transform Korea into a global economic leader alongside achieving carbon neutrality and inclusive growth. More than 220 trillion KRW (200 billion USD) will be allocated over the next five years (3Q 2020 to 2025): around 49 trillion KRW for the Digital New Deal, 61 trillion KRW for the Green New Deal, 50 trillion KRW for the Human New Deal, and 62 trillion KRW on the Regional

Balance New Deal. The Digital New Deal took up more than 8.6 trillion KRW in 2022 alone, spread across four categories and 12 main projects.

Table 3 | Digital new deal projects and budgets

Categories	Projects	Budget (to 2025)
DNA (Data, Network, AI) Ecosystem	1. Enhancing data accumulation, open data, and use 2. Diffusion of 5G, AI conversion industry 3. Smart government 4. Cyber security	33.5 tril. KRW
Digital Infrastructure	5. Digital education and job training infrastructure 6. Smart healthcare and medical infrastructure 7. Online business of SMEs	3.2 tril. KRW
Hyper-connected Industry	8. Metaverse and smart robot industry 9. Cloud, Blockchain, IoT Technologies	2.6 tril. KRW
Digitalisation of SOC	10. Digital management of transportation infrastructure 11. Smart city, smart industry complex, digital twin 12. Smart logistics system	9.7 tril. KRW

DNA Ecosystem is a flagship project within the Digital New Deal, taking up more than 33 out of the 49 trillion KRW budget until 2025. The project's primary focus is to establish a new growth path for the Korean economy by digitalising Korea's legacy industry and creating new jobs by promoting new initiatives. The project consists of AI learning data, big-data platforms, public data access, data-AI use vouchers, AI conversion, uses case projects, 5G intra-government networks, cyber security consulting, and AI security business.

Figure 13 Publicity poster recruiting trainees for data-labeling, in conjunction with Ministry of Labor, from www.hrd.crowdworks.kr, a crowd-sourcing data platform in Korea

The AI learning data accumulation project is also a part of the 'Data Dam' project. The objective is to accumulate open public datasets to develop and train AI algorithms. From the project's onset, the government has focused on the labour-intensive nature of AI data collection and annotation tasks. It sought to create a bulk of new jobs, which required valuable skills for a digitalised economy. The AI data project was designed to be scalable enough to support a large group of workers while allowing them to transition to a new career. Through an extensive crowdsourcing methodology, human annotators were permitted to work anytime and anywhere they chose through an uber-like smartphone app. By 2021, it was estimated that there were more than 100,000 participants in this project so far, including women on career breaks and the disabled. The government has completed over 1300 projects. The output was published on the government-run website AI Hub (https://aihub. or. kr), which is available for use by researchers and developers worldwide.

The data dam project also includes big data platform, open public data, and data voucher projects. Big data platform projects provide subsidies to private or public consortiums seeking to promote data reuse and sharing among members. To date, the Korean government has established big data platforms in 16 different fields[4]. The Comprehensive Data Map (www. bigdata-map. kr) offers a complete list of all the data platforms in Korea. The ownership structure is a mixture of public, private, and public-private consortiums that depend on the data topic. The public data portal (data. go. kr) is a hub for open data provided by the government. The data voucher is a need-based subsidy for firms that want to buy or use data but cannot afford them. The policy targets are the small and medium-sized businesses that want to buy proprietary data for analysis and marketing purposes. The AI voucher program matches AI demand firms (those seeking to apply AI technology to their process) with AI supply firms (technology firms specialising in AI). Overall, more than 5000 cases of voucher projects have been completed.

7.2.3 Achievements

In the digital economy, data acquired from customers and edge devices has become a major factor in production. The Korean government recognised the importance of data in the digital economy and made national efforts to activate the creation, distribution, and utilisation of data in the Digital New Deal. As a result, the market size of the data industry grew by an average of 9.8% annually, from 13,755 billion KRW in 2016 to 20,002 billion KRW in 2020. The number of people working in the data industry totalled 394,709 as of 2021, an increase of 7.8% compared to 2020. Among them, the number of people directly handling data was 122,431 in 2020, an increase of 20.1% from the previous year.

Figure 14 Market size of the data industry in Korea

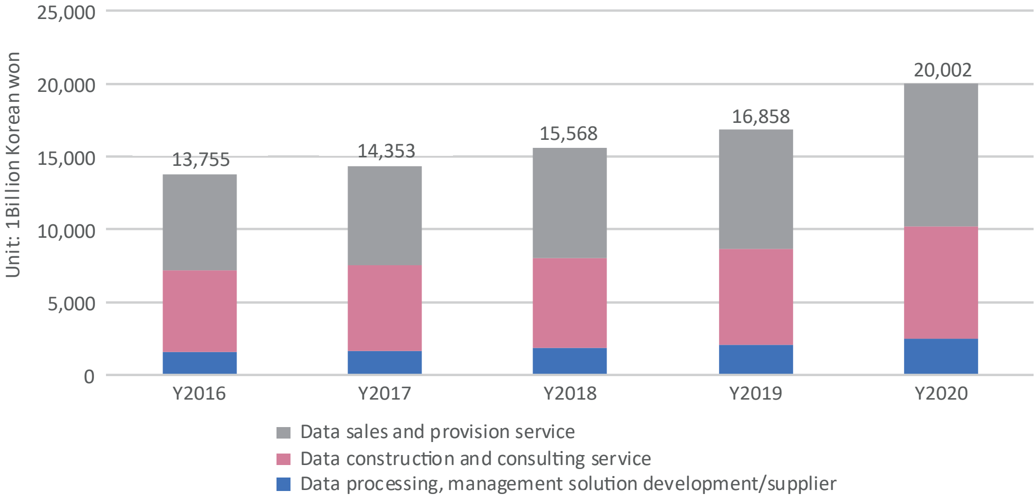
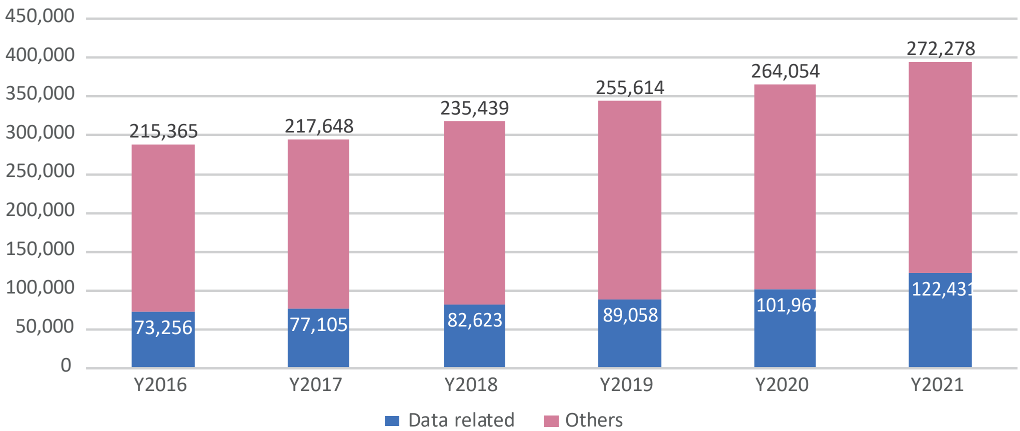
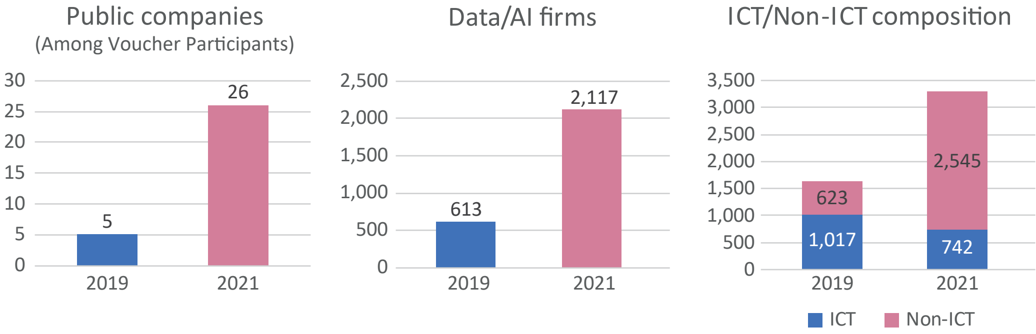


