

# Industrial Agglomeration in Border Areas in Northeast China: The Case of Yanbian in the China–North Korea–Russia Triangle Border Area

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**Abstract :** The aim of this study is to provide insight into the recent industrial agglomeration in China's border areas. As a first step towards more a comprehensive and extensive study on the interaction between industrial agglomeration and local economic development in the Chinese economy, this study examines the status of industrial development in Yanbian in the China-North Korea-Russia triangle border area. In particular, we examined the influence of a decrease in transport costs on industrial agglomerations in the Yanbian area, and describe the industrial agglomeration gradually appeared in these border areas by increasing international trade with regional economic integration, and decreasing transport costs by maintaining the traffic infrastructure under the support of national development policies. We also clarified that the development strategy covered the disadvantageous initial conditions for industrial agglomerations in the Yanbian area.

**Key Words :** Industrial agglomeration, Economic development policy, Border area, Yanbian Korean Autonomous Region

## 1. Introduction

Generally, industrial agglomeration refers to a large number of companies located close together geographically. Each plays a role in the relationship between the companies, such as ordering, information exchange, and cooperation. The older location theory assumed a closed economy. Thus, the potential labor force supply and a growing local market were the most important factors influencing investors' decisions. In this sense, the border areas that lacked these factors were unlikely to become industrial agglomerations because this was considered disadvantageous <sup>\*1</sup>. However, the spatial economics theory pointed out the possibility of continuous decreases in transportation costs, making industrial agglomerations more likely and stirring debate on such relationships within border areas [5]–[7],[12],[17].

Industrial agglomerations in China have advanced since 1978 under the reform and opening-up policy. During the first stage in the 1980s, with the construction of the Shenzhen Special Economic Zone, labor-intensive industry agglomeration advanced around the Guangdong area. Then, in the 1990s, the Changjiang Delta including the Shanghai, Jiangsu, and Zhejiang provinces, witnessed an agglomeration of the manufacturing industry, mainly in precision instruments and electronic products. In addition, specific industrial agglomeration occurred in many towns and villages in this area.

However, the industrial agglomerations and rapid economic development in the Zhujiang and Changjiang Deltas escalated

the disparity between the coastal and inner areas. As a result, China implemented growth-oriented economic policies in an attempt to reduce these regional disparities. In particular, the Chinese government implemented a local industrial development policy in inner border areas, including promoting border trade since the latter half of the 1990s.

In the Chinese long border area, many regions include minority groups such as those from Inner Mongolia, Xinjiang, and Tibet, and their history, culture, and manners are different from the Han ethnic group. The Yanbian Korean Autonomous Region (hereafter, Yanbian) located in the China–North Korea–Russia triangle border area is one such area, traditionally referred to as “frontier” or “border” areas. These areas are a long way from the political, administrative, and economic centers of the China, such as Beijing, Guangdong, Shenzhen, and Shanghai. As a result, they were left behind during the rapid growth of China's economy and could not participate in the export-led economic growth strategy after the reform and opening-up policy [20].

On the other hand, the border area's economy gradually advanced after the Chinese government implemented the opening-up and border trade policy in December 1990. In 1992, an economic development strategy focusing on exploiting resources and border trade started in earnest in the Chinese border area. This comprised 14 inner border cities, including Hunchun city of Yanbian, appointed as “the border area's opening-up cities.” Thereafter, these border areas benefited from various industrial agglomerations, while maintaining the specialty of the minority regions, including the merits of the border locations, with their unique natural environment and history, as well as cultural conditions.

Furthermore, industrial locations and agglomerations gradually increased in inner border areas with the Chinese government's strategic development policy transformations. These in-

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<sup>\*1</sup> For more detail, see Giersch [4].

cluded “The Great Western Development Strategy,” “The Strategy for the Revitalization of Northeast of China,” and “The Open-Border Area Policy,” promoted to advance economic integration in northeast Asia. However, the industrial agglomerations in the border areas differ considerably to those in the coastal regions because the former developed later as a result of historical and political factors. In addition, the industrial agglomerations in the border areas are smaller in scale, offer little added value, and are not as competitive owing to there being fewer industries.

Most of studies on industrial location and agglomeration in China focus on the coastal regions, with their continued rapidly economic growth, as well as on specific industrial geographical concentrations. In addition, most previous studies on regional economic development in the Chinese border areas examine the causes of their economic stagnation, and investigate the possibilities and problems associated with economic cooperation with neighboring nations and areas.

The purpose of this study is to provide insight into recent industrial agglomeration in border areas, and aim to expand the discussions of the industrial agglomeration throughout China. As a first step towards a more comprehensive and extensive study on the interaction between industrial agglomeration and regional economic development, we analyze the case of Yanbian in the China–North Korea–Russia triangle border area. In particular, we use a geographical approach to examine the characteristics and necessary conditions for industrial agglomeration in border areas where the economic scale is small, but the relative transportation costs are low.

