International Division of Labor and Economic Development of Inland Regions in Heilongjiang Province from Trade Data: An Analysis of Changes in the Structure of Trade in Terms of Trade Components

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1. Introduction.

The purpose of this study is to examine the characteristics of trade structure with neighboring and bordering countries in Northeast China as part of a study on the economic development of Eurasian landlocked regions. China has promoted economic growth by accepting foreign direct investment and expanding international trade since its reform and opening-up policy, especially since its accession to the World Trade Organization (WTO) in 2001. In recent years, China's trade has grown to account for more than 10% of world trade, and it has established its economic position in the world market as a central player in global value chains (GVCs)[1]. In 2013, China launched the "One Belt and Road Initiative" with the aim of developing the domestic economy and further growing Eurasia through international trade, thereby increasing China's political presence in the global market.

Many countries experience not only economic benefits but also negative aspects when they embark on a process of economic development, and China is no exception. In China, the benefits of globalization have mainly been enjoyed by the eastern coastal regions, while many inland regions have been left behind in economic development and still confront various problems. To address these problems, the Chinese government has implemented development policies for landlocked and border regions, such as the Great Western Development in 2000 and "One Belt and One Road" initiative in 2013. The "One Belt, One Road" initiative is a policy effort to grow China's inland areas as well as Eurasia through international trade, which is expected to help correct the economic disparity between coastal and landlocked regions. Although the "One Belt, One Road" initiative is associated with various risks, focusing only on the economic aspects of the policy, it is expected to promote economic development not only in coastal and landlocked regions but also in inland areas by strengthening economic linkages from Asian to European regions.

Looking more locally at China's policy efforts, China has been pursuing economic-development cooperation in border regions with neighboring countries and regions. Since 1990, representative multilateral economic cooperation for cross-border regional development has included the Greater Mekong Subregion (GMS), Shanghai Cooperation Organization (SCO), and Greater Tumen Initiative (GTI)[2].

The first, the GMS Development, is the Asian Development Bank's Greater Mekong Subregion Development Program, launched in 1992. This program, which focuses on regional development in the Association of Southeast Asian Nations (ASEAN) countries of Myanmar, Laos, Vietnam, Thailand, and Cambodia as well as China's

Yunnan Province and Guangxi Zhuang Autonomous Region, is a policy initiative aimed at developing and improving infrastructure for regional cooperation, establishing special economic zones in border areas, and developing water resources. To date, it has attempted to eliminate or reduce tariffs and liberalize the service sector, with transportation, energy, tourism, and public health as priority areas for cooperation[3].

The second is the SCO, a regional security cooperation organization in the Eurasian region established at China's initiative to promote effective regional cooperation in a wide range of areas, including politics, trade, economics, defense, energy, and transportation[4]. It was founded by China and the Central Asian countries of Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, and Russia, and it was later joined by India and Pakistan. The SCO is characterized by its role as a collective check on the United States (U.S.), although it does not explicitly state that it is a military alliance. Its objectives include the development of a trade and investment environment for the gradual liberalization of goods, services, capital, and technology; the development of infrastructure, including transportation and communications; and the development of energy systems. It is a regional cooperation organization.

The third, the GTI, is a multilateral, regional, economic development project initiated by the United Nations (UN) Development Program in the early 1990s[5]. Covering the northeastern region of China, North Korea-Russia border region, Russian Far East, eastern Mongolia, the east coast of South Korea, and the Sea of Japan, the GTI aims to develop the Northeast Asian regional economy through the establishment of a multilateral free trade zone in the Tumen River Basin and infrastructure and economic development. The region covered by this economic-development cooperation plan faces a number of political issues, and no significant results have been observed thus far, while development has been slower than in other parts of East Asia. However, economic development in the region is expected not only to lead to economic growth through the adjustment of international institutional design in the region but also to mitigate the geopolitical risks associated with such development.

With a view to the potential economic development of Northeast China and Northeast Asia, this study focuses on the international trade of Heilongjiang Province, the northernmost of the three Northeast Chinese provinces belonging to the Greater Tumen River Development Area. The study examines the characteristics of its trade structure with neighboring and bordering countries. Most of the existing studies have examined the institutional characteristics in border regions, all of which suggest meaningful policy recommendations; however, few studies have analyzed more realistic economic changes at the country and regional levels. The study is significant because it examines the characteristics of Heilongjiang Province's trade structure by examining changes in international trade. The analysis uses trade data at the tariff-line level in Heilongjiang Province to examine changes in the trade structure by industry and production process between Heilongjiang Province and four neighboring countries (Russia, Japan, South Korea, and North Korea). The study then decomposes the trade structure by trade components to determine which components are responsible for the changes in the trade structure.

This paper is organized as follows. The next section summarizes previous studies on the barriers to economic development facing China's border regions. Section 3 uses detailed trade product data for Heilongjiang Province to identify the trade structure with neighboring and bordering countries by industry and production process, and it then decomposes the trade structure into three trade components to examine the factors of trade change. Finally, we conclude with suggestions for further research.

2. Factors of economic development and barriers in border regions

2.1 Various studies on China's border regions and economic development

As pointed out in the previous section, multilateral economic-development cooperation in China's border regions has been pursued by China and its neighbors as a matter of policy, although the rate of progress has varied. In contrast to the remarkable market-economy-based economic development observed in China's coastal areas, its development policies have also been strongly influenced by geopolitics because China's border regions must consider the influence of diplomatic relations and other factors with its neighbors and neighboring countries. This has further widened the economic distance between China and its fast-growing coastal regions, and many border regions have been left behind in economic development, which is among the factors contributing to the disparity issues.

Among the factors hindering economic development in border regions is their geographical characteristics. Many border regions are located in landlocked regions and therefore face inherent barriers that are not present in coastal areas. From the analytical perspective of international trade, which is the focus of this study, the volume of trade is naturally relatively lower in landlocked regions as they face higher trade barriers than coastal regions. In other words, geographical factors are an important impediment to trade. Considerable research has highlighted the impact of the geographical factor of landlocked regions on trade. Coulibaly and Fontagné (2004) developed a model that included landlocked countries' element of the trade barriers that arose when they traded unless they opted for air transport, which always passed through a third country. They pointed out that it was insufficient to merely use the geographical distance between two countries engaged in trade in the analysis, and by further dividing the trade barrier of distance into several elements and using them in the analysis, they theoretically showed that landlocked countries faced higher trade barriers than coastal regions.

Furthermore, Wu (2015) and Wu (2018, 2020, 2022, 2023) develop economic models that reveal that establishing transportation competitiveness through infrastructure improvement can promote trade even in inland regions. Wu (2015) analyzes the competitive relationship between land and sea transport in terms of transport-competitiveness indicators. Wu (2018, 2020) analyzes the impact of transport competitiveness between coastal and landlocked regions on location advantage in terms of transport, and the effect of increasing landlocked regions' land-transport competitiveness. Wu (2022) then loosens the assumption of uniformity of transport conditions invoked in Wu (2018, 2020) and incorporates the heterogeneity of transport conditions into the model, revealing that when transport infrastructure development is highly regionally biased, the effect of transport-competitiveness enhancement is not expected.

Among systematic studies on development strategies in landlocked regions is Tsuji et al. (2015), which shows that industrial agglomeration is formed by the occurrence of industrialization and urbanization in landlocked regions and that the construction of economic belts linking industrial agglomerations leads to economic development in landlocked regions. In their study, the development-strategy model is used in policy research as a so-called "Beads-type" development strategy because the economic belt created by linking industrial agglomeration resembles beads. The framework for the development strategy is that industrial cities are formed as a result of industrial agglomeration and the expansion of international trade due to the development of transport infrastructure and improvement of transport competitiveness. This means that even landlocked regions can develop economically if they have a location advantage and can improve their transport competitiveness.

With the promotion of globalization, the influence of geographical barriers on economic activities is gradually decreasing due to improvements in transport and information and communications technology (ICT). Some countries and regions, even landlocked regions, are catching up with globalization by increasing their presence in international markets through use of their own comparative advantages, and many studies have been conducted on the various factors involved. For example, Ijiri and Maeno (2020) focus on the trade structure of landlocked Central Asian countries and attempt to analyze changes in the trade structure of these countries by closely examining the trade products with which they started trading from a state of purely no trade. They find that the reduction of trade barriers since independence has resulted in relatively higher imports than exports. Their study reveals a relatively large number of new transactions and examines the relationship between trade structure and trade costs in landlocked countries.

Maeno and Yasuda (2022) analyze changes in trade structure by industry and trade goods in the Xinjiang Uygur Autonomous Region, which borders the Central Asian region. Their study shows that although Xinjiang Uygur Autonomous Region has an export-biased structure relative to Central Asian countries, exports of processed intermediate goods, parts and components of intermediate goods, capital goods, and semi-durable consumer goods (semi-durable) are relatively large in terms of export commodities. Furthermore, the study reveals that the region has significantly expanded its exports of new-trade goods in machinery-related industries, suggesting that the impact of the international division of labor between the coastal regions and East Asian countries has spread to the landlocked regions.

Some of the policy instruments for economic-development cooperation in China's border regions are international cooperation initiatives between countries, while others are international cooperation initiatives between the provincial and city levels and other countries[6]. For example, in 2012, the Xinjiang Uygur Autonomous Region in the western border region launched a regional development strategy called the "Tianshan-Beipo Economic Zone Development Plan" with the aim of establishing an export processing base with Central Asian countries and others. In 2013, Heilongjiang Province in the northeastern border region signed an agreement with Russia to open markets and attract foreign companies to Northeast Asia. Provincial-level regional development strategies such as the "Heilongjiang and Inner Mongolia Northeast Border Region Development and Opening-up Plan," which aims to form a modern industrial base by opening up the market to Northeast Asia and attracting foreign companies, were attempted in the northeast border region of Heilongjiang with Russia in 2013.

Furthermore, as international cooperation at the city level, Fuyuan County in Heilongjiang Province approved a regional development strategy with Russia in 2009 for the purpose of opening up the border region's economy. In 2011, Kashgar and Korgas in the Xinjiang Uygur Autonomous Region approved a regional development strategy aimed at promoting the distribution of goods and accepting industrial transfers with Central and South Asian countries. Furthermore, in 2012, a strategy was approved in Hunchun (in Yanbian Korean Autonomous Prefecture in Jilin Province) with the aim of forming a business base and transport hub for Northeast Asia. Regional development strategies were approved with North Korea and Russia with the aim of establishing a business base and transport hub in Northeast Asia. The aim of international cooperation, both at the national and at the provincial and city levels, is to achieve economic benefits through international trade. The expansion of trade by landlocked regions not only contributes to the economic development of the region, but it also becomes an important economic strategy that plays a role in the international division of labor. Because a country-by-country analysis is

insufficient to observe the effects of policy initiatives at the provincial and city levels in border regions, the analysis in this study summarizes the current status of international trade in Heilongjiang Province and its characteristics in as much detail as possible.

