



Research on regional integration development and artificial intelligence development under the background of regional economic integration——Taking China's Yangtze River Delta and Pearl River Delta as examples

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Abstract. This study analyzes the development status of the Yangtze River Delta and the Pearl River Delta according to the process of regional integration, and then finds out a series of problems in the development of artificial intelligence in the Yangtze River Delta and the Pearl River Delta, and proposes relevant specific improvement measures. Through the comparative analysis of data on the status quo of emerging industries (artificial intelligence) in the Yangtze River Delta and the Pearl River Delta, some suggestions are put forward. The study found that in the future in the Pearl River Delta region, it is necessary to give full play to the role of each region, control the flow of talents, capital, technology, information and other elements, so that the resources of each region can complement each other's advantages. Finally, the following suggestions are put forward: (1) Improve the overall technical content and product quality of export products. (2) Increase support for production enterprises in the Pearl River Delta region. (3) Strengthen the exchange of experience and cooperation with provinces across the country, and at the same time solve the problem of insufficiently advanced production technology. (4) Improve coordination and organization. (5) The government should actively explore the tourism market.

Keywords: Regional integration, artificial intelligence, Yangtze River Delta, Pearl River Delta

1 Introduction

This article This article is divided into 2 parts. The first part analyzes the current situation of the regional integration development and the current problems faced by the Yangtze River Delta, Pearl River Delta regions, and offer some advices and specific measures to promote the regional integration development. The second part analyzes

the development of artificial intelligence in the Yangtze River Delta and Pearl River Delta regions, then analyzes and compares it, and provides specific solutions.

2 Methodology

The research method of this paper is secondary research, and the data are all from books, journals, economic journals and documents issued by the Chinese government. At the same time, all the data in the charts are from the National Bureau of Statistics, which is true and reliable.

3 Text content

3.1 Status and recommendations on regional integration in the Yangtze River Delta region and the Pearl River Delta region

3.1.1 Yangtze River Delta region.

3.1.1.1 History.

The Yangtze River Delta region is the birthplace of the Wuyue culture, which is the main culture of the Yangtze River Delta region. In the process of regional integration of the Yangtze River Delta, the regional cultural development is rich and colorful. Although the administrative divisions of Yangtze River Delta Region have changed many times, the Yangtze River Delta Region has adapted measures to local conditions, gradually developed and become rich, and has also become one of the most economically prosperous areas in China. By the end of 2019, the Yangtze River Delta had a population of 227 million [1], covering an area of 358,000 square kilometers. In 2020, the GDP of the Yangtze River Delta region was 24.5 trillion yuan. The urbanization rate of permanent residents has exceeded 60 percent, [2] accounting for nearly one quarter of China's economic output and one third of China's total imports and exports. [3]

3.1.1.2 Integrated development strategy.

If the local government wants to accelerate the comprehensive development process of the Yangtze River Delta Region, the key areas should be in four aspects: First, actively improve the infrastructure. The regional integration of the Yangtze River Delta should promote the construction of major transportation channels, develop various combined transport hubs, strengthen the connectivity and efficiency of all kinds of public transportation in the region, and better realize the same-city effect. Second, we

[1] We will precisely promote the integrated development of the Yangtze River Delta by connecting provinces and cross-border regions- National Development and Reform Commission (NDRC)

[2] Outline of the Plan for Integrated Regional Development of the Yangtze River Delta- GOC (the government of China)

[3] The new mission of Yangtze River Delta integration- State-owned Assets and Administration Commission of The State Council

should allocate resources more rationally. It is necessary to break down the administrative obstacles in the Yangtze River Delta region, promote the construction of a modern market system in the region quickly, make the advantages of all regions fully brought into full play, control flow of talented people, capital, technology, information and other factors, and make the resources of all regions realize complementary advantages. Third, coordinated innovation and collaborative upgrading. Improve the flow of trans-regional innovation resources, so that all regions can strengthen the innovation cooperation in emerging industries, and make the Yangtze River Delta region become the source of the latest technology and knowledge products.