Figure 15 Number of people working in data industry in Korea



According to the MSIT report published at the end of 2021, data dam projects helped foster the rapid growth of the data industry. The number of public firms participating in the data dam projects quadrupled between 2019 and 2021. Thanks to the voucher programs, the number of data/AI firms posting to be supply firms increased threefold. Furthermore, more than 75% of the project participants were non-ICT firms, indicating that the project helped the digital transformation of traditional and legacy firms. The government also picks and awards monthly Digital New Deal best practices. The award winners were startups and SMEs that developed data annotation tools, a simulation platform for autonomous vehicles, objective recognition tools for caring for pets, and an automatic health insurance claims analyser.

Figure 16 Data dam projects



Source: Ministry of Science, Technology and ICT of Korea (2021.12.13)

The Digital New Deal mainly consists of government-funded research projects, commercialisation projects, and procurement projects. However, government expenditures also play a role in promoting investment projects in the private sector. NAVER, the number one Korean portal service established in 1999, unveiled the first hyper-scale language processing engine, HyperCLOVA, in May 2021. CLOVA is the company's AI assistant, which provides speech recognition, voice-to-text transition, character recognition, and chatbot services. The company offers both free and premium versions of this service. KAKAO, the number one Korean messenger app service, is also investing heavily in its AI research branch. In November 2021, KAKAO uploaded their hyper-scale AI model KoGPT (the Korean version of the Open AI GPT-3) on GitHub and made the model public for non-profits, startups, and venture firms. KAKAO also provides enterprise solutions and cloud services intended for business consumers. Both NAVER and KAKAO are significant investors in data centres, and plan to add 28 more data centres by 2024.

7.2.4 The future

The Digital New Deal is a mass-scale government-led investment project aimed at promoting the competence of the Korean economy through 'digital transformation'. In order to achieve its goal, the Digital New Deal is moving toward a comprehensive digital growth policy that encompasses the diverse roles of the government.

Digital transformation is a comprehensive concept encompassing both economy and the society. In order for Korea to utilise the gains from digitalisation, a cohesive approach is necessary - not only investment in physical capital but also human capital, digital literacy of the public, organisational capital, protecting the labour force susceptible to automation, establishing ethics and norms for the new society, establishing a fair rule for competition, and opening up the economy to fully integrate into global trends are all part of the policy scope for the digital future.

Rodrik (2021)[5] also outlined the challenges that policies need to solve in the digital age in the context of growth policies. To fully utilise the growth effects, the economy needs to create many new high-quality jobs that sometimes need 'appropriate technologies' and intervention in the low-productivity sector through traditional social protection and poverty reduction models. A comprehensive approach is especially relevant when automation threatens to displace many legacy jobs. By incorporating these agenda, the Digital New Deal and its successor policy will play a key role in transforming Korea into a global role model in digital prosperity.

Reference

Documents in Korean

Action Plan for Korean New Deal 2.0 (2021.7.14) Joint statement of ministries

Summary of Past Year Achievements of Digital New Deal (2022.3.) Ministry of Science and ICT

China's New Infrastructure Construction Policy and its Implications to Digital New Deal, KIET

Database

OECD STAN

OECD Broadband statistics, [http://oe.cd/broadband]

OECD Going Digital Toolkit [https://goingdigital.oecd.org/]

Kosis, National Accounts, Information and Communication Technologies

KISDI National Accounts

Reports

OECD(2017), "OECD Science, Technology and Industry Scoreboard 2018: The Digital Transformation", OECD Publishing.

OECD(2020). "OECD Digital Economy Outlook 2020", OECD Publishing, Paris, https://doi.org/10.1787/bb167041-en

OECD(2021). "OECD Compendium of Productivity Indicators". OECD Publishing, Paris, https://doi.org/10.1787/f25cdb25-en.

WIPO (2021). Global Innovation Index 2021: Tracking Innovation through the COVID-19 Crisis. Geneva: World Intellectual Property Organization.

Articles

Flavio Calvino, Chiara Criscuolo, Luca Marcolin, Mariagrazia Squicciarini(2018). "A taxonomy of digital intensive sectors". OECD Science, Technology and Industry Working Papers 2018/14,

Rodrik D. Prospects for Global Economic Convergence Under New Technologies. 2021. Copy at https://tinyurl.com/ydenbnrn

1 Share of ICT tangible and intangible investment; share of intermediate purchases of ICT goods and services; stock of robots per hundreds of employees; share of ICT specialists in total employment; share of turnover from online sales. See Calvino, Criscuolo, Marcolin, Squicciarini (2018) for more detailed information.