## 2. Survey of research on industrial agglomeration in border areas

Of the reasons given for industrial spatial accumulation, much has been made of the theory of comparative advantage. Based on Marshall’s industrial agglomeration theory, specific areas benefit from the comparative advantage of the traditional factors of production. These include climate, soil, and mineral resources, and these elements combine with religious, political, and economic factors to bring about an industrial localization phenomenon called industrial agglomeration [13].

On the other hand, Alfred Weber, who developed the systematic theory about industrial location, proposed that an industrial cluster formed in a specific place owing to the minimization of total costs of production and transportation [16]. Weber focused on the cost of changing location, among various costs in industry management, and explained the development of a city (that he himself lived in) as a natural consequence of industrial agglomeration associated with transportation costs, labor costs, and the savings offered in terms of expenses by industrial agglomeration [1].

Weber’s industrial location theory assumes transportation costs are the most important factor, and is based substantially on a physics model, making it different to the industry agglomeration theory of Marshall<sup>\*2</sup>. In other words, Weber examines why the spatial heterogeneity called agglomeration happens rather than examining why “movement” happens [16]. Weber believed there is a stage of advanced agglomeration (social accumulation) in which companies gathered in an area benefit from

a reduction in costs, in contrast to the low-level agglomeration in which economies of scale are provided by the expansion of business.

In addition, the space economics theory of specialization by industrial geographical concentration of Krugman and others developed and elaborated on Weber’s theory of industrial agglomeration in the 1990s. This theory provided a theoretical explanation of the factors that bring superiority by economies of scale, such as increasing returns and transportation costs, and that cumulative effects in an economy produce industrial geographical concentration. In addition, the theory emphasizes the role of transportation costs, among others [3],[10]. Here, transportation costs are interpreted broadly to include a number of factors. These include the expenses required to move people and information, the logistics costs associated with foreign trade, duty and non-tariff barrier costs, the cost of foreign currency, and business intelligence costs.

Industrial agglomerations are classified into four types according to how they formed and their characteristics: 1) company town agglomerations; 2) production region agglomerations; 3) mixed urban agglomerations; and 4) mixed invitation agglomerations [14]. Seki and Fukuda [14] notes that the “full set type structure” of Japanese industry was formed by “small-and medium-sized local type industrial agglomerations” and “large-scale urban type industrial agglomerations.” Furthermore, the former group comprises mass production, while the latter group includes a variety of production in small quantities. Of course, it is difficult to categorize an entire area as belonging to a single industrial agglomeration type, and the individual types often have varying characteristics.

With regard to transport costs, as an important precondition in theoretical studies on industrial agglomeration, and to control for the industry agglomeration in the work of Weber and spatial economics theory, Hummels [8],[9] explains that it has been on the decline with the shortening of haul distances and the increase in transport volumes. Furthermore, with regard to transportation time costs as an important non-policy barrier, in addition to physical transport costs, Hummels [9] calculated that a delay of a day is equal to 0.8% of ad valorem duty. In other words, shortening the transportation period is connected to reducing costs because the average marine transport time of 20 days equates to 16% of duties. In addition, Kameyama [11] clarifies that maintaining the traffic infrastructure in a city to reduce transportation costs has a big influence on the formation of industrial agglomeration, as well as other changes in the city.

To understand industrial agglomeration in the inner border areas in China, the core-periphery model of Krugman [10] is an important analysis tool. The model assumes there are two areas with different real wages, and that the labor force moves towards a high area from a low area. Using the model, Krugman [10] shows that industries benefiting from economies of scale, such as the manufacturing industry, accumulate in a core area, while other industries become periphery areas.

In contrast, Wu [17] proposed a model with two countries and four areas that expands on the core-periphery model of Krugman from a viewpoint of space economics. In this case, the border areas benefit from relatively low international transportation costs and, thus, have stronger industry agglomeration power. In addition, the agglomeration power becomes stronger as the trade volume increases.

<sup>\*2</sup> See Yamamoto [19].

In the remainder of the paper, based on the aforementioned theoretical framework, we analyze the effect on industrial agglomeration and economic development in Yanbian of an increase in foreign trade and a decrease in transportation costs. Here, we also consider the effect of the de facto economic integration in East Asia, as well as the maintenance of the traffic infrastructure and the development of distribution routes using regional and centralized economic development policies, such as the “Tumen River Area Development Program” and the “Strategy for the Revitalization of Northeast China.”

### **3. Transformation of industrial agglomeration in China**

#### **3.1 Industrial agglomeration in southeast coastal areas**

An important characteristic of China’s industrial development is the increase in the number of foreign companies in the southeast coastal areas. This increase coincides with the active foreign capital invitation policies that have helped form the industrial agglomerations that include local industries. We can classify the formation of the main industrial agglomeration in China using three types of temporal axes and a space axis, as follows<sup>1,3</sup>.

