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Analysis of Countermeasures for Supporting the High-Quality Development of Tianjin's Economy through Higher Education

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Abstract: *Tianjin has a developed education industry and a number of universities. Higher education promotes Tianjin's economic development in areas such as scientific research, cultural services and talent resources. However, while promoting economic development, Tianjin's higher education also faces some challenges, mainly reflected in the mismatch between talent cultivation in universities and the optimization and upgrading of Tianjin's industrial structure, the unequal investment and transformation of scientific research achievements in universities, the weakening of talent attraction, and the mismatch between the huge demand for talent in Tianjin's high-quality economic development. Solving the challenges faced by higher education in supporting the high-quality development of Tianjin's economy is the key to promoting the high-quality development of higher education, and it is also the key to promoting the high-quality development of Tianjin's economy. Higher education should optimize talent training programs to support the optimization and upgrading of Tianjin's industrial structure. Universities should strengthen innovation in scientific research systems and models, and promote the transformation of scientific research achievements. And the government should improve policies to attract talents and fully develop talent resources.*

Keywords: *Higher Education, Tianjin, Industrial Chain, High Quality Development*

1. Introduction

The gross enrollment rate of higher education in China reached 51.6% in 2019, officially entering the stage of popularization. With the continuous expansion of China's higher education scale and strength, China's development has gradually shifted from demographic dividend to talent dividend. In the context of the new development pattern, the important role of higher education in supporting high-quality economic development has been highly valued. The overall plan for the work of the Higher Education Department in 2023 points out that the goal is to build a strong country in higher education, and the main line is to comprehensively improve the quality of talent independent training. We should explore the construction of a Chinese style higher education development model to better serve the country's regional economic and social development. In 2021, Tianjin issued the "Opinions on Deepening the Implementation of the Talent Leading Strategy to Accelerate Tianjin's High-Quality Development", proposing the overall requirement of providing solid talent guarantee for achieving high-quality development in Tianjin and comprehensively building a socialist modern metropolis. The key task of Tianjin's 14th Five Year Plan, which is to accelerate the construction of a modern industrial system and promote the construction of a new development pattern, also requires the support of higher education. As a talent gathering place, universities should actively integrate into the development of Tianjin's industry, in order to promote high-quality economic development in Tianjin. Solving the problems faced by higher education in supporting the high-quality development of Tianjin's economy is the key to promoting higher education in promoting Tianjin's economic development. This paper analyzes the current situation and challenges of higher education supporting the economic development of Tianjin, aiming to explore strategies for higher education supporting high-quality economic development in Tianjin.

2. Interactive Analysis of Higher Education and Tianjin's Economic Development

Higher education and Tianjin's economic development are inseparable, and there is a mutually

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promoting interactive relationship between them.[1] This paper analyzes the interactive relationship from two aspects: the contribution of higher education to Tianjin's economic development and the impact of Tianjin's economic development on higher education.

2.1. The Contribution of Higher Education to the Economic Development of Tianjin

2.1.1. Personnel Training

Higher education is an important place to cultivate high-quality talents, who plays a crucial role in the development of Tianjin's economy. Higher education can provide Tianjin with skilled, knowledgeable, and high-quality talents, becoming an important force in promoting regional economic development and industrial upgrading. [2]The number of "Double First Class" universities is an important symbol of regional higher education strength, and the number of students on campus is the basic manifestation of talent capital stock. There are five "Double First Class" construction universities in Tianjin, including Tianjin University, Nankai University, Tianjin Medical University, Tianjin University of Traditional Chinese Medicine and Tiangong University, ranking among the top in the country in terms of quantity. In 2021, Tianjin's higher education institutions had a total of 583353 enrolled students, providing an important talent reserve for Tianjin's economic development.