2.2 Research on the trade structure of Northeast China

The volume of China's trade in the global market has grown markedly, and China has increased its economic presence to the point where it plays an essential role in establishing global value chains (GVCs) in the global market. However, as previously mentioned, landlocked and border regions have not achieved the same scale of trade as coastal regions. The Northeast China region has been studied by Yasuda and Riku (2020), who attempted to examine the role of trade in China's border regions from the perspective of relay trade[7]. In their study, it was found that although Northeast China had established an industrial base to some degree from the early stage of economic development due to the heavy industrialization-development strategy of the Maoist era, its industrial structure was comparatively weighted toward heavy and large industries; moreover, the sophistication of the industrial structure was not measured based on the comparative advantage that other Asian countries had at the time, which raised their economies to prominence. The study mentions that the industrial structure was not measured and was in a sense artificially distorted, and that the promotion of the "Northeast Promotion" in 2003 was an opportunity to expand international trade.

Yasuda and Riku (2020) present a relationship between the quantitative expansion of exports and the upgrading of the export structure of the Northeast region due to its trade expansion. It can be summarized as follows: In the process of economic development, the quantitative expansion of exports increases urbanization by raising income in its border regions, which in turn leads to economic growth in the region. If, as a result of growth, trade barriers in the broader sense are sufficiently reduced in the border region, this will positively impact other parts of the country as they become hubs for imports from abroad, that is transit-trade hubs, thereby reducing trade costs. In addition, the growth of the region through the quantitative expansion of imports and exports will lead to a more sophisticated industrial structure if the region is positioned as a production and export base. In other words, the creation of trade or the establishment of a trade hub expands the economies of urbanization, thus enabling the formation of new growth areas in landlocked regions.

Based on this perspective, Yasuda and Riku (2020) analyze whether the Northeast China region plays the role of an export transit-trade hub, an import transit-trade hub, or a production hub for export goods. The term "transit-trade hub" here refers to the extent to which they serve as border regions to connect overseas markets with China's domestic market, and it does not mean transit-trade hub for trade to a third country. The analysis, based on Chinese province-level trade data, shows that the whole of Northeast China was in the pioneering stage of export expansion between 1995 and 2005, and it has been changing from an export transit-trade hub to an export-manufacturing base since 2006. The study also shows that Heilongjiang Province has transformed into an export transit-trade hub since 2005 and an import transit-trade hub since 2011. This study is significant because it analyses the characteristics of trade in China's border regions from the perspective of transit-trade hubs. However, due to statistical constraints, this analysis is limited to the overall provincial trade and does not reveal the characteristics of the trade structure by industry or trade products. The next section therefore attempts to examine the trade structure in Heilongjiang Province, Northeast China, by industry and goods.

3. Changes in Heilongjiang Province's trade structure

3.1 Heilongjiang Province's trade partners

This section provides an overview of Heilongjiang Province's trade structure. Regarding the trade data to be used in the analysis, some picture data are published by the UN, Organisation for Economic Cooperation and Development (OECD), and World Bank as representative data on international trade; however, these data are mainly at the country level. Therefore, in this study, we use Chinese trade data published by the Korea International Trade Association (KITA) mainly by province and product. These trade data are detailed at the 8-digit HS tariff-line level. The KITA trade statistics clearly indicate that the original data source is the General Administration of Customs of the People's Republic of China.

This section identifies the countries and regions with which Heilongjiang Province trades. Table 1 shows the top countries for Heilongjiang in terms of the value of its exports and imports in 2018. It shows that the value of Heilongjiang's imports exceeds that of its exports. The largest trading partner is Russia, with a trade volume of $950 million, or approximately 20% of Heilongjiang's total exports, and $16.1 billion, or approximately 85% of its total imports. Countries such as the U.S., Germany, and Australia rank high in both imports and exports, as do neighboring South Korea and Japan. The share of the total value of exports to the neighboring countries of Russia, South Korea, Japan, and North Korea, which account for approximately 30% and 90% of total exports and imports, respectively, shows a marked dependence on trade with Russia, which borders the country. The previous section confirmed the role of Heilongjiang Province as a transit-trade hub for both exports and imports; however, Table 1 suggests that most of the transit trade is with Russia, indicating a relative dependence on the Russian market.

3.2 Trade structure with neighboring countries by industry

We examine Heilongjiang's trade with neighboring regions and countries in more detail. Here, we use the eight-digit level of HS trade data of Heilongjiang Province's tariff lines and attempt to perform a comparison analysis between 2008 and 2018. The trade items covered in these two time periods are those exported and imported in 2008 and 2018, and the number of trade products by country is 4796 (Russia), 2342 (South Korea), 2527 (Japan) and 937 (North Korea). Fourteen industries were analyzed: 1) agricultural and fishery products (HS01 - HS15); 2) food and alcohol products (HS16 - HS24); 3) oil and coal (HS25 - HS27); 4) chemical products (HS28 - HS38); 5) plastic and rubber products (HS39 - HS40); 6) leather, fur, and handbags products (HS41 - HS43); 7) pulp, paper, and wood products (HS44 - HS49); 8) textile products (HS50 - HS67); 9) iron and steel and nonferrous metal products (HS68 - HS83); 10) general machinery (HS84); 11) electrical machinery (HS85); 12) transportation equipment (HS86 to HS89); 13) precision machinery (HS90 - HS92); and 14) toys and miscellaneous goods (HS94 - HS96). This industry classification is based on trade data from the 8-digit HS Code at the tariff-line level aggregated by industry at the 2-digit level of the HS Code. Trade products classified as arms and works of art/collectibles and antiques are excluded here, considering trade-data biases.

Trade in Heilongjiang Province is reviewed by industry. The following table shows which industries are actively trading in Heilongjiang, with exports and imports from each trading partner country broken down by industry and as a percentage of the total value of exports and imports. Table 2 summarizes the import/export proportions with Russia, South Korea, Japan, and North Korea by industry. Regarding Russia, Heilongjiang's largest trading partner,

Table 1: Ranking of Heilongjiang Province's trade partners, 2018

Rank	Country	export values	Rank	Country	import values
	World	4,815,758		World	18,766,552
1	Russia	953,465	1	Russia	16,128,933
2	U.S.	376,227	2	Mongolia	337,698
3	South Korea	329,293	3	U.S.	286,649
4	India	246,022	4	New Zealand	272,950
5	Japan	186,608	5	Japan	216,652
6	Belgium	174,815	6	Germany	169,753
7	Germany	143,847	7	Australia	143,559
8	Indonesia	119,156	8	France	143,203
9	Turkey	112,896	9	Sweden	134,433
10	Australia	102,865	10	South Korea	75,167
11	Spain	100,847	11	Spain	71,902
12	U.A.E.	100,316	12	Italy	69,268
13	U.K.	97,933	13	Australia	61,415
14	Viet Nam	91,816	14	U.K.	58,279
15	Hong Kong	83,376	15	Brazil	36,011
16	Netherland	81,474	16	Taiwan	35,255
17	Canada	69,416	17	Malaysia	32,793
18	Côte d'Ivoire	61,989	18	Belgium	32,492
19	Philippines	55,846	19	Singapore	31,286
20	Thailand	48,328	20	Hungary	31,248
38	North Korea	28,750	86	North Korea	149

（Note）Unit : 1,000 U.S. dollars

（Source）Authors' calculation using the data form KITA.

the largest export in both 2008 and 2018 was textile products, which accounted for approximately 65% of the total in 2008, and approximately 35% of the total in 2018, although the proportion has decreased. A marked change can also be seen in exports of agricultural and fisheries products, which increased from approximately 5% of exports in 2008 to more than four times that in 2018. The share of exports from other industries such as food and alcohol products, general machinery, and electrical machinery is also rising. Although textile products accounted for the largest share of Heilongjiang's exports to Russia in the period under review, in 2018, the share dropped significantly, and the share of exports of items actively traded in the East Asian region, such as general and electrical machinery, has instead increased.

　Imports from Russia are then reviewed. As can be seen from Table 1 in the previous section, Russia is Heilongjiang's largest import partner, with over 85% of total imports coming from that country in 2018. The largest imports are in oil and coal, which accounted for approximately 70% of total imports in 2008 and 87% of total imports in 2018. While imports of pulp, paper, and wood products and chemicals products accounted for approximately 15% and 10% of imports in 2008, respectively, the import share of both industries decreased significantly in 2018, indicating that Heilongjiang's imports from Russia tend to be dedicated to primary products related goods, such as oil and coal and pulp, paper, and wood products. In terms of trade with Russia, Heilongjiang

appears to be shifting the weight of its exports from trade products with low added value, such as textile products, to exports of relatively high added value products such as general machinery and electrical machinery, while imports are increasingly specializing in primary products such as fuel. This shows the characteristics of the inter-industry division of labor.

Trade by industry with other neighboring countries is reviewed below. South Korea's and Japan's trade structures in the world market are relatively similar. Among the characteristics of the two countries is their comparative advantage in machinery-related industries from the 1990s to the 2000s and onward, and the fact that they have few primary products such as natural resources makes them dependent on imports of resources. With a similar economic structure in terms of both supply and demand, and their geographical proximity, the trade structure with Heilongjiang can be considered similar. Considering Heilongjiang's exports to South Korea, the proportion of agricultural and fisheries products and food and alcohol products exported is relatively high at both points in time, with a high proportion of 40%-50% of exports to South Korea. This trend can also be observed from exports to Japan, where the share of agricultural and fisheries products and food and alcohol products in exports to Japan is approximately 35% to 40%. Pulp, paper, and wood products account for a notably high proportion of exports to Japan, approximately 30% in both periods, which is higher than the proportion of exports of agricultural and fishery products and food and alcohol products.

The machinery-related industries are reviewed here. In terms of exports to South Korea, general machinery and parts accounted for approximately 12% of exports to South Korea in 2008, the second highest proportion after agricultural and fisheries products; however, this share decreases to approximately 1% in 2018. Confirming the industry's import share, it can be seen that in 2008, it was higher than that of any other industry, at approximately 40%, and although this share decreases in 2018, it remains high. Meanwhile, regarding transport equipment, the export share increases significantly between 2008 and 2018, and this trend can also be seen for imports. In 2018, a relatively high proportion of imports were from machinery-related industries, such as general machinery (approximately 25%), electrical machinery (approximately 16%), and transportation equipment (approximately 24%). A similar trend can be observed for imports from Japan in these industries. High proportions of imports from Japan are in general machinery (approximately 23%), electrical machinery (approximately 17%), and transportation equipment (approximately 39%).

This suggests that the structure of trade between Korea and Japan in Heilongjiang Province is characterized by an intra-industry division of labor in machinery-related industries rather than the traditional inter-industry division of labor in which agricultural and fishery products are exported and industrial products are imported. Even within the same industry, we can obtain a more detailed picture of the characteristics of the trade structure by observing whether trade is in processed goods used as inputs or in final goods such as consumption goods. However, it is not possible to determine the type of products traded by each industry from these trade shares.