(1) In the 1980s, the labor-intensive industrial agglomeration developed with the implementation of the Shenzhen Special Economic Zone under the reform and opening-up policy around Guangdong and the Zhujiang River Delta. Here, the main cities are Hong Kong, Guangzhou, Shenzhen, Dongguan, Huizhou, Foshan, Zhongshan, and Zhuhai. Most of the industries that accumulated in the Zhujiang River Delta were labor-intensive manufacturing industries, such as the processing and assembling of parts, including the electronic equipment. These industries imported middle parts, assembled them, and exported products. The Zhujiang River Delta is now one of the biggest manufacturing industrial agglomerations in the world. However, this has made it easier to be influenced by overseas business fluctuations because of the increased dependence on foreign demand.

(2) In the 1990s, the Changjiang Delta (including Shanghai, Jiangsu, and Zhejiang) developed rapidly with the development of the Shanghai Pudong New Area as a special economic zone. This resulted in an agglomeration of mainly precision instrument and electronic machine and identification industries at a rural level.

(3) In addition to the industrial agglomeration and economic development in the Zhujiang River Delta and the Changjiang River Delta in the southeast coastal areas, the regional disparity in terms of economic development between coastal and inner areas increased. Furthermore, the development exposed problems in having an industrial structure that depended on foreign demand. In addition, there was a limit to what could be achieved by an economic growth regime based on export-oriented growth, which resulted in a transition to a domestic demand-oriented growth regime. After 2000, the Chinese government shifted the center of economic development from the southern coastal areas to the north, creating an important connection for domestic demand and environment-conscious industrial development.

As described earlier, industrial agglomeration in China de-

veloped over more than 30 years after the creation of the Shenzhen Special Economic Zone in 1980, contributing greatly to the country’s regional economic development. On the other hand, problems such as increased costs, a shortage of land in the southeast areas in later years, the tightening of environmental regulation and the income gap between areas and between industries became apparent.

These sudden and long-term economic environmental changes prompted the government to propose community development policies such as the “Great Western Development Strategy” and the “Strategy for the Revitalization of Northeast China” as part of a sustainable economic development strategy to prioritize correcting the disparities and improving the environment. As a result, as figure 1 shows, the economic growth rates in western areas (e.g., Sichuan and Shanxi) and northeastern areas (e.g., Jilin and Liaoning), which benefited from the strategy, were higher than the growth rates in the southeastern coastal areas after the mid-2000s.

#### **3.2 Regional industrial policy for industrial agglomeration in border areas in China**

The development of the border area progressed greatly in many areas after the opening-up policy and the increased border trade in the 14 border cities in the early 1990s. However, compared with the southeast coastal area, as well as with the predictions made by various social fields, the level of the development and the opening of the border area remain low. Therefore, advancing and accelerating the border area’s development by constructing a new and suitable regional development model has become an urgent and important problem for Chinese economic development [18].

To solve these problems in the border area and to promote regional economic development by endogenous development and improving efficiency, it is necessary to advance industrial competitiveness and to strengthen the formation of industrial agglomerations in the area. The main policies proposed by the government can summarized as follows.

(1) In March, 1992, to strengthen economic technology exchanges and cooperation with neighboring countries, the State Council appointed 14 cities in the border area as opening-up cities to accelerate economic development in the area. Since then, investment to maintain the industrial infrastructure in the border area has continued to increase. For example, in Hunchun City in Yanbian, fixed asset investment amounted to 12,900 million CNY from 1992 through 2006, predominantly to maintain the transportation facility and the water supply, as well as to provide basic maintenance of feeding facilities.

(2) Most of the authority in terms of the management and administration of border trade was transferred to the local government by the central government. In addition, each opening-up city in the border area established a “border economy collaboration park,” which companies interested in border trade were invited to use.

(3) On August 30, 2009, the State Council approved the “Tumen River area Development Program: Setting Changjitu (Changchun-Jilin-Tumen) as the Development and Opening-up Pilot Area” as a formal national strategy. As shown in figure 2, the Changjitu Development and Opening-up Pilot Area includes Changchun city, which is an industrial center of the Jilin province, one part of Jilin city, and the whole of Yan-

<sup>1,3</sup> For more detail, see [21].

