

An Empirical Analysis of Higher Education in Tianjin Serving Regional Economic Development

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Abstract: *The development level of higher education in a region is closely related to the economic development of the region. On the one hand, the development of higher education serves the economy. The setting of disciplines and majors in higher education determines the structure of talent training. Different majors cultivate talents in different aspects, affecting regional economic development's speed and quality. On the other hand, economy is the foundation of education development, and the level of economic development restricts the scale, speed, content and structure of higher education development. How to improve the level of higher education to serve the regional economy's development better has become a topic worth paying attention to. Based on the theoretical relationship between higher education and regional economic development, this paper studies higher education from the perspective of talent needs of regional economic development based on the relevant data of Tianjin from 2010 to 2019, draws relevant conclusions by comparing with the data of Beijing and Shanghai, and puts forward suggestions for the future development of higher education in Tianjin.*

Keywords: *Higher Education, Regional Economies, Economic Development, High-Quality Talents*

1. Introduction

The report of the 19th National Congress of the Communist Party of China clearly stated: "We will accelerate the construction of first-class universities and disciplines and achieve the connotative development of higher education." The construction of "first-rate universities and disciplines" is a major strategic decision of China. This marks a new historical period for China's higher education after decades of development and a stage of popularization. It is necessary to achieve the connotative development of higher education through qualitative transformation to improve the overall level and quality of higher education. In the process of connotative development, higher education must inevitably play its inherent functions, better realizing the functions of talent cultivation, scientific research, and serving society. In the process of serving social development through higher education, local universities play a particularly prominent role in promoting regional economic development, and their functions in serving regional economy are becoming increasingly prominent.

The "14th Five-Year Plan and 2035 Long-range Goals of Tianjin's National Economic and Social Development" point out that during the "14th Five Year Plan" period, Tianjin's economic and social development should basically achieve the goal of "one base, three areas" functional positioning. Namely, the national advanced manufacturing research and development base will be basically established, and the independent, controllable, safe and efficient industrial chain will be more sound, forming several internationally competitive industrial clusters, and the proportion of strategic emerging industries will be significantly increased. The ability and level of financial services to serve the real economy, prevent and control financial risks, and deepen financial reform will be significantly increased, forming a healthier and more benign financial ecological environment. However, there is still a significant gap between the current regional economic development of Tianjin and the aforementioned goals; the economic and industrial structure is not entirely reasonable, and there is still significant room for the quality of economic development. Universities are an important combination of science and technology as the primary productive force and talent as the primary resource. They are the main force for cultivating talents and the main source of knowledge innovation. They should play a more important role in the implementation of national strategies.

2. The Theoretical Basis of the Relationship Between Higher Education and Regional Economic Development

2.1 Human Capital Theory

The main idea of human capital is that the value created by the highly educated workforce is higher than the value created by the uneducated workforce. From a macro point of view, the economic growth rate, the sustainability of the economic development model, the potential of social innovation and so on are positively correlated with the average number of years of education of the workers in the region. From a micro point of view, for individual workers, the higher their education level, the higher their expected earnings in the future; For a region, education plays a significant positive role in promoting economic growth and establishing an innovative society. In addition, the total amount of regional educational resources and personnel training mode, regional industrial structure, and the allocation of economic base should be scientific and reasonable in order to effectively promote the sound development of regional economy.

2.2 Theory of External Relations in Education

The theory of external relations of education holds that education must be restricted by the economy, politics and culture of a certain society and play a role in the development of economy, politics and culture of a certain society. The economic system has the greatest influence on education. The development and reform of education cannot be separated from the support of economy. It can even be said that the development of education is carried out directly under the influence of economy. It also shows that higher education should serve the politics, economy and culture of society and meet the requirements of regional economic development. In addition, education has positive externality, which is proved in practice by the development of knowledge economy. For higher education, not only the individual subject who receives education benefits, but also the country. High-quality citizens are conducive to the harmonious and high-quality development of the country. Positive externality means that private gains are less than social gains, which will lead to private supply being less than the supply satisfied by the society, which is insufficient supply for the whole society. Resource allocation under the market mechanism cannot guarantee social needs, so externality is a manifestation of market failure. The global competition in the 21st century is essentially the competition for talents. To solve the positive externalities and increase the supply of talents, it is necessary for the government to subsidize education, so as to ensure that the private supply of education reaches the optimal level of social supply.