2 Summary of Past Year Achievements of Digital New Deal (2022.3.) Ministry of Science and ICT

3 Action Plan for Korean New Deal 2.0 (2021.7.14) Joint statement of ministries

4 The 16 Big Data Platform fields are Culture, Telecommunication, Logistics, Healthcare, Transportation, Environment, Finance, SME, Regional Economy, Forestry, Fire Safety, Smart Public Safety, Maritime and Fishery, Agriculture, Lifelog, and Digital Industry.

5 Rodrik (2021) Prospects for Global Economic Convergence under New Technologies

Chapter

8

Policy Recommendations for Trilateral Economic Cooperation

Contents

Chapter 8 - Policy Recommendations for Trilateral Economic Cooperation

8.1. Policy Recommendations (CASS)

8.1.1 Continue to promote the construction of the China-Japan-Korea Free Trade Zone

In 2002, the summit of the leaders of China, Japan, and South Korea formally proposed the establishment of the China-Japan-Korea Free Trade Zone (FTA). In May 2010, the first round of the China-Japan-Korea Free Trade Zone Joint Research Conference was held in Seoul, South Korea. In December 2011, the Joint Research Report on the Feasibility of the China-Japan-Korea Free Trade Area was released. The report pointed out that establishing the China-Japan-Korea Free Trade Area will bring macroeconomic benefits to the three countries and achieve a win-win effect for the three parties. In November 2012, during the series of East Asian leaders' meetings held in Phnom Penh, Cambodia, the economic and trade ministers of China, Japan and South Korea met and announced the launch of the China-Japan-South Korea Free Trade Area negotiations. By 2019, 16 rounds of negotiations on the China-Japan-Korea Free Trade Zone have been held.

The validity of the Regional Comprehensive Economic Partnership (RCEP) has created favourable conditions for accelerating the negotiation of the China-Japan-Korea Free Trade Agreement. RCEP was officially signed in November 2020 and officially validated in January 2022. It is the first free trade agreement covering China, Japan, and South Korea. It has laid a solid foundation for constructing the China-Japan-South Korea Free Trade Zone in terms of tariff concessions and market access. For example, in terms of tariff reduction, RCEP will eventually make 86 to 88 per cent of goods between China and Japan achieve 'zero tariff', 86 per cent of goods between China and South Korea achieve 'zero tariff', and 83 per cent of goods between Japan and South Korea achieve 'zero tariff' (see Table 1), which laid the foundation for the promotion of tariff reduction arrangements in the China-Japan-Korea Free Trade Agreement. To this end, China, Japan, and South Korea should seize the opportunity of the RCEP's taking effect, try to restart the China-Japan-Korea FTA negotiation as soon as possible based on RCEP, seek breakthroughs, and promote the realisation of the 'RCEP+' model. This could enable the China-Japan-Korea FTA to become an improved or upgraded version of RCEP, thereby further consolidating the trilateral cooperation's role in leading Asian economic development and promoting Asian regional economic integration.

Table 8-1 | China, Japan, and South Korea's final tariff relief under RCEP

Tariff elimination	China	Japan	Korea
Chinese goods ultimately enjoying zero tariffs	-	88%	86%
Japanese goods ultimately enjoying zero tariffs	86%	-	83%
Korean goods ultimately enjoying zero tariffs	86%	83%	-

Source: Ministry of Commerce, People's Republic of China, Regional Comprehensive Economic Partnership (RCEP), http://fta.mofcom.gov.cn/topic/enperu_recp.shtml.

8.1.2 Steady promotion of China-Japan-Korea financial cooperation

There is close financial cooperation between China, Japan, and South Korea. In March 2002, China and Japan signed a bilateral currency swap agreement. In October 2018, China and Japan signed a bilateral currency swap agreement again, and the scale of the swap was further expanded. In 2021, the two sides extended the swap agreement. Similarly, China and South Korea also signed a bilateral currency swap agreement in 2008. Since then, the swap agreement has been continuously extended, and the swapping scale has continued to expand. The most recent currency swap agreement between China and South Korea was signed in 2020 for five years, and the size of the agreement is 59 billion US dollars. It served as the largest currency swap agreement signed by China and other economies. Meanwhile, Japan and South Korea also signed a currency swap agreement in 2005, but in February 2015, the two countries announced the termination of the bilateral currency swap agreement. In addition to the bilateral swap agreement, in 2012, China and Japan also launched the RMB-Japanese yen direct trading. In the post-pandemic era, the world economy is still full of risks and uncertainties. Deepening the bilateral financial cooperation among China, Japan, and South Korea will help promote the growth of trade and investment among the three countries, enhance the three countries' economic development, and maintain financial stability.

At the same time, China, Japan, and South Korea should also strengthen financial cooperation at the regional level in Asia to ensure regional financial stability. In May 2000, the finance ministers of ASEAN and China, Japan, and South Korea (ASEAN+3) signed an agreement to establish a regional currency swap network, namely the Chiang Mai Initiative (CMI), to strengthen the region's ability to prevent risks and respond to challenges. In 2009, the 10+3 finance ministers and central bank governors signed the Chiang Mai Initiative Multilateralization Agreement (CMIM). In 2011, ASEAN+3 established the ASEAN+3 Macroeconomic Research Office (AMRO) to support the implementation of the Chiang Mai Initiative Multilateralization Agreement. In the future, China, Japan, and South Korea should work with ASEAN to continue to promote the CMIM, carry out crisis relief drills, improve the operational guidelines, enhance crisis relief capabilities, and continuously strengthen the operability and effectiveness of the multilateralization of the Chiang Mai Initiative. It is also needed to support AMRO by enhancing institutional capacity building and its macroeconomic and financial analysis capabilities, risk monitoring, economic assessment, and policy advice.

