

# Research on the Development of High-tech Industry in Beijing, Tianjin and Hebei

Jinghua Wu

School of Economics and Management, Beijing Jiaotong University, Haidian District, Beijing, China

18120536@bjtu.edu.cn

\*Jinghua Wu

**Key words:** High-tech industry, R&D input, Innovation output.

**Abstract:** The development of high-tech industry is more and more become a direct expression of the development level of regional industry. This paper explores the R&D input and innovation output of Beijing-Tianjin-Hebei high-tech industry and finds that the R&D input and innovation output of Beijing-Tianjin-Hebei high-tech industry have steadily increased in recent years. However, compared with other provinces in China, the Beijing-Tianjin-Hebei region is in the middle reaches of the country, lagging behind areas with more developed high-tech industry such as Guangdong and Jiangsu. Therefore, according to the R&D input and innovation output of Beijing-Tianjin-Hebei high-tech industries, this paper puts forward relevant suggestions to further improve the development level of the high-tech industry and the overall economic strength.

## 1. Introduction

In recent years, with the implementation of the coordinated development strategy of Beijing, Tianjin and Hebei, the Beijing-Tianjin-Hebei region has achieved leapfrog development in economic, social and other aspects, and its comprehensive strength has been on the rise. However, as the traditional region of China's economic development, the industrial development in this region is confronted with the problems of extensive development and low added value, the regional ecological environment is deteriorating, the demographic dividend is gradually disappearing, and the regional sustainable development is challenged.

With the further development of science and technology, the competition between different countries and regions is increasingly manifested as the contest of their own scientific and technological strength. The outline of the coordinated development of Beijing-Tianjin-Hebei region issued in 2014 defines the overall positioning of the Beijing-Tianjin-Hebei region. One aspect is to build the Beijing-Tianjin-Hebei region into a new engine for economic growth driven by innovation. Therefore, in the future, the economic and industrial development of the Beijing-Tianjin-Hebei region should be led by innovation and supported by science and technology. The high-tech industry, as a representative industry with high technological content, strong radiation and driving capacity, will be the key direction of industrial cooperation among the three places. Current high-tech industry of the Beijing-Tianjin-Hebei region has obtained a certain development, but the comprehensive strength is still not strong in the whole country. In order to further improve the innovation output and transformation of the high-tech industry, and drive the overall development of regional economy, it is of great significance to explore the development status of the high-tech industry in Beijing-Tianjin-Hebei region.

The existing literature on the development of high-tech industry mainly focuses on the following two aspects.

The first is to study the agglomeration of high-tech industries and the impact of different agglomeration models on technological innovation. Some scholars have found through empirical studies that industrial agglomeration can promote technological innovation and performance (Beaudry and Breschi, 2003; Li Jizi et al., 2006; Zhou Ming and Li Zongzhi, 2011; Niu Chonghuai et al., 2012)[1-4], and some scholars believe that industrial agglomeration has no impact or negative impact on technological innovation (Li Kai et al., 2007)[5]. In terms of the agglomeration model of

high-tech industry, low-level specialized agglomeration and high-level diversified agglomeration can promote technological innovation, while the reverse can inhibit technological innovation (Chen Jin et al., 2013) [6].

The second is to study the impact of different resource inputs on technological innovation. Pei Lingling (2017) [7] believed that gathering scientific and technological talents could promote the development of the high-tech industry. Government tax incentives will affect the innovation efficiency of high-tech industries, and R&D subsidies have different effects on different types of high-tech industries (Cai Wangchun, 2018) [8].

Through the above analysis, it can be found that the existing studies on the development of high-tech industries mainly focus on the impact of industrial agglomeration or agglomeration mode on technological innovation of high-tech industry and the impact of different resource inputs on technological innovation. Most of the existing studies are represented by specific regions or industries, and the conclusions are of great significance to the study of this paper. However, from the specific perspective of Beijing-Tianjin-Hebei region, the research on the development of high-tech industries is not sufficient. This paper will take the Beijing-Tianjin-Hebei region as the research object, and deeply discuss the status of the high-tech industry in Beijing-Tianjin-Hebei region, and provide countermeasures and suggestions for further promoting the development of the high-tech industry in Beijing-Tianjin-Hebei region.