2.3 The Interrelationship Between Higher Education and Economic Development

The economy is the foundation of educational development. The level of economic development restricts the scale, speed, content, and structure of higher education development. First of all, the economic system provides the material foundation for higher education, and the financial and material resources required for higher education depend on the economic system. Secondly, only with the improvement of the level of economic development can more resources in the economic system be guaranteed to flow continuously into the education system, and more financial revenue can be generated to support the development of higher education. Finally, improving the level of economic development puts higher requirements for the quality of workers, which becomes the driving force for the development of higher education. The development of higher education is to serve the economy. Universities have important functions in talent cultivation, scientific research, social services, cultural inheritance and innovation, and international exchange and cooperation. These functions are all aimed at serving economic and social development, and serving economic and social development is universities' basic function and inevitable mission. In the era of knowledge economy, education has become the most important factor to promote economic development, especially higher education and economy are more and more closely linked, higher education is playing more and more power source of knowledge economy and social development. Higher education trains high-quality talents and strengthens the reserve of senior human resources, thus providing the prerequisite for economic and social development. The high-quality talents it provides are the basis for improving the level of production management, and on this basis, the efficiency of economic operation can be improved.

3. Current Situation of Tianjin Regional Economic Development

3.1 The Gross Domestic Product and Economic Development Status of the Three Industrial Structures in Tianjin

This paper makes a comprehensive investigation of Tianjin's economic development in the past ten years from two aspects of scale and structure, and the results are shown in Figure 1. In Figure 1, the overall GDP of the city showed a steady upward trend from 2010 to 2020, which mainly came from the continuous improvement of the output value of the tertiary industry, while the growth rate of the output value of the primary and secondary industries was basically flat. The proportion of the primary industry is between 0% and 1%, with no significant fluctuation. The composition of the secondary industry and the tertiary industry in the total GDP of the city has changed significantly. In 2010, they were at a relatively close level. After that, the proportion of the tertiary industry decreased to nearly 30%, while the proportion of the secondary industry has steadily increased to nearly 65%. Overall, from 2010 to 2020, while the overall GDP of the city steadily increased, there were also certain adjustments in the three industrial structures. The tertiary industry is gradually rising, and the output value of the secondary industry is continuously decreasing. This change has been particularly evident since 2015, while the output value of the primary industry has always been on a smaller scale. This is because in recent years, Tianjin has continuously responded to national policies and focused on sustainable development, gradually moving a large number of heavy industrial and heavily polluting enterprises out of Tianjin, resulting in a gradual decrease in the secondary industry. Also, Tianjin fully utilizes its own port advantages and focuses on developing the tertiary industry. Due to the geographical location along the coast, a large amount of land is saline alkali land, which prevents Tianjin from vigorously developing agriculture. Data shows that the performance of Tianjin's primary industry is weak. According to Figure 2, before 2015, the contribution rates of the secondary and tertiary industries to the total output value were basically equal to each other. After 2015, the secondary industry gradually dropped to around 0%, and the tertiary industry gradually rose to around 100%.