3.1.1.3 Problems in regional integration.

There are still huge obstacles to the administrative cooperation between various regional governments, and various mechanisms still lack legal guarantee. In the existing administrative system, the maximization of local interests is the primary factor for provinces and cities. Localism is still prevalent in all provinces and cities. In practice, competition is more than cooperation, the construction of the common market is blocked, and the industrial structure cannot be reasonably adjusted. At the same time, various mechanisms lack legal protection. Regional cooperation and coordinated development depends on the preferences of leaders of provinces and cities and their interests at that time. Lack of certain authority, stability and even rationality will inevitably directly affect the integrated implementation effect of provinces and cities.

The degree of marketization is not high, and the lack of effective participation of market subjects. The market mechanism has not been fully played, and the market-oriented cooperation forms such as enterprises as the mainstay and joint-stock system have not been widely used in the integration of the Yangtze River Delta.

The function of the central city is not perfect, and the regional spatial connection degree is still not high. Central cities in foreign developed countries have a high first degree, with New York, Tokyo, London, Seoul and other cities accounting for about 11.4% of the national CDP, while Shanghai, As the main cities in the Yangtze River Delta region, only 5% of the country's CDP. Some developed cities in Jiangsu provinces and Zhejiang provinces have a similar level of development with Shanghai, but their economic ties with Shanghai are not close. For example, In Nanjing, Hangzhou, Suzhou and Wuxi, these relatively developed cities are not highly dependent on Shanghai.

3.1.1.4 Regional integration solutions.

1) Establish and improve regional coordination mechanisms

The focus of market integration mainly lies in establishing and improving the coordination institutions and mechanisms for regional coordinated development. Establish and improve the regional development coordination agency, which should adopt the multiple participation model, which is representative. The organization should be located at a higher level and is authoritative. The organization should have regional governance power and decision-making power. The establishment of the organization has the corresponding legal basis, can exercise various tasks according to law, is by the executive right. Institutions should have staffing and funding sources, and are permanent. Institutions should have certain financial capacity and financial support, and

should have financial power. The agency also needs to establish a coordination system of the separation of decision-making, execution and supervision.

2) Establish a regional fiscal and taxation coordination mechanism and a financial support system

A regional financial support system needs to be established to meet the financial needs of industrial adjustment, environmental protection and other integrated construction projects. First, we need to concentrate all kinds of allocations, subsidies, special funds and other transfer payments for coordinated regional development allocated by the central government. Second, the provinces and cities should establish a capital pool according to a certain proportion of their fiscal revenue. Third, we will explore ways to pay a certain proportion of local taxes, such as real estate value-added tax, environmental protection tolls, and regional highway tolls. Fourth, we need to issue special funds.

3) Establish a new type of government evaluation mechanism

The government's evaluation mechanism is based on GDP indicators, requiring a new scientific evaluation system. The evaluation of the work level of the regional government should not be based on the social and economic indicators of the administrative region, and also ensure the comprehensive development of the region and the contribution content to regional development. For example, the contribution to the transfer of technological innovation and the transfer of technological achievements within the region, the contribution of reducing pollution and carbon emissions to the regional environmental improvement, and the absorption of the labor force in other areas of the region. Providing education, medical care and elderly care services for other regions. For this new organization, evaluation is naturally needed. The evaluation suggestions should try to absorb the opinions of enterprises, public institutions and the public, and choose independent third-party intermediaries to complete the evaluation.

4) Accelerate regional legislation

It is very important for legislation to provide a solid legal foundation and organizational guarantee for coordinated regional development. The establishment of leading coordination agencies at all levels in the region, comprehensive development plans, including balanced economic and social development measures, adjustment of industrial layouts, infrastructure planning and construction, cooperation and division of labor in resource distribution and utilization, and environmental protection, need to be regulated and guaranteed by relevant legislation. The differences in local laws and rules in the region directly affect the process of regional integration, which needs the coordination and docking of laws between provinces and cities.