## 2. Development status of high-tech industries in Beijing-Tianjin-Hebei region

### 2.1 R&D input

As a typical technology-intensive industry, the high-tech industry needs a large number of talents and other advanced production factors, which is the basis of innovation output. From the vertical dimension, the R&D input in Beijing-Tianjin-Hebei region from 2009 to 2016 is shown in Fig. 1, in which the number of R&D personnel and the intramural expenditure on R&D have both achieved a relatively large increase.

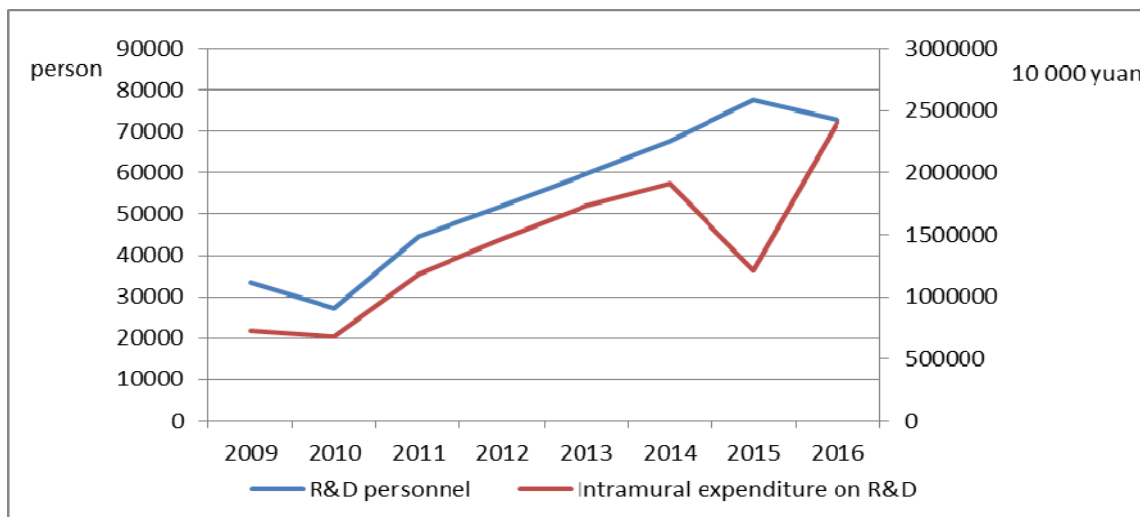


Fig. 1. R&D input of high-tech industries in Beijing-Tianjin-Hebei region from 2009 to 2016

Data source: *China Statistics Yearbook on High Technology Industry* (2010-2017).

### 2.2 Innovation output

The R&D input of Beijing-Tianjin-Hebei region has brought a certain amount of innovation output. The innovation output from 2009 to 2016 is shown in Fig. 2. Both the number of patent applications and the sales revenue of new products showed a growth trend before 2014, and remained stable or declined in the past two years.

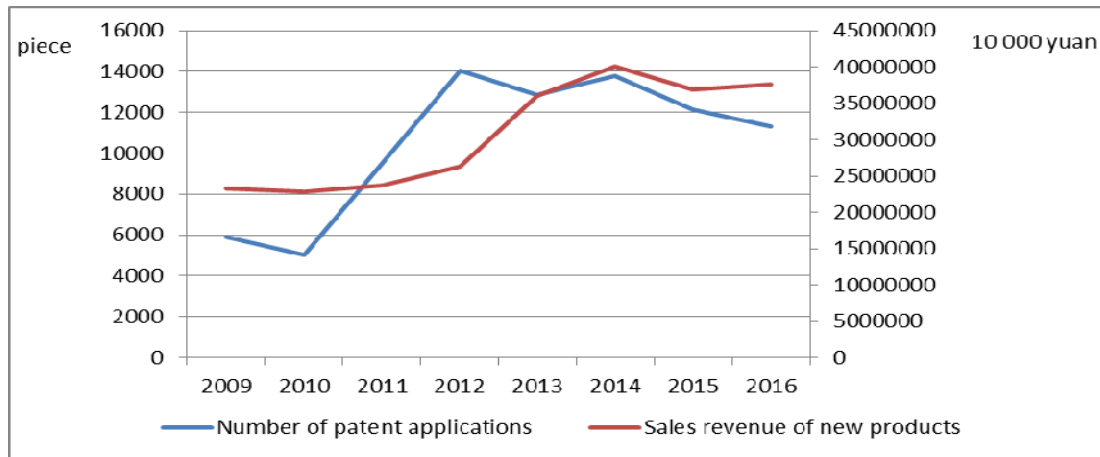


Fig. 2. Innovation output of high-tech industries in Beijing-Tianjin-Hebei region from 2009 to 2016

Data source: *China Statistics Yearbook on High Technology Industry* (2010-2017).