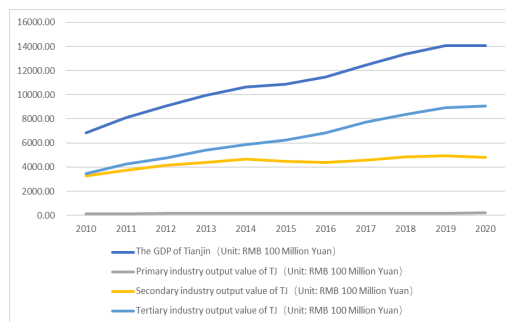


Figure 1: GDP and output value of three industries of Tianjin

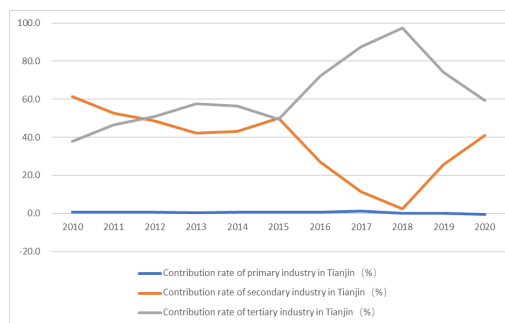


Figure 2: Gross domestic product composition of Tianjin

3.2 Comparison of Tianjin Regional Economic Development with Beijing and Shanghai

The "Shanghai 2035 Plan" points out that Shanghai is the core city of the world-class urban agglomeration in the Yangtze River Delta, an international economic, financial, trade, shipping, technological innovation center, and cultural metropolis, which is similar to many contents of "Tianjin's 14th Five-Year Plan and 2035 Vision goals" mentioned above. As a first-tier city in our country, Shanghai has many experiences that can be used for reference in the development of urban regional economy.

Meanwhile, Shanghai's higher education is also at a high level in China. Therefore, in the analysis of Tianjin higher education service regional economic development, the relevant data and measures of Shanghai have certain reference value. As one of the three national strategies, the Beijing-Tianjin-Hebei coordinated development strategy aims at the coordinated development of the three areas as a whole. Taking the removal of non-core functions of the capital and the solution of Beijing's "big city disease" as its basic starting point, we need to adjust and optimize the urban layout and spatial structure, build a modern transportation network, expand environmental capacity and ecological space, promote industrial upgrading and transfer, promote co-construction and sharing of public services, accelerate the process of market integration, and create a new type of modern capital circle. We will strive to form a new pattern of coordinated development featuring the same goals, integrated measures, complementary advantages and win-win results for the Beijing-Tianjin-Hebei region. Therefore, it is necessary to choose Beijing as a comparison to observe the advantages and disadvantages of Tianjin's higher education in serving the current regional economic development.

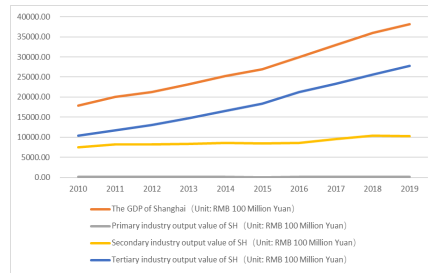


Figure 3: GDP and output value of three industries of Shanghai

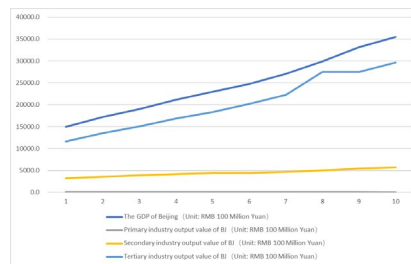


Figure 4: GDP and output value of three industries of Beijing

Comparing Figure 3 with Figure 4, we can see that the three industrial structures and development trends in Shanghai, Beijing, and Tianjin are basically the same, and the primary industry is not a key development area for the three cities. Therefore, we do not consider the factor of the primary industry when comparing the economic development status of the three cities at the same time

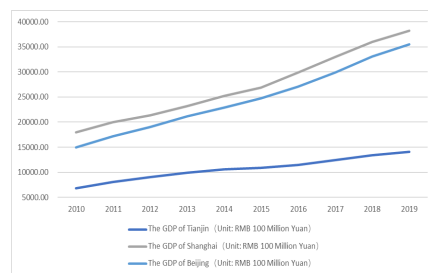


Figure 5: GDP of TJ, SH and BJ

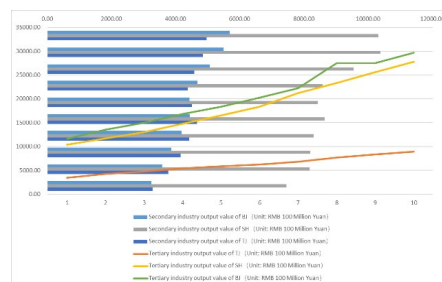


Figure 6: Output value of the secondary and tertiary industries in BJ, SH and TJ

From the perspective of urban gross domestic product, the trend of Beijing and Shanghai is basically the same and the gap is small (Figure 5). Compared to Beijing and Shanghai, Tianjin has a significant difference in volume and its growth rate is slightly lower. From the perspective of the output value of the secondary industry, there is not much difference between Beijing and Tianjin in the output value of the secondary industry, but there is a significant gap between them and Shanghai (Figure 6). This indicates that although Tianjin's secondary industry is not as developed as Shanghai, it is still at a relatively high level. From the perspective of the output value of the tertiary industry, the situation is similar to the performance of the three in terms of GDP.

