Research on Industrial Structure Transfer under the Coordinated Development of Beijing, Tianjin and Hebei

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Abstract. The Beijing-Tianjin-Hebei region is one of China's most innovative and populous regions and an important engine for economic development in the North. However, the Beijing-Tianjin-Hebei area is also facing many problems. In this context, the Beijing-Tianjin-Hebei coordinated development strategy came into being. However, due to the large differences in economic development between the Beijing-Tianjin-Hebei area, the industrial transfer process faces considerable challenges. Based on the analysis of the industrial transfer trend in Beijing-Tianjin-Hebei region, this paper summarizes the challenges facing the coordinated development of Beijing, Tianjin and Hebei, and proposes corresponding strategic recommendations to provide theoretical advice and guidance for coordinated development.

1. Introduction
In recent years, China's economy and society have achieved rapid development, and urban construction, economic development and innovation capabilities have achieved significant historic achievements. As the third pole of the Chinese economy, the Beijing-Tianjin-Hebei region has achieved remarkable development results in recent years, but it still faces many contradictions, and the regional development imbalance is particularly prominent. Under the new situation of China entering a new era, the Beijing-Tianjin-Hebei coordinated development policy came into being.

In order to realize the coordinated development of Beijing, Tianjin and Hebei, it is necessary to promote industrial upgrading and transfer, promote the sharing of public services, and create a modern new metropolitan area. In this way, it is possible to form a new pattern in which Beijing-Tianjin-Hebei has the same objectives, complementary advantages, comprehensive measures, and mutual benefit. Tianjin and Hebei have the advantages of resources and market, and the industrial structure and Beijing have obvious gradient differences, making it the basis of industrial transfer. However, due to the imbalance of regional economic development and the lack of cross-regional coordination mechanisms, the industrial transfer process of Beijing-Tianjin-Hebei is facing no small challenge.

2. Summary of Industrial Transfer Theory
Industrial transfer is an important economic phenomenon that occurs between regions with different levels of economic development. It means that under the conditions of market economy, some
enterprises in developed regions transfer production of some industries to developing regions through direct investment across regions. Industrial transfer is of great significance to the adjustment of regional economic structure and the optimization of inter-regional economic relations, and in turn affects the strategic decision-making of some enterprises.

Arthur Lewis believed that rising labor costs is the root cause of industrial transfer [1]. Raul Prebisch believes that the import substitution strategy implemented by developing countries under the pressure of development is the root cause of industrial transfer [2]. Thompson's regional life cycle theory holds that industrial zones are like organic organisms, with young, mature and old-age processes [3]. The factory life cycle theory holds that the plant life cycle is divided into four stages: birth, expansion, contraction and closure. Different stages have different requirements for the factory location [4]. Liang Qi put forward the theory of industrial location life cycle, and believed that the industrial location life cycle is “concentration-distribution-reconcentration”, so the dynamic change of industrial agglomeration presents “U” type [5]. The theory of marginal industry transfer believes that the industrial life cycle is the process of “introducing the modern industrial sector – creating comparative advantages – losing comparative advantage – shifting outwards” [6]. Smith's corporate profitability theory argues that companies located in established locations have profitable spatial boundaries. This limit is determined by the combination of the company's space revenue status and space cost status [7]. Shi Qi believes that industrial transfer is the result of economic realization by enterprises through restructuring and integration of technological means outside the market [8].

3. Analysis of Industrial Transfer Trends in Beijing-Tianjin-Hebei Region

The data on industrial and high-tech industries in the Beijing-Tianjin-Hebei region from 2011 to 2014 were collected, and the industrial transfer in the Beijing-Tianjin-Hebei area was analyzed from the similarity of industrial structure and the degree of specialization. Next, through the understanding of policies, the trend of industrial transfer in the Beijing-Tianjin-Hebei area was analyzed.

Using the industrial structure similarity index to measure the similarity of Beijing-Tianjin industrial structure, the index range is 0-1, close to 1, indicating that the industrial structure of the two regions is more similar, the closer to 0, indicating that the structure is more different. The location quotient is used to measure the specialization of the industrial structure in the Beijing-Tianjin-Hebei region.

**Table 1. Industrial industrial structure similarity**

| Year | Beijing-Tianjin | Beijing-Hebei | Tianjin-Hebei |
|------|-----------------|---------------|--------------|
| 2011 | 0.59%           | 0.43%         | 0.84%        |
| 2012 | 0.62%           | 0.33%         | 0.80%        |
| 2013 | 0.63%           | 0.21%         | 0.79%        |
| 2014 | 0.71%           | 0.31%         | 0.81%        |

It can be seen from Table 1 that the industrial structure of Tianjin and Hebei is similar. In recent years, it fluctuated around 0.8%, and there is a tendency to compete. The industrial structure of Beijing and Tianjin is similar, but gradually rising; between Beijing and Hebei. The similarity of Industrial structure is low and is decreasing year by year, and the gap is gradually widening.

