
Global Value Chains and the Industrialization of Korea

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Chapter 1. Introduction

1. Research Background

The dynamic development of global trade over the past 20 years has led to intensifying competition among the world's major economies to secure a leading role in global value chains (GVCs). GVCs have the effect of further broadening the horizons of untrammled competition in a global market where the loosening of trade barriers and developments in transportation and communications have resulted in competition between companies intensifying by the day. While GVCs are formed through the medium of trade, they are actually a complex process created as company management resources and know-how cross national borders. The characteristics defining the multinational corporations that dominate GVCs are their loss of manufacturing functions and their monopolies on such key capabilities as product planning and design, global pro-

curement of production resources, and marketing.

2. Research Goals and Content

This report was written with the goal of analyzing how GVC development has resulted in changes to the international industry relationship between Korea and other major economies and to industry competitiveness and the vertical international division of labor in GVC terms. Chapter 2 uses an inter-industry analysis to analyze the extent of the impact on industries in Korea and other major economies from shocks in overseas demand. Chapter 3 uses value-added exports to analyze how the industry competitiveness of major economies has changed amid GVC development. Chapter 4 uses the recently developed gross export decomposition method to analyze changes in the vertical international division of labor in terms of value-added structure. The final chapter seeks to offer avenues for Korean mainstay industries at a crossroads to make effective use of GVCs in achieving advanced industrial power status.

3. Research Methods

The focus of this study is on using international interindustry tables and recently developed interindustry analysis methods to identify changes in GVC structure.

In addition to conventional interindustry analysis, this report also attempts to calculate different indicators for GVC analysis and assess the positions of different countries within GVCs.

This approach is expected to contribute to overcoming the

limitations of traditional trade statistic-dependent competitiveness analysis methods and understanding the sources of industry competitiveness.

Chapter 2. Intensifying International Interindustry Linkages

1. Analysis Background

The recent sharp slowdown in the growth curve for global trade has raised concerns about the negative effects that stagnant trade has on global growth. In particular, deepening stagnation in import demand amid the slowdown in China's growth since 2015 has exacerbated the slump in global trade. The slowdown in Chinese imports has had a major effect on other Asian countries with close GVC relationships to China, causing a simultaneous slump in Asian trade.

Another characteristic of global trade in the 2000s was that the change in trade volumes outpaced the rate of change in gross domestic product (GDP). In other words, trade elasticity increased with respect to GDP. Recent studies have identified GVC expansion as one of the chief reasons for this.

The above discussion suggests the possibility that GVC expansions have resulted in deepening interindustry linkages between countries that have intensified the impact on domestic industries from shocks occurring overseas.

2. Analysis of Influences on Changes in Overseas Demand

Analysis of shocks in terms of overseas manufacturing demands

shows relatively lesser impacts for the US, Australia, and Japan, while countries such as Taiwan, Germany, and the Czech Republic were heavily affected. Korea was similar to Taiwan in being a more strongly affected country. In terms of the impact of shocks in overseas demand, those coming through indirect pathways accounted for around 20%–30% of all effects, but for Australia and Taiwan the percentage exceeded 50%. This can be attributed to large amounts of exports of raw materials (Australia) and electronics industry intermediate goods (Taiwan) to China and various other countries. Korea, Taiwan, and the Czech Republic experienced large increases in indirect pathway effects compared to other countries. In Taiwan's case, the fact that changes in effects through indirect pathways were greater than changes in overall effects suggests GVC participation has left the industry structure highly susceptible to overseas shocks.

In the Korean case, the transportation equipment industry ranked as the most strongly affected by overseas shocks in 2011. A 10% change in global manufacturing import demand was associated with a roughly 5% change in value-added production for this industry. Electronics and machinery ranked as the most heavily affected industries after transportation equipment. These three industries share commonalities in being mainstay Korean export industries with strongly developed GVCs. The country with the greatest increase in import demand influences on Korean industries over the period of analysis was China. As trade between Korea and China also experienced the largest increase over this period, this may be seen as a natural outcome of China's increased influence. The effects of Chinese import demand on the machinery

and electronics industry grew enough for shocks to rival those associated with the US.