4. Current Situation of Higher Education Development in Tianjin

4.1 The Characteristics and Scale of Discipline Structure in Tianjin Universities

Tianjin has two first-class university construction universities and three first-class discipline construction universities. The specific list of these two first-class disciplines is shown in Table 1.

Table 1: List of the current double first-class disciplines in Tianjin

University	Double first-class construction disciplines
Nankai University	Applied economics, World history, Mathematics, Chemistry, Statistics, Materials Science and Engineering
Tianjin University	Chemistry, Materials Science and Engineering, Power engineering and engineering thermal physics, Chemical Engineering and Technology, Management Science and Engineering
Tianjin Medical University	Clinical medicine
Tianjin University of Traditional Chinese Medicine	Traditional Chinese medicine
Tiangong University	Textile Science and Engineering

Among the 14 double-first-class disciplines, there are two medical disciplines, six engineering disciplines, four science disciplines, one economics discipline and one history discipline. And we can see that the construction of science and engineering disciplines in Tianjin is good, which has a certain promoting effect on the development of industry and manufacturing in Tianjin. At present, there are 32 major categories of colleges and universities. The top ten categories with a large number of students account for about 80% of the total number of students. It mainly focuses on engineering (undergraduate), management (undergraduate), economics (undergraduate), education (undergraduate), literature (undergraduate), art (undergraduate), finance and commerce (junior college), electronic information (junior college), equipment manufacturing (junior college), transportation (junior college), which is the corresponding discipline of finance industry, transportation industry and industrial manufacturing industry. Among them, the number of engineering undergraduate students is larger than that of other disciplines, which is not only because engineering disciplines cover more subordinate disciplines, but also due to the good development of engineering majors in Tianjin. In addition, electronic information and equipment manufacturing, which have a large number of students in junior college, also belong to the industrial manufacturing industry, especially advanced manufacturing. Tianjin has a strong reserve force of industrial and manufacturing talents with different levels and subdivisions. In addition, the number of undergraduate management majors is second only to engineering. The abundance of management talents contributes to the high-quality development of various industries. The number of undergraduates majoring in economics is relatively less than those majoring in finance and trade. For the industry that needs higher quality talents, such discipline structure still has great room for adjustment in the future.

4.2 Discipline Scale Structure and Characteristics of Beijing and Shanghai Universities

The number and scale of double first-class universities in Beijing and Shanghai are far greater than those in Tianjin, and the scope of Double First Class disciplines is very wide. Not only can it support the high-quality development of regional economy, but it can also support the diversified development of urban industries in terms of structure. In addition, the diversification of first-class disciplines is also conducive to supporting interdisciplinary research, which creates favorable conditions for scientific research innovation and the cultivation of innovative talents, and is also an important prerequisite for the development of economic innovation. Although the current construction of disciplines and majors in

Tianjin's universities has shown comprehensive coverage and has the advantage of having many double first-class discipline construction points in engineering disciplines, this is precisely the problem that exists in the current construction of Tianjin's higher education. Compared to Beijing and Shanghai, the coverage of high-quality development (classified as high-quality subject education based on whether it is rated as a dual first-class discipline) in universities is still relatively narrow, mainly limited to engineering, science, economics, and medicine, making it difficult to support diversified high-quality education development.