2.1.2. Technology Research and Development

Higher education institutions can promote the generation, development, and application of advanced technologies through technological research and development, develop new products, technologies, and processes, and promote the further development of Tianjin's economy. Tianjin University, relying on its Binhai Industrial Research Institute, has extended the petrochemical industry chain and increased product added value. The wireless charging system developed by the "Engineering Electromagnetic Field and Magnetic Technology" team at Tianjin University of Technology has formed multiple wireless charging products with independent intellectual property rights, resulting in an increase of over 20 million yuan in revenue for related enterprises. These research and transformation achievements are the contributions of higher education to promoting industrial upgrading and economic development in Tianjin, reflecting the innovative spirit of leading scientific and technological progress and the responsible spirit of actively serving Tianjin's economic development.

2.2. The Impact of Tianjin's Economic Development on Higher Education

2.2.1. Financial Guarantee

The economic development of Tianjin can provide financial support for higher education, provide more sources of funding for higher education investment, and optimize the allocation of higher education resources. Adequate funding can provide funding for scientific research and school construction in universities, promoting their comprehensive development. On the other hand, it can provide higher education institutions with better salary benefits and development space, thereby attracting more high-quality teachers to come to Tianjin higher education institutions to teach, greatly enhancing the faculty of higher education.

2.2.2. Industrial Demand

As an economic center city, Tianjin has a good social environment, high market demand, and strong consumption capacity, which has attracted various enterprises and institutions to move in. This provides more practical and employment opportunities for higher education, enabling students to better apply their knowledge to practice and improve their practical abilities and employment competitiveness. The economic development of Tianjin has stimulated the demand for cooperation between universities and the industry, making the connection between universities, enterprises, and the government closer, promoting the transformation of scientific research achievements and industrial development.[3]

The interaction between higher education and Tianjin's economic development is very close, and higher education plays a crucial role in Tianjin's economic development. At the same time, the development of Tianjin's economy will also have an impact on higher education. Therefore, we should focus on promoting the coordinated development of higher education and Tianjin's economy.

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3. The Problems Faced by Higher Education in Supporting High-quality Economic Development in Tianjin

3.1. The Mismatch between Talent Cultivation in Universities and the Need for Optimizing and Upgrading the Industrial Structure in Tianjin

According to the Three-year Action Plan for High-quality Development of Tianjin's Industrial Chain (2021-2023), Tianjin will take the intelligent technology industry as the lead, focus on strengthening emerging industries such as biopharmaceuticals, new energy, and new materials, and consolidate and enhance advantageous industries such as equipment manufacturing, automotive, petrochemical, and aerospace. According to the Tianjin Statistical Yearbook, the overall enrollment of higher education institutions in Tianjin showed an upward trend from 2011 to 2021 (Figure 1), which provides an important talent reserve for Tianjin.

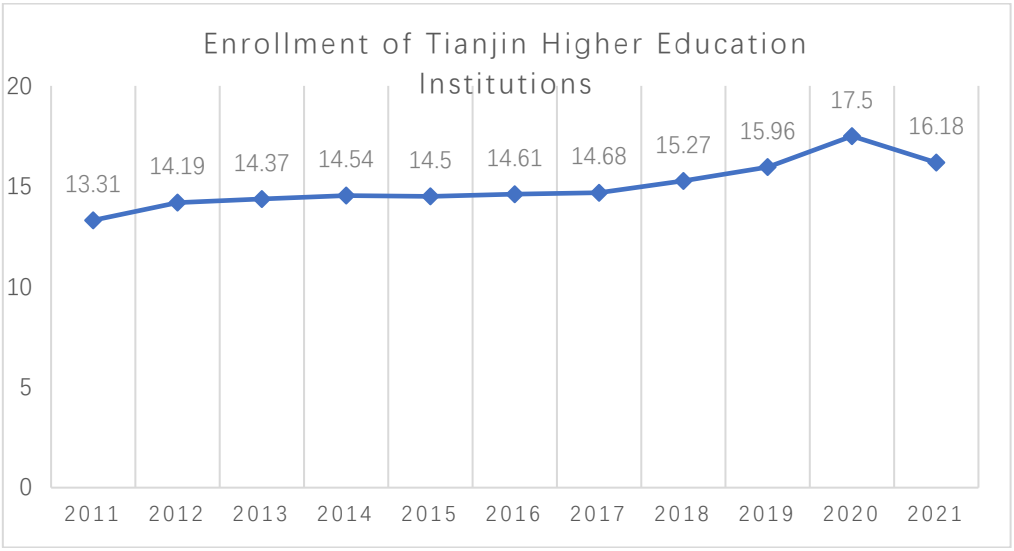

Figure 1: Enrollment of Higher Education Institutions in Tianjin from 2011 to 2021

Table 1: Advantage majors of some universities in Tianjin.