Examination of influences and correlation between shocks in overseas demand and extent of GVC participation showed positive correlations with the impact of overseas demand shocks for all three indicators used to gauge participation. This means that influences from changes in overseas demand increased with the extent of a country's GVC involvement. Among the three indicators, GVC length has the smallest and loosest correlation. This can be attributed to the potential amplification or damping of ripple effects from overseas shocks as longer GVCs lead to more complex industry interlinkages.

3. Interrelationships among Asian Countries

For analysis of industry interrelationships between Asian countries, the Yokohama National University-developed Global Input-Output (YNU-GIO) Database was used in place of the World Input-Output Database (WIOD). Examination of indicators for influence on Asian countries showed the greatest impact from import demand shocks in 1997 to have come from Japan, whereas in 2012 Chinese import demand was responsible for the largest impact. This is the result of rapid development in Asian GVCs resulting in a large increase in intermediate goods from various Asian countries being input into Chinese manufacturing production. The countries subject to the greatest influence from China were Taiwan, Korea, and Vietnam.

Sensitivity indicators for Asian countries showed a contrast be-

tween declining sensitivity for Japan and increasing sensitivity for China. The increase in China's sensitivity is a result of its deep GVC-based involvement in other countries' production over the past 15 years, offering evidence that Chinese industries are absorbing much of the import demand changes in Asian countries. Korea's sensitivity was found to be high for China (9.9%), Vietnam (9.7%), and Singapore (7.4%). As noted in the background section, Vietnam's trade relationship with Korea in particular has deepened enough for it to have become one of Korea's top ten export destinations.

Chapter 3. Changes in GVC Competitiveness

1. Research Background

In trade terms, industry competitiveness depends more on how much value-added can be obtained from export-related production activities than on how many products are exported. In the case of the global smartphone market, China is determined to have strong export competitiveness because it is an exporter of finished products, while the US is an importer of finished products. In terms of value-added obtained from the GVC, however, the US, and most notably Apple, has the absolute advantage.

In terms of final value, completely different conclusions of export competitiveness are reached when it is re-analyzed in terms of value-added through GVC decomposition. Factors such as exchange rate changes and removal of trade barriers exert different effects on trade depending on where in the value chain they are located and how much they contribute to value-added. The world's major inter-

national organizations have worked actively to closely analyze GVC structure and build internationally linked interindustry tables to aid in identifying national and industry GVC relationships.

2. Analysis Indicator Selection

Revealed comparative advantage (RCA) is a traditional export competitiveness indicator through which export statistics are used to calculate market share and make determinations on the extent of competitiveness. When used as a means of analyzing GVC competitiveness, RCA calculation is performed using only domestic value-added included in final exports, rather than the final export amount itself.

The term “GVC income” refers to value-added generated in connection with manufacturing production of end goods. Because GVC income includes value-added for all domestic industries directly and indirectly input into manufacturing, it is a suitable measure for comparison and assessing individual countries’ industry competitiveness at the international level.

As a competitiveness indicator to assess GVC standing, the GVC participation rate (value-added to export and value-added to import ratios) was used. The value-added to export (VAX) ratio represents the percentage of value-added produced domestically that is consumed indirectly overseas through exports of intermediate goods and services. The value-added to import ratio represents the percentage of value-added produced overseas that is indirectly consumed domestically through imports of intermediate goods and services.

3. Competitiveness Analysis by Indicator

Comparison of the RCA index for the electronics industry shows China's total export competitive index level to be very high compared to its value-added export competitiveness index level. The reason for China's high total export competitiveness index is rooted in traditional trade theory: China's competitiveness is high because it simply exports finished smartphones. In contrast with China, value-added competitiveness exceeded total export competitiveness for Korea, the US, and Japan. In Korea's case, value-added competitiveness has come to surpass the US, Japan, and China due to a large increase in electronics industry value-added exports since the 2000s.

