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The Impact of Chinese Economic Structural Changes on Korea's Export to China

SHIN Kotbee and CHOI Bo-Young



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Executive Summary

This paper examines the structural changes of the Chinese economy and how they have affected Korea's exports to China. Focusing on the evolution of China's role in the global value chain, we estimate the impact of China's external demand and domestic demand. We also shed light on the effect of compositional changes in China's GDP on Korea's exports to China. The results of the VAR analysis suggest that external demand had a significant impact on Korea's exports to China prior to 2008, while Chinese domestic demand became more important afterwards. Moreover, Chinese investment is the most important factor in determining Korea's exports to China, and Chinese private consumption has recently been gaining relevance.

Keywords: VAR, Chinese structural change, Korean exports to China
JEL Classification: F10, F14, F4

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The Impact of Chinese Economic Structural Changes on Korea's Export to China

SHIN Kotbee* and CHOI Bo-Young**

1. Introduction

Along with China's trade reforms in the 1990s, China's accession to the World Trade Organization in 2001 has led to exceptional economic growth in China and has allowed East Asian countries to enjoy greater access to the Chinese market for their exports. Korea, as one of China's closest neighbors, has been one of the greatest beneficiaries of China's growth.

However, China is in the midst of major structural changes in many dimensions. At the aggregate level, Chinese real GDP has slowed down, entering a new stage of development, the so-called "New Normal era," since the global financial crisis.[1] At the same time, China has shifted its strategy from export-led growth toward domestic demand-led growth, par-

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[1] Chinese real GDP growth fell from 14.2% in 2007 to 9.8% in 2008 and reached 6.9% in 2015 (Oxford Economics Database, accessed on 2016. 4. 16).

ticularly consumption. Meanwhile, China's processing trade has declined dramatically. Fearing an overheating economy, China intensified its processing trade restriction measures during 2007/2008. The Catalogue of Prohibited Commodities listed 1,140 items in 2007 and increased the number of items to 1,860 in 2008.[2] This was part of the Chinese government's effort to control its exports of low-value-added products. Recent studies show that China has shifted from imports of intermediate inputs from Japan and Korea to the local sourcing of inputs (e.g., Aziz and Li 2008) Such structural changes are likely to have a significant impact on China's major trade partners.

The main purpose of this paper is to empirically investigate the impact of structural changes in China's economy on Korean exports to China. To assess the evolution of the relative importance of China's external and domestic demand, we adopt the recursive vector autoregressive approach based on the import–demand relationship. In addition, since the compositional shift in Chinese expenditure is also likely to affect the trade volume of its major exporters, we extend the VAR analysis by considering each component of Chinese GDP. Although compositional changes in China's demand have been pointed out, there has been little empirical work done to assess the impact of such changes on China's trade. As the import contents of the components of China's expenditures are different, their impacts on Korea's trade to China may not be identical.

To preview the results, we find that Chinese exports to advanced economies had a statistically significant effect on Korea's exports to China before the global financial crisis but that the effect became insignificant afterwards. Conversely, China's domestic demand shock did not have a significant effect on Korea's exports to China before the crisis but significantly increased Korea's exports to China after the crisis. The results imply that China's role as an assembler of parts and components and exporter to oth-

[2] Luo and Zhang (2010).

er countries has dwindled. Instead, the Chinese domestic market has been of growing importance to its trade partners. When investigating the VAR analysis by expenditure components, we find that the shock on China's private consumption and investment both had a significant impact on Korea's exports to China after the crisis, while government expenditures had no significant effects on either the pre- or post- crisis period. China's investment, which has higher import content than private or government consumption, shows a relatively strong effect on Korea's exports to China. Thus, the net effect of a 1% decline in Chinese investment with a 1% positive growth in Chinese consumption on Korean exports to China is expected to be negative, even with the same level of aggregate GDP.

The rest of the paper is organized as follows. In section II, we review the related literature. In section III, we show the structural changes in the Chinese economy. Section IV presents the VAR model and empirical results. Section V concludes the paper with a brief discussion of its possible policy implications.

2. Literature Review

This paper contributes to the strand of literature that has stressed the importance of considering compositional changes in estimations of trade elasticities. Bussière *et al.* (2013) propose an import intensity-adjusted measure of aggregate demand and use it to estimate demand trade elasticities. Their seminal work sheds light on the role of demand composition in trade dynamics because the most import-intensive components of expenditure, investment and exports, tend to show greater movement. Using the same measure, Morel (2015) finds that a main factor in sluggish export growth since 2011 was the weakness of global investment, a trade-intensive demand component, and weak demand out of Europe. Aziz and Li (2008) find that the change in Chinese aggregate export elasticities reflects changes in the composition of China's trade, particularly the increasing sophistication of exports and the rising domestic content of processing trade.

As China has become an increasingly important part of the global trading system over the past three decades, examining the impact of the Chinese economy on other Asian countries has been of great interest to economists. Haltmaier *et al.* (2007) assess China's role in Asia in various dimensions: as an independent engine of growth, as a conduit of demand from the industrial countries, and as a competitor for export markets. Comparing the impact of U.S. and Chinese demand on the output growth of Asian economies by estimating growth comovements and VARs for 1993:Q2-2006:Q4, they find an increasing role of China as an independent source of growth, especially for Korea, Singapore, Taiwan, and Thailand. They also confirm the significant role of China as a conduit with large volumes of trade in parts and components and find evidence that China had negative effects on the exports of some products for some Asian countries. Park and Shin (2011) adopt the VAR framework of Haltmaier *et al.* (2007) for a longer time horizon, 1990:Q1 to 2010:Q1, and show that exports to China

contributed to developing Asian countries' recovery from the 2008/09 global financial crisis. However, when extending the model to incorporate derived demand, China's positive impact disappears at a longer horizon. While much previous work has emphasized China's role as a conduit of demand from advanced economies, Cui and Syed (2007) find that China is moving away from traditional assembly operations in its processing activities and that its exports have started to rely more on domestically sourced components. As a result, China's exports and imports have begun to delink, implying that China's external demand has become less important to its exporters.

