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Construction and Analysis of New Quality Productivity Evaluation Index System in Shanghai

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Abstract: The development of new quality productivity is a significant strategic decision focused on high-quality economic development. Shanghai, as an influential international metropolis, leads the nation in scientific innovation, technological innovation, and industrial innovation, playing a pioneering and demonstrative role in promoting new quality productivity. This paper constructs an evaluation index system by collecting relevant data on new quality productivity from authoritative websites and integrating these data to present and analyze the evaluation index system for new quality productivity in Shanghai. The constructed evaluation index system comprises four primary indicators: scientific and technological innovation, industrial development, talent, and green development, along with corresponding secondary indicators. The study reveals that although there is room for improvement in innovation efficiency in Shanghai, the city shows a positive development trend in new quality productivity, particularly in the number of high-tech enterprises and investment in scientific research. This paper aims to provide a comprehensive understanding of the development status of new quality productivity in Shanghai and offer reference value for analyzing new quality productivity nationwide.

Keywords: Shanghai, New Quality Productivity, Development Level Measurement, Evaluation Index System.

1. Introduction

In the context of profound global economic transformation and rapid technological advancement, new quality productivity has emerged as a new engine driving economic and social development, becoming a crucial factor in national competitiveness. As China's economic center, the development level of Shanghai's new quality productivity is not only vital for the region's economic transformation and upgrading but also has far-reaching impacts on the national and global economic landscape. Therefore, analyzing the development level of Shanghai's new quality productivity is of great significance for understanding development trends and formulating effective policy measures. This paper first introduces the foundational overview of the development of new quality productivity in Shanghai, emphasizing the importance and objectives of the research. Subsequently, the paper constructs a comprehensive evaluation index system and, through the collection and processing of relevant data, analyzes the development level of Shanghai's new quality productivity. This provides

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a new perspective and basis for understanding the development status of new quality productivity in Shanghai and helps inform relevant decision-making.

2. Overview of the Development Foundation of Shanghai's New Quality Productivity

"The acceleration of new quality productivity development to solidify high-quality growth" [1] highlights China's strategic shift towards "new" and "quality" in economic development. Since the formal introduction of the concept of new quality productivity, the academic community has extensively explored its connotations and characteristics. New quality productivity refers to a comprehensive ability driven by innovation, aimed at improving production efficiency and quality through technological advancements, informatization, and intelligence, characterized by high technology, high efficiency, and high quality. Unlike traditional productivity, it is a new engine for economic and social development and a new driving force for Chinese-style modernization [2]. New quality productivity encompasses various fields, including intelligent manufacturing, new-generation information technology, new energy technology, and biotechnology. The development in these areas has disrupted traditional production methods and development paths, reconstructing high-quality economic development. The development of new quality productivity is particularly prominent in the Yangtze River Delta urban agglomeration. By 2023, the GDP of the Yangtze River Delta accounted for about a quarter of the national total, with an economic aggregate reaching 30.5 trillion yuan. As the leading city in the Yangtze River Delta integration, Shanghai plays a pivotal role in "high quality" development. Shanghai, also the top economic center city in the country and a global metropolis, achieved a regional GDP of 4.721866 trillion yuan in 2023, maintaining its position as the leading national economic center city. At constant prices, this represents a 5.0% increase over the previous year. From the perspective of industrial growth, the added value of the tertiary industry was 3.55096 trillion yuan, an increase of 6.0%. In terms of per capita disposable income, the per capita disposable income of Shanghai residents was 84,834 yuan in 2023, a nominal increase of 6.6% over the previous year, with a real increase of 6.3% when adjusted for inflation. Overall, Shanghai's economic development is progressing steadily, with a solid promotion of high-quality economic growth, forming an essential foundation for the development of new quality productivity. Shanghai has a leading advantage in developing new quality productivity, excelling in scientific and industrial innovation nationwide and having made significant efforts in new quality productivity layout. Furthermore, with the deepening of a new round of technological revolution and industrial transformation, many new technologies and industries are still in their infancy, and the foundational and developmental levels among countries are relatively similar. This provides an opportunity for Shanghai to seize the moment and continually develop new quality productivity, achieving breakthroughs through strategic maneuvering [3]. Despite the rising complexity, severity, and uncertainty of the external environment, economic development faces challenges. Shanghai is still in a transition period between old and new industries and between traditional and new drivers of growth, relying significantly on old drivers. Additionally, industrial development faces constraints from population, resources, and the environment. In 2023, the national intensity of research and experimental development (R&D) expenditure (as a percentage of GDP) was 2.64%, with basic research funding accounting for 6.57% of R&D expenditure. The proportion of basic research in total social R&D investment during the 14th Five-Year Plan period still lags significantly behind developed countries. Although China's overall R&D investment is comparable to the EU average, the shortfall in basic research investment is substantial, with a significant gap compared to developed countries. Moreover, many scientific research achievements in China have not been commercialized or converted into actual productivity. In developing new quality productivity, Shanghai needs to pioneer mechanisms for the industrialization of scientific and technological achievements to set an

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example. How to enhance the quality of the economy has become a crucial issue in Shanghai's development of new quality productivity.