3.1.2 Pearl River Delta region.

3.1.2.1 Origin.

The Pearl River Delta, formerly known as Yuejiang Plain, is the general name of the Great Delta formed by the joint alluvial deposits of the Xijiang and Beijiang Rivers and the small Delta formed by the alluvial deposits of the Dongjiang River. The Pearl River Delta is located in the lower reaches of the Pearl River in Guangdong Province, adjacent

to Hong Kong and Macao, and facing Southeast Asia across the sea, with convenient transportation by sea and land.[4]

3.1.2.2 The issue of regional integration.

Competition between regions is serious, and the overall interests of the region are damaged, and vicious competition damages the overall interests of the region. The repeated construction of large projects leads to low efficiency of resource utilization, relatively large consumption of energy and resources, and the fragile guarantee capacity of major resources. In addition, the extensive economic growth mode makes pollution control difficult, bringing serious environmental and resource problems.

Large infrastructure is not coordinated. For example, the utilization rate of Zhuhai airport is only 6%. The route selection of regional transportation facilities such as intercity rail, Guangzhou-Shenzhen-Hong Kong high-speed railway and expressways along the Yangtze River are inconsistent with the development plans of various cities, leading to slow progress.

The Pearl River Delta has a low-end industrial chain, and a high technology and market dependence on foreign countries. The Pearl River Delta industry is at the low end of the global industrial chain. Labor-intensive and seriously polluting industries are the main factors leading to environmental pollution. Only a small part of the independent innovation industries are weak, and the independent innovation ability is inferior, with a relatively lack of talents, and the international competitiveness of the industry is not strong.

Low-end industries also make environmental problems increasingly prominent, which has also is a major constraint restricting the sustainable development of regional economic integration in the Pearl River Delta.

3.1.2.3 Solutions of regional integration

First, the Pearl River Delta region should improve the overall technical content and product quality of export products. Third, we should increase efforts to support production enterprises in the Pearl River Delta region, especially enterprises with high technology new technology advantages. Fourth, the Pearl River Delta Region should strengthen the experience exchange and cooperation with all the provinces, actively introduce talents from all countries, and accelerate the industrial upgrading of the region. Fifth, increase the investment in advanced science and technology, introduce advanced technology and equipment, encourage enterprises to actively improve their product research and development capabilities, and solve the problem that the production technology in the Pearl River Delta is not advanced enough. Sixth, continue to improve the coordination organization, strengthen regional communication and cooperation, and continue to strengthen cooperation in the economic field, in-depth and institutionalized cooperation. Finally, the government of the Pearl River Delta Region should actively explore the tourism market and develop the local tourism resources, so that the economic structure of the Pearl River Delta region is more diversified and also improve the environment in the Pearl River Delta.

3.2 The Status and Prospect of Artificial Intelligence in the Context of Chinese Regional Integration

3.2.1 Comparison of the development status of artificial intelligence in the Yangtze River Delta and the Pearl River Delta.

3.2.1.1 Development of artificial intelligence in the Yangtze River Delta.

The Yangtze River Delta city cluster has the largest number of AI patent applications, reaching 36,854. The AI intellectual property strength is relatively balanced within the region, which has laid a good atmosphere for technological innovation for the coordinated development of industrial and regional integration. The number of patent applications in the Pearl River Delta urban agglomeration is lower than that in the Yangtze River Delta urban agglomeration, with about 24,713 patent applications. Guangdong province has an absolute advantage among the 31 provinces and cities in China. From 2018 to 2019, Guangdong province ranked first in the number of AI patent applications two years in a row in China, with 6,896 and 5,171 patent applications, respectively.