In this paper, we apply the VAR framework following Haltmaier *et al.* (2007) and Park and Shin (2011). Unlike the previous studies, however, we compare the impacts of China's exports to advanced economies and Chinese domestic demand on Korea's exports to China in order to determine whether the relative importance of China's domestic demand or China's external demand has indeed changed during the period we investigate. In addition, because China is going through structural changes to pursue more sustainable economic growth by transforming from investment-led growth to consumption-led growth, we decompose the components of China's domestic demand and examine the evolution of the importance of the components for Korea's exports to China.

3. The Structural Changes of the Chinese Economy

In this section, we document the structural changes in the Chinese economy according to two dimensions. First, we focus on the compositional change in China's GDP; this change may have a substantial impact on Korea's exports because each component of GDP may have different import content. Second, we examine the evolution of China's role in the global value chain. Changes in the Chinese trade structure is expected to affect Korea's exports to China due to their close production network.

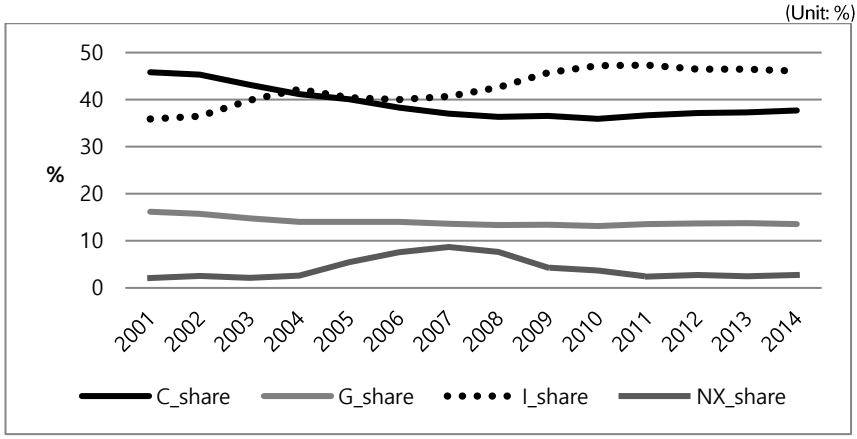
3-1. The Compositional Change in China's GDP

During the last decade, China's growth was based on resource-intensive investment, manufacturing, and exports. However, because such growth is believed to create economic, environmental, and social imbalances, the Chinese government has attempted to shift from investment-led growth to consumption-led growth—rebalancing domestic growth by increasing the share of private consumption of GDP to ensure an increase in average household welfare and greater social stability. Figure 3-1 shows the share of each component of GDP expenditure. The share of consumption declined from 2001 to 2009 but has increased steadily in recent years. The investment share increased until 2011, reaching 47.3% of total GDP, but has exhibited a slight decline since then.[3] Because consumption grew slightly faster than investment, Prasad (2015) detects signs of transition from investment-led growth to consumption-led growth. Meanwhile, the share of net exports peaked in 2007 and has exhibited a downward trend since the

[3] Examining the three components of expenditure from 2004 to 2009, Knight and Wang (2011) point out China's "expenditure imbalance." Chinese consumption is close to 50% and investment is over 40% of GDP, while consumption generally comprises two-thirds or more and investment one-third or less of GDP in other countries.

Figure 3-1. The Components of GDP in China (The Shares of Components in GDP)

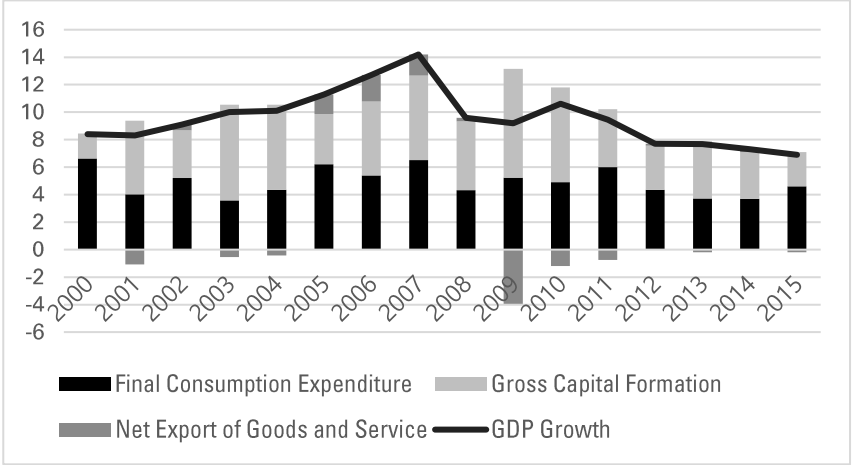
(Unit: %)



Note: The share of each GDP component is based on nominal values. The nominal GDP and its components are collected from the International Monetary Fund compiled by CEIC Database (accessed on 2016. 4. 28).

Figure 3-2. Contributions of Components to Nominal GDP Growth

(Unit: %)



Source: CEIC (accessed on 2016. 5. 3).

crisis. Figure 3-2 shows that investment has been a major contributor to growth, but the contribution has been declining recently. Investment accounted for around 86% of China's nominal growth in 2009 and then de-

clined to 36.1% by 2015. The contribution of China's trade balance was limited throughout the period we examine, except for 2005 to 2007.

3-2. China's Import Intensity-Adjusted Demand

The ongoing structural change in China will affect the structure of its imports since the import requirements of a domestic demand- and consumption-based economy differ from those of an export- and investment-based economy. Bussière *et al.* (2013) point out that different components of import demand have different import intensities: investment and exports have particularly rich import content, while other components, like private consumption and government spending, have lower import content. Thus, assuming that the decline in investment is completely made up by an increase in private consumption in China, the net effect on Korea's exports to China is likely to be negative. This means that, along with the overall slow growth in China, the compositional shift of China's import demand may compound the negative effects on Korea's exports to China.