3. Construction and Analysis of Shanghai's New Quality Productivity Evaluation Index System

3.1. Data Sources and Index System Construction

New quality productivity encompasses aspects such as innovation-driven development, green and low-carbon initiatives, open integration, and human-centric intrinsic values. To assess the development level of new quality productivity in Shanghai, a series of measurement indicators need to be established. Given the incomplete nature of data collection, this paper selects representative indicators to construct a comprehensive evaluation system composed of 4 primary indicators and 9 secondary indicators. The primary indicators are: Technological Innovation, Industrial Development, Talent, and Green Development. The secondary indicators are further detailed as follows: Technological Innovation Indicators: Number of High-Tech Enterprises, Number of High-Value Invention Patents per 10,000 People, and Research and Development (R&D) Expenditure (in 100 million yuan). Industrial Development Indicators: Proportion of the Tertiary Industry and Added Value of Core Digital Economy Industries. Talent Indicators: Number of High-Skilled Talents and Gross Enrollment Rate in Higher Education. Green Development Indicators: Energy Consumption Reduction Rate per Unit GDP and Forest Coverage Rate. Data for the past four years were collected from relevant authoritative departmental websites. These indicators were compiled and analyzed using cluster analysis to identify differences and characteristics of various indicators, which serve as a reference for evaluating the development level of new quality productivity in Shanghai [4].

Table 1: Construction of the Index System

Technological Innovation Indicators	2023	2022	2021	2020
Number of High-Tech Enterprises	Over 24,000	Over 22,000	Over 20,000	17012
Number of High-Value Invention Patents per 10,000 People	50.2	40.9	33.2	60.21
R&D Expenditure (in 100 million yuan)		1981.6	1700	

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Table 1: (continued)

Industrial Development Indicators	2023	2022	2021	2020
Proportion of the Tertiary Industry	75.2 %	74.12%	73.3%	73.1%
Added Value of Core Digital Economy Industries (in 100 million yuan)	6600	5500		
Talent Indicators	2023	2022	2021	2020
Number of High-Skilled Talents (in 10,000 people)				116
Gross Enrollment Rate in Higher Education (%)	60.2%	59.6%	57.8%	
Green Development Indicators	2023	2022	2021	2020
Energy Consumption Reduction Rate per Unit GDP (%)		6.1%	1.5%	

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Table 1: (continued).

Forest Coverage Rate (%)	18.81%	18.51%	19.42%

3.2. Analysis of the Index System

Based on the data from Shanghai's technological innovation indicators, the number of high-tech enterprises has shown a significant growth trend, increasing from less than 10,000 in 2020 to over 24,000 in 2023. This indicates a tremendous potential for growth in high-tech enterprises in Shanghai, showcasing robust innovation vitality and strong momentum for the development of new quality productivity. Regarding the number of high-value invention patents per 10,000 people, it peaked at 60.21 in 2020, achieving the "13th Five-Year Plan" target. Despite a steady year-on-year increase, from 33.2 in 2021 to 40.9 in 2022 and 50.2 in 2023, the growth rate of innovation activities has slowed down. In terms of Research and Development (R&D) expenditure, it increased from 170 billion yuan in 2021 to 198.16 billion yuan in 2022, an approximate growth of 16.56%. This demonstrates a continuous increase in investment in R&D, reflecting the high importance placed on technological innovation by the government and enterprises. Overall, Shanghai's technological innovation indicators show a positive development trend, with the significant growth in the number of high-tech enterprises indicating notable success in nurturing innovative enterprises. The steady increase in R&D funding provides a solid material foundation for ongoing technological innovation. However, the stagnation in the peak number of high-value invention patents per 10,000 people since 2020 suggests that Shanghai needs to focus on enhancing innovation quality and efficiency, avoiding the mere pursuit of quantity growth. To further enhance technological innovation capabilities, it is recommended that Shanghai continue to optimize the innovation environment, increase R&D investment, and improve R&D output efficiency. Additionally, strengthening intellectual property protection and encouraging more original research and innovation activities by enterprises and individuals are crucial. Furthermore, fostering cross-regional cooperation to create a collaborative innovation environment will promote the overall technological innovation level in the Yangtze River Delta region [5].