8.1.3 Deepening China-Japan-Korea industrial chain cooperation

Regional integration is critical to ensuring the stability and security of the industrial chain and reducing the impact of external shocks such as trade protectionism and global emergencies on the industrial chain of the three countries. Deepening the internal cooperation in the industrial chain among China, Japan, and South Korea and emphasising the industrial complementarity of the three countries will help reduce the dependence of the countries on industrial chains outside the region. There are differences in the development level and development stage of China, Japan, and South Korea, and they can complement each other in terms of resource endowment and industrial structure. There is room for optimising the division of labour, improving efficiency and quality, and differentiated competition in national and regional industrial chains. Traditional labour-intensive industrial chains such as textiles and clothing are being transferred from China to Southeast Asia, South Asia, and other regions. The competitive relationship has been moving forward to a complementary relationship within the region. For high-tech products such as electronic products, mainland China currently undertakes the production of low-end electronic products or the low-end production steps of high-end electronic products. But Japan and South Korea could compete with the United States and Europe to produce high-end electronic products. For this industry, the three countries are relatively less dependent on the added value of the United States and Europe. They are most likely to carry out regional industrial chain cooperation. In addition, in the context of the pandemic, China, Japan, and South Korea can also establish a tripartite information communication and coordination mechanism for the security of industrial chain and supply chain, jointly maintain the security and stability of supply chains in Asia and promote the process of regional economic integration in East Asia.

8.1.4 Jointly safeguard the global free trade system

After the global financial crisis in 2008, the trend of anti-globalisation rose and trade protectionism appeared. It has brought a serious negative impact on the economic and trade development of the world and Asia. As three important countries in the Asian trade and production network, China, Japan, and South Korea should jointly safeguard multilateralism and free trade and promote the opening and development of the world economy. The World Trade Organization is the core of the multilateral trading system and plays a crucial role in maintaining the liberalisation and facilitation of global trade and investment. With the changing of circumstances both inside and outside of the organisation, deep-seated problems showed in the WTO, such as the failure of the decision-making mechanism, the vacuum of leadership, and the lack of inclusiveness. Reform is imperative. China, Japan, and South Korea have all emphasised maintaining the WTO-centred multilateral trading system. They should build consensus on the WTO reform issue, coordinate their positions, push the WTO reform out of the predicament, and support the inclusive development of the multilateral trading system.

The Development Research Center (DRC) of the State Council of China, the Japan Comprehensive Research and Development Agency (NIRA), and the Korea Institute for International Economic Policy (KIEP), Joint Study Report on the Feasibility of China-Japan-Korea Free Trade Area, December 2011. http://fta.mofcom.gov.cn/article/chinarihan/chinarhnews/201203/9715_1.html.

8.2 Policy Recommendation for Trilateral Economic Cooperation (JCER)

The economic developments of China, Japan, and Korea have been made possible by joining international economic organizations such as General Agreement on Tariff and Trade (GATT) / World Trade Organization (WTO) and International Monetary Fund (IMF), participating in economic forums like Asia-Pacific Economic Cooperation (APEC), and making efforts to liberalize trade and investment regimes. Access to the global market made possible by the outward-oriented growth strategy enabled the economies to achieve economic growth and improve the living standard of the people within a short period. If other economies in the region follow such policies, economies in the area would be able to sustain economic growth in the medium term (for a medium-term projection of the Asian economies, see JCER, 2021). The three economies need to be the frontrunners in this regard.

8.2.1 Cooperation in the liberalization of trade and investment

It would be in the interest of the three economies to continue pursuing liberalization of trade and investment. While actively participating in the multilateral negotiations to achieve a successful conclusion of the Doha round, efforts to expand free trade agreements (FTAs) and economic partnership agreements (EPAs) should also be made by the three economies.

In this respect, the enforcement from 1st January 2022 of the Regional Comprehensive Economic Partnership (RCEP) Agreement, which covers all three economies as its members, is a milestone. Setting a higher standard by reaching a successful conclusion of the Japan-China-Korea FTA should benefit the three economies. Further effort towards this end needs to be made.

8.2.2 Cooperation in promoting financial integration and financial stability

Integration of the three economies is also taking place in the financial arena. An increase in direct and portfolio investment among the three economies benefits both the host economies and the home economies of the investment by making efficient use of their resources. It would also promote the transfer of technology and business models among economies. Further promoting financial integration by the three economies should be important.

At the same time, an increase in capital flows would raise the risk of propagating financial shocks in the region. It is essential to preserve the effectiveness and further strengthen the functions of the Chiang Mai Initiative Multilateralization (CMIM) to secure financial stability in the region. Achieving effective functioning of the ASEAN+3 Macroeconomic Research Office (AMRO) to support CMIM is also vital.

8.2.3 Cooperation in strengthening the resilience of global value chains

Free trade and investment will further promote global value chains in the region, an essential driving force of regional economic growth and development. Since their potential will only materialize if there is a free trade and investment regime, the three economies need to commit to securing such a favorable environment. The three economies also need to support the global value chains when they engage in restructuring to make them more resilient to shocks.

8.2.4 Cooperation in tackling global issues

The increasing importance of the three economies in the global economy also requires the three economies to be actively involved in addressing global issues, such as climate change. Because about half of CO2 is emitted from the Asia-Pacific region, the three economies should accelerate their efforts to ensure that limiting the global temperature to 1.5 degrees will be achieved. The experience of the three economies should also benefit other economies that are also making efforts to meet the challenge facing all citizens on this planet.

8.2.5 Cooperation in addressing a common issue

Three economies have successfully hosted the Olympic and Paralympic games in succession: PyeongChang in 2018, Tokyo in 2021, and Beijing in 2022. The significance of the successive hosting of the Games by the three economies was discussed in the Trilateral Economic Report of TCS (2017). The three economies reconfirmed the importance of enjoying sports, improving health, and promoting diversity through the games. Since there is still significant room for improvement, the three economies should cooperate in securing advancement in these areas.

Making progress in the areas such as sports, health, and diversity is all the more critical because of the common challenge that is faced by the three economies: the ageing and the shrinking of the population. Japan is already ageing fast and seeing a decline in the population; Korea is expected to age faster than Japan and see its population start to decline, and China is also going to see an ageing and the shrinking of the population soon. In such a situation, providing maximum opportunities for the people to enjoy sports, stay healthy, and realize their diverse potentials fully should be beneficial not only for the individuals but also for the society as a whole.

8.2.6 Role of think-tanks and the TCS

Think-tanks in the three economies can engage in joint research on the issue of ageing and the shrinking of the population by analyzing the causes and the implications of the development, sharing best practices in the economies, and recommending measures to overcome their negative consequences. It would be beneficial to the government and the people of the three economies. Still, it would also be useful to other economies that are already seeing, or expecting to see, the ageing and the shrinking of the population.

To support the efforts that will be made by the three economies in line with what has been mentioned above, further strengthening of the organization and the scope of the Trilateral Cooperation Secretariat (TCS) should be considered.