While GDP and domestic demand (the sum of private and government consumption and investment) have been used as a traditional measure of import demand to explain trade flows, Bussière *et al.* (2013) propose the import intensity-adjusted demand measure as a better proxy of import demand. Table 3-1 shows the import intensity-adjusted demand measure calculated for China, Japan, Korea, and the U.S. for 1995, 2000, and 2005. For all four countries, the import content is greatest for either exports or investment, followed by private consumption and government consumption. In particular, the import content for China's investment and exports is 28.8% and 27.4%, respectively, while it is only 19.1% and 10.8% for private consumption and government consumption. This may imply that a decline in China's investment and exports would have a much greater negative impact on Korea's exports to China than would a decline in either

private or government consumption. The country order of import content share is mainly determined by the position in the global production chain: Japan and the U.S. have more domestic intermediate suppliers than China and Korea, so the import contents are lower.

Table 3-1. Total Import Content of Main GDP Components

(Unit: %)

	Import Content of Private Consumption			Import Content of Government Consumption			Import Content of Total Investment			Import Content of Exports		
	1995	2000	2005	1995	2000	2005	1995	2000	2005	1995	2000	2005
Japan	9.1	9.8	11.7	3.0	2.8	6.0	8.2	10.6	15.3	8.4	9.6	15.4
Korea	21.4	23.8	24.2	11.4	10.2	10.5	30.8	35.5	28.9	29.9	38.1	38.6
United States	8.7	10.5	11.9	3.7	6.0	6.2	18.4	19.1	17.3	9.5	11.0	12.3
China	11.4	13.4	19.1	9.9	10.8	13.8	26.2	20.8	28.8	15.5	19.6	27.4

Source: Bussière *et al.* (2013), online appendix Table Al (accessed on 2016. 4. 28).

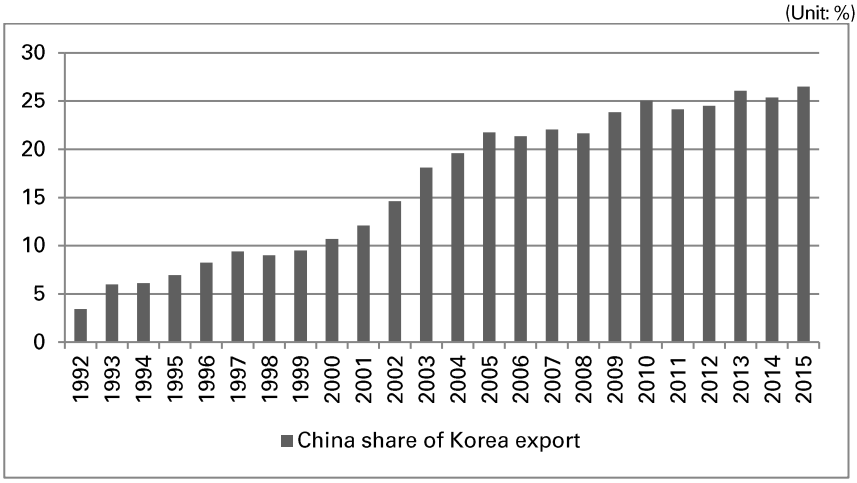
3-3. The Evolution of Korea–China Trade

The gradual liberalization of trade in China resulted in a remarkable expansion of Chinese trade growth. On December 11, 2001, China joined the World Trade Organization (WTO) and committed to implementing a series of tariff cuts. In addition to the reduction in China's import tariffs, because of China's rapid economic growth and geographical proximity with Korea, China has become Korea's top trade partner. China's share of Korea's total export expanded from 3.43% in 1992 to 26.5% in 2015 (see Figure 3-3).

The expansion of trade in China was not only due to its import tariff cuts, made to abide by WTO rules. China also offered extensive tariff reduction or tariff exemption to encourage the development of processing trade; along with this policy, low labor costs have made China an attractive

Figure 3-3. China's Share in Korea's Total Export

(Unit: %)



Source: Direction of Trade Statistics, IMF (accessed on 2016. 4. 28).

country for such type of trade. As a result, a large part of Chinese imports has consisted of processing trade; processing imports from the world accounted for around 40% of total Chinese imports from 2001 to 2007. Because of China's traditional role as a processing center, China's final goods exports to other advanced countries such as the U.S. and EU have been tightly linked to its imports from countries like Korea and Japan, which provide high-tech intermediate inputs to China.[4]

The importance of Chinese processing imports is declining, however. The share of Chinese processing imports out of its total import remained at around 40% from 2001 to 2007 but fell to 33.7% in 2008. Table 3-2 shows that the importance of processing imports declined further in later years. Likewise, the share of processing trade originating from Korea also shows a downward trend since 2009. Studies suggest that the decline in processing imports from China is due to the increase in domestic production

[4] Yu and Tian (2012) find that Korea ranks first, with a 14.97% share of China's processing imports, followed by Hong Kong, Macao, Japan, and Taiwan in 2010.

Table 3-2. China's Import Share by Customs Regime

(Unit: %)

Country	Trade type by customs regime	2006	2007	2008	2009	2010	2011	2012	2013	2014
Korea	ordinary trade	29.8	29	31.4	33.7	32.7	34	33.7	34.2	33.4
	processing trade	54.2	54.4	52.9	53.3	51.5	49.2	49.8	47.6	51.9
	other trade	16	16.6	15.7	13	15.8	16.8	16.5	18.2	14.7
World	ordinary trade	42.1	44.8	50.5	53.1	55.1	57.8	56.2	56.9	56.6
	processing trade	41.0	38.9	33.7	32.1	30.0	27.0	26.5	25.5	26.8
	other trade	16.9	16.3	15.8	14.7	14.9	15.2	17.2	17.6	16.6

Source: China's customs (purchased on 2015. 3. 24).