Finally, in terms of trade with the Democratic People's Republic of Korea (DPRK), in 2008, almost all exports were oil and coal, and in terms of imports, the trade structure was very heavily weighted toward oil and coal, iron and steel, and nonferrous metal products; it can also be observed that in 2018, the proportion of agricultural and fisheries products imported and exported increased. In the figures in the table, 0% means that the country does not trade, while 0.00% means that it does trade but in very small quantities. As it is not possible to determine whether this trade bias is due to trade statistics or for other reasons, a detailed analysis will be omitted.

Table 2: Trade structure by industry in Heilongjiang Province

Industry	Russia			
	Export share		Import share	
	2008	2018	2008	2018
agricultural and fishery products	5.44%	21.87%	0.07%	1.95%
food & alcohol products	0.34%	6.10%	0.00%	0.22%
oil and coal	0.78%	0.01%	69.66%	87.86%
chemicals products	0.91%	1.06%	9.47%	0.75%
plastic and rubber products	1.54%	3.14%	2.53%	0.07%
leather, fur, and handbags products	8.01%	1.96%	0.00%	0.00%
pulp, paper, and wood products	0.80%	1.29%	15.28%	9.02%
textile products	64.34%	35.21%	0%	0.00%
iron and steel, and nonferrous metals products	5.30%	6.59%	2.49%	0.09%
general machinery	3.28%	7.75%	0.24%	0.02%
electrical machinery	1.97%	4.72%	0.00%	0.00%
transportation equipment	1.38%	2.82%	0.23%	0.00%
precision machinery	1.74%	1.49%	0.01%	0.01%
arms	0.05%	0.00%	0%	0%
toys and miscellaneous goods	4.10%	5.98%	0%	0.00%
works of art and collectibles and antiques	0.01%	0%	0.00%	0%
Total	100%	100%	100%	100%

Industry	South Korea			
	Export share		Import share	
	2008	2018	2008	2018
agricultural and fishery products	36.69%	48.19%	0.00%	0.08%
food & alcohol products	10.75%	14.95%	0.53%	2.70%
oil and coal	4.21%	0.32%	0.45%	2.48%
chemicals products	8.70%	6.90%	6.56%	8.05%
plastic and rubber products	1.01%	0.28%	6.62%	2.09%
leather, fur, and handbags products	0.61%	0.10%	0.02%	0.01%
pulp, paper, and wood products	6.99%	5.84%	2.57%	0.67%
textile products	2.41%	1.77%	1.03%	0.58%
iron and steel, and nonferrous metals products	11.90%	7.67%	27.29%	14.86%
general machinery	12.49%	0.99%	41.61%	25.46%
electrical machinery	1.88%	1.28%	9.80%	15.98%
transportation equipment	0.09%	11.32%	2.12%	24.08%
precision machinery	0.27%	0.15%	1.37%	2.12%
arms	0%	0%	0%	0%
toys and miscellaneous goods	1.99%	0.23%	0.05%	0.84%
works of art and collectibles and antiques	0.02%	0%	0%	0%
Total	100%	100%	100%	100%

| Industry | Japan | | | |
| | Export share | | Import share | |
	2008	2018	2008	2018
agricultural and fishery products	15.58%	14.01%	0.63%	0.29%
food & alcohol products	20.93%	23.12%	0.12%	0.54%
oil and coal	1.95%	6.30%	0.00%	0.27%
chemicals products	17.04%	9.25%	5.62%	2.58%
plastic and rubber products	0.79%	0.28%	1.11%	0.71%
leather, fur, and handbags products	0.40%	0.13%	0.00%	0.00%
pulp, paper, and wood products	30.66%	26.67%	0.27%	0.16%
textile products	5.81%	10.56%	0.17%	2.94%
iron and steel, and nonferrous metals products	1.95%	0.50%	35.48%	6.61%
general machinery	1.04%	2.34%	35.80%	22.62%
electrical machinery	0.47%	5.16%	9.69%	16.66%
transportation equipment	0.02%	0.02%	4.63%	39.23%
precision machinery	0.75%	1.33%	6.43%	7.26%
arms	0%	0%	0%	0%
toys and miscellaneous goods	2.61%	0.32%	0.05%	0.14%
works of art and collectibles and antiques	0.00%	0%	0%	0%
Total	100%	100%	100%	100%

| Industry | North Korea | | | |
| | Export share | | Import share | |
	2008	2018	2008	2018
agricultural and fishery products	4.96%	70.83%	0%	92.34%
food & alcohol products	0.75%	22.64%	0%	0%
oil and coal	90.95%	0%	42.45%	0%
chemicals products	0.26%	0.27%	0%	0%
plastic and rubber products	0.23%	3.39%	0%	0%
leather, fur, and handbags products	0.31%	0%	0%	0%
pulp, paper, and wood products	0.04%	1.59%	0%	0%
textile products	1.98%	0.89%	0%	7.66%
iron and steel, and nonferrous metals products	0.18%	0%	57.55%	0%
general machinery	0.07%	0.10%	0%	0%
electrical machinery	0.11%	0%	0%	0%
transportation equipment	0.02%	0.00%	0%	0%
precision machinery	0.04%	0.13%	0%	0%
arms	0%	0%	0%	0%
toys and miscellaneous goods	0.11%	0.16%	0%	0%
works of art and collectibles and antiques	0.00%	0.00%	0%	0%
Total	100%	100%	100%	100%

（Note）Unit：1,000 U.S. dollars

（Source）Authors' calculation using data form KITA.

3.3 Trade structure of trade goods with neighboring countries by production use

Next, the trade structure is analyzed by production process. Here, the Broad Economic Categories (BEC) classification, a UN classification of trade by production use, is used and matched with Xinjiang trade data. This is an international classification suitable for analyzing the extent of trade of production processes. Table 3 shows the BEC classification, which is further broken down into more detailed products in the medium classification, which are classified as primary, intermediate, and final goods. The products and BEC codes are organized as follows. Primary goods are classified as BEC 111: food and beverages (mainly for industry); BEC 21: industrial supplies (primary); and BEC 31: fuels and lubricants (primary). Intermediate goods are divided into processed goods, such as BEC 121: food and beverages (mainly for industry); BEC 22: industrial supplies (processed); BEC 32: fuels and lubricants (processed); and components, such as BEC 42: capital goods (parts and accessories except transport equipment) and BEC 53: transport equipment (parts and accessories). Final goods are divided into capital goods and consumption goods, with capital goods divided into BEC 41: capital goods (excluding transport equipment) and BEC 521: transport equipment and parts and accessories (industrial), while consumption goods are divided into food products as follows: BEC 112: food and beverages (primary, mainly for household consumption); BEC 122: food and beverages (processed, mainly for household consumption); BEC 51: transport equipment and parts and accessories (passenger motor vehicles); 522: transport equipment and parts and accessories (non-industrial); BEC61: consumer goods (durable); BEC62: consumer goods (semi-durable); and BEC63: consumption goods (non-durable). Like the HS classification, the BEC classification is revised every few years; thus, a reconciliation between the BEC classification as of 2008 and that as of 2018 is attempted and used in the analysis.

Table 4 summarizes the trade structure by trading partner country according to BEC codes by converting trade data at the 8-digit level of the HS classification of Heilongjiang Province and the UN BEC classification. As in the discussion of trade structure by industry, this identifies the BEC code for all trade products in exports and imports

Table 3: BEC classification

Production use	Code	Definitions
Primary goods	111	Food and beverages (Mainly for industry)
	21	Industrial supplies (Primary)
	31	Fuels and lubricants (Primary)
Intermediate goods: processed goods	121	Food and beverages (Mainly for industry)
	22	Industrial supplies (Processed)
	32	Fuels and lubricants (Processed)
Intermediate goods: parts & components	42	Capital goods (Parts and accessories except transport equipment)
	53	Transport equipment (Parts and accessories)
Final goods: capital goods	41	Capital goods (excluding transport equipment)
	521	Transport equipment and parts and accessories (Industrial)
Final goods: consumption goods	112	Food and beverages (Primary, mainly for household consumption)
	122	Food and beverages (Processed, mainly for household consumption)
	51	Transport equipment and parts and accessories(Passenger motor vehicles)
	522	Transport equipment and parts and accessories(Non-industrial)
	61	Consumer goods (Durable)
	62	Consumer goods (Semi-Durable)
	63	Consumer goods(Non-Durable)

(Source) UN Broad Economic Categories

to each trading partner country and uses the ratio of total exports to total imports. By identifying the trade structure according to the BEC classification, it is possible to identify the production processes in which Heilongjiang is engaged in in trade with neighbors and neighboring countries.

The trade structure with Russia is reviewed by production process. Heilongjiang Province exports agricultural and fisheries products, textiles, and footwear to Russia and imports oil and coal, indicating an international division of labor among different industries. This feature can be confirmed to some extent by the trade structure by production use. In both 2008 and 2018, the share of exports of textiles and footwear was high, whereas that of exported goods was reduced. In terms of trade by production use, the change in the share of exports of semi-durable consumer goods (BEC62) shows a similar trend. In other words, even for the textile and footwear trade products, it can be said that these are predominantly exports of final consumption goods. Non-durable consumer goods (BEC63) are relatively more value-added final goods than semi-durable consumer goods (BEC62), and because the export share of non-durable consumer goods (BEC63) has not increased, Heilongjiang's consumer goods exports are still not high value-added goods.

The same can be said based on the export share of food and beverages, where the export share of raw materials (BEC 112) is increasing for food and beverages for household consumption, while the export share of processed food and beverages (BEC 122) is not as high. In other words, although the export shares of agricultural and fisheries products and food and alcohol products are increasing, these are trade products that have not undergone any processing, which means that they are exporting trade products from production processes in which the value added is not high. However, the export share of industrial supplies (processed) (BEC22) of processed intermediate goods has almost doubled. Table 4 confirms the increase in the export shares of general and electrical machinery and transport equipment, and this increase in the export share of industrial supplies (processed) is probably a reflection of this trend. It can be assumed that the characteristics of China's overall trade structure are gradually being observed in exports from Heilongjiang to Russia.

Confirming imports from Russia by production use, the import share of industrial supplies (processed) (BEC22), which are primary goods, was by far the highest in both 2008 and 2018, although the import share of fuels and lubricants (primary) (BEC31) was also relatively high. This relationship can be explained by the high import share of oil and coal, which means that Heilongjiang Province plays the role of one of the gateways to the Chinese economy, which is dependent on Russian mineral resources. This can be understood from the perspective of Heilongjiang's role as an import-transit point, as mentioned in the previous section.

We now review the trade structure of Heilongjiang Province with Korea and Japan by production process. The trade products with the highest percentage of exports to Korea by production use of primary goods in both 2008 and 2018 are food and beverages (mainly for industry) (BEC 111); the share increases from approximately 32% to approximately 40%. This is probably due in part to the increase in the share of agricultural, forestry, and fisheries products in exports. Next are industrial supplies (processed) (BEC 22) of intermediate and capital goods (parts and accessories except transport equipment) (BEC 42), with high shares of approximately 28% and 9%, respectively, and capital goods (parts and accessories except transport equipment) (BEC 41), with a level of approximately 4.5%.