Reference

1. JCER (2021). *Medium-Term Forecast of the Asian Economies: China to become the world's largest economy in 2033 - Korea set to overtake Japan in 2027 in terms of GDP per capita.* Japan Center for Economic Research.

2. TCS (2017). *2017 Trilateral Economic Report: The economic impacts of the Olympic Games.* Trilateral Cooperation Secretariat.

8.3 Policy Recommendations for Trilateral Economic Cooperation (KIEP)

8.3.1 Deepen the trade and investment cooperation in Northeast Asia by resuming CJK trilateral FTA negotiations or participation of Korea and China in the CPTPP.

Korea has built 18 FTA networks worldwide, including the United States, European Union, ASEAN, China, Australia, Canada, U.K., since the Korean-Chile FTA took effect in

2004. It has pursued a comprehensive and high-level FTA that includes tariff elimination in commodity trade and global standard rules in services trade, investment, government procurement, intellectual property rights, and technical standards. Meanwhile, in the Northeast Asia area, Korea signed a bilateral Korea-China FTA (KC FTA), which came into effect in December 2015. The RCEP is significant because it is the first mega FTA in East Asia in which Korea, China, and Japan participate simultaneously. And the RCEP was successfully concluded in November 2020 after eight years of negotiations from November 2012.

However, the economic effects of the Korea-China FTA were not yet apparent. Korea's exports to China increased only 0.1% on an annual average from 2016 to 2018, and the share of China in Korea's total exports decreased slightly from 25.8% to 25.6% in the same period. The reason why the trade effect between the two countries was not visible can be deduced from the fact that the trade liberalization rate of the KC FTA was not so high. According to the KC FTA, Korea's tariff elimination ratio on tariff lines within ten years is 79.2%, and in the case of China, only 71.3%. Furthermore, looking at the tariff concession schedules of Korea and China under the RCEP, the tariff elimination ratio within ten years after the RCEP agreement came into force is 77.3% for Korea and 79.3% for China. Also, under the RCEP, Korea's tariff elimination ratio for Japan is 73.8% on tariff lines and Japan for Korea is 74.4%. There is little difference in the trade liberalization rate between the KC FTA and the RCEP.

There needs to be continuous efforts to deepen the trade and investment cooperation in Northeast Asia through the resumption of CJK trilateral FTA negotiations or participation of Korea and China in the CPTPP.

8.3.2 Re-enter the Korea-Japan bilateral currency swap agreement for the safety net to facilitate trade between the two countries.

As the Korean government experienced the Asian financial crisis in 1997 and the global financial crisis in 2008, it regarded exchange rate stability as the most important economic policy goal. It can be considered that exchange rate stabilization from January 2011 to December 2019, before the outbreak of COVID-19, was generally successful. Also, the Korean economy has been expanding its current account surplus from about USD 16.6 billion in 2011 to USD 75.9 billion in 2020.

The Bank of Korea (BOK) worked diligently to strengthen its network of bilateral currency swap agreements with other central banks in consideration of the significance of currency swaps to financial stability as a form of secondary foreign exchange reserves. As a result, the Korea-China currency swap was first signed at USD 2 billion in 2002, then gradually expanded to USD 56 billion in 2011, and renewed by increasing the volume to 400 billion CHY/70 trillion KRW and extending the period to five years in October in 2020. On the other hand, the Korea-Japan bilateral currency swap contract of USD 3 billion expired in July 2013. The USD 10 billion CMI currency swap agreement between Korea and Japan expired in February 2015.

The Korean foreign exchange market has not been shaken since the global financial crisis in 2008. However, the volatility of the international financial market may increase further after the COVID-19 outbreak. It is recommended to re-enter the bilateral currency swap between the Bank of Korea (BOK) and the Bank of Japan (BOJ). This move will strengthen the safety net to facilitate trade with Japan, one of Korea's main trading partners, even in times of global financial market instability.

8.3.3 Facilitate the service trade liberalization through the resumption of CJK trilateral FTA negotiations or participation of Korea and China in the CPTPP.

The economic growth of the three countries needs to develop innovative technologies and strengthen industrial competitiveness in new industries of high-added value, such as bio and healthcare, e-commerce, software, and cultural content, as recognized at the sixth CJK Trilateral Summit of 2015.

In Korea, the bio-industry (especially biopharmaceuticals), software industry, and cultural content industry (especially game content) have achieved remarkable development. However, looking at the trade partners of Korean bio-pharmaceuticals, China and Japan have not developed into Korea's cooperative partners compared to the United States and Europe. Korea's cultural content exports to China have been heavily biased toward game content, while the exports of other content such as music, films, and knowledge information have almost frozen. Meanwhile, Korea's cultural content exports to Japan have seen little progress since 2011, even if they are relatively diverse compared to China.

For the practical progress in the trilateral cooperation of new industries such as bio and healthcare, software, and the cultural content industry, it is recommended to start by investigating regulatory trends in the three countries and share the information with the trilateral governmental consultative bodies. And then, a meeting for negotiations to lower the non-tariff barriers between the three countries should be established. For now, it is conceivable to facilitate the service trade liberalization through the resumption of CJK trilateral FTA negotiations or participation of Korea and China in the CPTPP.

8.3.4 Establish a new inter-governmental consultative body to discuss the trilateral supply chain cooperation focused on intermediate goods among Korea, China, and Japan.

The dependence of the Korean economy on exports to China has increased even when evaluated as a domestic value-added amount created through exports. In contrast, its reliance on Japan has decreased. Meanwhile, Korea's backward GVC participation index indicates its dependence on foreign intermediate goods for its exports was still high compared to China and Japan. Also, Korea's forward GVC participation index, which indicates its contribution to foreign countries' exports by exporting intermediate goods, was significantly lower than that of Japan in the early 2010s. Still, the gap has narrowed since the late 2010s. The trend of these backward and forward GVC indices suggests that the global, particularly the CJK trilateral SCC (Supply Chain Connectivity) linkage, is more important for the Korean economy than China and Japan.

However, looking at Korea's import trends from China and Japan for intermediate goods, such as materials, parts, and equipment, it was clear that the SCC linkage of the Korean economy with Japan, unlike China, has been significantly weakening.

It is recommended that the TCS establish a new trilateral inter-governmental consultative body to discuss supply chain cooperation among Korea, China, and Japan to strengthen the resilience of Korean and CJK trilateral supply chains. The new trilateral governmental body will be expected to facilitate the supply chain cooperation in intermediate goods separately from regional connectivity cooperation focused on transport and logistics areas.

