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Measurement of the Development Level of New Productivity in Sichuan Province

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Abstract

New-quality productive forces are characterized by the leap in the optimization of the combination of laborers, means of production, and objects of labor, with the core feature being a significant improvement in total factor productivity. The article constructs an evaluation index system for new-quality productive forces and applies the entropy-weighted TOPSIS method to assess the 18 prefec-ture-level cities in Sichuan Province from 2016 to 2021. The results show that the new-quality productive forces of all prefecture-level cities generally exhibit an upward trend, but there was a slight decline in 2020. An analysis of the pri-mary indicators of new-quality productivity reveals that the levels of techno-logical productivity, green productivity, and digital productivity in Sichuan Province's prefecture-level cities showed an overall upward trend from 2016 to 2021. To enhance Sichuan Province's new-quality productivity, strategies such as strengthening regional collaboration to promote balanced development, in-creasing efforts to guide the development of new-quality productivity, and re-adjusting the three key indicators constituting new-quality productivity can be employed to optimize the development path of new-quality productivity in Si-chuan Province.

Keywords

New quality productivity; Evaluation indicators; Entropy weight TOPSIS method

1. Introduction

In September 2023, General Secretary Xi Jinping first put forward the concept of “new quality productivity” during his visit to Heilongjiang, and further elaborated on it at the Symposium on Promoting Comprehensive Revitalization of the Northeast in a New Era, which was held in Harbin, and again emphasized “promoting industrial innovation through scientific and technological innovation” at the Central Economic Work Conference in December. The Central Economic Work Conference in Decem-ber re-emphasized the importance of “promoting industrial innovation through sci-entific and technological innovation, especially the development of new industries, new modes and new kinetic energies through disruptive and cutting-edge technolo-

gies, and the development of new-quality productive forces". Later, in January 2024, General Secretary Xi Jinping systematically elaborated on the importance of new quality productivity during the 11th collective study of the Political Bureau of the CPC Central Committee, taking it as an inherent requirement and an important focus point for promoting high-quality development. And on March 5, 2024, the Government Work Report formally wrote about new quality productivity. New quality productivity emphasizes the qualitative leap of productivity through technological innovation, model innovation and institutional innovation, with the remarkable features of high technology, high efficiency and high quality. It not only represents the new direction of productivity development, but is also an important engine for regional economic transformation and upgrading to enhance competitiveness. As an important economic center in the western region of China, Sichuan Province has made remarkable progress in the fields of science and technology innovation, green development and digital economy in recent years, and the new quality productivity has shown a vigorous development. However, the development of new quality productivity in Sichuan Province still faces many challenges, such as unbalanced regional development, uneven distribution of innovation resources, and shortage of high-end talents. An in-depth study of the current situation, trends and challenges of the development of new quality productivity in Sichuan Province is of great theoretical and practical significance for promoting the high-quality development of Sichuan Province's economy and enhancing regional competitiveness.

Regarding the connotation of new quality productivity, many scholars in the academic world have studied it. Zhang Lin and Pu Qingping (2023) argue that new-quality productive forces refer to productive forces of a new quality and high standard, representing a new type of productive force that differs from traditional ones and surpasses old-quality productive forces in terms of quality. It is a highly efficient and high-quality ability to utilize and transform nature, driven by strategic emerging industries and future industries under the leadership of scientific and technological innovation. It plays a leading role in the new technological revolution, It is productivity driven by high-tech innovation; it possesses the forward-looking nature of new industrial empowerment, being productivity rooted in emerging and future industries; and it has the purpose of high-quality development, serving as productivity dedicated to providing a high-quality, fulfilling lifestyle[1]. Pu Qingping and Xiang Wang (2023) believe that the new quality productivity is the advanced form of productivity in the informationization and intelligent society, which is mainly composed of "high-quality" workers, "new medium" labor materials and "new materials". It mainly consists of three elements: "high-quality" workers, "new medium" labor materials and "new material" labor objects[2]. Zhou Wen and Xu Lingyun (2023) studied the connotation of new quality productivity from the perspective of political economy, and concluded that new quality productivity is the productivity generated by scientific and technological innovation and key disruptive

technological breakthroughs, and it is the transcendence of the traditional productive forces, which requires new relations of production to adapt to it[3]. Yang Guangyue (2024) studies the new quality productivity from four aspects: generative logic, concept and characteristics, research value and path formation, and fully explores the connotation of new quality productivity from three perspectives: the essence of new quality productivity, the elements of new quality productivity and the comparison with traditional productivity[4]. Gong Xiaoying and Yan Yujun (2024) argue that new quality productivity is productivity centered on scientific and technological innovation, productivity with strategic emerging industries and future industries as its pillars, and productivity with the value goal of satisfying the people's aspirations for a better life, while incorporating the new concept of development aimed at meeting the requirements of high-quality, high-efficiency, and low-carbon green development[5]. Jia Ruoxiang and Dou Hongtao (2024) believe that the "quality" of the new quality productivity emphasizes "quality and excellence", which is different from the traditional factors of productivity such as the massive consumption of labor, energy resources and ecological environment, and that the new quality productivity is more embodied in the systematic reshaping of the factors of production and the overall restructuring of the new quality productivity. Regarding the characteristics of new-quality productivity[6]. Li Zheng and Liao Xiaodong (2023) believe that the basic characteristics of new-quality productivity are: digitalization, networking, intelligence and greening[7]. According to Xu Zheng et al. (2023), the key features of the new quality productivity are: taking the new development concept as the ideological guide, taking scientific and technological innovation as the fundamental driving force, and taking industry cultivation as the main focus[8]. Yang Guangyue (2024) believes that the new quality productivity is driven by science and technology innovation, with the direct purpose of high-quality development, and with the future foresight of new industry empowerment[4].