In 2018, however, the share of capital goods (parts and accessories except transport equipment) (BEC42) and capital goods (excluding transport equipment) (BEC41) falls to less than 1%, while the share of industrial supplies (processed) (BEC22) remains almost the same as in 2008, at approximately 21%. Furthermore, the export share of

final goods (passenger motor vehicles) (BEC51) changes from 0% to 11%. Considering the import side to clarify this change with regard to export shares, in 2018, imports from South Korea accounted for 85% of total imports in intermediate-goods industrial supplies (processed) (BEC22) and capital goods (parts and accessories except transport equipment) (BEC42), and if capital goods (except transport equipment) (BEC41) were included, imports would account for approximately 95% of the total. By 2018, this has also increased the share of imports of transport equipment (parts and accessories) (BEC 53). In other words, it can be assumed that the increase in the import share of intermediate processed and capital goods (parts and accessories except transport equipment) and transport equipment (parts and accessories) has led to an increase in the export share of final goods, namely, passenger motor vehicles (BEC 51). Heilongjiang has increased its production and export share of final goods of passenger motor vehicles, as the intermediate goods of parts and components required for its manufacturing base are sourced from South Korea. This is one of the characteristics of intra-industry trade in globalization, whereby intermediate goods are imported and final goods are exported.

Similarly, trade with Japan is also examined. As Korea and Japan have similar trade-structure characteristics in the production network in the East Asian region[8], we examine whether the same trends can be observed in Heilongjiang's trade with Japan as with Korea. Considering the import shares from Japan in 2008, those of industrial supplies (processed) (BEC 22), capital goods (parts and accessories except transport equipment) (BEC 42), and final goods as capital goods (except transport equipment) (BEC 41) are high, accounting for approximately 42%, 30%, and 16% of total imports, respectively. This represents approximately 80% of total imports. This high import share in production uses is similar to the import share from South Korea. Considering 2018 imports of intermediate and capital goods, the import share of industrial supplies (processed) (BEC22) has decreased but is still high at over 11%, while the share of capital goods (except transport equipment) (BEC41) of final goods is high at approximately 38%. Even more characteristic is the import share of parts and components of intermediate goods, which has changed from capital goods (parts and accessories except transport equipment) (BEC 42) not for transport equipment to transport equipment (parts and accessories) (BEC 53).

Furthermore, for the share of exports to Japan, the expansion of the export share of transport equipment and parts and accessories (passenger motor vehicles), which was confirmed in South Korea's exports, has not been confirmed, and exports of motor vehicles (BEC51) to Japan have remained largely unchanged. The high export shares between 2008 and 2018 are those for food and beverages (processed and household) (BEC122), which increased from approximately 20% to approximately 23%, and semi-durable consumer goods (BEC62), which further increased from approximately 16% to approximately 21%. This is also shown by the trade structure by industry in Table 2, which shows that exports to Japan in 2018 were mainly agricultural and fisheries products, alcohol, pulp, paper, and wood products, and textile products and footwear, with these four industries accounting for approximately 75% of exports to Japan; passenger motor vehicles and transport equipment related exports to and from Japan have not yet arisen. A comparison between South Korea and Japan shows that the structures of Heilongjiang's imports from South Korea and Japan have similar characteristics, with a markedly higher share of imports of parts and components for the production of transport equipment (parts and accessories) in the import of intermediate goods but different trade items in the export of final goods to South Korea and Japan. Clearly, there are different trends in the export of passenger motor vehicles from Heilongjiang Province to Korea and Japan; however, the factors behind these trends should be examined in a future study.

Table 4: Trade structure of Heilongjiang Province by production use

BEC		Russia			
		Export share		Import share	
		2008	2018	2008	2018
primary goods	111	0.25%	1.87%	0.02%	1.63%
	21	0.08%	0.35%	14.52%	5.07%
	31	0%	0%	67.98%	85.94%
processed goods	121	0.17%	0.60%	0.00%	0.10%
	22	9.86%	18.66%	16.93%	5.91%
	32	0.01%	0.00%	0.00%	0.91%
parts & components	42	0.76%	3.34%	0.08%	0.00%
	53	1.13%	2.45%	0.01%	0.01%
capital goods	41	3.25%	7.55%	0.17%	0.01%
	521	0.81%	0.43%	0.23%	0.00%
final goods	112	4.89%	19.53%	0.04%	0.07%
	122	0.38%	4.42%	0.00%	0.33%
	51	0.03%	0.45%	0%	0%
	522	0.01%	0.58%	0%	0%
	61	0.64%	1.40%	0.00%	0.00%
	62	65.80%	34.14%	0.01%	0.00%
	63	11.94%	4.22%	0.00%	0.00%

BEC		South Korea			
		Export share		Import share	
		2008	2018	2008	2018
primary goods	111	32.60%	40.61%	0%	0%
	21	8.86%	7.94%	0.12%	0.03%
	31	0.09%	0%	0%	0%
processed goods	121	2.95%	2.66%	0.00%	0.08%
	22	28.58%	21.60%	43.37%	27.49%
	32	0.02%	0.00%	0.52%	0.20%
parts & components	42	9.30%	0.93%	42.66%	26.51%
	53	0.78%	1.30%	2.14%	32.24%
capital goods	41	4.50%	0.53%	10.52%	8.74%
	521	0.01%	0%	0.00%	0%
final goods	112	1.10%	4.74%	0%	0%
	122	2.80%	6.07%	0.46%	2.71%
	51	0%	11.29%	0%	0%
	522	0.00%	0%	0%	0%
	61	2.33%	0.16%	0.01%	0.09%
	62	5.21%	2.02%	0.09%	1.00%
	63	0.87%	0.16%	0.11%	0.92%

		Japan			
		Export share		Import share	
BEC		2008	2018	2008	2018
primary goods	111	9.98%	4.23%	0%	0%
	21	3.58%	11.22%	0.73%	0.24%
	31	0.14%	0.01%	0%	0%
processed goods	121	0.13%	0.18%	0.11%	0%
	22	42.11%	27.28%	42.35%	11.61%
	32	0.15%	0%	0.00%	0.27%
parts & components	42	0.72%	1.28%	30.30%	8.92%
	53	0.28%	0.12%	7.71%	38.87%
capital goods	41	1.08%	6.36%	16.67%	37.85%
	521	0.01%	0%	1.49%	0.00%
final goods	112	1.84%	4.04%	0.00%	0%
	122	20.01%	22.91%	0.08%	0.54%
	51	0%	0.02%	0.07%	0.98%
	522	0%	0%	0%	0.00%
	61	2.71%	1.31%	0.16%	0.11%
	62	16.57%	20.77%	0.25%	0.26%
	63	0.68%	0.25%	0.06%	0.34%

		North Korea			
		Export share		Import share	
BEC		2008	2018	2008	2018
primary goods	111	3.28%	1.28%	0%	0%
	21	0.13%	0.09%	99.52%	0%
	31	90.60%	0%	0.48%	0%
processed goods	121	0.21%	4.76%	0%	0%
	22	1.26%	23.59%	0%	0%
	32	0.25%	0%	0%	0%
parts & components	42	0.03%	0.00%	0%	0%
	53	0.04%	0%	0%	0%
capital goods	41	0.15%	0.24%	0%	0%
	521	0.01%	0%	0%	0%
final goods	112	0.22%	7.38%	0%	92.34%
	122	1.67%	62.36%	0%	0%
	51	0%	0%	0%	0%
	522	0%	0%	0%	0%
	61	0.06%	0.14%	0%	0%
	62	1.59%	0.11%	0%	7.66%
	63	0.49%	0.05%	0%	0%

（Note）Unit：1,000 U.S. dollars

（Source）Authors' calculation using data form KITA.

3.4 Changes in trade structure by trade component

Finally, we review changes in trade components. The term "trade components" is used here to break down changes in trade into their various components and to analyze which components affect these changes. This method is used to examine the impact of changes in various factors on trade in the global market, including not only changes in trade barriers such as the reduction of tariff barriers, geographical distance between two countries, the introduction of a common currency, and the introduction of trade-facilitation systems, but also changes in cultural closeness such as the existence of a common language, former colonial relations, and community formation through immigration. The analysis is used to examine the impact of changes in cultural closeness, such as the existence of a common language, former colonial relations, and the formation of communities through immigration, on changes in trade[9]. In other words, the homogenization in various fields that accompanies globalization lowers the cost of international trade, and it is difficult to determine whether changes in trade accompanying changes in trade costs are the result of newly trade products due to lower trade barriers or whether they are the result of existing trade products being traded more than ever. This is a useful analytical perspective from which to consider whether the change in trade costs is due to the creation of new traded items as a result of lower trade barriers or the effect of more trade in already traded products.

As globalization progresses, international institutional coordination is expected to reduce economic trade barriers and increase trade. In addition, because many countries' border areas share the same ethnic groups, speak the same language, and have a high degree of social and cultural proximity, a different perspective to that in other regions is required when considering barriers to economic activity. The same can be said for Northeast China. However, for the sake of analytical simplicity, this study does not discuss trade barriers in detail but rather examines the trade components that have led to changes in the structure of trade between Heilongjiang and its bordering and neighboring countries over the two time periods.

In decomposing the changes in trade structure by trade components at the product level, we use the following decomposition equation [10]:

$$\triangle\, Trade\, Value_{i,j,k}^{m} = EXT_{i,j,k}^{m} + INT_{i,j,k}^{m} - DIS_{i,j,k}^{m}$$

Based on this decomposition equation, in this study, the change in trade values will be divided into trade in the newly added trade products (*EXT*: new trade), trade in the intensive margin of trade (*INT*: continuous trade), and trade in the dis-extensive margin of trade (*DIS*: exit trade)[11]. Additionally, i denotes Heilongjiang Province, j denotes a trading partner, k denotes a trade product, and m denotes exports or imports. Using this method, it is possible to identify which factor is responsible for changes in trade in terms of trade categories such as industry and production use, and simultaneously, even if the value of trade declines between two points in time, it can be said that a structural change has occurred within that trade category.

The main focus of this study is on the trade component, *EXT*. We would like to focus on *EXT* as the scale of the export value (import value) of trade products whose export value (import value) from Heilongjiang Province to the target neighboring and bordering countries is zero in 2008 and whose trade started in 2018, and the number of goods (#) represents the number of trade products in that new period. *DIS* is measured as the export value (import value) of a traded good that is traded in 2008 and has zero trade value in 2018. *INT* denotes the value of the

difference between *EXT* and *DIS* subtracted from Δ *Trade Value*.