As the country most actively involved in GVCs, China experienced the largest increase in GVC income market share. The rise in China's income market share has accelerated even further since the 2000s, a phenomenon that may be attributed to its increased GVC rule thanks to greatly enhanced access to global markets with its 2002 membership in the World Trade Organization (WTO). Korea's increased involvement in Asian value chains has translated into a relatively stable and consistent income market share.

Comparison of the net income contribution rate for GVC income produces very different findings for major economies' standings compared to those calculated in terms of simple income market share. Net income contribution rate figures were greater than 1 for Japan, less than 1 for China, and close to 1 for the US, Germany, and Korea. Japan has maintained the highest level in terms of net income contribution rate, a fact that can be attributed to Japanese

businesses relocating manufacturing activities with low domestic value-added overseas and focusing their domestic capacities in high value-added manufacturing activities.

Examination of changes in overseas GVC length for major economies showed a rapid increase since the 2000s, although countries differed in changes to their value-added to export and value-added to import ratios. Foreign value chain length increased more rapidly for Korea, Japan, and Taiwan, offering indirect evidence of the large increase in intermediate goods trade within the Asian value chain due to China's emergence. In terms of value-added to export and import ratios, only China had a level far below 1, resulting in a structure strongly characterized by low value-added upstream industry (assembly). Taiwan's value-added to export and import ratios have increased markedly since the 2000s, indicating an intensifying role in intermediate goods supply.

4. Service Industries and GVC Competitiveness

Because a higher per capita income for advanced economies is associated with a high percentage of the economy represented by service industries, the percentage of services among exports also tends to be high. In the case of the US, business and financial services both account for large percentages of service exports. For Japan, China, and Korea, the rate of contribution is lower for financial than for business services, resulting in a weaker financial industry role in trade support. The contribution rates for the two types of services were lowest in Korea's case due to underdevelopment in domestic service industry support services for company

activities overseas.

Variation in the RCA index for business services was relatively slight, and a large gap was observed between the US on one side and Korea, China, and Japan on the other. The US has the highest value-added RCA index rating at around 1.5, whereas Korea, Japan, and China all had values less than 1. China's value-added competitiveness level was lowest at under 0.5.

In the case of manufacturing, the net income contribution rate for business services exceeded 1 for the US, Japan, and Germany and was close to 1 for Korea, but stood at around 0.7 for China. A similar pattern was also observed for the electronics industry. This was the result of the US, Japan, and Germany earning more than they lost in business services through manufacturing and electronics industry activities, compared to the opposite situation for China. Korea occupied a position roughly midway between the advanced economies and China.

Chapter 4. Changes in International Vertical Specialization

1. Research Background and Methods

In the world of traditional trade theory, the only trade involves finished products; trade among various countries through intermediate goods and the resulting vertical specialization between countries cannot be taken into account. The Leontief model, which is the most commonly used for interindustry analysis, considered only trade in finished goods for final demand, and is incapable of analyzing trends in value-added through intermediate goods trade.

The recently researched and developed total export decomposition method has provided a means of overcoming the limitations of the traditional interindustry analysis approach by taking into account the sources and destinations of the value-added included in intermediate goods. Use of this method enables analysis of how domestic and foreign value-added in exports not only of end goods but of intermediate goods as well is traded by country and industry. A key element of total export decomposition is matrix manipulation to identify value-added flows generated through intermediate goods trade and decompose them in terms of their sources and destinations.

2. Analyzing Vertical Specialization at the National Level

Total global exports were classified into four value-added groups, and changes between 1995 and 2011 were compared. The results showed domestic value-added (DVA) shrinking from 78.3% to 72.4%, while percentages increased for the remaining groups. This is a result of GVCs expanding around the world over the same period, resulting in active international vertical specialization.