Some universities in Tianjin	Nankai University	Tianjin University	Tiangong University	Tianjin University of Technology
Advantage Major	Finance, Mathematics, Economics, Business Administration, Accounting, Chemistry, insurance, Financial Engineering, International Economics and Trade, public finance	Architecture, engineering management, chemical engineering and technology, civil engineering, ship and marine engineering, electrical engineering and its automation, measurement and control technology and instruments, urban and rural planning, automation, port and waterway and coastal engineering	Textile Engineering, Materials Science and Engineering, Mechanical Engineering and Automation, Clothing Design and Engineering, Finance, International Economy and Trade, Accounting, Electrical Engineering and Automation, Non-woven Materials and Engineering, Automation	Engineering cost, electrical engineering and its automation, automation, navigation technology, communication engineering, mechanical engineering and automation, machinery, computer science and technology, marine engineering, engineering management

Table 1 lists the advantageous majors of some universities in Tianjin. Among them, chemical engineering and process, mechanical engineering and its automation, material science and engineering and other majors are closely related to petrochemical, assembly manufacturing, new materials and other industries, and can send a large number of talents to related enterprises. However, other majors have not

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dynamically adjusted according to the emerging and advantageous industries planned by Tianjin, which will inevitably crowd out the teaching resources urgently needed for industrial structure optimization and upgrading. The lag of professional adjustment behind industrial adjustment will lead to a mismatch between the urgent shortage of talents in Tianjin's industrial development and the surplus of talents trained in other majors.

3.2. Unequal Scientific Research Investment and Transformation of Scientific Research Achievements

In recent years, the number of scientific papers published by researchers in Tianjin universities has shown an increasing trend year by year (Figure 2). However, the level of transformation of scientific research achievements is still relatively low, presenting a contradictory situation of more achievements and less transformation, which is not equal to the investment of scientific research resources. The income from the transformation of scientific research achievements can intuitively reflect the ability of universities to transform scientific research achievements. Tianjin University and Nankai University, two national "Double First Class" universities, are the "leaders" in scientific research and the transformation of scientific research achievements in Tianjin's universities. According to the summary statistics of the 2017-2020 China Science and Technology Achievement Transformation Report, the contract amount for scientific research achievement transformation between the two universities shows an increasing trend, but the growth rate has significantly slowed down (Figure 3). The contract amount for the transformation of scientific research achievements between the two universities is significantly different from that of top universities, and does not match the comprehensive strength of the two universities in the national ranking. Some scientific researchers prioritize paper output over achievement transformation, prioritize theoretical research over practical application, and fail to effectively understand the development needs and enterprise needs of Tianjin. The ability to transform scientific research achievements needs to be improved.[4]