Tables 5 to 12 summarize the changes in trade structure by trade component and production process based on changes in exports and imports between 2008 and 2018. First, trade with Russia is reviewed. Comparing 2008 and 2018 for exports from Heilongjiang to Russia, the total value of exports has declined. By industry, the value of exports has fallen in all industries except agricultural and fishery products and food and alcohol products, with a particularly marked decline in textile products. When this is analyzed by trade component, the impact of the decline in the export scale of *INT*, an item that has continued to be exported in both periods, is more significant than the export scale of *DIS*, an item that is no longer exported. In textile products, the export scale of *EXT*, a new export item, is larger than that of *EXT* in other industries, and the changes in exports from Heilongjiang to Russia in this period can be attributed to changes in the export scale of textile products, with a particularly large impact from the decline in *INT*. Furthermore, let us examine the structure of exports to Russia by production use from Table 6. As most of the trade products belonging to textile products are semi-durable consumer goods (BEC62), the decline in the export scale of textile products and footwear can be seen from the changes in this category. In semi-durable consumer goods, although *EXT* is larger in its export scale than others, the overall export value of semi-durable consumer goods is negative due to the decrease in the export scale of *INT* and size of the export of *DIS*.

Next, imports from Russia are reviewed. In contrast to exports, the scale of imports from Russia between the two time periods has increased. We have already established that imports from Russia are mainly mineral fuels; however, the scale of imports of *INT* among oil and coal is significantly larger, amounting to approximately 8 billion USD. The scale of imports of EXTs of oil and coal is also higher than that of the EXTs of other industries, at approximately 220 million USD; however, it can be said that the increase in imports of oil and coal is due to the increase in *INT*. Apart from oil and coal, the import size of *EXT* in pulp, paper, and wood products is significant, accounting for more than 60% of all new imports from Russia.

The structure of imports from Russia by production use is reviewed in Table 6. While the *EXT* of industrial supplies (processed) (BEC22) in intermediate goods is at a high level, accounting for approximately 26% of total *EXT* imports, the imports of food and beverages (mainly for industry) (BEC111), industrial supplies (primary) (BEC21), and fuels and lubricants (primary) (BEC 31) are significantly larger than that in *EXT*. These three primary goods alone account for approximately 70% of new imports from Russia. Furthermore, the *INT* of fuels and lubricants (primary) (BEC31) in primary goods is approximately 7.8 billion USD, which is where the increase in imports in this category can be found.

In terms of trade with Russia, Heilongjiang Province has exported new trade products, albeit in a small number of industries; however, the decline in the exports of existing items has been even more significant, making it difficult to confirm the effect of new exports in the export structure. In terms of imports, it can be seen that imports of new and raw materials and imports of existing items have expanded significantly. If it can be ascertained whether the imports of these materials and raw materials are regarded as inputs within the province or whether they are sent to other provinces, it can be determined whether Heilongjiang Province plays the role of a manufacturing center or transit-trade hub in the border region; however, this is a subject for a future study.

Heilongjiang's trade structure with South Korea by industry and by production process was characterized by a shift in the weight of imports to intermediate goods in general machinery and parts and components, electrical equipment and parts, transport equipment and parts, and an increase in the export scale of final goods in passenger

motor vehicles. Considering this feature, changes in trade with South Korea are reviewed by trade component based on Tables 7 and 8. Comparing 2008 and 2018, the total value of exports and imports has declined. When examining the machinery-related industries mentioned above, it is observed that the scale of *EXT* imports in general and electrical machinery is significantly larger than that in other industries, while the scale of *INT* imports has been declining significantly and that of *DIS* imports is also larger.

This means that although imports of new trade products are expanding, this increase in size is offset by a decline in the imports of intensive margins of trade in the same industry and an increase in imports of goods that are no longer traded. A review of the changes in the trade components of the industry's imports by production use shows that the scale of *EXT* imports has increased in industrial supplies (processed) (BEC 22) and capital goods (parts and accessories except transport equipment) (BEC 42), and transport equipment (parts and accessories) (BEC53) has experienced an increase in both *EXT* and *INT*, which is a contributing factor to the increase in the size of the imports of intermediate goods. In addition, for industrial supplies (processed) (BEC22) and capital goods (parts and accessories except transport equipment) (BEC42), *INT* has decreased while *DIS* has increased. In other words, the increase in the imports of processed goods and parts and components can be attributed to a change in the type of products traded from existing products to newly traded products. Similarly, exports are confirmed: in 2008 and 2018, exports from Heilongjiang to South Korea declined in almost all industries in value terms; however, only transport equipment and parts and accessories (industrial) increased. No increase in the export scale of *INT* and *DIS* can be observed in transport equipment (parts and accessories), while the export scale of *EXT* has increased.

In other words, the increase in exports from Heilongjiang to South Korea can be attributed to an increase in the *EXT* of transport equipment (parts and accessories). Confirming this export growth in terms of exports by production use, the *EXT* of passenger motor vehicles (BEC51) has expanded, and it can be said that new transactions in final goods have been initiated from Heilongjiang Province. In addition, in the intermediate-goods industrial supplies (processed) (BEC22), in addition to the noticeable export scale of *INT* and *DIS*, an expansion in the export scale of *EXT* can be seen. This can be seen as a significant change in the types of processed intermediate goods exported, and it can be considered as a change in Heilongjiang's position in the international division of labor network in the East Asian region.

Next, we review the change in trade between Heilongjiang and Japan by trade component. Tables 9 and 10 summarize the changes in each trade component by industry and production use, respectively. As already confirmed, Heilongjiang's imports from Japan are characterized by an increasing weight of imports of intermediate goods from machinery-related industries, particularly in transport equipment, which is similar to imports from South Korea. In exports, however, there was no expansion of passenger motor vehicles seen in exports to South Korea. Given this feature of the trade structure, changes in trade with Japan are reviewed by trade component. Comparing 2008 and 2018, both exports and imports have decreased in total value. In addition, changes in trade components are reviewed by industry. Transport equipment shows the largest increase in imports, followed by electrical equipment. It can be said that changes in the scale of imports in these industries are similar to those in imports from the same industries in South Korea. However, the extent to which this change in imports is due to changes in trade components differs between Japan and Korea. Comparing *EXT* and *INT* in transport, electrical, and transport equipment, the scale of imports of *INT* has decreased in South Korea, while Japan's *INT* has expanded and the scale of its imports is much larger than that of its *EXT*. Confirming imports by trade component,

the share of *INT* imports of intermediate goods in the transport equipment (parts and accessories) (BEC 53) is large, while the shares in both *INT* and *EXT* imports in the capital goods (except transport equipment) (BEC 41) as final goods are relatively large.

Similarly, considering the export side, the export expansion of transport equipment and parts and accessories (passenger motor vehicles) seen in exports to Korea (BEC51) cannot be confirmed for both *EXT* and *INT*. Examining pulp, paper, and wood and textile products, where the weight of exports by industry is significant, it can be seen that the export scale of *EXT* is relatively larger than that of other industries in both industries; however, the increase in *EXT* is offset by the decrease in *INT* and increase in *DIS*. This can also be seen from industrial supplies (processed) (BEC22) and consumer goods (semi-durable) (BEC62) in the change in trade components by production use, where the export scale of *EXT* is larger for both than for the other industry but the scale of the decline in *INT* is even larger. Regarding the characteristics of Japan's trade, in exports, although an increase in the scale of *EXT* can be observed in some industries, there has not been a marked increase, while in imports, an increase in the imports of intensive margin of trade can be observed, both by industry and by production use, rather than new products[12].

Table 5: Changes in the structure of trade by components of trade (analysis by industry: Russia)

	Heilongjiang Province		⇔	Russia							
	Export			EXT				INT		DIS	
Industry	2008	2018	ΔEX	values	%	No.	%	values	No.	values	No.
agricultural and fishery products	199,006	208,499	9,493	35,505	13.3%	79	9.3%	3,000	55	29,012	30
food & alcohol products	12,587	58,204	45,617	27,926	10.5%	32	3.8%	21,155	18	3,464	13
oil and coal	28,654	141	-28,513	94	0.0%	4	0.5%	-1,426	3	27,181	21
chemicals products	33,395	10,096	-23,299	3,430	1.3%	41	4.8%	-19,381	24	7,348	53
plastic and rubber products	56,479	29,910	-26,569	2,851	1.1%	31	3.6%	-24,679	81	4,741	29
leather, fur, and handbags products	293,212	18,721	-274,491	2	0.0%	1	0.1%	-267,327	17	7,166	6
pulp, paper, and wood products	29,205	12,302	-16,903	7,208	2.7%	24	2.8%	-16,331	33	7,780	61
textile products	2,355,881	335,711	-2,020,170	118,928	44.7%	69	8.1%	-1,645,166	181	493,932	186
iron and steel, and nonferrous metals products	194,007	62,872	-131,135	15,583	5.9%	132	15.5%	-100,035	209	46,683	136
general machinery	120,157	73,849	-46,308	9,608	3.6%	178	20.9%	-37,387	242	18,529	112
electrical machinery	72,202	44,980	-27,222	14,915	5.6%	129	15.1%	-35,531	88	6,606	43
transportation equipment	50,445	26,862	-23,583	9,268	3.5%	42	4.9%	-4,972	57	27,879	39
precision machinery	63,737	14,229	-49,508	2,721	1.0%	49	5.7%	-50,186	24	2,043	30
arms	1,885	16	-1,869	16	0.0%	1	0.1%	0	0	1,885	1
toys and miscellaneous goods	150,248	57,059	-93,189	18,029	6.8%	41	4.8%	-78,134	83	33,084	18
works of art and collectibles and antiques	299	0	-299	0	0.0%	0	0.0%	0	0	299	2
Total	3,661,399	953,451	-2,707,948	266,084	100%	853	100%	-2,256,400	1,115	717,632	780

	Heilongjiang Province		⇔	Russia							
	Import			EXT				INT		DIS	
Industry	2008	2018	ΔIM	values	%	No.	%	values	No.	values	No.
agricultural and fishery products	5,731	314,976	309,245	305,076	20.5%	43	19.3%	6,180	3	2,011	6
Food & alcohol products	224	35,485	35,261	15,442	1.0%	42	18.8%	19,819	3	0	0
oil and coal	5,942,898	14,171,635	8,228,737	220,265	14.8%	13	5.8%	8,029,431	6	20,959	10
chemicals products	808,242	121,440	-686,802	11,558	0.8%	14	6.3%	-541,728	4	156,632	25
plastic and rubber products	215,642	10,786	-204,856	67	0.0%	4	1.8%	-140,734	6	64,189	15
leather, fur, handbags products	320	252	-68	34	0.0%	2	0.9%	3	3	105	2
pulp, paper and wood products	1,303,422	1,454,375	150,953	921,781	61.9%	46	20.6%	-75,162	16	695,666	14
textile products	0	530	530	530	0.0%	3	1.3%	0	0	0	0
iron and steel, nonferrous metals products	212,514	13,801	-198,713	9,177	0.6%	13	5.8%	-145,778	3	62,112	42
general machinery	20,274	3,155	-17,119	2,211	0.1%	19	8.5%	-969	4	18,361	38
electrical machinery	410	752	342	741	0.0%	11	4.9%	-84	2	315	11
transportation equipment	20,028	723	-19,305	305	0.0%	3	1.3%	395	1	20,005	3
precision machinery	988	930	-58	910	0.1%	8	3.6%	-595	3	373	7
arms	0	0	0	0	0.0%	0	0.0%	0	0	0	0
toys and miscellaneous goods	0	92	92	92	0.0%	2	0.9%	0	0	0	0
works of art and collectibles and antiques	9	0	-9	0	0.0%	0	0.0%	0	0	9	2
Total	8,530,702	16,128,932	7,598,230	1,488,189	100%	223	100%	7,150,778	54	1,040,737	175

（Note）Unit：1,000 U.S. dollars

（Source）Authors' calculation using data form KITA.