### 2.3 Comparison with the whole country

The R&D input and innovation output of the high-tech industry in Beijing-Tianjin-Hebei region show an obvious growth trend, but there is still a gap compared with other regions in China. As can be seen from Table 1, the R&D input and innovation output of high-tech industries in Beijing, Tianjin and Hebei in 2016 are in the middle and upper reaches of the country, but closer to the middle. There is a big gap between the Beijing-Tianjin-Hebei region and Guangdong, Jiangsu and Zhejiang provinces with strong high-tech industries.

Taking 2016 data as an example, from the perspective of R&D input, the number of R&D personnel in Beijing-Tianjin-Hebei high-tech industries accounts for 7.36% of the national total, while Guangdong, which ranks first, accounts for 26.53% of the national total, 3.6 times that of Beijing-Tianjin-Hebei. The intramural expenditure on R&D of Beijing-Tianjin-Hebei high-tech industries was 24.075 billion yuan, accounting for 8.26% of the national total. Guangdong ranks first with 92.011 billion yuan, accounting for 31.56% of the national total, about 3.8 times that of Beijing-Tianjin-Hebei. It can be seen that both the R&D personnel and the intramural expenditure on R&D, the sum of the three places are far behind Guangdong. R&D input in Beijing-Tianjin-Hebei region is insufficient.

From the perspective of innovation output, sales revenue of new products of high-tech industries in Beijing-Tianjin-Hebei reached 375.629 billion yuan, accounting for 7.84% of the total revenue of the whole country. The number of high-tech industry patent applications in Beijing-Tianjin-Hebei region was 11,310, accounting for 6.08% of the total number of high-tech industry patent applications in China that year. Guangdong which ranks first with 34.9%, is 5.74 times of that in Beijing-Tianjin-Hebei region. Similar to the R&D input, the innovation output represented by the number of patent applications and the sales revenue of new products in the three places still lags behind that of Guangdong, which ranks first in China, and the research and development results are not transformed enough.

It can be seen that the R&D input and innovation output of the high-tech industry in Beijing-Tianjin-Hebei region are not ideal. There is a big gap between Beijing-Tianjin-Hebei and regions with more developed high-tech industries. Compared with R&D input, the innovation output of high-tech industries in Beijing-Tianjin-Hebei region is worse. Therefore, Beijing, Tianjin and Hebei should take appropriate measures to improve the innovation efficiency of high-tech industries and the transformation efficiency of research and development results to enhance industrial competitiveness.

Table 1. R&amp;D input and innovation output of Beijing-Tianjin-Hebei high-tech industries in 2016.

Region	R&D personnel [person]	Ranking	Intramural expenditure on R&D [10 000 yuan]	Ranking	Sales revenue of new products [10 000 yuan]	Ranking	Number of patent applications [piece]	Ranking
Beijing	3.02	11	4.46	6	3.69	6	3.64	8
Tianjin	2.47	14	2.40	11	3.34	7	1.60	12
Hebei	1.87	15	1.40	16	0.81	18	0.84	18
Shanxi	0.52	22	0.29	24	0.11	27	0.10	26
Inner Mongolia	0.21	27	0.31	22	0.18	23	0.05	30
Liaoning	1.19	18	1.24	17	0.92	17	1.18	17
Jilin	0.54	21	0.40	21	0.40	19	0.20	23
Heilongjiang	0.83	19	0.84	19	0.20	22	0.57	20
Shanghai	3.45	7	4.59	5	2.39	10	4.11	6
Jiangsu	14.93	2	13.32	2	19.01	2	14.19	2
Zhejiang	8.62	3	7.31	4	6.66	3	7.44	4
Anhui	2.80	13	2.18	13	2.31	11	3.67	7
Fujian	3.91	5	3.83	7	3.28	8	3.18	10
Jiangxi	1.75	16	1.03	18	1.18	15	1.51	13
Shandong	7.44	4	7.63	3	6.15	4	7.52	3
Henan	2.99	12	1.98	14	5.95	5	1.48	14
Hubei	3.05	10	3.53	8	1.72	14	3.25	9
Hunan	3.27	8	2.19	12	2.76	9	2.09	11
Guangdong	26.53	1	31.56	1	32.43	1	34.90	1
Guangxi	0.36	23	0.29	23	0.22	21	0.27	21
Hainan	0.23	26	0.14	26	0.02	30	0.14	24
Chongqing	1.57	17	1.52	15	2.30	12	1.33	16
Sichuan	3.63	6	3.45	9	2.21	13	4.17	5
Guizhou	0.79	20	0.66	20	0.29	20	0.60	19
Yunnan	0.35	24	0.22	25	0.11	26	0.24	22
Tibet	0.01	31	0.01	31	0.00	31	0.00	31
Shaanxi	3.12	9	2.87	10	0.98	16	1.33	15
Gansu	0.24	25	0.13	27	0.13	25	0.12	25
Qinghai	0.03	30	0.03	30	0.04	29	0.10	28
Ningxia	0.19	28	0.12	28	0.13	24	0.10	27
Xinjiang	0.08	29	0.08	29	0.08	28	0.06	29