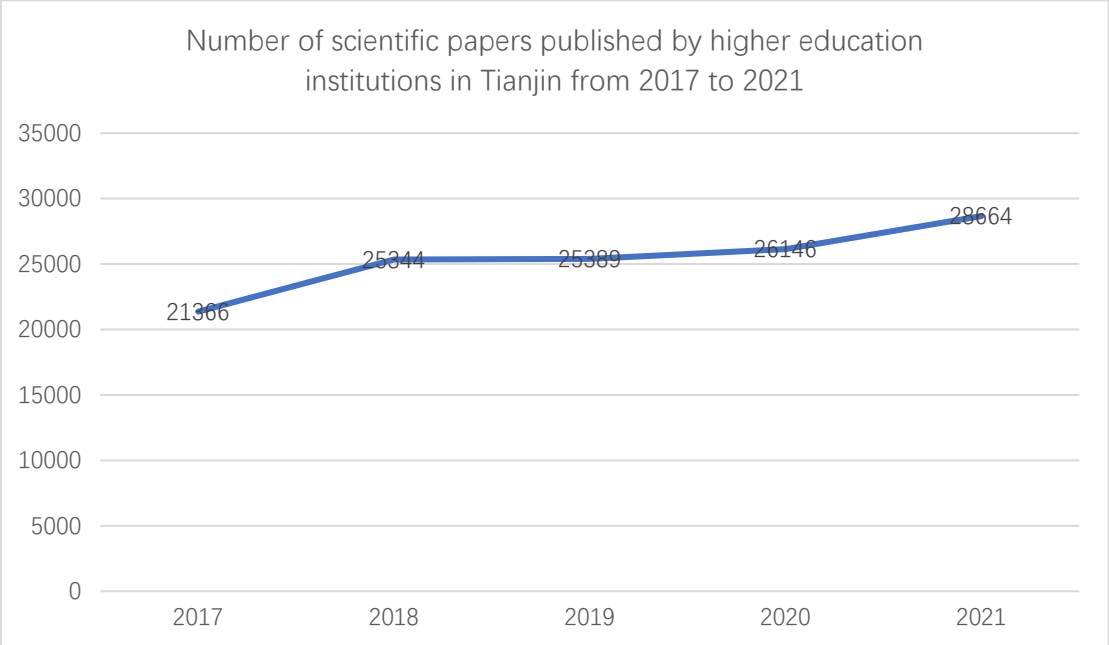

Figure 2: Number of scientific papers published by higher education institutions in Tianjin from 2017 to 2021

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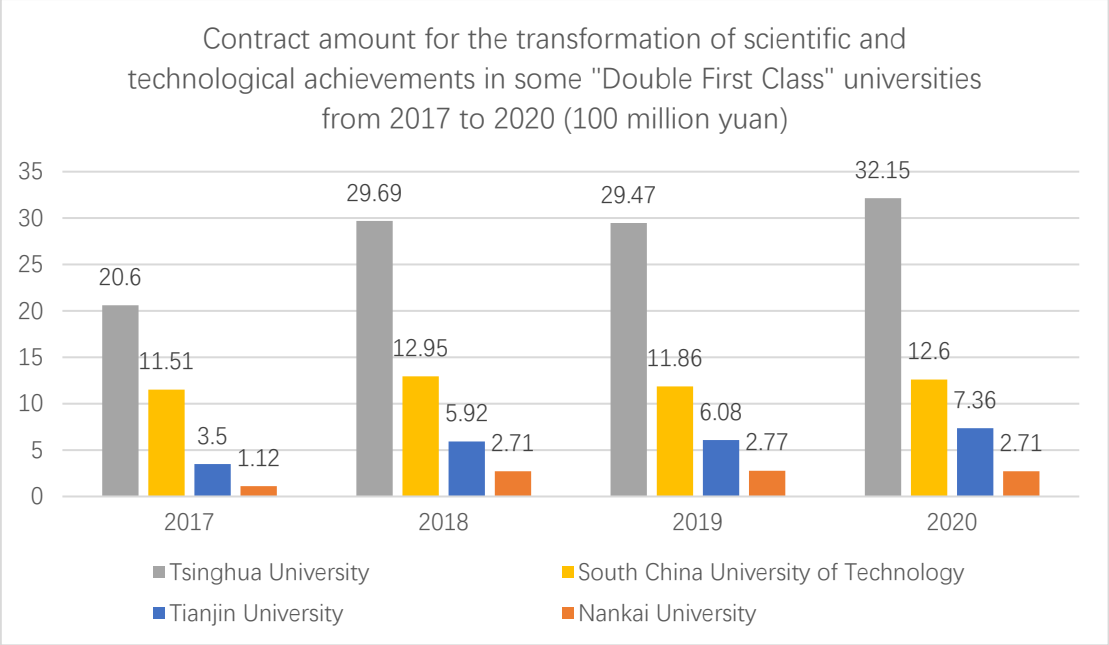

Figure 3: Contract Amount for the Transformation of Scientific and Technological Achievements in Some "Double First Class" Universities from 2017 to 2020