3.2.1.2 Comprehensive evaluation of artificial intelligence industry policies in the Yangtze River Delta urban agglomeration.

The policy system of the AI industry in the Yangtze River Delta urban agglomeration is relatively perfect. The layout of the AI industry was earlier, especially in 2018 was an important stage of the AI industry layout. From the perspective of policy level, although the urban agglomeration has made nine policy text, but Shanghai, Zhejiang, Jiangsu and Anhui policy system lack of top design or lack of concrete measures, local artificial intelligence industrial policy is not perfect, the local artificial intelligence development is not mature, cannot support the development of cross-regional artificial intelligence industry.

3.2.1.3 Comprehensive evaluation of artificial intelligence industry policies of urban agglomeration in the Pearl River Delta.

The Pearl River Delta urban agglomeration has its own advantages in promoting the integrated and innovative development of regional AI industry. Different from the inter-provincial development of the Yangtze River Delta, its development only includes the regional development of nine cities. This makes the Pearl River Delta face less resistance than the Yangtze River Delta in promoting the regional AI industry agglomeration effect and industrial chain integration. The unique industrial development model also makes the policy system of AI industry different from other regions and presents a certain particularity. Compared with the Yangtze River Delta, the Pearl River Delta industrial intelligent industry layout is earlier. In 2015, Guangdong formulated and issued a 10-year development plan for Guangdong's manufacturing industry. After many years of development, the policy level has been relatively complete, many cities in the region have made plans to improve the AI industry. When continuous improvement and improvement of the policy system, it has also laid a strong foundation for the local AI industry, and the policy system has formed a benign interaction with the development

of the AI industry. Although the supporting policies of the AI industry in Shenzhen, Guangdong and other cities with good economic foundation are relatively perfect, the AI industrial policy system in Jiangmen, Huizhou, Zhaoqing and other cities still need to be strengthened, as a result, the development of artificial intelligence technology in the Pearl River Delta has become even slower.

3.2.1.4 Development of artificial intelligence.

The main task is to integrate the resource elements of AI industry among the Pearl River Delta city clusters, which has natural advantages compared with the inter-provincial integration of the resource elements of other urban agglomerations. Considering that the current regional integration of the Pearl River Delta is still in the stage of exploration and development, it still faces multiple difficulties in industrial integration and resource sharing.

3.2.1.5 Comparison of artificial intelligence data in the Pearl River Delta and the Yangtze River Delta.

Table 1. Distribution of artificial intelligence enterprises and science and technology parks in the Yangtze River Delta and Pearl River Delta

Artificial intelligence enterprise distribution statistics		
	Number of artificial intelligence technology industrial parks	Number of artificial intelligence enterprises
The pearl river delta region	356	672
The pearl river delta region	221	596
Statistics on the number and distribution of science and technology parks		
Beijing-Tianjin-Hebei region		7.64%
The Yangtze River Delta region,		33.18%
The Pearl River Delta Region		20.6%
Sichuan and Chongqing Region		6.24%
others		32.34%

Source: National Bureau of Statistics of China

The number of AI enterprises in the Yangtze River Delta Region was 672, accounting for the first place, among which 314 are AI enterprises in Shanghai, accounting for 46.73% of the total Yangtze River Delta Region. The number of AI enterprises in the Pearl River Delta region is 596, among which Shenzhen has the largest number, with 308, accounting for 51.68 percent of the total Pearl River Delta Region. There are 356

artificial intelligence technology industrial parks in the Yangtze River Delta region, accounting for 33.18% of the total parks, ranking first in the economic circle. It was followed the Pearl River Delta Region, with a total of 221 AI technology industrial parks, accounting for 20.60%.