5. Analysis on Tianjin Higher Education Serving Regional Economic Development

5.1 Overall Situation and Distribution of Professional Talent Resources in Tianjin

Professional and technical personnel in public enterprises and institutions as well as employees in urban non-private units are analyzed, among which professional and technical personnel refer to those who specialize in various scientific research and professional and technical work. Personnel engaged in this kind of professional work are generally required to have received systematic professional education, have the corresponding professional theoretical knowledge, and according to the prescribed standard conditions of evaluation and employment of professional and technical positions, as well as those who are not employed in professional and technical positions but work in professional and technical positions. The total number of professional and technical personnel and employees showed a slight upward trend from 2010 to 2013, and showed a slight downward trend from 2014 to 2016. This is due to the reform measures of "streamlining administration and delegating power to lower levels" implemented by the municipal government in 2015. In addition, from 2011 to 2017, the number of professional and technical personnel and the proportion of professional and technical personnel in the total number of employees were basically flat and did not fluctuate much, which indicates that Tianjin needs to improve its talent attraction. From the perspective of the quality of professional talents in Tianjin, the total number of professional and technical personnel shows a clear trend of first increasing and then decreasing. However, the overall number of personnel with higher education has increased. Although there was a significant decline in 2015, it quickly recovered in 2016, indicating that the city still has a certain ability to attract talents. Overall, the proportion of highly educated professionals in Tianjin's professional and technical personnel is gradually increasing, indicating that the overall quality of urban professional talents has improved, which helps to enhance the innovation ability of the industry and accelerate the growth of industrial output value. This is a very positive and promising trend for the future. The trend of changes in the proportion of employees in the three industries is basically the same as the trend of output value in the three industries (Figure 7). The proportion of employees in the primary industry has always been low and on a downward trend. This also indicates that the economic center of Tianjin is gradually shifting towards the tertiary industry.

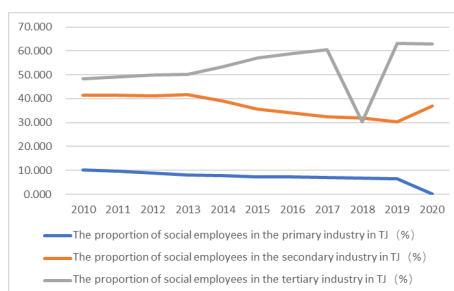


Figure 7: The proportion of Tianjin's tertiary industry employees in the total social workforce

5.2 Tianjin's tertiary industry practitioners and their proportion compared to Beijing and Shanghai

Figure 8 indicates that there is still a significant gap in GDP between Tianjin and first tier cities in China, with the main problem being the slow growth rate. According to Figures 8 and 9, the output value of the tertiary industry in the Shanghai stock market is higher between the Beijing and Shanghai regions, but the number of employees and their proportion in the tertiary industry are relatively small. This indicates that Shanghai has created higher value by utilizing fewer talents, resulting in higher talent quality and more efficient market utilization of talents. Although Tianjin has some differences in the number and proportion of employees in the tertiary industry compared to Shanghai, it is much smaller than the gap in the output value created by the tertiary industry compared to Shanghai. In addition, except

for the slightly abnormal data from Tianjin in 2018, there is not a significant difference in the proportion of employees employed in the tertiary industry to the total number of social workers between Tianjin and Shanghai, and the trend of output value is basically consistent with the city's GDP. This indicates that if Shanghai's development model is used as a reference, the industrial structure of the tertiary industry in the three industries in Tianjin's current development goals is relatively reasonable, but there is a gap in scale (i.e. output value and number of employees), which is not only an increasing relative gap, but also a more obvious gap in growth rate that can be observed.

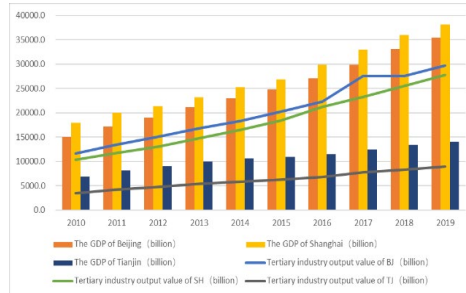


Figure 8: Comparison of GDP and output value of tertiary industries in TJ, BJ and SH