Table 6: Changes in the structure of trade by components of trade
(analysis by production use: Russia)

		Heilongjiang Province ⇔ Russia										
		Export			EXT				INT		DIS	
BEC		2008	2018	ΔEX	values	%	No.	%	values	No.	values	No.
primary goods	111	8,990	17,832	8,842	502	0.2%	7	0.8%	8,444	4	104	3
	21	2,981	3,384	403	3,273	1.2%	9	1.1%	-2,343	3	527	21
	31	0	0	0	0	0%	0	0%	0	0	0	0
processed goods	121	6,137	5,695	-442	745	0.3%	2	0.2%	1,961	2	3,148	3
	22	360,838	177,932	-182,906	42,560	16.0%	214	25.1%	-121,724	323	103,742	313
	32	245	5	-240	5	0.0%	1	0.1%	0	0	245	5
parts & components	42	27,676	31,808	4,132	6,677	2.5%	106	12.4%	897	93	3,442	40
	53	41,424	23,366	-18,058	4,555	1.7%	47	5.5%	-17,794	66	4,819	27
capital goods	41	118,911	72,012	-46,899	17,119	6.4%	211	24.7%	-40,694	255	23,324	118
	521	29,519	4,110	-25,409	2,618	1.0%	3	0.4%	-9,189	6	18,838	16
final goods	112	178,818	186,251	7,433	31,491	11.8%	54	6.3%	1,391	47	25,449	16
	122	13,743	42,134	28,391	16,313	6.1%	39	4.6%	15,657	17	3,579	14
	51	1,206	4,284	3,078	4,284	1.6%	1	0.1%	0	0	1,206	2
	522	247	5,528	5,281	479	0.2%	5	0.6%	4,802	6	0	0
	61	23,377	13,303	-10,074	4,429	1.7%	52	6.1%	-10,860	34	3,643	28
	62	2,407,282	325,526	-2,081,756	126,757	47.6%	69	8.1%	-1,817,817	200	390,696	115
	63	436,901	40,281	-396,620	4,277	1.6%	33	3.9%	-269,131	59	131,766	57

		Heilongjiang Province ⇔ Russia										
		Import			EXT				INT		DIS	
BEC		2008	2018	ΔIM	values	%	No.	%	values	No.	values	No.
primary goods	111	1,854	262,426	260,572	262,426	17.6%	9	4.0%	0	0	1,854	2
	21	1,238,431	817,692	-420,739	570,906	38.4%	27	12.1%	-310,075	8	681,570	25
	31	5,799,516	13,861,901	8,062,385	199,554	13.4%	4	1.8%	7,862,833	2	2	1
processed goods	121	62	16,921	16,859	14,882	1.0%	5	2.2%	1,978	1	1	1
	22	1,444,187	953,914	-490,273	392,539	26.4%	60	26.9%	-565,552	25	317,260	79
	32	126	147,148	147,022	8,317	0.6%	5	2.2%	138,759	2	54	1
parts & components	42	6,402	419	-5,983	417	0.0%	13	5.8%	1	1	6,401	15
	53	1,253	1,798	545	1,380	0.1%	4	1.8%	395	1	1,230	8
capital goods	41	14,103	2,281	-11,822	1,308	0.1%	21	9.4%	-1,649	8	11,481	34
	521	19,876	252	-19,624	252	0.0%	1	0.4%	0	0	19,876	1
final goods	112	3,798	10,631	6,833	2,941	0.2%	7	3.1%	4,048	1	156	3
	122	241	52,753	52,512	32,539	2.2%	56	25.1%	19,973	4	0	0
	51	0	0	0	0	0%	0	0%	0	0	0	0
	522	0	0	0	0	0%	0	0%	0	0	0	0
	61	19	8	-11	8	0.0%	2	0.9%	0	0	19	3
	62	833	693	-140	693	0.0%	7	3.1%	0	0	833	2
	63	1	95	94	27	0.0%	2	0.9%	67	1	0	0

（Note） Unit：1,000 U.S. dollars

（Source） Authors' calculation using data form KITA.

Table 7: Changes in trade structure by trade component
(Industry analysis: Korea)

| | Heilongjiang Province | | ⇔ | South Korea | | | | | | | |
| | Export | | | EXT | | | | INT | | DIS | |
Industry	2008	2018	Δ EX	values	%	No.	%	values	No.	values	No.
agricultural and fishery products	166,327	158,676	-7,651	67,191	37.3%	16	8.0%	34,011	12	108,853	24
food & alcohol products	48,718	49,245	527	20,770	11.5%	17	8.5%	18,796	10	39,038	14
oil and coal	19,081	1,052	-18,029	42	0.0%	4	2.0%	-3,965	2	14,105	15
chemicals products	39,429	22,727	-16,701	8,475	4.7%	23	11.6%	-778	15	24,399	43
plastic and rubber products	4,599	911	-3,689	737	0.4%	13	6.5%	-336	6	4,089	34
leather, fur, and handbags products	2,770	340	-2,430	0	0.0%	0	0.0%	-1,180	4	1,250	15
pulp, paper, and wood products	31,682	19,245	-12,437	16,509	9.2%	17	8.5%	-10,592	10	18,354	50
textile products	10,940	5,834	-5,106	40	0.0%	6	3.0%	2,394	14	7,540	174
iron and steel, and nonferrous metals products	53,935	25,270	-28,665	24,004	13.3%	36	18.1%	-4,806	21	47,863	113
general machinery	56,613	3,249	-53,364	2,096	1.2%	31	15.6%	-2,259	18	53,201	64
electrical machinery	8,530	4,199	-4,331	2,141	1.2%	18	9.0%	-1,727	3	4,745	44
transportation equipment	413	37,292	36,879	37,240	20.7%	4	2.0%	-270	2	91	12
precision machinery	1,225	496	-729	363	0.2%	8	4.0%	100	3	1,192	30
arms	0	0	0	0	0.0%	0	0.0%	0	0	0	0
toys and miscellaneous goods	9,038	756	-8,282	373	0.2%	6	3.0%	-5,799	10	2,856	53
works of art and collectibles and antiques	86	0	-86	0	0.0%	0	0.0%	0	0	86	3
Total	453,385	329,293	-124,093	179,981	100%	199	100%	23,588	130	327,662	688

| | Heilongjiang Province | | ⇔ | South Korea | | | | | | | |
| | Import | | | EXT | | | | INT | | DIS | |
Industry	2008	2018	Δ IM	values	%	No.	%	values	No.	values	No.
agricultural and fishery products	4	60	56	60	0.2%	3	1.3%	0	0	4	1
Food & alcohol products	695	2,032	1,337	1,749	4.8%	16	6.8%	-263	17	149	7
oil and coal	592	1,865	1,273	1,799	5.0%	3	1.3%	56	1	583	4
chemicals products	8,672	6,050	-2,622	5,806	16.1%	22	9.4%	142	4	8,570	32
plastic and rubber products	8,748	1,573	-7,175	449	1.2%	10	4.3%	398	10	8,022	34
leather, fur, handbags products	31	6	-25	4	0.0%	7	3.0%	-2	2	28	2
pulp, paper and wood products	3,393	504	-2,888	17	0.0%	2	0.9%	401	3	3,306	15
textile products	1,358	435	-923	272	0.8%	58	24.8%	142	14	1,337	43
iron and steel, nonferrous metals products	36,077	11,170	-24,907	607	1.7%	30	12.8%	-14,473	21	11,041	72
general machinery	55,015	19,139	-35,877	11,964	33.1%	45	19.2%	-15,777	24	32,063	75
electrical machinery	12,964	12,011	-953	11,350	31.4%	18	7.7%	-4,993	9	7,310	36
transportation equipment	2,798	18,097	15,298	211	0.6%	5	2.1%	15,277	6	190	13
precision machinery	1,815	1,596	-219	1,211	3.4%	10	4.3%	-165	7	1,264	14
arms	0	0	0	0	0.0%	0	0.0%	0	0	0	0
toys and miscellaneous goods	60	630	570	600	1.7%	5	2.1%	2	5	32	15
works of art and collectibles and antiques	0	0	0	0	0.0%	0	0.0%	0	0	0	0
Total	132,221	75,167	-57,054	36,099	100%	234	100%	-19,255	123	73,898	363

（Note）Unit：1,000 U.S. dollars

（Source）Authors' calculation using data form KITA.

Table 8: Changes in trade structure by trade component
(analysis by production use: Korea)

		Heilongjiang Province			⇔		South Korea					
		Export			EXT				INT		DIS	
BEC		2008	2018	ΔEX	values	%	No.	%	values	No.	values	No.
primary goods	111	147,792	133,720	-14,073	62,107	34.5%	8	4.0%	25,461	2	101,641	4
	21	40,165	26,138	-14,027	961	0.5%	7	3.5%	20,439	3	35,427	29
	31	404	0	-404	0	0%	0	0%	0	0	404	2
processed goods	121	13,357	8,773	-4,584	6,560	3.6%	4	2.0%	-7,852	3	3,292	3
	22	129,561	71,116	-58,445	47,476	26.4%	77	38.7%	-10,581	55	95,340	270
	32	110	0	-110	0	0%	1	0.5%	0	0	110	1
parts & components	42	42,179	3,066	-39,113	2,238	1.2%	24	12.1%	-1,442	13	39,909	49
	53	3,552	4,286	734	2,603	1.4%	6	3.0%	-1,777	3	92	16
capital goods	41	20,401	1,746	-18,655	732	0.4%	33	16.6%	-809	11	18,578	81
	521	25	0	-25	0	0%	0	0%	0	0	25	1
final goods	112	4,968	15,601	10,633	3,401	1.9%	1	0.5%	7,798	6	566	5
	122	12,704	19,990	7,286	10,980	6.1%	15	7.5%	3,346	8	7,040	11
	51	0	37,162	37,162	37,162	20.6%	3	1.5%	0	0	0	0
	522	14	0	-14	0	0%	0	0%	0	0	14	1
	61	10,561	528	-10,033	249	0.1%	2	1.0%	-8,521	4	1,762	19
	62	23,626	6,646	-16,979	5,238	2.9%	11	5.5%	-1,114	18	21,104	143
	63	3,967	521	-3,446	274	0.2%	7	3.5%	-1,361	4	2,360	53

		Heilongjiang Province			⇔		South Korea					
		Import			EXT				INT		DIS	
BEC		2008	2018	ΔIM	values	%	No.	%	values	No.	values	No.
primary goods	111	0	0	0	0	0%	0	0%	0	0	0	0
	21	159	20	-140	20	0.1%	1	0.4%	0	0	159	4
	31	0	0	0	0	0%	0	0%	0	0	0	0
processed goods	121	1	57	56	56	0.2%	1	0.4%	0	1	0	0
	22	57,338	20,662	-36,676	8,392	23.2%	47	20.1%	-13,278	32	31,791	152
	32	694	150	-543	84	0.2%	1	0.4%	56	1	684	4
parts & components	42	56,406	19,927	-36,478	13,076	36.2%	28	12.0%	-19,300	25	30,254	57
	53	2,829	24,234	21,405	6,348	17.6%	7	3.0%	15,257	8	200	17
capital goods	41	13,903	6,567	-7,336	5,384	14.9%	44	18.8%	-2,180	15	10,541	78
	521	3	0	-3	0	0%	0	0%	0	0	3	1
final goods	112	0	0	0	0	0%	0	0%	0	0	0	0
	122	602	2,035	1,433	1,752	4.9%	18	7.7%	-262	16	57	6
	51	0	0	0	0	0%	0	0%	0	0	0	0
	522	0	0	0	0	0%	0	0%	0	0	0	0
	61	15	69	54	69	0.2%	3	1.3%	0	0	15	6
	62	125	753	627	365	1.0%	66	28.2%	322	18	60	28
	63	144	692	548	551	1.5%	18	7.7%	130	7	132	10

（Note）Unit：1,000 U.S. dollars

（Source）Authors' calculation using data form KITA.