Data source: *China Statistics Yearbook on High Technology Industry 2017*.

### 3. Conclusion

This paper explores the development status of high-tech industries in Beijing-Tianjin-Hebei region, and through comparison with provinces with more developed high-tech industries in China, it is found that although the high-tech industries in Beijing-Tianjin-Hebei are developing continuously, there is still a big gap between them and developed regions. Finally, in order to better promote the development of the high-tech industry in Beijing-Tianjin-Hebei, this paper proposes the following countermeasures and suggestions.

First, accelerate the cultivation of innovative talents. The development of high-tech industries depends on the level of science and technology, and the improvement of the level of science and technology greatly depends on talents, who are the source and power of enterprise innovation. Therefore, in order to realize the further development of high-tech industries, it is necessary to pay attention to cultivating a group of high-tech talents with high skills and high quality. Second, provide financial guarantee for enterprise research and development. High technology industry development

and achievements transformation requires plenty of research and development funds as a guarantee. As the main body of R&D activities, enterprises are often unable to support high R&D expenditure. Therefore, the government should take certain measures to support enterprises' R&D activities and provide financial support for high-tech enterprises with broad prospects but weak development foundation.

## References

- [1] Beaudry C, Breschi S. Are firms in clusters really more innovative? [J]. *Economics of Innovation and New Technology*, 2003, 12(4): 325-342.
- [2] Li Jizi, Liu Chunling, Zou Dewen. Industrial Concentration, Organizational Succession of Cluster Supply Chain and Technological Innovation—A Case Study on Optoelectronic Industry of 'Optics Valley of China' in Wuhan [J]. *Journal of Finance and Economics*, 2006, 32(7): 41-52.
- [3] Zhou Ming, Li Zongzhi. Research on innovative capacity of High-tech industry among provinces in China—Based on the view point of industry agglomeration [J]. *Science Research Management*, 2011, 32(1): 15-21, 28.
- [4] Niu Chonghuai, Zhang Fan, Feng Haiyan. On the Relationship among Science and Technology Talent Accumulation, High-tech Industry Agglomeration and Regional Technologic Innovation [J]. *Science & Technology Progress and Policy*, 2012, 29(15): 46-48, 50-51.
- [5] Li Kai, Ren Xiaoyan and Xiang tao. Contribution of industrial cluster's effects to technology innovative ability—an empirical research based on hi-tech industrial development zone in China [J]. *Studies in Science of Science*, 2007(3): 448-452.
- [6] Chen Jin, Liang Liang, Wu Hang. Industrial agglomeration and innovation performance under the background of open innovation: evidence from chinese high-tech industries [J]. *Studies in Science of Science*, 2013, 31(4): 623-629, 577.
- [7] Pei Lingling. Interactive relationships between talents agglomeration and high-tech industry development [J]. *Studies in Science of Science*, 2018, 36(5): 813-824.
- [8] Cai Wangchun, Wu Fuxiang, Liu Qi. Comparative analysis of R&D subsidies and export competitiveness of China's high-tech segment industry [J]. *Industrial Economics Research* 2018(6): 1-9.