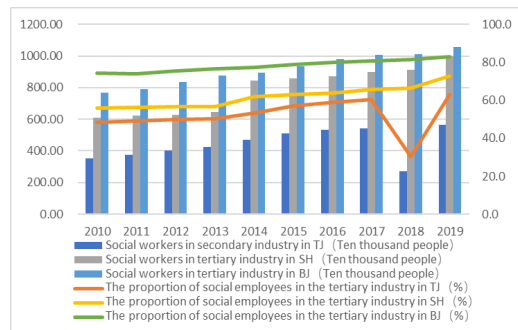


Figure 9: Tertiary industry employees and their proportion

5.3 Talent Demand Forecast in Tianjin

This paper uses R language to make time series predictions on the total number of employees in Tianjin's society and the number of employees in the tertiary industry from 2010 to 2019. The current development level of Tianjin is generally close to the development level of Beijing and Shanghai from 2008 to 2009. Comparing Figures 10 and 11 with Figures 12 and 13, we can see that there is still a significant gap in the number of employees in the tertiary industry in Tianjin. Tianjin aims to catch up with the development of the tertiary industry in Beijing and Shanghai over the past decade. Although it is possible to achieve this from the predicted results, it is not realistic from a practical perspective. Specifically, this requires Tianjin to attract at least nearly 3 million related professionals. In addition, there is a relatively large gap in the total number of employees in the two cities of Beijing and Shanghai. Both cities have entered the platform period, so Tianjin can choose a stable development strategy that is suitable for itself. Figures 11 and 13 show that there was a process of exponential growth in the number of employees in Shanghai around 2013. In terms of the number of employees in the tertiary industry, Shanghai has greatly narrowed the gap with Beijing and widened the total number of employees in its society to a certain distance from Beijing. And Beijing has been in a steady and uniform upward trend. Therefore, in order to seek high-quality industrial development, Tianjin should combine its own stable development strategy, learn from the excellent experience of Shanghai, and utilize the more reasonable allocation of majors in universities and a series of policies to improve the number and quality of employed talents. Tianjin can first increase the total number of employees to the level of Shanghai before 2013, which is to meet the social total employment gap of about 2 million people and the tertiary industry employment gap of about 500,000 people, and then seek development opportunities to strive for high-quality development in the next stage.

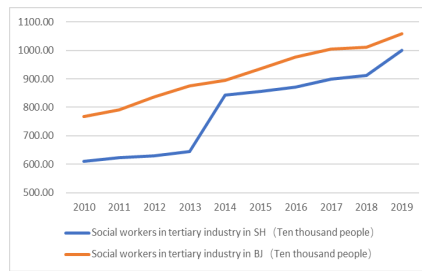


Figure 10: Number of employees in the tertiary industry in Beijing and Shanghai (ten thousand)

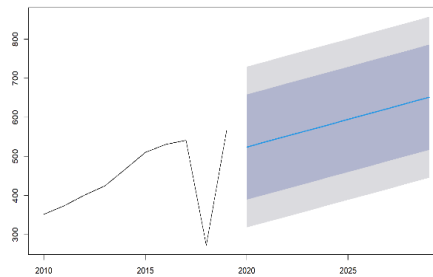


Figure 11: Time series and forecast of employees in the tertiary industry in Tianjin (ten thousand)

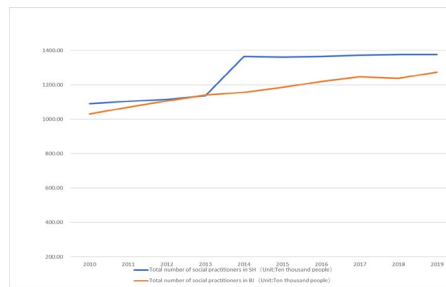


Figure 12: Total number of employees in Beijing and Shanghai (ten thousand)

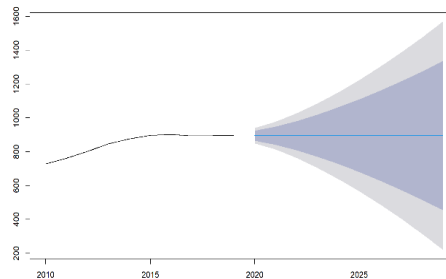


Figure 13: Time series and forecast of the total number of employees in Tianjin (ten thousand)

5.4 Talent Supply Forecast in Tianjin

This paper predicts the total number of college graduates to measure whether the talent output capacity of Tianjin's higher education can meet the needs of regional economic development. The data results are shown in the following figure:

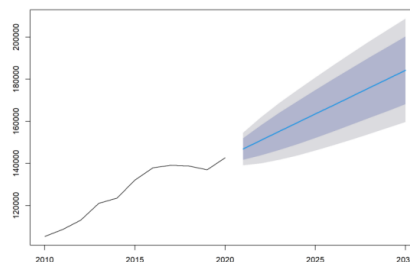


Figure 14: Time series and forecast of the number of college graduates in Tianjin