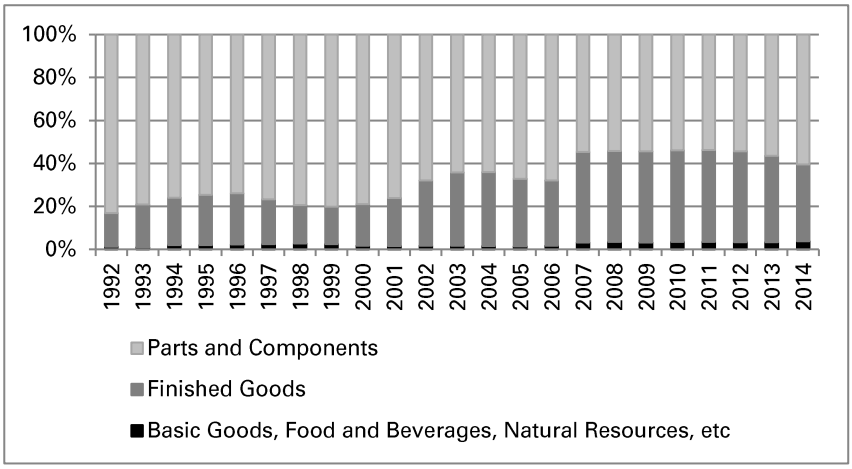
capacity; China is shifting away from assembling imported parts and components to domestic sourcing. This structural change in trade may "delink" Chinese intermediate imports from its exports.

The change in the Korea–China trade structure becomes clearer when examining trade by product type for usage. Figure 3-4 shows the share of Korean exports to China by product type for usage based on the classification suggested by Haltmaier *et al.* (2007).[5] Parts and components constituted 83% of total Korean exports to China in 1992, but the share decreased to 76% in 2002 and then further to 55% in 2007. On the other hand, the share of finished products increased substantially from 2001 to 2003 and increased further in 2007. Overall, the figure suggests that parts and components are becoming less important, while finished goods and basic goods, food and beverages, and natural resources have become a greater part of Korean exports to China.

Because the structure of exports with respect to technological sophistication may also affect trade elasticity, it is worthwhile to examine such changes

[5] Haltmaier *et al.* (2007) define "parts and components" by comprehensively extending and modifying the classification suggested by Athukorala (2005).

Figure 3-4. Korea's Exports to China by Type of Product Usage



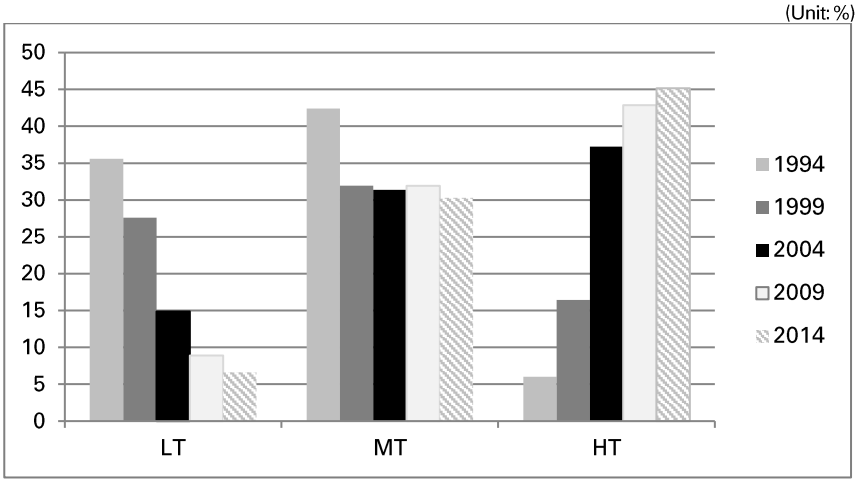
Note: The classification is based on Haltmaier *et al.* (2007).

Source: UNCTAD Comtrade via WITS (accessed on 2016. 2016. 3. 7).

in Korea's exports to China. Figure 3-5 shows the change in the structure of Korean manufacturing exports to China based on Lall's (2000) classification of technological sophistication. In 1994, 32.4% of Korean exports consisted of low-tech manufacturing products, including textile, garments, and footwear, while the share declined to only 8.6% by 2014. The share of medium-tech manufacturing products such as automotive, chemicals, basic metals, and engineering products also declined slightly, from 44.5% in 1994 to 33.1%, in 2014. On the other hand, the share of high-tech manufacturing products was only 10.8% in 1994, increased to 48.7% in 2004, and then dropped to 28.8% in 2014. However, the decline was due mainly to the increase in the share of non-manufacturing product exports; manufacturing goods exports accounted for 87.7% in 1994, increased to 89.1% in 2004, and dropped to 70.5% out of total Korea exports to China in 2014. This upgrading of the Chinese import structure also suggests that China has moved up the global value chain.

Figure 3-5. Korea's Exports to China by Technological Sophistication

(Unit: %)



Note: The classification is based on Lall (2000).

Source: UNCTAD Comtrade via WITS (accessed on 2016. 4. 11).

4. Empirical Analysis: VAR Approach

4-1. Model Specification

In this section, we employ a recursive VAR model to assess the impact of Chinese macroeconomic variables on Korean exports to China. The theoretical foundation for the dynamic relationship between variables is based on the imperfect substitutes model of Goldstein and Khan (1985). The model derives an import function whereby the quantity of imports (or exports of the counterparts) is determined by the importing country's real income and relative prices. Real income is often measured in real GDP, and aggregate relative prices can be interpreted as the real exchange rates. A VAR model with the importing country's GDP, real exchange rate, and import volume can be applied, as in Kim and Choi (2010).[6] However, this paper focuses on the evolution of the trade–income relationship by decomposing the Chinese GDP into external demand and domestic demand and then further decomposing domestic demand into private consumption, investment, and government consumption. China has been intensively importing intermediate goods and capital goods from Korea to produce final goods and re-export them to advanced economies. Due to this production network, Korean exports to China will be affected by external demand as well as domestic demand. As discussed in the previous section, the relative importance of derived demand from final destinations such as the U.S. and Europe may evolve along with China's changing role in the global value chain. Thus, we divide real income into two components, exports and domestic demand.