3.3. The Weakening of Talent Attraction is not in line with the Demand for Talent from High-quality Economic Development

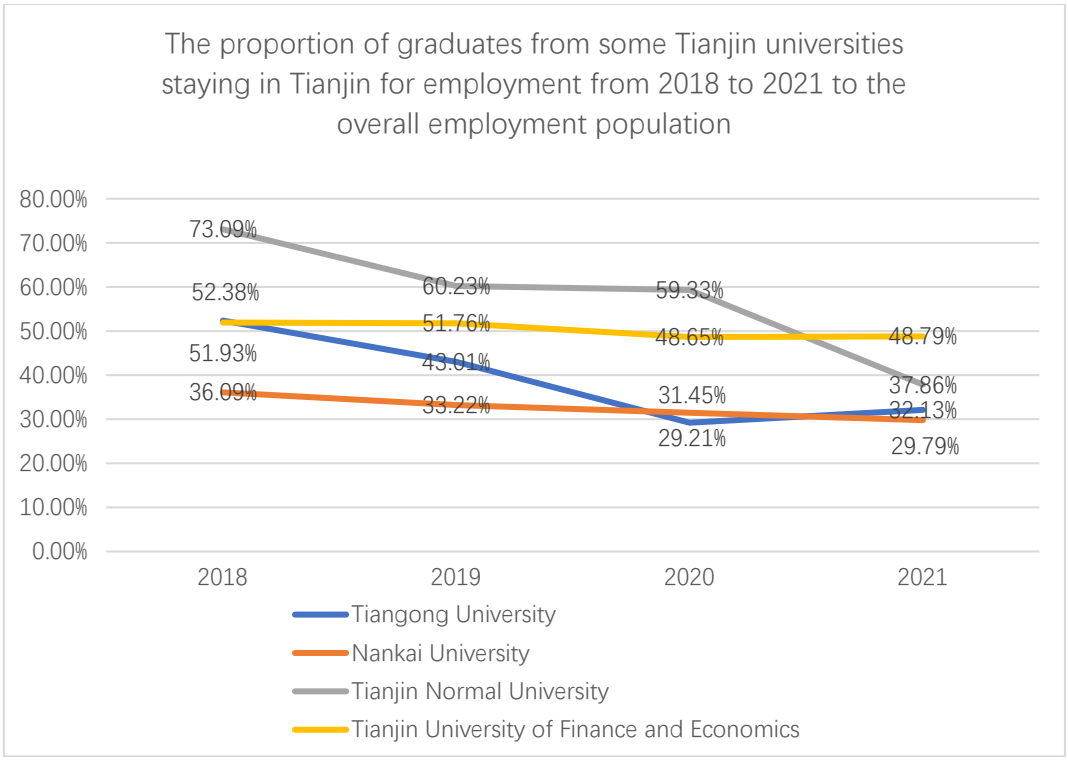

Figure 4: The proportion of graduates from some Tianjin universities staying in Tianjin for employment from 2018 to 2021 to the overall employment population

In 2022, Tianjin's GDP increased by 1% to 1.63 trillion yuan, maintaining the 11th place in the national urban GDP after falling out of the top ten for the first time in 2021. Shanghai, Beijing, Shenzhen, Chongqing, and Guangzhou still lead the national economy, while cities such as Chengdu and Nanjing are developing rapidly. The slowdown in economic growth, Beijing's siphon effect on talent, and the rapid development of cities in the south have all made Tianjin's attraction to talent relatively weaker.[5]

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In recent years, various regions have introduced talent attraction policies, which undoubtedly increases the mobility of talents and the difficulty of retaining talents trained by local higher education institutions in Tianjin. The focus of Tianjin's "Haihe Plan" to attract talents is the same as other major cities, mainly in reducing the threshold for settling down and providing subsidies. Compared to other cities, its advantages are not obvious. The proportion of graduates from Tianjin's higher education institutions who stay in Tianjin for employment each year can directly reflect the attractiveness of Tianjin to the talents cultivated by local higher education institutions. The relevant data of Tiangong University, Nankai University, Tianjin Normal University, and Tianjin University of Finance and Economics are relatively complete. According to the statistical analysis of the "Graduate Employment Quality Report" released by these four universities from 2018 to 2021, the proportion of graduates staying in Tianjin for employment as a whole has shown a downward trend (Figure 4). This indicates that Tianjin's attractiveness to talents trained by local higher education is decreasing.