**Table 2. High-tech industrial structure similarity**

| Year | Beijing-Tianjin | Beijing-Hebei | Tianjin-Hebei |
|------|-----------------|---------------|--------------|
| 2011 | 0.92%           | 0.60%         | 0.58%        |
| 2012 | 0.93%           | 0.62%         | 0.58%        |
| 2013 | 0.94%           | 0.75%         | 0.61%        |
| 2014 | 0.96%           | 0.68%         | 0.62%        |
It can be seen from Table 2 that in the high-tech industry, the similarity between Beijing and Tianjin is high and there is an upward trend; the similarity between Hebei, Beijing and Tianjin in the high-tech industry sector has shown a volatility in recent years. This shows that there is still a big gap between Hebei and Beijing and Tianjin in the high-tech industry.

### Table 3. 2014 Beijing-Tianjin-Wing Partial industrial sector department quotient

| Industrial industry | Beijing | Tianjin | Hebei |
|---------------------|---------|---------|-------|
| Coal mining and washing industry | 0.57% | 2.32% | 0.85% |
| Ferrous metal mining and dressing industry | 0.41% | 0.51% | 5.54% |
| Non-metallic mining and dressing industry | 0.01% | 0.11% | 0.59% |
| Food manufacturing | 0.09% | 2.93% | 1.12% |
| Textile industry | 0.02% | 0.12% | 1.05% |
| Furniture manufacturing | 0.36% | 0.54% | 0.77% |
| Paper and paper products industry | 0.15% | 0.73% | 0.87% |
| Printing and recording media reproduction industry | 0.61% | 0.62% | 1.17% |
| Petroleum processing, coking and nuclear fuel processing | 0.61% | 1.15% | 1.04% |
| Chemical raw materials and chemical manufacturing | 0.13% | 0.71% | 0.67% |
| Pharmaceutical manufacturing | 0.86% | 0.86% | 0.71% |
| Non-metallic mineral products industry | 0.25% | 0.26% | 0.75% |
| Ferrous metal smelting and rolling processing industry | 0.06% | 2.51% | 3.52% |
| Non-ferrous metal smelting and rolling processing industry | 0.04% | 0.76% | 0.26% |
| Metal products industry | 0.25% | 1.38% | 1.63% |
| General equipment manufacturing | 0.35% | 0.94% | 0.64% |
| Automotive Manufacturing | 1.81% | 1.82% | 0.64% |

As can be seen from Table 3, industries with a high degree of specialization in Beijing are concentrated in high-end manufacturing. There are 14 departments with higher degree of specialization in Tianjin, namely coal mining and washing industry, food manufacturing and so on. There are 8 specialized departments in Hebei Province, which are concentrated in high-energy, high-pollution and low-end manufacturing industries, namely ferrous metal mining and mining, ferrous metal smelting and rolling processing, food manufacturing, etc. The two industrial sectors show a very high degree of specialization, which also reflects the characteristics of high industrial energy consumption and high pollution in Hebei industrial structure.

### Table 4. 2014 Beijing-Tianjin-Wing High-Tech Industry Department Location Vendor

| High-tech industry | Beijing | Tianjin | Hebei |
|--------------------|---------|---------|-------|
| Pharmaceutical manufacturing | 0.85% | 0.93% | 0.83% |
| Aerospace equipment and equipment manufacturing | 1.81% | 7.80% | 0.13% |
| Electronics and communication equipment manufacturing | 0.97% | 1.63% | 0.15% |
| Computer and office equipment manufacturing | 0.88% | 0.57% | 0.01% |
| Medical equipment and instrumentation manufacturing | 1.26% | 0.42% | 0.24% |

As can be seen from Table 4, Beijing has a higher degree of specialization in the aerospace machinery and equipment manufacturing industry, medical equipment and instrumentation manufacturing industry; Tianjin aerospace machinery and equipment manufacturing industry,
electronic and communication equipment manufacturing industry has a higher degree of specialization, and the degree of specialization in the aerospace industry is in a leading position in the country; Hebei does not clearly show a specialized high-tech industry.