[6] Kim and Choi (2010) estimate a VAR model with Chinese GDP, real exchange rates, and Korean exports to China. They extend the model by considering Chinese real exchange rates and Korean real exchange rates separately so that the price effect of Chinese real exchange rates on Chinese GDP may be reflected indirectly.

We construct a four-variable VAR model with Chinese real exports to U.S. and Europe, Chinese real domestic demand, Korean real exports to China, and won–yuan real exchange rates. The dynamic relationship between variables is summarized in the following structural form:

$$A_0 y_t = c + A_1 y_{t-1} + \cdots + A_p y_{t-p} + e_t \qquad E(e_t e_t') = \Sigma \qquad (1)$$

where c is a constant vector, and e_t denotes a vector of structural shocks. Since structural shocks are assumed to be mutually uncorrelated, the covariance matrix of e_t, Σ, is a diagonal matrix whose diagonals are the variances of each structural shocks.

Equation (1) can be rewritten as a reduced-form VAR by inverting A_0:

$$\begin{aligned} y_t &= A_0^{-1}c + A_0^{-1}A_1 y_{t-1} + \cdots + A_0^{-1}A_p y_{t-p} + A_0^{-1}e_t \\ &= c^* + B_1 y_{t-1} + \cdots + B_p y_{t-p} + u_t \quad E(u_t u_t') = \Omega \end{aligned} \qquad (2)$$

where the variance–covariance matrix of reduced-form error is $\Omega = A_0^{-1} \sum A_0^{-1}$. Since the variance–covariance matrix is symmetric, additional identifying restrictions are required to recover the parameters in (1) from the estimated parameters in the reduced-form VAR. Our identification approach is to place short-run restrictions on the contemporaneous relations by ordering the most exogenous variable first and the most endogenous variable last. Considering that Chinese exports to U.S. and Europe are determined primarily by demand in U.S. and Europe for Chinese goods, Chinese exports can be regarded as exogenous with respect to China's domestic demand. It is also natural to think that Chinese exports and domestic demand are affected by neither Korean exports nor real exchange rates, as Korea is a small open economy. Finally, we assume that Korea's exports to China affect the real exchange rates in the contemporaneous period but not vice versa. To summarize, the ordering of the variables is [China's exports to

U.S. and Europe, China's real domestic demand, Korea's exports to China, won–yuan real exchange rates].

Data on Chinese exports to the U.S. and Europe and Korean exports to China are obtained from IMF Direction of Trade Statistics. Chinese domestic demand is defined as the sum of private consumption, government consumption, and investment. Data on Chinese real private consumption, government consumption, and investment are obtained from the Oxford Economics database. Won–yuan nominal exchange rates are calculated based on the won–dollar exchange rates and the yuan–dollar exchange rates, which are then multiplied by the ratio of CPIs[7] for conversion into real exchange rates. Export data are transformed in real terms. Korea nominal exports to China are deflated by the Korea export deflator. China nominal exports to U.S. and Europe are deflated by the U.S. import deflator. Nominal exchange rates, CPI indices, and export and import deflators are obtained from the Oxford Economics database. After seasonal adjustments through the Census X-12 procedure, all variables are converted into quarter-over-quarter growth rates. The sample ranges from 2001:Q1 to 2015:Q3.

To examine the change in the Chinese impact on Korean exports, we estimate the model for two sample periods, 2001:Q1-2008:Q2 and 2008:Q3-2015:Q3. Due to the limited number of observations, samples are divided according to the major global structural break, the 2008 global financial crisis. China went through structural changes such as a diminishing share of processing trade around the global financial crisis. The length of lag is set at one, based on the Akaike information criterion.

[7] For a robustness check, PPP indices to construct the real exchange rates are used; the empirical results are qualitatively the same.