8.3.5 Strengthen the 'CJK Centrality' of TCS in the institutional cooperation context regarding the RCEP Secretariat.

Trilateral cooperation has been systemized through the establishment of the TCS. Regarding the efforts in institutional cooperation over the last decade, 21 ministerial-level meetings have been held periodically, and more than 70 partners were involved in the trilateral cooperation program. However, the CJK FTA negotiations have slowed in recent years. The three countries have convened at 16 rounds of negotiations but failed to make any substantial breakthrough because no party views the CJK FTA as a top priority nor wishes to take the lead.

As a result, despite the efforts of the Pan-Yellow Sea Rim Economy and Technology Exchange Meeting, IT-DG (Director-Group) OSS Meeting, and the Trilateral Cultural Content Industry Forum under the framework of the trilateral governmental consultative body, the three countries could not achieve outstanding market-oriented performance in terms of economic and industrial cooperation.

It is recommended to consider strengthening the CJK trilateral cooperation by using the RCEP framework rather than the CJK FTA, in which the prospect of a negotiation settlement is unclear. The institutional provisions under the RCEP provide the 'living' agreement framework–setting up annual RCEP ministerial meetings, the RCEP Joint Committee, and four committees to address and review issues related to (i) trade in goods, (ii) trade in services and investment, (iii) sustainable growth, and (iv) the business environment. Under the institutional provision, the RCEP Joint Committee will meet within 1 year after the agreement enters into force, and the RCEP Secretariat will coordinate all meetings thereafter. From the point of the trilateral institutional cooperation among Korea, China, and Japan, it is necessary to review the plan to expand and reorganize the role of the TCS concerning the RCEP Secretariat.

Chapter

9

Policy Recommendations for Digital Economic Cooperation

Contents

Chapter 9 - Policy Recommendations for Digital Economic Cooperation

9.1 Policy Recommendations for China-Japan-Korea Cooperation in the Digital Economy (CAICT)

China, Japan, and the ROK have been promoters and beneficiaries of free trade and multilateralism both in the past and present. Maintaining multilateral cooperation is in line with the common interests of the three countries and the global development trend. Currently, the three countries are facing good cooperation opportunities. Based on expressing their wishes and demands, they are advised to jointly promote reforms and improvements in multilateral governance mechanisms and guide economic globalization toward a more open, inclusive, balanced, and win-win direction.

9.1.1 Strengthen joint construction and sharing of a new ecosystem of infrastructure

China, Japan, and the ROK are leading the way in Asia and the world in smart manufacturing, 5G networks, AI, big data, and blockchain. Therefore, China-Japan-Korea (CJK) should further leverage the existing advantages of each country, share experience in information infrastructure construction, promote information interconnection among the three countries, and enhance digital development capabilities.

1 **Promote cooperation in network communication and other fields.** 1) Focus on the key channels, nodes, and projects. 2) Promote cooperation in network communication and other fields. 3) Reach cooperation agreements with stakeholder countries on information connectivity for the realization of network connectivity. The construction of

the spatial information corridor by the Belt and Road countries can serve as a typical example of trilateral cooperation.

Based on the existing advantages of the three parties, technical cooperation can be carried out to achieve technological innovation breakthroughs and better improve the supply capacity of information infrastructure. Both Japan and the ROK successfully achieved industrialization and economic transformation after World War II, and innovation and development are one of the keys to their success. China has a large number of mobile Internet users and a strong manufacturing base, which can provide a huge market for the transformation of scientific research cooperation results between China, Japan, and the ROK.

2 Effectively carry out high-quality and credible digital economic infrastructure cooperation among CJK. 1) Jointly boost technological innovation. 2) Promote the construction, popularization, and upgrading of ICT infrastructure. 3) Strengthen sharing of experiences. 4) Accelerate the digital transformation of traditional infrastructure, and steer social infrastructure toward intelligent development.

9.1.2 Boost innovative integration and promote the digital transformation of the real economy

Cooperate pragmatically based on local development realities, deepen the integration of digital technology and intelligent manufacturing and other key fields, promote the application of digital technology in manufacturing, services, innovation, and other fields, and strengthen the supporting role of digital technology in economic and social development. Specific recommendations are as follows.

1 Make full use of the differences in the industrial structure and development of CJK. China has a complete range of industries, a well-developed manufacturing industry, a large-scale industrial worker and a scientific and technological research and development team, a high level of education, and a strong spirit of hard work. Japan has strong advantages in high-tech fields, and the added value of the service industry accounts for about 70% of GDP. Moreover, as an emerging developed country, the ROK has strong innovation capability and rapid development of high-tech industries. The three countries can further leverage their advantages and seek cooperation space for industrial digital transformation based on the actual development of the country.

2 Explore the space for industrial cooperation based on the situation of each country. At present, Japan is in urgent need of industrial transfer, the ROK is eager to get rid of the constraints of its small domestic market, and a large number of traditional industries in China are undergoing transformation and upgrading. China has a huge demand for cooperation in environmental protection, agriculture, and recreation. Relevant enterprises in China, Japan, and the ROK can strengthen inter-country and inter-industry cooperation based on the above situation.

3 Cultivate new models and business forms in the digital economy. 1) Transforming traditional industries with next-generation of ICTs, cultivating new models such as personalized customization, on-demand manufacturing, and industrial chain-based collaborative manufacturing, and developing platform economy, sharing economy, industrial chain finance, and other new business forms. 2) Facilitate e-commerce cooperation, and explore closer cooperation in financial payment, warehousing and logistics, technical services, and offline exhibition in cross-border e-commerce.

4 Support Internet-based entrepreneurship and innovation. 1) Encourage Internet-based R&D and innovation and support Internet-based entrepreneurship through a solid and transparent legal framework among CJK. 2) Leverage the Internet to facilitate innovation in products, services, procedures, organization, and business models.

9.1.3 Promote the formulation of international rules that meet common demands.

The innovative development of the digital economy brings new challenges to the existing international rule system, and international rules need to be reshaped. CJK are advised to, based on fully respecting their respective sovereignty and development interests, jointly discuss and establish international standards for the related technologies, products, and services.

1 **Explore international rules for the safe and orderly flow of data across borders.** With respect to privacy protection, data security, data rights determination, digital taxation, data laws, etc., the three countries are advised to strengthen exchanges and cooperation, build consensus and trust, and jointly promote the formulation of feasible international rules so that the flow of data can better facilitate technological progress and serve the digital economy.