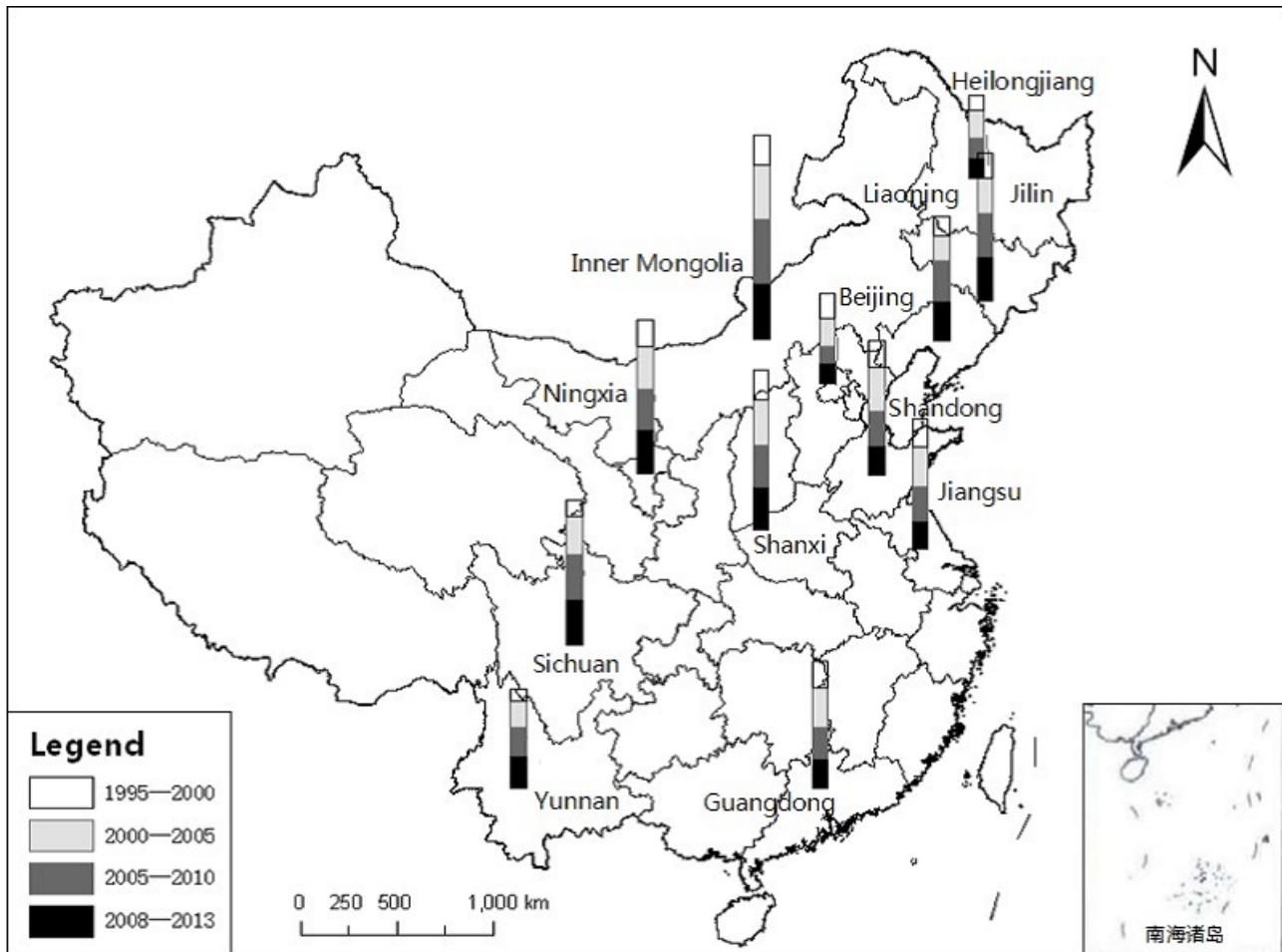


Fig. 1 Changes in annual growth rate of manufacturing industries by region  
(Source: Described by authors based on NBSC database)

bian as a core economic development zone. This program was intended to stimulate economic activity in both cities and the China-North Korea-Russia triangle border area. In particular, Hunchun city, which is adjacent to North Korea and Russia, is the entrance to the area, with Yanji city, Longjing city, and Tumen city as front areas, and with Changchun and Jilin further inland.

The Changjiu Development and Opening-up Pilot Area is the first border development opening-up area, and is a model area that the Chinese government approved. In other words, it is an important component of the strategic system to develop the Chinese border area. Eight projects have been implemented in the area: the “Tumen River Area International Free Trade Zone,” “Changchun-Jilin International Inland Port Area,” “Technological innovation Park,” “Trans-province, Trans-national corporation industry Park,” “Modern Distribution Park,” “Green Tourism Area,” “High-tech Service Industrial agglomeration Zone,” and “Modern Agriculture Model Area.” In addition, to promote trans-regional and trans-national cooperation in this area, the program constructed an international industry park in which Russia, Japan, Korea, and Hong Kong participated in. There is also a trans-province industry park at Hunchun, in which Shanghai, Zhejiang, Guangdong, and other provinces participate<sup>\*4</sup>.