By 2030, the number of graduates from universities in Tianjin can basically reach around 190,000, which is inevitably better compared to the predicted result of the total number of employees in society approaching horizontal growth (zero growth) as shown in Figure 14. However, in order to break through the current development bottleneck and build regional economic development according to the target plan, the talent scale is far from enough. In addition, Tianjin's ability to attract talents is not strong, which cannot guarantee that most college students from other provinces choose to stay in Tianjin for development. Therefore, there is still a significant talent gap in Tianjin's economic development. This paper combines Tianjin's long-term plan for 2035 and predicts the number of graduates from the two disciplines of economics and engineering in Tianjin's universities over the next decade based on the talent transfer situation in the finance, advanced manufacturing, and transportation industries in Tianjin's universities over the next decade (due to changes in the classification of specialized disciplines before and after 2015, only the number of undergraduate students is considered) using R language. Figures 15 and 16 indicate that the talent transported by Tianjin's higher education in the next decade has great development potential for its key pillar industries, and economic talents have a higher growth rate than engineering talents, providing a good platform for the development of Tianjin's financial industry.

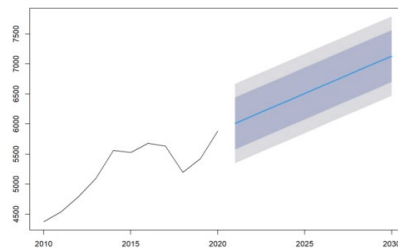


Figure 15: Time series and forecast of the number of graduates majoring in economics in Tianjin universities

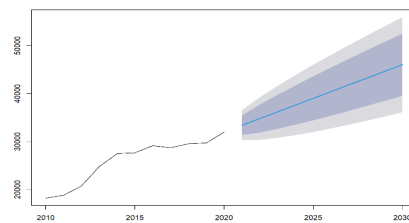


Figure 16: Time series and forecast of engineering graduates in Tianjin universities

6. Conclusions and Suggestions

6.1 Conclusions

6.1.1 The Setting of Higher Education Disciplines and Majors is Not Synchronized with Regional Economic Development

In the past decade of development in Tianjin, from the perspective of economic development, the development of the tertiary industry has gradually risen, and the output value of the secondary industry has continuously decreased. However, the overall GDP and output value of the tertiary industry in Tianjin are relatively small and have a low growth rate. The secondary industry is relatively at a high level, but there is still a lot of development space. From the perspective of economic development's demand for talent, the total number and proportion of employees in the three industries are basically the same as the development trend of the three industries. However, the coverage of disciplines in higher education in Tianjin is relatively narrow, and engineering disciplines are the better constructed disciplines. The number of undergraduate students in economics is relatively less than that in vocational finance and commerce. This indicates that in the process of rapid development of the tertiary industry, the establishment of higher education disciplines and majors in Tianjin is not synchronized with regional economic development.

6.1.2 Lack of Overall Planning and Systematic Layout in The Setting of Disciplines and Majors

Tianjin has two Double-First-Class Universities and four First Class Disciplines, with expertise in engineering and economics. However, the number and scale of Double First Class universities in Beijing and Shanghai are far greater than those in Tianjin, and the scope of Double First Class disciplines is very

wide. Compared with developed cities in China, Tianjin has a smaller number of double first-class higher education schools and a narrower coverage of high-quality disciplines. In contemporary society, the construction of knowledge intensive industries and the development of industrial innovation often require interdisciplinary communication and interdisciplinary integration, which requires regions to have multiple types of high-level disciplines.

6.1.3 The Quality of Talent Cultivation in Higher Education Does Not Match the Strength of Regional Economic Development

Overall, the current regional economic development in Tianjin is at a stable but extremely slow level of growth. The high-speed and high-quality development of the industry requires a large amount of manpower and material investment, that is, a large number of talents, especially high-quality and well-educated professionals with higher education qualifications, especially the development of the tertiary industry. In the current development process, the industrial structure of Tianjin's tertiary industry within the three industries is relatively reasonable, but there is a significant gap in growth rate compared to Beijing and Shanghai. This is because the quality and efficiency of employees in the tertiary industry are low, and they are unable to utilize fewer talents to create higher value like Shanghai. The current scale of talent cultivation in Tianjin's universities can theoretically only meet the pace of urban regional economic development. If it wants to accelerate the pace of development, relying solely on attracting foreign talents cannot completely solve the problem. The more effective measure is to cultivate more relevant industry talents through local universities and create the value they possess by stimulating them. Tianjin needs to continue to expand its advantages in engineering and enhance the reserve of industry professionals.