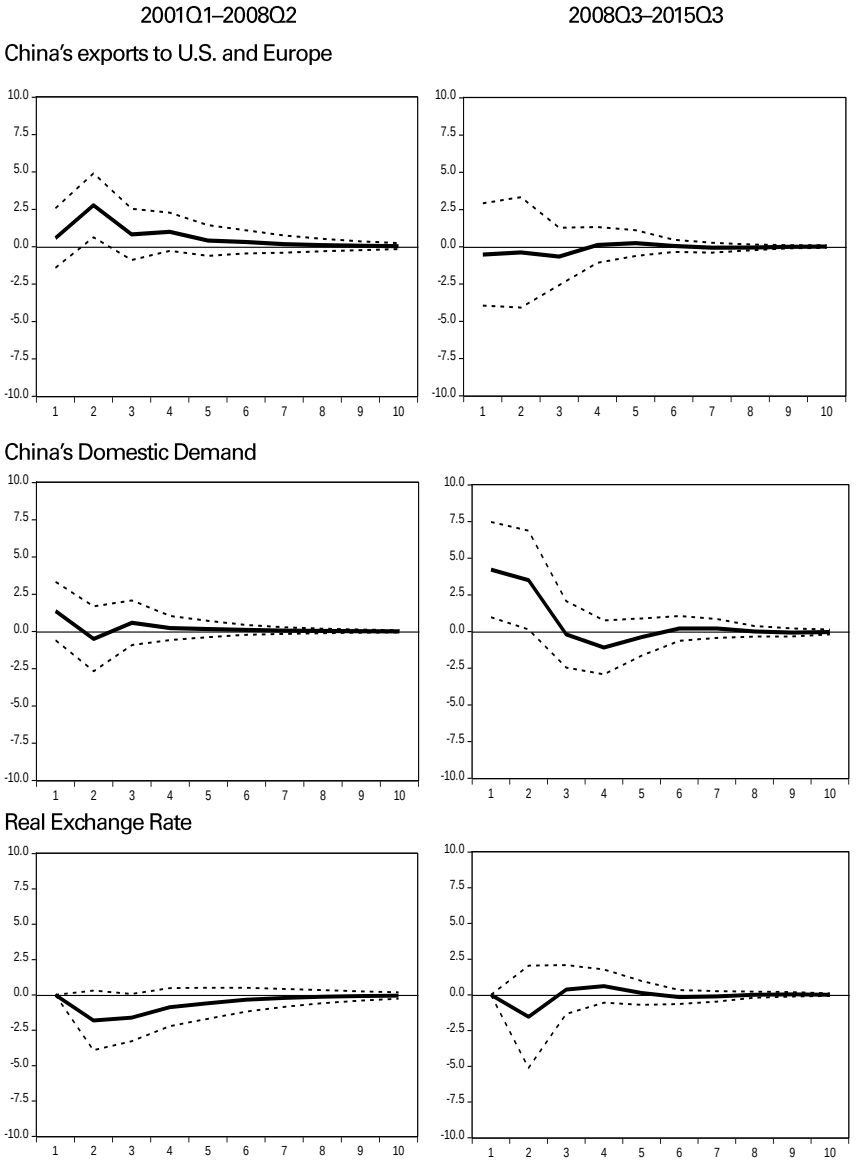
4-2. Empirical Results

Figure 4-1 reports the responses of Korea's real exports to China to one standard deviation shocks to Chinese exports to U.S. and Europe, Chinese domestic demand, and the real exchange rates. The left panels show the impulse-response functions for 2001:Q1-2008:Q2, and the right panels show the impulse-response functions for 2008:Q3-2015:Q3. The solid lines represent the point estimates, and the dotted lines cover 95% confidence intervals.

Before the global financial crisis, the response to the Chinese export shock is hump-shaped, with a peak in the second quarter. A one standard-deviation innovation in Chinese exports increases the growth in Korean exports to China by 0.58% point in the first quarter and further increases it by 2.8% points in the second quarter. The second quarter response is statistically significant. One possible explanation for the significant linkage between external demand and imports from Korea is the prominent share of processing trade both in Chinese exports and imports.[8] China has been deeply integrated into the vertical supply chain with its neighboring East Asian countries, especially Taiwan, Japan, and Korea, due to its comparative advantages in manufacturing parts and components. Korea provided intermediate and capital goods to Chinese exporters, who re-exported to third countries. In addition to the processing trade channel, this could also be explained by the rapid expansion of Korea's foreign direct investment (FDI) to China during this period. Korea's FDI to China increased from 660 million dollars in 2001 to 5.4 billion dollars in 2007. Since Korea's investments in China tended to seek low-wage labor and target advanced countries, the hike in production fragmentation by FDI may be another channel

[8] Ianchovichina and Walmsley (2005) and Eichengreen *et al.* (2007) find that Japan and newly industrialized economies (Korea, Singapore, Taiwan, and Hong Kong) benefited from China's WTO accession by positioning themselves well as important intermediate goods suppliers for China's increasing exports.

Figure 4-1. Response of Korea's Exports to China



Note: The graphs show the responses of Korea's real exports to China to a one standard deviation shock to China's real exports to the U.S. and Euro (top panel), one standard deviation shock to China's domestic demand (middle panel), and one standard deviation shock to real exchange rates (bottom panel). The solid lines are the point estimates, and the dotted lines represent 95% confidence intervals.

Source: Author's calculations.

linking Korean exports to China to Chinese exports.[9]

After the global financial crisis, the shock to China's domestic demand significantly increased Korean exports to China, while the shock to Chinese exports was less strongly transmitted to Korean exports to China. One possible interpretation of this is that more intermediate goods have tended to be transformed into final goods and consumed in Chinese domestic market than have been exported to third countries in recent periods. Moreover, since capital goods exports such as machinery and equipment seem to be closely related to Chinese domestic activities, especially to domestic investment, Chinese domestic demand has become more relevant to Korean exports. On the other hand, noticeable trend changes occur around the global crisis. China's processing exports and imports started to slow down, and the gap between processing exports and imports began to widen (Poon 2014). Chinese policy has suppressed processing trade with assembly operations to replace the imports contents with domestically produced inputs. Thus, as the linkage between Chinese exports and imports has been weakened,[10] Korean exports to China have become less affected by external demand.

The effect of real exchange rate movements is not different from zero for both periods. This may be due to the global value chain: if yuan appreciation occurs not just against the won but also against other currencies, the downturn of competitiveness in Chinese exports may reduce the demand for the intermediate and capital goods in Korean exports to China.

The variance decompositions in Table 4-1 show the percentage contribution of each identified shock in forecasting Korea's exports to China. Variance decomposition reflects the size and frequency of shocks as well as their impact, while the impulse-response function shows the effect of a standardized shock. The overall result of the variance decomposition shows

[9] Han and Lee (2012) find that the increase in Korean firms' investments in China intensifies vertical intra-industry trade between the two countries, as it is associated with production fragmentation.

[10] Cui and Syed (2007) document the delinking of Chinese imports from exports, using disaggregated trade data.