#### 4. Economic development and industrial agglomeration in Yanbian

##### 4.1 Economic development in Yanbian

Yanbian was a peripheral part of the Chinese economy and a poor agricultural area until the beginning of the 1990s. However, the economy of Yanbian has continued to grow steadily with the increase in FDI from South Korea after the China-South Korea diplomatic normalization in 1992. In addition, Yanbian benefited from The Great Western Development Strategy in 2000 and the Strategy for the Revitalization of Northeast of China in 2003. The nominal GDP of Yanbian increased by approximately 15 times in two decades (from 4,380 million CNY in 1990 to 65,172 million CNY in 2011). In addition, the border trade and FDI continue to increase under the strong national and local promotion policies, and have a big influence on regional economic growth and job creation.

###### 4.1.1 Border trade

Foreign trade in Yanbian increased markedly, mainly with Russia and North Korea, as a result of border trade deregulation and the opening-up promotion policy in 1992. The amount of border trade in Yanbian in 1993 reached 327 million U.S. dollars and accounted for nearly 50% of all China-North Korea trade.

However, after 1995, border trade between Yanbian and

<sup>\*4</sup> For more detail, see the documents issued by the Japan-China Northeast Development Association (<http://www.jcjc.org.cn/>).



Fig. 2 A map of the Changji Development and Opening-up Pilot Area  
(Source: Described by Authors)

North Korea, South Korea, and Japan almost stopped because of factors such as the North Korean food shortage, a large decrease in mining industry production, an electricity shortage, the decrease in the international price of mineral products, and the appreciation of the JPY. Furthermore, border trade between Yanbian and North Korea and Russia decreased rapidly because the relationship between Russia and North Korea deteriorated.

After 2001, an external economic development strategy for border trade expansion was initiated by the Yanbian government. There was a significant increase in border trade when large-scale private trading companies adhered to the policy of the government. In subsequent years, border trade grew rapidly with the implementation of three special national policies, namely the “Strategy for the Revitalization of Northeast China,” “Preferential Treatment Policies in Minority Border Area,” and “Border Economy Collaboration Zone, Free Trade Zone, The Commerce Trade Zone.”

From 2008 onward, there was a reduction in border trade owing to the economic decline of the global economy following the world financial crisis. However, from 2010 onward, border trade increased again and the value of foreign trade increased to 1,860 million U.S. dollars (an increase of 19.5% compared from the previous year) in 2011. The value of exports was 1,450 million U.S. dollars (14.2%) and that of imports was 410 million U.S. dollars (43.2%). The main trade partners in the area are North Korea, Russia, and South Korea. There was also an increase in trade with Japan of 43.8% (170 million U.S. dollars). The main export item is textile products, which is a labor-

intensive manufacturing industry, followed by wood products and agricultural products.

#### 4.1.2 Foreign direct investment

Foreign direct investment, which is the result of the low labor cost in China, is not distributed evenly, and depends on each province and the economies of scale in each area. This is affected strongly by companies' country or origin, as seen in the industrial agglomeration of South Korean companies in North and East China, and Taiwanese companies in South China. In other words, the distribution of factories in China and the nationality of the foreign companies are fundamentally connected [2].

In addition, the rapid growth of FDI from South Korea from 1992 onwards affected the location of Yanbian (the area where most Koreans live in China), which is next to the Korean Peninsula, as a result of an ethnic sense of closeness, as well as historical and cultural factors. After 1997, FDI to the Yanbian area decreased sharply under the influence of Asian currency crisis, but increased again when China joined the WTO in 2000. In addition, with the advent of the economic policies described earlier, investment in Yanbian investment increased markedly.

As figure 3 shows, most manufacturing industries are labor intensive and account for more than 80% of FDI in Yanbian. On the other hand, the investments in the agriculture and service industries have decreased over time. In addition, FDI from South Korea has increased, affected by the increase in China-Korea cultural cooperation, geographical location, and the ethnic characteristic of Yanbian.

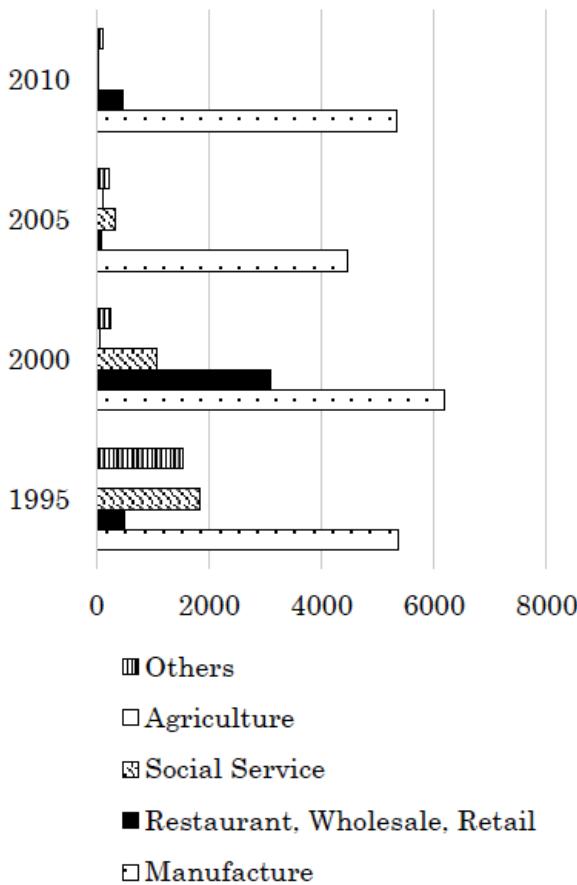


Fig. 3 Changes in FDI in Yanbian according to industry (Unit: 10 thousand U.S.dollars) (Source: Based on Yanbian Statistic Year Books)