A separate comparison of changes between 1995 and 2011 for foreign value added (FVA) alone showed low FVA percentages for Australia, the US, and Japan and high percentages for Mexico, Korea, Taiwan, and the Czech Republic. Australia, the US, and Japan have a low dependence on overseas raw materials and intermediate goods, the first because it is a raw materials exporter with a small manufacturing presence and the latter two because they have domestically self-sufficient industry structures. In contrast,

Mexico, Korea, Taiwan, and the Czech Republic are small-scale, open economies with industry structures that are heavily reliant on overseas intermediate goods for manufacturing production.

Comparison of DVA-FIN percentages (domestic value-added consumed overseas through end good exports) for ten selected countries in 2011 showed Australia and Taiwan accounting for the lowest levels and China and Japan for the highest. Because Australia chiefly exports raw materials and Taiwan intermediate goods, the contribution to domestic value-added from end good exports is very low for both countries. China and Japan both had high DVA-FIN percentages, albeit for different reasons. In China's case, end goods account for a very large percentage of exports; in Japan's case, end goods do not account for that large a percentage of exports, but their contribution to domestic value-added is large. Vertical specialization (VS) and vertical specialization 1 (VS1) ratios are leading indicators for estimating the level of a country's vertical specialization. VS, VS1, and VS1/VVS ratios rose for all countries over the period from 1995 to 2011, suggesting a global trend of increase in the percentage of intermediate goods trade. In terms of VS and VS1 scale, the US and Japan showed larger VS1 values, while Korea and Taiwan showed larger VS values. Both indicators underwent similar changes for Germany and China. As a result, the VS/VVS ratio is greater than 1 for the US and Japan and less than 1 for Taiwan and Korea; for Germany and China, the level is close to 1. As small-scale, open economies, Korea and Taiwan are heavily reliant on intermediate goods trade, which translated into high VS and VS1 ratios and a lower VS1/VVS ratio than those of other countries.

3. Electronics Industry Vertical Specialization Analysis

Comparison of the VS ratio and foreign value-added (FVA-FIN) percentages for the electronics industry in major economies showed increases in the VS ratio for all countries as a result of GVC development. The percentage of foreign value-added going into end good exports generally decreased, rising only in the case of the Czech Republic due to that country's increasingly pivotal role in assembling and exporting end goods within the European value chain. Taiwan had a relatively high VS ratio but a very low FVA-FIN value, reflecting its characteristic trade structure of importing and processing intermediate goods for re-exporting as intermediate goods. In contrast to Taiwan, China had a low VS ratio but a high FVA-FIN value, reflecting an industry structure in which intermediate goods are imported for assembly and exportation as end goods. Korea's specialization structure falls midway between those of Taiwan and China, though slightly closer to the Taiwanese structure of intermediate goods processing and export. Alongside domestic value-added (DVA), the value-added to exports (VAX) ratio is an indicator for determining how great a contribution domestic value-added makes within international vertical specialization. Because VAX represents domestic value-added, VAX ratios generally decreased over the period of analysis as GVC expansions resulted in increasing overseas procurement. The only exception here was the US, which showed an increase in its electronics industry VAX ratio. This suggests that the US electronics industry has established implicit growth through indirect exports of technology and services rather than through production and exportation of goods.

For the US and Germany, electronics industry exports consisted of around 40% end goods and 60% intermediate goods; for China, the levels were roughly similar at around 50% each for end goods and intermediate goods. Despite GVC expansions, the US experienced almost no changes in its end goods and intermediate goods export percentages. Examination of changes in the composition of US value-added showed a relatively stable rate of roughly 30%–40% domestic value-added included in end good exports, whereas the percentage of domestic value-added included in intermediate good exports rose to nearly 50%. This is the result of the US electronics industry's development through enhanced domestic value-added in domestic intermediate goods production.

In China's case, the percentage of domestic value-added included in end good and intermediate goods was only around 30%, lower than in either the US or Germany. While China's electronics industry has outwardly experienced significant growth, it remains structurally characterized by a large percentage of end good exports, and the contribution of domestic value-added remains low. Examination of changes in Japan, Taiwan, and Korea showed a marked increase in the percentage of intermediate good exports in response to China's end good exports. As China's role in end good exports has increased, these three countries have adopted a strategy of abandoning that area and achieving a more advanced structure through exportation of intermediate goods with higher value-added. For Taiwan in particular, the percentage of intermediate good exports rose from 60% in 1995 to 80% by 2011.