4. Strategies for Supporting High Quality Economic Development in Tianjin through Higher Education

Supporting high-quality economic development in Tianjin through higher education is a dynamic development proposition. Higher education has made significant contributions to the economic development of Tianjin in terms of research output and talent resources. However, it also faces issues such as mismatch between talent cultivation in universities and the needs of optimizing and upgrading the industrial structure of Tianjin, unequal investment and transformation of scientific research results, weakened talent attraction, and disharmony between the huge demand for talent in high-quality economic development. In order to promote higher education to support the high-quality development of Tianjin's economy, this paper proposes the following countermeasures:

4.1. Optimize Talent Training Programs to Support the Optimization and Upgrading of Tianjin's Industrial Structure

Serving regional economic development is the responsibility and obligation of higher education. Firstly, the focus of major settings in various universities in Tianjin should match the focus of Tianjin's economic development, with a focus on supporting the high-quality development of strategic emerging industries such as new materials, new energy, biopharmaceuticals, aerospace equipment, etc. in Tianjin. Teaching resources should be tilted towards majors related to these industries to improve the quality and level of talent. Secondly, we should establish a diversified talent cultivation model. A diversified talent cultivation model can break traditional disciplinary barriers, promote interdisciplinary integration, cultivate versatile talents, and provide more impetus for promoting the optimization and upgrading of Tianjin's industrial structure. From Table 1, we can see those majors such as finance, computer science and technology are advantageous ones in some universities in Tianjin. We can focus on exploring the auxiliary role of these majors in Tianjin's strategic information emerging industries, so as to organically combine the two.[6] Thirdly, according to the dynamic needs of industrial development, adjust the professional settings and talent cultivation plans to improve the pertinence of talent cultivation. We can use big data technology to analyze the recruitment information of enterprises, establish a profile of scarce positions, and provide guidance for professional settings and course design.

4.2. Strengthen Innovation in Scientific Research Systems, and Promote the Transformation of Scientific Research Achievements

Scientific research achievements that can withstand industry and market tests are truly valuable achievements. Firstly, it is necessary to improve the intellectual property protection system and benefit allocation mechanism, effectively protect the interests of scientific researchers, stimulate their enthusiasm for high-level research and participation in the transformation of scientific research results, and thus promote the efficiency of the transformation of scientific research results.[7] Secondly, encourage the two-way flow of personnel between universities and enterprises. Specific measures include enterprise employees giving lectures on campus, university teachers serving as enterprise consultants to solve practical problems, and exploring mechanisms for universities and enterprises to jointly cultivate students. The mechanism of school enterprise joint training of students can refer to the apprenticeship cooperative education model in the United States. After six months of enrollment, the actual training of the enterprise and university teaching will alternate for about two months.[8] University teachers and students are guided by practical problems when conducting scientific research, which can greatly

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improve the practicality of scientific research results and thereby improve the success rate of scientific research transformation.

4.3. Improve Policies to Attract Talents and Fully Develop Talent Resources

Talent is the core element of enterprise innovation and industrial development. Currently, Tianjin is undergoing innovation transformation, pursuing high-quality development, and achieving independent innovation and development, all of which require more talents. The government can further relax the conditions for the introduction and settlement of education-oriented talents, qualification-oriented talents, skill-oriented talents, entrepreneurial talents, and urgently needed talents, and provide convenience for them in various aspects such as work, life, innovation and entrepreneurship. Tianjin should attract talents through the industrial chain, accelerate the introduction of high-level talents, urgently needed talents, and young talents. Tianjin should form a deep integration of talents and industries by introducing personnel from strategic emerging industries such as artificial intelligence, biopharmaceuticals, new energy and materials, and high-end equipment manufacturing.

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