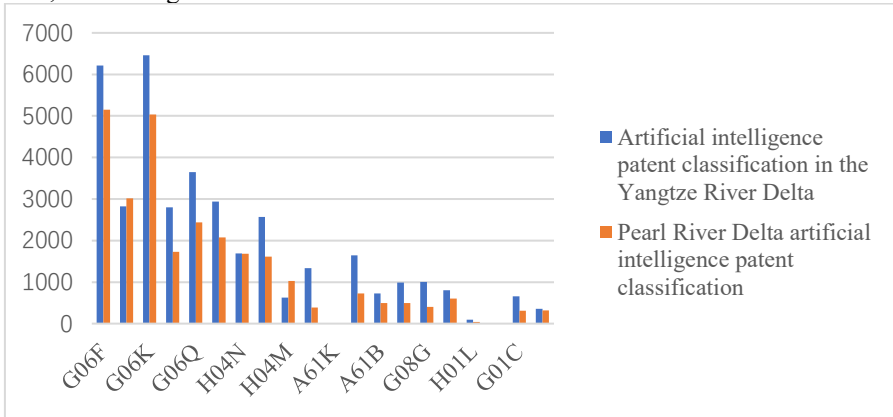


Fig. 1. Statistics of artificial intelligence patent application categories in the Yangtze River Delta, pearl river delta

Source: National Bureau of Statistics of China

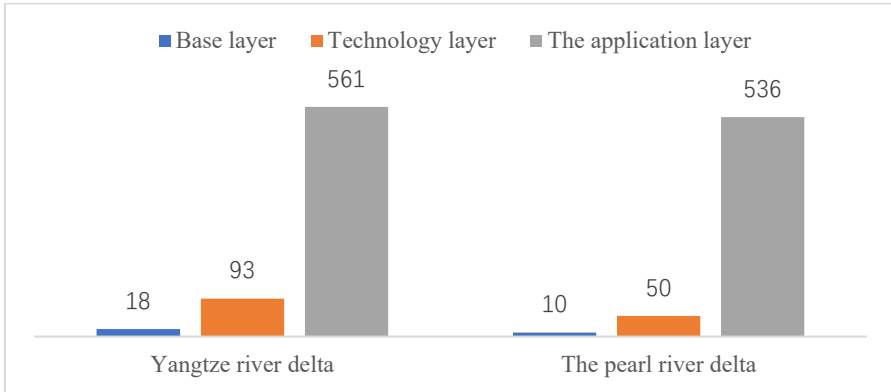


Fig. 2. Yangtze River Delta and Pearl River Delta artificial intelligence enterprise level distribution statistics

Source: National Bureau of Statistics of China

From the perspective of the industrial level of artificial intelligence enterprises, the number of application layer enterprises in the Yangtze River Delta, Pearl River Delta regions is relatively high, and the difference is not big between the two regions. However, the basic layer, application layer and technology level of the Yangtze River Delta are higher than those of the Pearl River Delta Region, respectively. It is worth noting that the technology level of AI in the Yangtze River Delta region is nearly twice that of the Pearl River Delta.

3.2.2 Causes of common problems in the development of artificial intelligence in the Pearl River Delta and the Yangtze River Delta.

According to the patent application of artificial intelligence in the two regions, the patent technologies applied in the two regions are mainly concentrated in the layer of technology and application about the AI industry chain, the number of applications was significantly higher than the number of basic applications, and the distribution of industrial patent technologies is seriously unbalanced.

The main reason for this situation is that the basic layer is supported by theory and data, so the construction effect is slow, and the investment return cycle is long, so it has become the short board of the AI industry in various regions and even the whole country. The unbalanced distribution of patented technologies can also be seen that there are prominent problems in the AI industry chain of various urban agglomerations, such as the basic layer, the unhealthy development of the technology layer and the application layer, and the insufficient integration of the industrial chain.