Table 4-1. Variance Decomposition

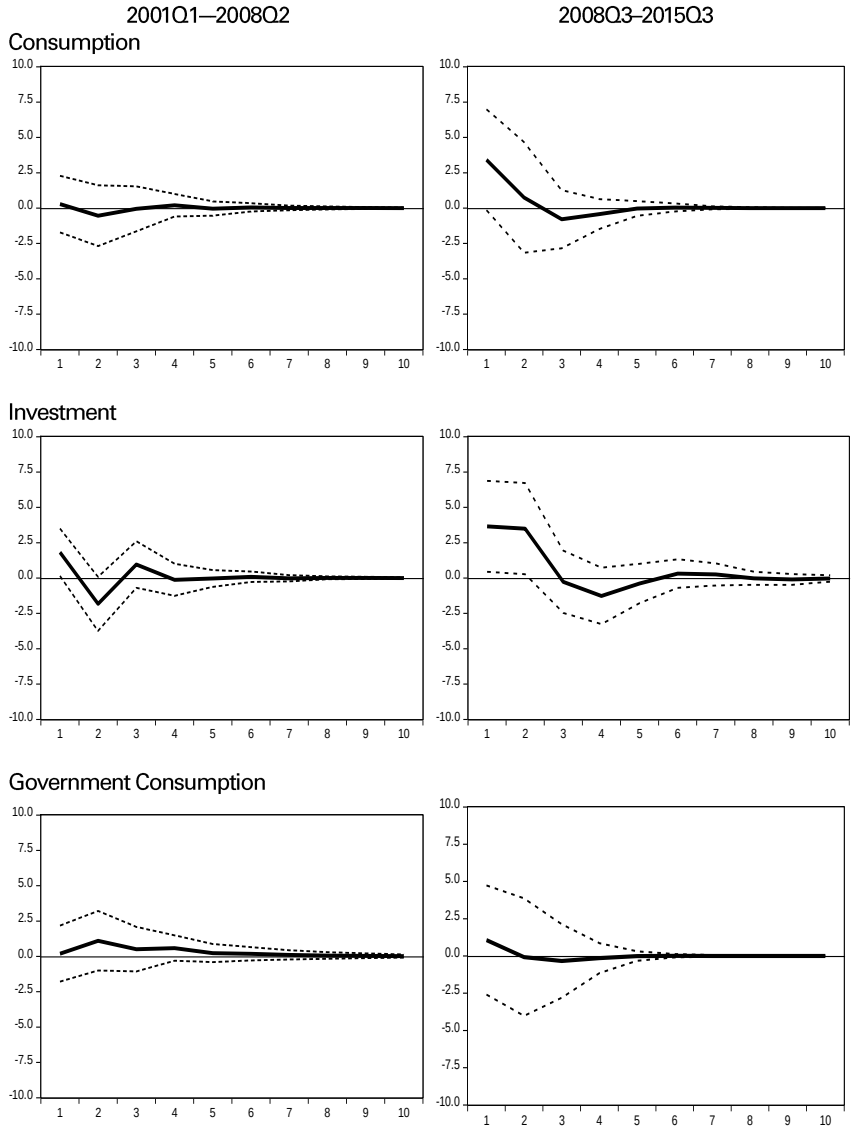
	2001Q1–2008Q2				2008Q3–2015Q3			
	1	2	3	10	1	2	3	10
China's Exports to U.S. and Europe	4.11	17.06	18.16	18.99	0.44	2.20	2.48	2.46
China's Domestic Demand	0.10	3.03	2.95	3.05	14.23	20.27	19.45	20.01
Real Exchange Rate	80.63	68.44	67.65	66.94	17.78	17.28	16.65	16.46
Other shocks	15.16	11.47	11.23	11.03	67.55	60.25	61.42	61.07

Source: Author's calculations.

that the importance of external and domestic demand for the Korean exports to China changed dramatically before and after the global financial crisis: prior to the crisis, the fluctuations in Korean exports to China are explained more by China's exports to the U.S. and Europe than by domestic demand. China's exports to the U.S. and Europe accounted for approximately 19% of the forecast variance in Korea's exports to China, while China's domestic demand explained around 3% for all horizons. Thus, China's exports to the U.S. and Europe have contributed six times more to Korea's exports to China than China's domestic demand before the crisis. However, these observations are reversed after the global financial crisis. The contribution of China's external demand to Korean exports to China has fallen to approximately 2%, while that of China's domestic demand has risen to 14.23% in the one-period ahead forecast and 20.01% in the 10-period ahead forecast.

To further investigate the impact of domestic demand, VAR analysis is modified to consider the impact of Chinese private consumption, investment, and government consumption. It would be ideal to extend the model with all relevant expenditure components together. However, given the small sample size, the costs of increasing the dimensions would outweigh the benefits. We keep the four-variable system and replace domestic demand with each different component in place of Chinese domestic demand.

Figure 4-2. Response of Korea's Exports to China by Components



Note. Each impulse response function shows the response of Korean exports to China to the shock to Chinese consumption, Chinese investment, or Chinese government consumption. The solid lines are the point estimates, and the dotted lines represent 95% confidence intervals.

Source: Author's calculations.

Figure 4-2 reports the responses of Korean exports to China to Chinese real private consumption, real investment, and real government consumption. For the earlier sample period, each expenditure component has positive effects on Korean exports, but the responses are not significant. The right panels show the impulse-response function for the latter period: a one-standard deviation of shock to investment significantly increases the growth of Korean exports to China by 3.66% points in the first quarter, and the response remains significantly positive for two quarters. Private consumption and government spending also increase Korean exports, and the magnitudes of the responses become greater than those before the crisis. The response to private consumption is significant at a 90% confidence level.

4-3. Export by Type of Goods

To examine the effects of China's macroeconomic variables on the specific classification of Korean goods exports to China, we also estimate the same VAR model for different types of goods exports: raw material, consumption goods, and capital goods. The IMF database does not provide disaggregated trade data, and UN COMTRADE does not provide data on quarterly frequency. In this section, we therefore utilize disaggregated trade data from the Korea International Trade Association Database, classified on the basis of MTI.

For comparison across the models, the normalized impulse response functions to a 1% point increase in the growths of Chinese exports to the U.S. and Europe and Chinese domestic demand, respectively, are reported in Table 4-2 and Table 4-3. The responses of raw material and capital goods are largely similar, but the magnitudes of the responses are somewhat different. Prior to the crisis, the responses to China's exports are hump-

Table 4-2. Response of Korean Exports to China to Chinese Exports to U.S. and Europe by Type of Goods

	Period\Type	Overall	Capital good	Raw material	Consumption good
2001Q1–2008Q2	1	0.19 [-0.44 0.82]	0.56 [-0.31 1.50]	0.27 [-0.41 0.95]	-1.68 [-3.30 -0.06]
	2	0.89 [0.22 1.57]	1.26 [0.22 2.30]	0.74 [0.08 1.40]	1.06 [-0.63 2.74]
	3	0.27 [-0.28 0.81]	0.75 [-0.21 1.70]	0.13 [-0.33 0.58]	0.58 [-0.47 1.63]
2008Q3–2015Q3	1	-0.22 [-1.42 0.97]	-0.34 [-1.36 0.68]	-0.49 [-2.01 1.03]	-0.06 [-1.01 0.89]
	2	-0.10 [-1.35 1.15]	-0.28 [-1.41 0.85]	-0.34 [-0.50 0.35]	-0.47 [-1.53 0.59]
	3	-0.11 [-0.68 0.47]	0.07 [-0.56 0.70]	0.00 [-0.22 0.51]	-0.22 [-0.84 0.39]

Note: 95% confidence intervals for each point estimates are shown in parentheses.