According to the industrial development indicators of Shanghai, the proportion of GDP from the tertiary industry has grown from 73.1% in 2020 to 75.2% in 2023, indicating a slight upward trend. This shows that the tertiary industry is playing an increasingly important role in Shanghai's economic development. Regarding the added value of the core digital economy industries, it was 550 billion yuan in 2022, increasing to 660 billion yuan in 2023, maintaining about 13% of the city's GDP. This significant growth reflects the rapid expansion of the digital economy in Shanghai, contributing substantially to overall economic efficiency and competitiveness. Given the rapid growth of the digital economy and the increasing proportion of the tertiary industry in GDP, it is expected that Shanghai's economy will continue to transition towards a service-oriented and digital economy. The government and enterprises should continue investing in digital infrastructure and the service industry to accelerate the development of new quality productivity in Shanghai.

From the talent indicators, it is evident that in 2020, Shanghai formed a large-scale, high-quality skilled talent pool well-aligned with industrial development needs. Statistics show that the proportion of high-skilled talent among registered skilled laborers in Shanghai reached 35.03% in 2020, with a total of approximately 1.16 million high-skilled talents. This demonstrates Shanghai's strong attractiveness and competitiveness for talent nationwide, with the concentrated flow of high-skilled talents promoting knowledge and technology dissemination, accelerating regional innovation activities, and optimizing economic structure. In terms of the gross enrollment rate in higher

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education, the data for Shanghai was 59.6% in 2022, an increase from 57.8% in 2021, continuing to grow in 2023. The increase in the gross enrollment rate in higher education over the past three years reflects the richness and quality of higher education resources in Shanghai, which is crucial for attracting and cultivating high-end talents. These quality educational resources are also key drivers for technological innovation and industrial upgrading. The growth trend in the gross enrollment rate in higher education in Shanghai indicates a further enhancement of potential in talent cultivation and scientific research innovation in the future.

Combining the data from industrial development and talent indicators, it is clear that Shanghai demonstrates strong advantages in attracting talent and higher education resources. This advantage creates a virtuous cycle: on one hand, the rich talent resources and high-quality university resources mutually promote each other, enhancing regional innovation capabilities and economic vitality; on the other hand, the growth of the digital economy further attracts more outstanding talents, creating a talent aggregation effect. However, the high concentration of talent might also pose challenges such as rising housing prices, increased living costs, and competitive pressures, potentially affecting long-term talent retention and development. Therefore, while benefiting from the talent dividend, Shanghai needs to continuously improve relevant policies to ensure the sustainable development and utilization of talent resources. From a practical perspective, Shanghai's significant advantages in talent quantity and educational resources are crucial for the continuous and healthy development of new quality productivity. At the same time, it is important to address potential challenges through policy guidance and management innovation to achieve coordinated progress in talent and economic and social development in Shanghai.

According to the green development indicators of Shanghai, the energy consumption reduction rate per unit GDP decreased from 1.5% in 2021 to 6.1% in 2022. The energy consumption per unit GDP reflects the amount of energy consumed to produce one unit of Gross Domestic Product (GDP), indicating the relationship between economic growth and energy consumption. The increase in the energy consumption reduction rate per unit GDP shows that Shanghai has managed the relationship between economic growth and energy consumption well, achieving effective control over energy consumption while maintaining or increasing economic output. This implies that Shanghai is making strides in more efficient energy use and optimizing industrial structure upgrades. On the other hand, the forest coverage rate reflects the richness of forest resources and the state of ecological balance. The forest coverage rate decreased from 19.42% in 2021 to 18.51% in 2022 but rebounded to 18.81% in 2023. The fluctuation in forest coverage rate may reflect the trade-offs between economic development and environmental protection in Shanghai. Balancing economic growth with environmental protection is a significant challenge that the Shanghai government and enterprises need to address. Overall, these two indicators show that Shanghai is striving to achieve green development while pursuing economic growth. The reduction in energy consumption per unit GDP and the fluctuation in forest coverage rate indicate that Shanghai is attempting to achieve a win-win situation for economic growth and environmental protection through technological innovation, industrial upgrades, and policy guidance.

4. Conclusion

As China's economic center and an international metropolis, Shanghai has demonstrated significant leadership and exemplary effects in the development of new quality productivity. By constructing a comprehensive evaluation index system that encompasses four core dimensions—technological innovation, industrial development, talent support, and green development—this paper provides an in-depth analysis of the current state and trends of new quality productivity in Shanghai. Despite the room for improvement in innovation efficiency, the strong momentum and substantial development potential in the field of new quality productivity in Shanghai are evident. This paper not only

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elaborates on the advantages and challenges of Shanghai's new quality productivity but also provides policymakers and researchers with a set of quantitative evaluation tools through meticulous data integration and analysis. These tools are instrumental in accurately identifying and promoting the key elements of new quality productivity, thereby fostering sustainable high-quality economic development. In the future, Shanghai is expected to further leverage its robust technological foundation and open innovation environment to optimize resource allocation, enhance innovation efficiency, and lead new quality productivity to higher levels. This will contribute more "Shanghai wisdom" and "Chinese solutions" to national and global economic development.

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