#### 4.1.3 Transportation infrastructure and distribution route

The traffic infrastructure of Yanbian improved greatly after the Tumen River area development. Although Yanbian does not have a port, there are Russian ports, including Posiet Port, Zarubino Port, Vladivostok Port, Nakhodka Port, and Vostochny Port, as well as North Korean ports, such as Rajin Port and Chongjin Port, close by. To make use of this geographical advantage, Yanbian proposed the strategies of “Kaibiantonghai” (meaning to develop the border area and secure the route to the sea) and “Jiegangchuhai” (meaning to borrow a foreign port and access to the sea). As of today, three sea lanes have opened: Yanbian-Rajin-Pushan, Yanbian-Posiet-Akita, and Yanbian-Zarubino-Sokcho.

On the other hand, the construction of a land traffic distribution infrastructure (between Changchun and Hunchun, about 600 km) has accelerated. The highway opened in September 2010, and the construction of a high-speed railway is in its final stage. The whole line will open in 2015, but the section between Changchun and Jilin opened in January 2011. After the opening of the high-speed railway, the old line will be used to transport goods. In addition, the railway line between China and Russia is being maintained, with freight transport between Zalubino Port and Changchun, the political and economic center of Jilin province.

With regard to air transport routes, a new terminal building at Yanbian International Airport following international standards was constructed in 1997, and an airline operating between the major domestic cities of Shanghai, Beijing, and Dalian opened. In 2001, the international airline between Seoul (South Korea)

and Yanji (China) became active, increasing access from South Korea to Yanbian.

As summarized above, border trade in Yanbian has improved with the improvement of the traffic infrastructure, but an increase in the flow of freight has yet to be achieved. Therefore, it is necessary to reduce transportation costs by increasing the volume of freight and passengers being transported.

First, the custom procedures with respect to freight and passengers is still complicated. Therefore, simplifying these procedures and improving efficiency is necessary. Second, human resources that specialize in distribution need to be developed. The human resources in the Yanbian area need knowledge and technology through training by sending the relevant people to developed countries such as Japan and Korea. Third, cooperation between the domestic areas and northeast Asian countries is necessary to improve the distribution environment of Yanbian.

#### 4.2 Main industrial agglomeration in Yanbian

Generally, in an industrial agglomeration, companies belong to a specific industry and benefit from the division of labor and economies of scale in specific production processes. In addition, it is assumed that the production capacity in the area concerned improves because many companies that specialize in a process are located in one area [15].

In contrast, in the industrial agglomeration of Yanbian, the main industries are agricultural food products, which utilize local natural resources, mining, medical and pharmaceutical products, sawmills and furniture products, and the outsourcing of services. Therefore, the characteristics of the industrial agglomeration of Yanbian are clearly different to other areas in China, which tend to comprise machine product manufacturing industries.

In 2011, the total production of the manufacturing industry in Yanbian was 74,960 million CNY (an increase of 26.5% from 2010), which constitutes approximately one-third of the total production. The wood processing, food, textile, and medical and pharmaceutical manufacturing industries have been nominated for specialization with regional competitive advantages (see figure 4).

##### 4.2.1 Wood processing

With regard to the Chinese forestry and wood processing industry, the forest area in Yanbian is 3.2 million hectares, with a forest coating rate of 80%, and an assumed wood of 380 million cubic meters. In addition, Yanbian has begun to import a large quantity of wood from Eastern Russia to secure resources necessary to develop the wood processing business in the region. Based on the advantage of such resources and the border location, a wood processing industrial agglomeration has formed.

In 2011, the number of wood processing companies in Yanbian was 98, with a total production of 12,430 million CNY (an increase of 40% from 2010), constituting 18% of total manufacturing production. The production in the wood processing industry per city is as follows: 650 million CNY in Yanji; 380 million CNY in Tumen; 5,650 million CNY in Dunhua; 3,359 million CNY in Hunchun; 870 million CNY in Helong; 1,050 million CNY in Wangqing; and 450 million CNY in Antu.