Source: Author's calculations.

Table 4-3. Response of Korean Exports to China to Chinese Domestic Demand Shock by Type of Goods

	Period\Type	Overall	Capital good	Raw material	Consumption good
2001Q1–2008Q2	1	1.56 [-0.62 3.73]	1.42 [-1.30 4.15]	4.98 [-1.20 11.17]	1.22 [-3.79 6.22]
	2	-0.57 [-2.99 1.85]	-1.93 [-5.24 1.38]	-6.77 [-13.63 0.08]	-2.43 [-7.90 3.04]
	3	0.67 [-1.00 2.33]	0.80 [-1.72 3.31]	1.79 [-3.11 6.69]	1.10 [-1.57 3.77]
2008Q3–2015Q3	1	7.06 [2.77 11.34]	5.41 [2.03 8.78]	7.75 [1.80 13.69]	3.18 [-0.28 6.63]
	2	3.59 [-0.67 7.85]	4.15 [0.43 7.88]	2.54 [-2.90 7.98]	3.16 [-0.41 6.72]
	3	-0.55 [-3.08 1.98]	0.59 [-2.10 3.27]	-0.30 [-2.92 2.32]	0.67 [-1.70 3.04]

Note: 95% confidence intervals for each point estimates are shown in parentheses.

Source: Author's calculations.

shaped, with a peak in the second quarter. The peak response of capital goods to a 1% point increase in the growth of Chinese exports to the U.S. and Europe is the greatest, at 1.26% point in the second quarter after the

impact, followed by raw material (0.74% point). Consumption goods exports in response to external demand is significantly negative in the first quarter and becomes insignificant. The response of overall exports is effectively a weighted average of the strong positive response of capital goods and raw material and the negative response of consumption goods. After the crisis, the responses to Chinese exports to U.S. and Europe are insignificant regardless of type of goods. On the other hand, Chinese domestic demand does not significantly affect the exports of any types of good before the crisis, whereas it significantly increases raw material exports and capital good exports after the crisis. The responses to Chinese domestic demand shock in the first quarter are 7.06% point for overall exports, 5.41% point for capital good exports, and 7.75% point for raw material exports. In the second quarter, the responses are 3.59% point for overall exports, 4.15% point for capital goods exports, and 2.54% point for raw material exports. Raw material is initially more sensitive to Chinese domestic demand than are capital goods right after the impact, while the response of capital goods is more persistent than is that of raw material. The response of consumption good exports to Chinese domestic demand is positive and significant at a 90% confidence level (but insignificant at a 95% confidence level).

5. Conclusion and Implications

We investigate the effects of China's ongoing structural changes on Korea's exports to China using the VAR model. Before the global financial crisis, Chinese exports significantly increased Korea's exports to China, while Chinese domestic demand and real exchange rate had no significant effects. However, after the global financial crisis, Chinese domestic demand became a more influential factor in Korean exports to China than were Chinese exports or the real exchange rate. Furthermore, we examine the effect of each component (i.e., consumption, investment, government spending) of domestic demand on Korea's exports to China. Among these components, Chinese investment is the most important in determining Korea's exports to China, while Chinese private consumption is also gaining in relevance.

We also estimate the VAR models by type of goods in Korean exports. Capital goods and raw material exports to China show results that are similar to overall exports in terms of the direction and significance of the impulse response functions. Raw material and capital goods exports show more sensitive responses to Chinese domestic demand shocks than do consumption goods exports.

Growth in Chinese exports and investment has recently slowed significantly. Our results suggest several implications. First, the Chinese export slowdown may not damage Korea's exports to China, as Chinese domestic demand could be a new engine for them. Second, since investment in China is the most important factor in the GDP components for Korea's exports to China, close monitoring of that investment and its surrounding conditions is necessary for understanding the variability in Korea's exports to China.

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국문요약

본 연구는 중국경제의 구조변화를 검토하고, 이러한 변화가 대중 수출에 미치는 영향에 대해 알아보았다. 글로벌 가치사슬에서 중국의 역할이 달라지는 것에 주목하여 중국의 수입수요를 대외수요와 대내수요로 구분하여 대중 수출에 미치는 효과를 추정하였다. 또한 중국 GDP 구성요소의 변화가 대중 수출에 어떠한 영향을 미칠지 알아보았다. 벡터자기회귀모형(VAR) 결과에 의하면 2008년 이전에는 중국의 대외수요가 대중 수출에 유의한 영향을 미친 반면, 2008년 이후에는 중국의 대내수요가 더 중요해졌다. 대내수요를 구성요소별로 분석해본 결과, 2008년 이후 투자가 대중 수출에 가장 큰 영향을 미치는 것으로 드러났으며, 소비의 중요성 또한 증대된 것으로 나타났다.

핵심용어: VAR, 중국의 구조적 변화, 대중 수출

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The Impact of Chinese Economic Structural Changes on Korea's Export to China

SHIN Kotbee and CHOI Bo-Young

In this paper, we examine the structural changes of the Chinese economy and how they affected Korea's export to China. Focusing on the evolution of China's role in the global value chain, we estimate the impact of China's external demand and domestic demand. We also shed light on the effect of compositional changes of China's GDP on Korea's exports to China. The results of the VAR analysis suggest that external demand had a significant impact on Korea's exports to China prior to 2008, while Chinese domestic demand became more important afterwards. Moreover, Chinese investment is the most important in determining Korea's exports to China and Chinese private consumption is also gaining more relevance in recent periods.

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