Table 9: Changes in trade structure by trade component
(industry analysis: Japan)

	Heilongjiang Province			⇔		Japan				
	Export			EXT				INT		DIS	
Industry	2008	2018	Δ EX	values	%	No.	%	values	No.	values	No.
agricultural and fishery products	53,812	26,144	-27,668	9,235	11.7%	18	7.8%	-25,335	17	11,567	27
food & alcohol products	72,298	43,150	-29,148	4,533	5.7%	11	4.7%	28,107	13	61,788	11
oil and coal	6,741	11,749	5,008	8,064	10.2%	2	0.9%	1,158	2	4,214	15
chemicals products	58,867	17,269	-41,598	3,243	4.1%	15	6.5%	-2,810	8	42,030	50
plastic and rubber products	2,731	527	-2,204	36	0.0%	7	3.0%	25	14	2,265	23
leather, fur, and handbags products	1,392	252	-1,141	0	0.0%	0	0.0%	-447	5	694	6
pulp, paper, and wood products	105,900	49,775	-56,125	36,356	46.0%	20	8.6%	-65,473	26	27,008	61
textile products	20,071	19,707	-364	13,355	16.9%	40	17.2%	-8,967	42	4,751	135
iron and steel, and nonferrous metals products	6,727	925	-5,802	242	0.3%	31	13.4%	-1,205	30	4,839	87
general machinery	3,578	4,366	788	3,264	4.1%	25	10.8%	-2,060	12	416	52
electrical machinery	1,610	9,634	8,024	370	0.5%	46	19.8%	7,989	13	335	32
transportation equipment	68	44	-24	44	0.1%	1	0.4%	-68	0	0	9
precision machinery	2,576	2,477	-98	171	0.2%	10	4.3%	1,719	2	1,989	20
arms	0	0	0	0	0.0%	0	0.0%	0	0	0	0
toys and miscellaneous goods	9,002	590	-8,413	141	0.2%	6	2.6%	-2,132	13	6,421	46
works of art and collectibles and antiques	7	0	-7	0	0.0%	0	0.0%	-7	0	0	2
Total	345,380	186,608	-158,771	79,052	100%	232	100%	-69,506	197	168,318	576

	Heilongjiang Province			⇔		Japan				
	Import			EXT				INT		DIS	
Industry	2008	2018	Δ IM	values	%	No.	%	values	No.	values	No.
agricultural and fishery products	1,879	633	-1,246	121	0.4%	4	1.3%	251	1	1,617	4
Food & alcohol products	345	1,163	818	1,163	4.0%	6	2.0%	-345	0	0	2
oil and coal	3	578	575	400	1.4%	2	0.7%	177	1	3	1
chemicals products	16,758	5,579	-11,179	932	3.2%	25	8.2%	-8,107	16	4,005	33
plastic and rubber products	3,317	1,536	-1,781	107	0.4%	18	5.9%	-520	26	1,367	24
leather, fur, handbags products	0	9	9	9	0.0%	4	1.3%	0	0	0	1
pulp, paper and wood products	806	349	-457	196	0.7%	7	2.3%	-474	8	179	19
textile products	511	6,370	5,860	6,170	21.4%	55	18.0%	-224	11	87	40
iron and steel, nonferrous metals products	105,765	14,330	-91,435	4,972	17.3%	45	14.8%	-7,535	56	88,873	67
general machinery	106,718	48,997	-57,721	6,943	24.1%	48	15.7%	20,204	75	84,868	72
electrical machinery	28,896	36,085	7,188	4,204	14.6%	40	13.1%	28,122	65	25,138	52
transportation equipment	13,811	84,993	71,183	2,224	7.7%	13	4.3%	77,823	24	8,864	17
precision machinery	19,174	15,733	-3,442	1,307	4.5%	23	7.5%	6,240	35	10,988	28
arms	0	0	0	0	0.0%	0	0.0%	0	0	0	0
toys and miscellaneous goods	146	296	150	48	0.2%	15	4.9%	244	9	142	7
works of art and collectibles and antiques	0	0	0	0	0.0%	0	0.0%	0	0	0	0
Total	298,129	216,652	-81,477	28,797	100%	305	100%	115,855	327	226,129	367

（Note）Unit：1,000 U.S. dollars

（Source）Authors' calculation using data form KITA.

Table 10: Changes in trade structure by trade component
(analysis by production use: Japan)

		Heilongjiang Province		⇔	Japan							
		Export			EXT				INT		DIS	
BEC		2008	2018	ΔEX	values	%	No.	%	values	No.	values	No.
primary goods	111	34,472	7,902	-26,570	7,468	9.4%	5	2.2%	-33,122	3	916	6
	21	12,351	20,944	8,593	9,338	11.8%	9	3.9%	6,467	7	7,212	27
	31	468	12	-456	12	0.0%	1	0.4%	-468	0	0	3
processed goods	121	458	338	-120	4	0.0%	1	0.4%	330	1	454	1
	22	145,438	50,909	-94,529	21,408	27.1%	71	30.6%	-38,825	69	77,112	228
	32	521	0	-521	0	0%	0	0%	-521	0	0	4
parts & components	42	2,487	2,395	-92	390	0.5%	24	10.3%	686	15	1,168	47
	53	962	219	-743	219	0.3%	4	1.7%	-962	0	0	15
capital goods	41	3,733	11,870	8,137	3,066	3.9%	46	19.8%	5,995	16	925	47
	521	45	0	-45	0	0%	0	0%	-45	0	0	2
final goods	112	6,363	7,533	1,171	1,063	1.3%	9	3.9%	5,449	5	5,341	6
	122	69,127	42,755	-26,372	3,721	4.7%	8	3.4%	31,449	15	61,542	9
	51	0	44	44	44	0.1%	1	0.4%	0	0	0	0
	522	0	0	0	0	0%	0	0%	0	0	0	0
	61	9,371	2,453	-6,919	76	0.1%	7	3.0%	1,051	5	8,046	15
	62	57,222	38,767	-18,455	32,129	40.6%	38	16.4%	-45,482	47	5,102	122
	63	2,361	466	-1,895	115	0.1%	8	3.4%	-1,510	14	501	44

		Heilongjiang Province		⇔	Japan							
		Import			EXT				INT		DIS	
BEC		2008	2018	ΔIM	values	%	No.	%	values	No.	values	No.
primary goods	111	0	0	0	0	0%	0	0%	0	0	0	0
	21	2,177	527	-1,651	14	0.0%	3	1.0%	-48	1	1,617	5
	31	0	0	0	0	0%	0	0%	0	0	0	0
processed goods	121	325	0	-325	0	0%	0	0%	-325	0	0	1
	22	126,249	25,153	-101,096	7,916	27.5%	109	35.7%	-14,614	109	94,397	147
	32	14	577	563	398	1.4%	1	0.3%	178	3	13	1
parts & components	42	90,346	19,326	-71,021	5,471	19.0%	36	11.8%	7,988	79	84,480	46
	53	22,995	84,204	61,209	214	0.7%	11	3.6%	82,535	35	21,539	26
capital goods	41	49,705	82,011	32,307	10,565	36.7%	71	23.3%	45,009	85	23,268	97
	521	4,455	4	-4,451	0	0%	0	0%	-4,430	1	22	3
final goods	112	1	0	-1	0	0%	0	0%	-1	0	0	1
	122	234	1,163	929	1,163	4.0%	6	2.0%	-234	0	0	3
	51	218	2,130	1,912	2,130	7.4%	3	1.0%	-218	0	0	2
	522	0	7	7	7	0.0%	1	0.3%	0	0	0	0
	61	491	243	-248	7	0.0%	7	2.3%	-200	3	55	2
	62	735	571	-164	189	0.7%	31	10.2%	361	4	714	19
	63	182	735	553	722	2.5%	26	8.5%	-145	7	24	14

（Note）Unit：1,000 U.S. dollars

（Source）Authors' calculation using data form KITA.