##### 4.2.2 Mining

Yanbian has abundant mineral resources. Currently, there are 10 kinds of energy minerals, 33 kinds of metallic minerals, 48

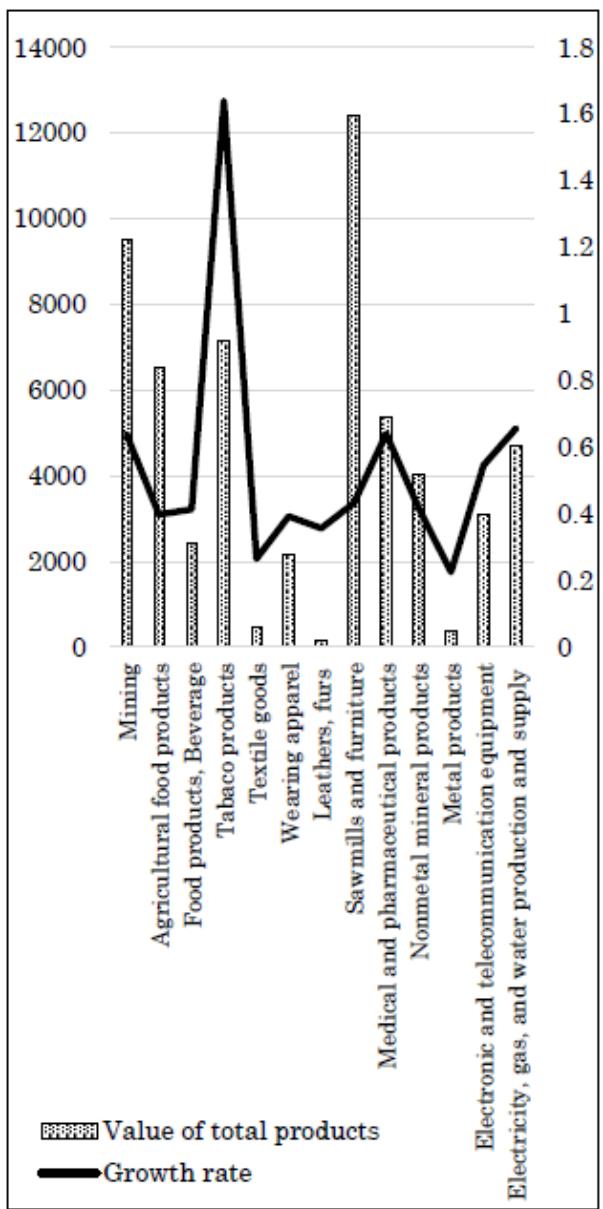


Fig. 4 Production of manufacturing industries in 2011 (Unit: million CNY, %) (Source: Based on Yanbian Statistic Year Books, 2012)

kinds of non-metallic minerals, and 2 kinds of liquid and gas resources. In particular, the reserves of coal, gold, and limestone (marble) are abundant. For example, there are abundant coal resources in Hunchun city, with reserves amounting to 780 million tons. From 2012 onward, with the improved maintenance of the coal transportation routes such as the Hunchun-Lajin Port?Southeast China route, the coal transport volume in Yanbian increased rapidly. Furthermore, in January 2014, Yanbian imported 2,700 tons of coal from Russia, along with a small increase in the mineral trade<sup>\*5</sup>.

In 2011, the number of mining companies in Yanbian was 28, and production increased to 950 million CNY from 270 million CNY in 2000. The production in the mining industry per city is as follows: 370 million CNY in Yanji; 280 million CNY in Tumen; 1,150 million CNY in Hunchun; 270 million CNY in Wangqing; and 330 million CNY in Antu.

<sup>\*5</sup> For more detail, see <http://www.searchnavi.com/hp/chosenzoku/news3/140113.htm>.

#### 4.2.3 Food products and the medical and pharmaceutical manufacturing industries

The Yanbian area has a notable concentration of Chinese-Korean people and its own gastronomic culture. As a result, the food industry has become a local specialization industry. In 2011, total production in the food processing industry amounted to 6,530 million CNY (an increase of 40% from 2010), constituting 10% of the total manufacturing production. Production in the food processing industry per city is as follows: 1,170 CNY in Yanji; 290 million CNY in Tumen; 2,640 million CNY in Dunhua; 42 million CNY in Hunchun; 120 million CNY in Longjing; 86 million CNY in Helong; 350 million CNY in Wangqing; and 570 million CNY in Antu.

Changbai Mount, located in Yanbian, has plentiful natural resources. In particular, the quantity of wild carrot in this area constitutes 80% of the total in China and 70% of the total worldwide. Under these conditions of abundant natural resources, the Yanbian area has become an important district for the production of medical products.

Until the 1980s, most development was by state-owned enterprises, and the medical and pharmaceutical products industry in Yanbian had very few products and little production. However, since the 1990s and the government's various preferential policies, R&D has expanded, along with the production of new medicine. As a result, the yearly average growth rate of the medical and pharmaceutical products industry reached 9.3%, with the leading actors including both state-owned enterprises and private companies.