Chapter 5. Korean Industry Development and Policy Tasks

1. GVCs and Korean Industry Development

The future of Korean industry depends on how swiftly and flexibly it responds to global value networks dominated by fusion and convergence industries. The core of global value networks is connectivity: between countries, between industries, and between activities. Efforts must be made to develop industry structure to establish close connections between activities and key industries or industries that occupy key positions with very high connectivity within value networks. The new growth strategies that domestic companies consider to produce future growth drivers on must adopt a value network approach toward maximizing value chain competitiveness.

2. Policy Tasks and Directions

In the future, the source of value chain competitiveness in international trade will lie in the production of service value-added and the acquiring of exclusive intangible assets. The continued rise in trade around intangible assets such as intellectual property rights and human capital is expected to inevitably place services at the center of global trade. For small-scale, open economies such as Korea's, a GVC strategy of importing value-added from overseas and creating higher value-added for exportation is effective. A crucial question for domestic mainstay industries is how to link the new technology and information of the present and future into existing

or new products to produce high value-added services. Korea must adopt a forward-thinking approach toward the establishment of a new trade order that will regulate trade issues for deep integration of service trade, intellectual property rights, and technology transfers.

Smooth functioning of GVCs will require not only product and service transactions, but also active exchanges of technology, ideas, and personnel. As GVCs become more complex, the role and service of connecting with the right trade and investment partners for different companies' demands assume greater importance.

For this reason, a stronger information network must be established to take advantage of trade promotion organizations such as KOTRA and the Korea International Trade Association to support domestic companies entering overseas markets and overseas companies entering the domestic market.

With protectionism around the world becoming a matter of concern, Korea must make the freezing and abolition of protectionist policies a priority condition for new trade negotiations. Indeed, the protectionism freezing and abolition approach had the intended effect as a precondition in the past Uruguay Round of trade talks. Thanks to this approach, it became harder for countries to adopt protectionist measures while talks were beginning or under way as a means of gaining the upper hand.

It would not be overstating the matter to say that the GVCs of the future will hinge on the servitization of manufacturing and advancements in factory-free manufacturing. The companies that flourish in the value network era will be those that create key value chains and produce new value-added that combines with them.

The government must combine policies effectively to create a corporate ecosystem where the results of innovation by companies spread to industries as a whole and new profit models are constantly being developed. Removing barriers to entrepreneurship and growth by companies possessing new ideas and technology is of paramount importance. Because the government cannot distinguish and remove all the different obstacles on its own, a network of private/government/academic/research collaboration must be established. Trade and foreign direct investment are the two pillars that sustain GVCs. It would not be going too far to say that the very core of GVC lies in varied and vigorous activity by multinational enterprises (MNEs). As GVCs develop, the focus of direct investment by MNEs is shifting from industries to activities. For Korea to attract high value-added technology- or knowledge-intensive activities, it will need the intellectual capital and/or infrastructure to support those activities. This will require the development of an agglomeration economy of accumulated human or knowledge capital, particularly in its large cities and innovation cities. Policies should be particularly oriented toward removing business and land regulations that are impeding development of an agglomeration economy in the greater Seoul area and promoting a concentration of blue-chip enterprises and specialized workers.

GVCs are offering a new opportunity to small businesses: the chance to flourish as “micro-MNEs.” Micro-MNEs represent a new form of company created by GVC expansion. Because businesses themselves are hard-pressed to independently acquire the capabilities they need to become global companies with domains of their own, support from the government or related institutions is

essential. Korea has many policies and systems in place to boost the global capabilities of small businesses. Trade support institutions and the banks involved in lending funds to small businesses must develop more organic systems for assessing and supporting the improvement of these businesses' global capabilities.