3.2.3 Recommendations on artificial intelligence in the Yangtze River Delta, pearl river delta.

The urban agglomeration in the Yangtze River Delta region and the Pearl River Delta region has a high level in the field of national economic and scientific and technological development. Therefore, in the development, we should increase research and development and invest more resources in the current weak links in the current domestic regional AI industrial chain, so as to realize the improvement of the national AI industrial chain and optimize the industrial layout. The Yangtze River Delta region not only needs to focus on industrial applications, but also the Pearl River Delta Region. timely adjust the industrial development mode, increase the artificial intelligence industry chain basic theory and data support technology research, make more core patent output, in make up for the local industrial chain development, also promote regional artificial intelligence to realize the whole industry chain efficient integration development.

4 Conclusion

Obviously, it is clear that the Yangtze River Delta and the regions receiving the press have made some achievements in integrated development, but there are still various problems to be solved. According to the data analysis of artificial intelligence in these two regions, there is a gap between the development level of artificial intelligence in the Pearl River Delta urban agglomeration and that in the Yangtze River Delta urban agglomeration. The Pearl River Delta city cluster has its own advantages in promoting the integration, innovation and development of regional AI industry, but it faces many difficulties in industrial integration and resource sharing. At the same time, there are common problems and main causes in both regions. Therefore, the following suggestions are put forward: (1) Improve the overall technical content and product quality of export products. (2) Increase support for production enterprises in the Pearl River Delta region. (3) Strengthen the exchange of experience and cooperation with provinces across the country, and at the same time solve the problem of insufficiently advanced

production technology. (4) Improve coordination and organization. (5) The government should actively explore the tourism market.

References

1. Yuan Ye, Yu Minmin, Liu Jiming,. Regional Comparison of China's New Generation Artificial Intelligence Industry Policy Based on Text Analysis: Taking Beijing, Guangdong, Zhejiang, Shanghai, and Jiangsu as examples, China's new generation of artificial intelligence industry planning policy interpretation[J]. Internet World, 2018(9):29-33.
2. Wu Kun, Liu Kai. A Comparative Study of China's High-tech Industrial Science and Technology Policies: A Textual Analysis of Policies Based on Beijing, Shanghai, Jiangsu and Zhejiang[J]. Journal of Nanjing University of Technology (Social Sciences Edition),2017(1):114-120.
3. Jiang Xing.Research on the development of artificial intelligence industry based on strategic trade policy [J]. Reform of the economic system,2018(6):82-88.
4. Lu Rongjie, Hao Lixiao. Spatial correlation characteristics and formation mechanism of AI development in China [J]. Soft science,2022, 36(2):8.
5. Chen Xiaoliang, Chen Yanbin. Problems and adjustment ideas in the industrial policy of developing artificial intelligence [J]. Humanities Magazine, 2019(11):25-32.
6. Lv Wenjing, Chen Jin, Liu Jin. Quantitative analysis of Chinese intelligent industrial policies from the perspective of policy tools [J]. Scientific research,2019(10):1765-1774.
7. Wang Yawei, Zhou Yuan, Chen Luyi. Identification and analysis of technological innovation path in China's artificial intelligence industry—— based on patent analysis method[J]. Science and technology management research, 2019, (10): 210-216.
8. Lin Fei. Co-construction, co-governance and sharing: regional integration from the perspective of innovation economy: Taking the integrated development of the Yangtze River Delta as an example[J]. Western Forum, 2020, (3):68-77.
9. Deng Ziyun, He Tingqin. Research on regional artificial intelligence industry development strategy [J]. Science and technology management research, 2019, (7):39-50.
10. Liu Lei, Lei Yi, Sun Hongyao. In 2017 Chinese the main statistical data report of patents in the field of intelligent engineering[J]. Scientific observation, 2019, (1):47-61.
11. Zhang Longpeng, Zhang Shuangzhi. Technology empowerment: the technological innovation effect of artificial intelligence and industrial integration development [J]. Financial Science, 2020, (6):74-88.
12. Jin Shuanglong, Long Yuntao, Chen Lisong. Research on regional artificial intelligence industry policy based on text analysis[J]. Reform and strategy, 2020, (3):44-53.

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