Table 11: Changes in the structure of trade by trade component
(analysis by industry: DPRK)

	Heilongjiang Province		⇔	North Korea							
	Export			EXT				INT		DIS	
Industry	2008	2018	Δ EX	values	%	No.	%	values	No.	values	No.
agricultural and fishery products	24,985	20,363	-4,622	14,152	92.5%	4	9.3%	1,956	6	20,730	27
food & alcohol products	3,795	6,510	2,715	354	2.3%	2	4.7%	5,273	4	2,912	25
oil and coal	457,957	0	-457,957	0	0.0%	0	0.0%	0	0	457,957	12
chemicals products	1,317	78	-1,239	70	0.5%	9	20.9%	0	5	1,309	36
plastic and rubber products	1,135	975	-159	105	0.7%	5	11.6%	401	11	666	27
leather, fur, and handbags products	1,538	0	-1,538	0	0.0%	0	0.0%	0	0	1,538	11
pulp, paper, and wood products	205	457	251	256	1.7%	5	11.6%	43	5	47	9
textile products	9,967	255	-9,712	252	1.6%	10	23.3%	-4	4	9,960	79
iron and steel, and nonferrous metals products	907	0	-907	0	0.0%	0	0.0%	0	0	907	66
general machinery	328	28	-299	28	0.2%	1	2.3%	0	0	328	36
electrical machinery	537	0	-537	0	0.0%	0	0.0%	0	0	537	12
transportation equipment	121	0	-121	0	0.0%	0	0.0%	0	0	121	14
precision machinery	201	36	-165	36	0.2%	1	2.3%	0	0	201	9
arms	0	0	0	0	0.0%	0	0.0%	0	0	0	0
toys and miscellaneous goods	559	47	-512	42	0.3%	6	14.0%	-12	5	542	17
works of art and collectibles and antiques	0	0	0	0	0.0%	0	0.0%	0	0	0	0
Total	503,553	28,750	-474,803	15,296	100%	43	100%	7,657	40	497,756	380

	Heilongjiang Province		⇔	North Korea							
	Import			EXT				INT		DIS	
Industry	2008	2018	Δ IM	values	%	No.	%	values	No.	values	No.
agricultural and fishery products	0	138	138	138	92.3%	1	50%	0	0	0	0
food & alcohol products	0	0	0	0		0		0	0	0	0
oil and coal	479	0	-479	0		0		0	0	479	2
chemicals products	0	0	0	0		0		0	0	0	0
plastic and rubber products	0	0	0	0		0		0	0	0	0
leather, fur, and handbags products	0	0	0	0		0		0	0	0	0
pulp, paper, and wood products	0	0	0	0		0		0	0	0	0
textile products	0	11	11	11	7.7%	1	50%	0	0	0	0
iron and steel, and nonferrous metals products	649	0	-649	0		0		0	0	649	1
general machinery	0	0	0	0		0		0	0	0	0
electrical machinery	0	0	0	0		0		0	0	0	0
transportation equipment	0	0	0	0		0		0	0	0	0
precision machinery	0	0	0	0		0		0	0	0	0
arms	0	0	0	0		0		0	0	0	0
toys and miscellaneous goods	0	0	0	0		0		0	0	0	0
works of art and collectibles and antiques	0	0	0	0		0		0	0	0	0
Total	1127	149	-978	149	100%	2	100%	0	0	1127	3

（Note）Unit：1,000 U.S. dollars

（Source）Authors' calculation using data form KITA.

Table 12: Changes in the structure of trade by components of trade (analysis by production use: DPRK)

		Heilongjiang Province		⇔	North Korea						
		Export			EXT				INT		DIS	
BEC		2008	2018	ΔEX	values	%	No.	%	values	No.	values	No.
primary goods	111	16,521	368	-16,153	368	2.4%	1	2.3%	0	0	16,521	3
	21	649	26	-623	0	0.0%	0	0.0%	-621	1	2	2
	31	456,223	0	-456,223	0	0.0%	0	0.0%	0	0	456,223	4
processed goods	121	1,080	1,369	289	1,369	8.9%	2	4.7%	0	0	1,080	5
	22	6,342	6,781	439	639	4.2%	27	62.8%	4,649	26	4,849	117
	32	1,278	0	-1,278	0	0.0%	0	0.0%	0	0	1,278	4
parts & components	42	164	1	-163	1	0.0%	1	2.3%	0	0	164	18
	53	221	0	-221	0	0.0%	0	0.0%	0	0	221	14
capital goods	41	772	69	-703	69	0.4%	4	9.3%	0	0	772	47
	521	39	0	-39	0	0.0%	0	0.0%	0	0	39	5
final goods	112	1,105	2,122	1,016	1,926	12.6%	1	2.3%	180	1	1,090	16
	122	8,389	17,930	9,540	10,844	70.9%	2	4.7%	3,481	6	4,785	26
	51	0	0	0	0	0.0%	0	0.0%	0	0	0	0
	522	0	0	0	0	0.0%	0	0.0%	0	0	0	0
	61	306	41	-264	37	0.2%	2	4.7%	1	3	302	7
	62	7,994	31	-7,963	30	0.2%	2	4.7%	-33	2	7,960	80
	63	2,471	14	-2,456	14	0.1%	1	2.3%	0	1	2,470	32

		Heilongjiang Province		⇔	North Korea						
		Import			EXT				INT		DIS	
BEC		2008	2018	ΔIM	values	%	No.	%	values	No.	values	No.
primary goods	111	0	0	0	0	0%	0	0%	0	0	0	0
	21	1,121,889	0	-1,122	0	0%	0	0%	0	0	1,122	2
	31	5,370	0	-5	0	0%	0	0%	0	0	5	1
processed goods	121	0	0	0	0	0%	0	0%	0	0	0	0
	22	0	0	0	0	0%	0	0%	0	0	0	0
	32	0	0	0	0	0%	0	0%	0	0	0	0
parts & components	42	0	0	0	0	0%	0	0%	0	0	0	0
	53	0	0	0	0	0%	0	0%	0	0	0	0
capital goods	41	0	0	0	0	0%	0	0%	0	0	0	0
	521	0	0	0	0	0%	0	0%	0	0	0	0
final goods	112	0	138	138	138	92.3%	1	50.0%	0	0	0	0
	122	0	0	0	0	0%	0	0%	0	0	0	0
	51	0	0	0	0	0%	0	0%	0	0	0	0
	522	0	0	0	0	0%	0	0%	0	0	0	0
	61	0	0	0	0	0%	0	0%	0	0	0	0
	62	0	11	11	11	7.7%	1	50.0%	0	0	0	0
	63	0	0	0	0	0%	0	0%	0	0	0	0

(Note) Unit : 1,000 U.S. dollars

(Source) Authors' calculation using data form KITA.

4. Conclusion

China is said to have economic disparities between coastal areas and inland or landlocked regions, and the Chinese government is attempting cross-border regional development cooperation, one of the objectives of which is to eliminate regional disparity problems. Northeast China is a region where such regional development is being attempted, and Heilongjiang Province is among the provinces in the border region and has a role as the gateway to the Northeast in the Chinese economy; it is a province where economic development is expected in the wider Tumen River region in Northeast Asia. Therefore, with the aim of exploring the potential for economic development in landlocked border regions, this study examines the characteristics of the trade structure of border regions, which are difficult to clarify in a country-level analysis of China, by observing changes in the trade structure of Heilongjiang Province. Many existing studies on China's international trade have mainly focused on national-level macro analysis and have failed to grasp the characteristics of regional economies in detail, while existing studies on regional economies have suggested meaningful policy recommendations but have yet to conduct a detailed analysis of the external economy. Against this background, the analysis in this study is significant because it uses detailed trade data to analyze the characteristics of border provinces in terms of their external trade.

The study is characterized by the use of tariff-line-level trade data at the provincial level in China, analysis at the industry and production-process levels, as well as a comparative analysis of changes in Heilongjiang's trade structure with neighboring and bordering countries between two time points. The analysis is conducted by trade component through a decomposition of the trade structure. The main results of the analysis are as follows.

First, in terms of trade volume, Heilongjiang has a trade structure that is highly dependent on Russia for both exports and imports. In terms of total trade flows, Russia is Heilongjiang's largest trading partner, and this is most pronounced for imports.

Second, although Heilongjiang Province is dependent on Russia in terms of imports of mineral resources, the weight of trade by industry and production process shows that imports of intermediate goods from some machinery-related industries are expanding in trade with Korea and Japan. This indicates that the impact of the trade structure sophistication in China's coastal regions has extended to Heilongjiang Province and the northeastern landlocked regions. This point suggests that Northeastern China has been included in the production network in the East Asian region, such as the internationally distributed location of production bases due to decreasing trade barriers and the formation of agglomerations due to enterprises' overseas expansion.

Third, observing Heilongjiang's trade structure by trade component for the machinery-related industries already mentioned, a similar point is that imports of processed goods and intermediate goods such as parts and components from both South Korea and Japan have increased; however, trade with south Korea has experienced a relatively large expansion of newly traded products, while imports from Japan have experienced a relatively large expansion of existing products. Furthermore, the structure of exports from Heilongjiang to these two countries by trade component shows different characteristics: exports to South Korea are expanding in new trade in transportation equipment, especially passenger motor vehicles, while this trend is not seen in exports to Japan. Although South Korea and Japan have relatively similar trade structures, their trade with Heilongjiang shows a different trade pattern, and it is necessary to examine the factors driving the import and export decisions.

This study is limited to only capturing the characteristics of trade structure from changes in trade data. Future research on economic development in border regions must clarify the factors responsible for changes in trade components. Whether this is due to changes in trade barriers resulting from multilateral economic cooperation in the border region or changes in internal factors in Heilongjiang and its trading partners, and which factors have the strongest impact, should be clarified through statistical analysis and will require further interdisciplinary research and field surveys.

Notes

1) Measurements are taken from World Bank data (World Development Indicators) and UN trade data (UN COMTRADE).

2) See Maeno and Yasuda (2022).

3) Numerous earlier studies on economic development in the Mekong region have been accumulated. Ishida and Umezaki (2010) analyses changes in trade in the Mekong region, focusing on road logistics and air and sea logistics in the five countries of the region. Oki (2016) analyses the characteristics of trade in intermediate goods in the least developed ASENA countries of Cambodia, Lao PDR, Myanmar, and Viet Nam, clarifying that Viet Nam is expanding exports of apparel products and communication equipment products to Western markets and imports of components from China and examining the current state of the division of production in the Mekong region. The report examines the current state of the division of production in the Mekong region. Yasuda and Maeno (2021) use trade data from Yunnan Province and Guangxi Zhuang Autonomous Region, located in southern China, to reveal that Guangxi serves as a transit point for exports to other Mekong region countries and Yunnan serves as a transit point for imports and exports.

4) Research on the economic effects of accession to the Shanghai Cooperation Organisation remains scarce; however, research on economic development in inland regions is gradually accumulating. Representative studies on trade barriers in inland regions include Limao and Venables (1999), Coulibaly and Fontagné (2004), Shepherd and Wilson (2006), and Behar and Venables (2010).

5) For studies on the Greater Tumen River Development Programme, see Zheng (2010), Yasuda (2016), Kim (2017), Mu (2019), and others.

6) Mu (2019) is a literature review of regional development policies in China.

7) Yasuda and Maeno (2021) mention the role of transit trade in China's southern border region.

8) Ishikawa, Umada, and Shimizu (2021) discuss the international competitiveness of East Asian countries by industry.

9) See also Amiti and Freund (2010), Amurgo-Pacheco and Pierola (2007) , Felbermayr and Kohler (2006), Flam and Nordstrom (2008) , and Debaere and Mostashari (2008).

10) See the trade structure decomposition equation in Amiti and Freund (2010) for this formula.

11) The trade component here is denoted by the extensive margin of trade (extensive margin of trade), the existing margin of trade (intensive margin of trade) is denoted by EXT, the intensive margin of trade (intensive margin of trade) is INT, and the dis-extensive margin of trade is DIS, which means the trading of existing trade items (intensive margin of trade).

12) Briefly review the changes in trade structure by trade component with the DPRK in Tables 11 and 12. Both exports

and imports have decreased in total value during the period under review. The increase in exports was in agricultural and fisheries products. This is reflected in the increase in exports of food and beverages (processed, household) (BEC 122) by production use, *EXT*. Because Heilongjiang Province's imports from the DPRK are very small in the statistics, we omit their discussion here.

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