According to the analysis of the similarity of industrial structure, the similarity of industrial structure between Beijing and Hebei and Tianjin is low, and the similarity of high-tech industrial structure between Hebei and Beijing and Tianjin is low. The possible reason is that with the adjustment of Beijing’s industrial structure, some labor-intensive and resource-intensive industries have moved to Hebei and Tianjin. The industrial structure between Tianjin and Hebei is similar. The possible reason is that there is overlap between the leading industries in Tianjin and Hebei. There is a dislocation competition between Hebei and Tianjin in the process of undertaking industrial transfer. The high-tech industrial structure between Beijing and Tianjin is very similar. The possible reason is that Beijing and Tianjin are geographically adjacent and have similar technical levels. [9]

According to the numerical analysis of location quotient, the coordinated development of regional economy promotes the specialized division of labor, and the characteristics of industrial agglomeration are obvious. However, according to national policies, the choice of Beijing-Tianjin-Hebei leading industries has different degrees of trend. Beijing needs to form a strategic emerging industry innovation cluster with international influence to enhance the capabilities of a new generation of high value-added industries such as information technology, biomedicine, aerospace and new materials. Tianjin has made great progress in the high-tech industry, Tianjin will take advantage of the ocean to integrate marine technology into strategic emerging industries. Hebei Province needs to expand the scale of the four major industries, improve its competitiveness, and build a leading industry [10].

4. Challenges facing industrial transfer in the Beijing-Tianjin-Hebei region

Through the analysis of the industrial transfer trend in the Beijing-Tianjin-Hebei region, combined with the constraints of economic, resource and environmental factors, the Beijing Tianjin and Hebei still faces many challenges in the process of industrial transfer.

4.1. Beijing-Tianjin-Hebei economic imbalance

The economic development of Beijing, Tianjin and Hebei is unbalanced. There are different dominant industries, followed by high-tech; modern service industry; advanced manufacturing and traditional manufacturing, which are in the high-end, mid-range and low-end of the industrial chain. The differences in industrial structure between Beijing, Tianjin and Hebei have led to a lack of close industrial linkages, easy breaks in industrial chains, and low industrial clusters. It is difficult to carry out deep industrial cooperation and is not conducive to achieving regional win-win.

4.2. Insufficient industrial transfer Receiving force

With the resolving of non-core functions in Beijing, a considerable number of enterprises have not settled in Tianjin, but instead chose to enter the Yangtze River Delta and the Pearl River Delta to take advantage of their comprehensive industrial supporting capabilities. The contradiction of insufficient industrial undertaking capacity in Hebei Province has been highlighted. The level of economic development in various parts of Hebei Province is different, and regional coordination has not been fully utilized. Resources, population, education, environment, transportation and other factors are unbalanced. The gap between Baoding, Langfang, Qinhuangdao, Zhangzhou and other cities and Beijing-Tianjin big cities is too large, and the lack of public facilities has determined that their ability to undertake the transfer of Beijing-Tianjin industry, capital and technology is relatively limited. The productivity in the towns of Hebei Province is very limited, resulting in the fact that the Beijing-Tianjin region can not effectively undertake the transfer of Beijing-Tianjin industry, nor can it effectively promote the development of the surrounding areas.

4.3. Restriction of administrative barriers

The Beijing-Tianjin-Hebei region is subordinated to different administrative regions, forming a separate pattern of interests. Under the policy of coordinated development of Beijing-Tianjin-Hebei, the three regions gradually began to cooperate, but the requirements for maximizing their own
interests have not changed. Therefore, competition will be greater than cooperation, and even repeated construction of industries and projects will result in huge waste of resources, which is not conducive to the adjustment and upgrading of the industrial structure of Beijing-Tianjin-Hebei. In practice, compared with Beijing and Tianjin, Hebei is obviously weak, planning is difficult to unify, and cross-regional cooperation and interest coordination mechanisms need to be improved.

4.4. Resources and ecological environment are under pressure
Water shortages, water pollution and air pollution are common problems in Beijing, Tianjin and Hebei. The contradiction between resources, environment and development is very sharp. The per capita share of water resources of Beijing, Tianjin and Hebei are seriously inadequate, and the situation in Hebei Province is even more severe. Beijing-Tianjin-Hebei has become the most polluted area in the country with frequent smoke. Resources and ecological issues are consistent issues facing Beijing-Tianjin-Hebei. It is necessary to manage and unify environmental issues to jointly improve the quality of the regional ecological environment.

5. Conclusion
In response to the above-mentioned industrial transfer challenges under the coordinated development of Beijing, Tianjin and Hebei, the following two suggestions should be proposed.

In the overall path of industrial transfer, efforts should be made to create a “Beijing urban agglomeration, a new engine for national innovation-driven economic growth, and an ecological recovery environment improvement demonstration zone”. Industrial layout and development must be clear that the division of labor and positioning of the three places is the basis and prerequisite for the coordinated development of Beijing, Tianjin and Hebei.

In terms of industrial transfer measures, we must first optimize the industrial structure and increase regional production capacity. According to regional comparative advantages, clear industry positioning and determine a reasonable industrial development policy. Secondly, the industrial park is an important carrier to undertake industrial transfer, and it is necessary to strengthen the construction of industrial parks. Finally, play a market-driven role and create a good institutional environment. It is necessary to break through the shortcomings of existing systems and mechanisms, strengthen dialogue and exchanges between governments, abandon local protectionism, and promote rational and orderly flow of production factors and market mechanisms.

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