2 **Step up cooperation in cyberspace security.** 1) Through cooperation frameworks of CJK, promote cooperation in standards formulation, technological R&D, and product R&D related to cyberspace security, and organize various exchange activities such as seminars, exhibitions, and personnel training sessions between CJK in related fields. 2) Strengthen cooperation in online transactions to jointly combat Internet-based crimes and protect the environment for the development of the digital economy. 3) Comprehensively improve the capabilities in protecting key information infrastructure, network data, and personal information, enhance the capabilities in safeguarding the business areas by integrating digital technology, and actively respond to new security risks in cyberspace. 4) Explore new rules for the digital economy that reflect the

common interests and demands of China, Japan, and the ROK.

9.1.4 Explore a unified digital economy measurement framework.

Organize seminars and expertise sharing sessions to share the practices and experiences of digital economy measurement, and explore the construction of a basic database of the digital economy that is accessible to CJK.

1 **Share the best practices and experiences in measuring the digital economy.** Based on forming a unified perception among CJK, make full use of the cooperation frameworks of the United Nations, G20, and OECD to promote the sharing of the consensus among member countries. In-depth discussions on typical and excellent practices and cases of measuring the digital economy should be conducted to jointly provide a reference for countries to carry out digital economy measurement practices.

2 **Study and formulate a unified approach to measuring the digital economy.** 1) Unify the understanding of digital economy measurement. 2) Strengthen multilateral cooperation, and explore the construction of a basic database that is accessible to the participating countries. 3) Develop a road map and promote a unified approach to measuring the digital economy.

3 **Promote the sharing of digital dividends and narrow the digital divide.** 1) Close the gender-based digital divide, including developing a framework for measuring and tracking data that is listed for each gender. 2) Work to increase women's access to digital networks. 3) Eliminate Internet-based abuse and violence against women. 4) Improve the participation of women and girls in science, technology, engineering, and math (STEM), and support women in starting their own businesses in digital commerce. 5) Help the disabled and the elderly to enjoy digital dividends. For example, new digital interfaces

such as sensors and VUIs (Voice User Interfaces) could be used to support the disabled and the elderly in accessing digital services.

9.2 Policy Recommendations for Trilateral Cooperation in the Digital Field (RIETI)

In the digital field, every country around the world is fiercely competing. This is because digital technology has a great influence on the trend: Which company or country will have the economic hegemony of the next era in the world? In that sense, it is no exaggeration to say that the companies of the three countries are in a competitive relationship.

The digital field is one of the aspects where China has begun to challenge the US's superiority, and it may be difficult for the current Japanese industry to imagine providing digital technology to China.

In addition, Japan once had an advantage in the fields of semiconductors, LCDs, home appliances such as TVs, and mobile phones. However, South Korea has presently overtaken Japan. It may also be difficult for the current Japanese business persons to envision that Japan should provide digital technology to South Korea.

9.2.1 Competition and cooperation

Nonetheless, there is always a "competition and cooperation" relationship in every world and every industry. Even if companies are in a competitive relationship, there are always areas where it is mutually beneficial to cooperate.

If there is an industry-specific problem that cannot be solved by the efforts of only one company, it would be beneficial for all companies if the problem could be solved by cooperation between competing companies.

There is always an "industry group" in every industry in every country. Companies that are in a competitive relationship with each other gather there to discuss and cooperate on how to solve each problem in the entire industrial group that cannot be solved by one company alone.

Although it is only a conceptual general theory, if such a field can be found among the three countries, it is worth the cooperation among the three countries, and their trio can enjoy the merits.

For example, if there are digital products and digital data that can be distributed, provided free trade between the three countries is possible, the market will expand for companies in the three countries.

The first candidate may be the border systems and rules in a coordinated manner.

The second candidate is that if the domestic standards or rules of the three countries are different, the digital products and digital data of the company will be limited to their own country, but if the domestic standards or rules are matched among the three countries, they will be exported to other countries or distribution becomes possible. For example, security standards, privacy protection standards, ethical standards for AI, and so on can be considered. This is a standardization of domestic rules.

9.2.2 Study Group for Strengthening the Competitiveness of SMEs by IoT and AI

The Study Group has received several approaches from Korean manufacturing SMEs, and from that experience, small and medium-sized manufacturing companies, which are important players in the Korean industrial structure, are recognized to be interested in the "Study Group for Strengthening the Competitiveness of Small and Medium-sized Enterprises by IoT and AI," which has been held since April 2016.

Eight small and medium-sized manufacturing companies participated in this Study Group as model companies and actually made digital investments to increase sales and profit. Through the practice of eight companies, know-how on how to make digital investment to increase the sales and profit of small and medium-sized manufacturing companies has been accumulated.

One idea is to provide this know-how to the Korean side, provided it helps the development of South Korea's small and medium-sized manufacturing industry and contributes to the improvement of Japan–South Korea relations. The Study Group would be happy to provide it consulting fee-free, which is a steady and long attempt at the manufacturing factory site.

Meanwhile, Korean experts will also be trained to enable sustainable support for SMEs. This know-how is that, if provided by an information technology (IT) consulting company, a consulting fee would be much expensive. Moreover, most IT consulting companies are aimed at large companies for much profit, and there are few specialists for digitalization of small and medium-sized companies in the IT consulting company.

9.3 Policy Recommendation for Trilateral Cooperation (KISDI)

The COVID-19 breakout has accelerated the 'digital transformation', a technological and economic transition into a whole new society. Policymakers around the globe now face the challenge of enhancing the potential of the new technology, while minimizing the fallout from increased uncertainty. The holistic nature of digital transformation is emphasised in the OECD's approach to policymaking in the digital age, as presented in the Going Digital Toolkit. The toolkit is intended both as a measure to assess the country's state of digital development and to formulate relevant policies. The seven policy dimensions of this framework are outlined below.