6.2 Suggestions

6.2.1 Optimizing the Discipline and Professional Structure of Higher Education

Firstly, we need to fully leverage the macro regulatory role of government departments. The main manifestation of the government's macroeconomic regulation role is policy adjustment. When the government formulates economic and social development plans or industrial structure adjustment plans, it regularly releases support priorities and policies for regional economic development, industrial structure, technological structure, major industries, pillar industries, and emerging industries, clarifying the direction of industrial development, and providing reference for decision-making on the adjustment of the specialized industry structure in universities. Secondly, universities should optimize and adjust themselves based on the employment market, and cultivate students around the needs of social and economic development. Universities control the enrollment scale and structure based on industrial structure adjustment and labor market demand, adjust and optimize disciplines and majors, focus on talent cultivation in high-tech fields such as advanced manufacturing, modern service, and financial service industries, meet the demand for talents in regional economic development, and improve the quality of higher education services for regional economic development.

6.2.2 Exploring the Construction of Interdisciplinary and Edge Oriented Majors, Cultivating Advantageous and Distinctive Disciplines

According to the actual situation of regional economic development, Tianjin needs to improve its disciplinary level in humanities and social sciences (including media, education, language, etc.), while maintaining its original advantages in engineering disciplines, and seeking more possibilities, especially focusing on the construction of engineering disciplines in the new era, such as emerging edge disciplines such as communication, electronics, and biomedicine, in order to strive for higher levels of development. The development of humanities and social sciences disciplines helps to promote the construction and development of the financial service industry. The construction of engineering disciplines in the new era is an inevitable choice to comply with the trend of the times, and is also an effective means to help Tianjin accelerate high-quality and advanced manufacturing, laying a solid foundation for Tianjin to achieve the 2035 long-term goal. Therefore, universities should set and adjust their majors according to their own conditions, combine the creation of advantageous and characteristic disciplines with the incentive mechanism of universities, and continuously achieve the establishment and improvement of advantageous and characteristic disciplines through the incentive mechanism. In addition, it is necessary to integrate the construction of advantageous and characteristic disciplines into the school's educational philosophy and cultural atmosphere, in order to avoid the phenomenon of high professional repetition rate and serious homogenization, and achieve the inheritance and promotion of advantageous and characteristic disciplines. Universities with conditions and capabilities can break traditional disciplinary

barriers, establish interdisciplinary majors without violating the laws of professional development and talent cultivation, set up pilot programs, study complementary fields of different disciplines, establish interdisciplinary and marginal disciplinary mechanisms, and cultivate talents with multiple professional abilities. It can also establish and improve the multi-degree system and the major and minor system, and gradually form a diversified pattern of talent training in colleges and universities.

6.2.3 Enhancing the Contribution Ability of Higher Engineering Education to Regional Economy

The added value of the secondary industry brought by the number of employees in the secondary industry in Tianjin is much lower than that of Shanghai, and in recent years, the number of engineering graduates in Tianjin has shown an increasing trend every year. The quality of engineering majors in Tianjin urgently needs to be improved to meet the needs of further development of the secondary industry. At present, the training quality of engineering students in universities is far from meeting the needs of industrial development. To enhance the level of higher engineering education, firstly, we need to vigorously strengthen student engineering education and meet the demand for engineering and technical talents who need to transform science and technology into productive forces in reality. Practice and innovation are two key issues in the cultivation of engineering education talents. It is necessary to encourage and support interdisciplinary collaborative teams composed of engineering university teachers and students, delve into the front-line of enterprises, and establish a training system centered on solving engineering problems. The second is to do a good job in predicting talent demand, scientifically planning different levels of talent demand, and expanding the scale of applied undergraduate and vocational students. We will continue to promote the transformation of ordinary undergraduate universities into application-oriented ones, encourage well-known enterprises to cooperate with universities, promote the integration of industry and education and collaborative innovation mechanisms, and cultivate urgently needed scientific research personnel, technical skills talents, and composite talents in the manufacturing industry.

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