In 2011, the total production of medical products amounted to 5,370 million CNY (an increase of 30% from 2010), constituting 8.8% of the total manufacturing production. Furthermore, the medical and pharmaceutical products industry in Yanbian receives support from the government as the industry has been appointed as a national strategic developing industry in 12th Five Year Plan that started in 2011. This is an opportunity for the medical and pharmaceutical products industry of Yanbian, and shows the possibility of further development, given the area's resource advantage and globalization strategy.

#### 4.2.4 Outsourcing services

The development of the service outsourcing industry is important to the quality of FDI, based on the advancement of a foreign investment structure, the transformation of border trade strategies, and the expansion of knowledge-intensive goods exports. In China, service outsourcing is an important component of the modern advanced service industry. Therefore, the Chinese government has implemented various policies to develop service outsourcing, because the industry depends heavily on information technology, the additional value is high, consumes few resources and generates little environmental pollution, and creates jobs for university graduates.

Based on the geographical advantage of being nearby to Korea and Japan, and the human resources advantage of having many bilingual and trilingual speakers, Yanbian started to construct an outsourcing service base for Korea and Japan. In addition, the IT industry began to be developed from 2006. The Yanji City government carried out a provisional standard in support of the development of software and information services in January 2008, and took concrete measures to secure and develop IT personnel.

Specifically, the government established an exclusive fund

for developing and securing human resources, assisting software companies, and training in the field of IT services. In addition, to encourage Chinese or Korean people in other countries to return, the government established a special fund to pay the balance of the salary an employee was receiving in the foreign country. This outsourcing service industrial development amounted to 10 million CNY in 2008.

In 2011, the number of IT companies in Yanji city was 176. Of these, 132 were domestic companies, 38 were South Korean direct investment companies, and 6 companies were based in Japan. In all, 5,000 people were employed in this industry. However, the outsourcing service industry in Yanbian is still in a developmental stage and has various problems such as a small corporate scale, few skilled and management-level people, and an outflow of IT people to foreign countries, among others. Therefore, the government needs to improve the investment environment of the outsourcing service industry and to promote infrastructure construction, improve skill training and education, and to prevent skilled personnel from leaving the country.

## 5. Conclusion

In this study, we summarized the industrial agglomeration process in China's coastal area and examined the possibility of industrial agglomeration in the inner border area based on national and regional economic development strategies. Industrial agglomerations in disadvantaged areas such as border areas depend mainly on easy and convenient access to neighboring markets, the existence of local unique, historic, and cultural factors, changes in national economic development policies to converge the disparity between areas, and a change to domestic demand-oriented growth in China.

Furthermore, as a case study on industrial agglomeration in inner border areas, we examined the influence of a decrease in transport costs on industrial agglomerations in the Yanbian area. In addition, industrial agglomeration gradually appeared in these border areas by increasing international trade with regional economic integration, and decreasing transport costs by maintaining the traffic infrastructure under the support of national development policies. We also clarified that the development strategy covered the disadvantageous initial conditions for industrial agglomerations in the Yanbian area.

As previous studies on transport costs have mentioned, the haul distance, increased transport volume, reduced transit time, and development of a traffic infrastructure will reduce transport costs per unit and influence the formation of industrial agglomeration and changes to the city system. In the Yanbian area, although the development of the infrastructure has a constant influence on reducing transport costs, the area has yet to reach a point where it fully benefits from this. In addition, the scale of FDI and trade is small, and customs clearance and other procedures are overly complicated.

Furthermore, we can classify agglomerations into four groups, depending on how they formed and their characteristics: 1) company town agglomerations; 2) production region agglomerations; 3) mixed urban agglomerations; and 4) mixed invitation agglomerations. Then, we can further divide these into small- and medium-sized local industrial agglomerations and large-scale urban industrial agglomerations, according to their geographical range and scale. Based on this classification,

we can categorize industrial agglomerations in Yanbian as production region agglomerations, with small- and medium-sized local industrial agglomerations.

For these industrial agglomerations, many regional policy programs have been implemented, such as maintaining the traffic infrastructure and establishing economic zones. As a result, Yanbian utilized the superiority of the border area effectively, which encouraged foreign and domestic direct investment, and formed industrial agglomerations such as agriculture vice-food industry, mining, pharmaceutical products, wood processing businesses, and the outsourcing of services.

However, despite these advantages, industries in Yanbian have several weaknesses, such as low added-value, and not being competitive in international and domestic markets owing to low technical standards. Therefore, to sustain and advance these areas, market expansion, manufacturing process and company effort, such as the reinforcement of value-added by increasing technical standards, reducing the dependence on brand, reinforcing R&D in an area, and training are necessary. Furthermore, the support of further policies by the central and regional governments are necessary for industries and businesses, both local and foreign, to construct a transnational production and circulation distribution network in inner border areas.

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