Policy Dimension[1]	Description
Access	Access to communications infrastructures, services, and data
Use	Effective use of the power and potential of digital technologies and data for people, firms, and government
Innovation	Pushing the frontier of what is possible in the digital age drives job creation, productivity and sustainable growth
Jobs	Labour market evolves for more and better jobs while facilitating just transitions from one job to the next
Society	Stakeholders work together to balance the complex and interrelated benefits and risks from the introduction of digital technologies
Trust	Realize the economic and social potential by fostering trust in the digital environment
Market Openness	Create an enabling environment for digital transformation to change the ways firms compete, trade, and invest

1) OECD Going Digital Toolkit, Policy Dimensions OECD Going Digital Toolkit

According to this framework, policies targeting high-productivity sectors need to provide appropriate incentives for innovation systems and intellectual policy rules. The digital growth strategy also needs to go hand in hand with higher education reform and flexible labour practices. Competition law also plays an integral part because many digital business models rely heavily on the reform of traditional regulatory frameworks. Due to the disrupting nature of digital businesses, it is necessary that the regulation opens ground for a new kind of business and provides a fair base for competition in the digital platform.

We suggest that collaboration and market integration among China, Japan and Korea can significantly help three countries achieve the outlined objectives. The three countries are global leaders in innovation and dissemination of digital technologies, as indicated by the annual Global Innovation Index (GII), published by the World Intellectual Property Organization (WIPO). The GII represents the country's innovation capabilities, ranking 132 countries worldwide. According to a 2021 report, Korea ranked fifth in the global ranking, along with Singapore, one of only two Asian countries in the top ten. China was the only middle-income country in the top-20 list (12th), while Japan's place was 13. Based on the creation of articles and patents, out of the top 10 clusters in the science and technology field, six are located in East Asia: Korea (1), China (3), and Japan (2). The Tokyo-Yokohama region ranked at the top in the intensity of science and technology activities.

Dimension	Description	Korea (5)	China (12)	Japan (13)
Institutions	Political, regulatory, and business environment	28	61	7
Human capital and research	Education expenditure, Tertiary education, R&D expenditure	1	21	20
Infrastructure	ICT access and use, general infrastructure, ecological sustainability	12	24	9
Market sophistication	Credit, investment, trade, diversification, and market scale	18	16	15
Business sophistication	Firm offered training, Business R&D, University-industry collaboration, clusters, knowledge absorption (imports)	7	13	10
Knowledge and technology outputs	Patent/articles creation, high-tech manufacturing, knowledge diffusion (exports)	8	4	11
Creative outputs	Intangible assets, creative goods, and services, online creativity	8	14	18

Along with the absolute level of competence in global scale, there are relative strengths and weaknesses that the three countries can learn or gain from each other. Korea's strength lies in its human capital and research input, ranking at the global top for three consecutive years. Diverting some of the resources to collaboration with China or Japan may help enhance the outcome efficiency. Korea also has weaknesses in its institutions (28) and market sophistication (18), such as 'cost of redundancy dismissal', 'regulatory quality', 'venture capital recipients', 'applied tariff rate', and 'ease of getting credit'. Inflow of foreign capital and market integration can help accelerate institutional upgrade.

China consistently outperformed the same income group in dimensions such as:

- PISA scores (a measure of student achievement in reading, math, and science).
- Firms offering formal training.
- Patent/utility models (a less stringent form of a patent) filed at the national patent office (per GDP).
- High-tech exports (% of total trade).
- Trademarks/industrial designs filed at the national office (per GDP).
- Creative goods exports (% of total trade).

Japan's strengths were in institutions, R&D, and knowledge diffusion. Japan was ranked 1st in the 'cost of redundancy dismissal', 'patent families (per GDP)', 'intellectual property receipts (% of total trade)', 'production and export complexity'.

China's enormous talent pool and domestic market can help expand the narrow research circle in Korea and Japan. Japanese institutions can serve as a benchmark for setting rules in the digital economy of China and Korea.

The digital economy results from digital transformation in all industries and relies on advanced ICT general-purpose technologies (GPT), such as AI, metaverse, and blockchain. GPT creates new customer utility through new innovative business models while improving productivity and innovating the ways of using technologies. Therefore, it is essential to develop ICT GPT and become a global leader in the field of sustainable economic growth in the digital economy. Hence, all three governments are making national efforts to develop ICT GPT by establishing national ICT strategies and large-scale R&D projects.

To become a global leader in the ICT GPT field, a detailed standardisation strategy must be accompanied by a national-scale R&D strategy. Even if we have future leading technologies, if we do not reflect them in international standards or respond appropriately to global technological development trends, technologies developed through national efforts may become extinct or isolated from the global market. Recently, in international standardisation, the international joint development model through multilateral cooperation is being actively promoted. The Northeast Asian Standards Cooperation Forum is being operated with the participation of public officials in charge of the standard trilateral policies of Korea, China, and Japan and private standards experts. It is necessary to broaden the scope of discussion at the forum and establish a mid to long-term roadmap of the standardisation strategies of the three countries' general-purpose technologies to gain an edge in standardisation competition. It is crucial to ensure smooth technology transfer and interoperability between countries while compensating for each other's shortcomings in the process of technology development and standardisation between countries with different technological strengths.

Name: Trilateral Cooperation Secretariat
Title: Trilateral Economic Report 2011-2020
Other titles: TER | Trilateral Economic Report
Publisher: OU Boqian, Secretary-General
BEK Bumhym, Deputy Secretary-General
SAKATA Natsuko, Deputy Secretary-General

The *Trilateral Economic Report* (TER) is an annual flagship report of the Trilateral Cooperation Secretariat (TCS). It reviews economic cooperation among the three countries and showcases the joint efforts the three countries made at national, regional, and global levels. It also provides insights into the cooperation in the future, with a view to spur the efforts of our region to achieve common prosperity.

Recommended citation: Trilateral Cooperation Secretariat. 2022. Trilateral Economic Report 2011-2020. Seoul, the Republic of Korea, June.

Trilateral Cooperation Secretariat, Economic Affairs Department
S-Tower 20th FL, 82 Saemunan-ro, Jongno-gu, Seoul, Korea 03185
Tel: (82) 2-733-4700 Fax: (82) 2-733-2525 E-mail: tcs@tcs-asia.org
www.tcs-asia.org

Corrections and Revisions

The data and analysis appearing in the Trilateral Economic Report (TER) are compiled by the TCS staff at the time of publication. Every effort is made to ensure their timeliness, accuracy, and completeness. When errors are discovered, corrections and revisions are incorporated into the digital editions available from the TCS website.

Print and Digital Editions

HMDESIGN
Tel : (82) 1566-9967 / (82) 2-566-8020 Fax : (82) 2-561-7785 E-mail : info@hmdesign.kr

Print

You can contact TCS for the print copies of this TER.

Digital

The digital editions of the TER is available on the TCS e-publication at tcs-asia.org/en/data/publications.php.