Scholars have devoted themselves to the research on the connotation characteristics and evaluation index system of new quality productivity, but there is a lack of measurement of the level of new quality productivity of each prefecture-level city and state within a single province. Therefore, this paper evaluates the new quality productivity level of 18 prefecture-level cities in Sichuan Province by constructing a new quality productivity index system, aiming to provide a basis and reference for the research and evaluation of new quality productivity in Sichuan Province.

2. Measurement of new quality productivity in Sichuan Province

2.1. Construction of the indicator system

In this paper, we refer to Lu Jiang et al. (2024) indicator selection method on new quality productivity to construct a new quality productivity evaluation indicator system, as shown in Table 1. The indicator system includes three first-level indicators of scientific and technological productivity, green productivity and digital

productivity, six second-level indicators of innovative productivity, technological productivity, resource-saving productivity, environmentally friendly productivity, digital industrial productivity and industrial digital productivity, so as to evaluate the situation of new-quality productivity in the 18 prefectural-level municipalities in Sichuan Province.

Table 1. New quality productivity indicator system in Sichuan Province.

Tier 1 indicators	Tier 2 indicators	Measurement modalities	Units	Attributes
Science and technology productivity	Innovative productivity	Number of domestic patents granted	Piece	+
		Revenue from high-tech industries	Hundred million yuan	+
		New product development expenditure of industrial enterprises above designated size	Ten thousand yuan	+
	Technological productivity	Total value of technology market contracts concluded	Ten thousand yuan	+
		Publish scientific papers	Chapter	+
		Full-time equivalent R&D personnel in industrial enterprises above designated size	Hour	+
Green productivity	Resource-efficient productivity	Energy consumption per unit of regional GDP	Tons of standard coal/ Ten thousand yuan	-
		Industrial water consumption	Million cubic meters	-
	Environmentally friendly productivity	Total amount of industrial solid waste recycled	Percentage	+
		Industrial wastewater discharge	Ten thousand tons	-
		Industrial SO2 emissions	Ton	-
Digital productivity	Digital industrial productivity	Number of people employed in information transmission, software, and information technology services	Ten thousand people	+
		Total telecommunications business volume	Ten thousand yuan	+
	Industrial Digital Productivity	Number of Internet broadband access ports	Ten thousand households	+

2.2. measurement method

The Entropy Weighting Method is an objective weighting method based on information entropy. Information entropy is used to measure the uncertainty of infor-

mation; the smaller the entropy value, the lower the uncertainty of the information, and the higher the validity of the indicator, so it should be assigned a higher weight. The TOPSIS method is a ranking method that approximates the ideal solution, with the basic idea being to rank alternatives by calculating the distance between them and the ideal solution and the negative ideal solution. The entropy-weighted TOPSIS method is a method that combines the two.

2.3. Data and description

The new-quality productive capacity indicator system comprises 14 sub-indicators, with the sample scope covering panel data from 2016 to 2021 for 18 prefecture-level cities in Sichuan Province (excluding the three autonomous prefectures of Aba Tibetan and Qiang Autonomous Prefecture, Ganzi Tibetan Autonomous Prefecture, and Liangshan Yi Autonomous Prefecture). Data sources include: China Urban Statistical Yearbook, Sichuan Provincial Statistical Yearbook, Sichuan Provincial Science and Technology Yearbook, and statistical yearbooks of various prefecture-level cities in Sichuan Province. Due to minor data gaps in the original data, interpolation methods were used to process the missing data to minimize sample loss.

3. Level of new quality productivity in Sichuan Province

3.1. Overall level of new quality productivity in Sichuan Province

This paper uses Stata software to calculate the development level of new-quality productivity in the 18 prefecture-level cities of Sichuan Province from 2016 to 2021 based on the entropy-weighted TOPSIS method, as shown in Table 3. As shown in Table 3, the average level of new-quality productivity across prefecture-level cities in Sichuan Province steadily increased from 2016 to 2019, with the provincial average rising from 0.055 in 2016 to 0.072 in 2019. However, the average level of new-quality productivity across prefecture-level cities in Sichuan Province declined in 2020, with the provincial average decreasing from 0.072 in 2019 to 0.068 in 2020, and then increasing to 0.076 in 2021, which is higher than the level of new-quality productivity in Sichuan Province in 2019; Chengdu City's new-quality productivity level significantly leads the province, with its value notably higher than that of other cities. The overall level of new-quality productivity in Sichuan Province remains relatively low, indicating that while significant progress has been made in the development of new-quality productivity in the province, there is still considerable room for improvement. At the prefecture-level city level, the top five cities in terms of average new quality productivity development levels from 2016 to 2021, from highest to lowest, were Chengdu, Mianyang, Deyang, Nanchong, and Neijiang, while the bottom five were Panzhihua, Zigong, Ziyang, Guangyuan, and Bazhong. The average level of new-type productive forces in Chengdu, the highest in Sichuan Province, was 22.15 times that of Bazhong City, the lowest (0.026), highlighting the significant

disparities between cities. Due to the uneven distribution of resources within Sichuan Province, especially as Chengdu, as the provincial capital and economic hub, has received more resource allocation and policy support, its new-type productivity level is significantly higher than that of other cities. In contrast, regions with relatively fewer resources, such as Zigong City and Panzhihua City, have relatively lower new-type productivity levels.

Table 2. Development Level of New Productive Forces in Sichuan Province, 2016-2021.

Cities	2016	2017	2018	2019	2020	2021
Chengdu	0.481	0.533	0.593	0.632	0.589	0.630
Mianyang	0.100	0.114	0.120	0.129	0.096	0.116
Deyang	0.048	0.057	0.055	0.061	0.055	0.075
Yibin	0.028	0.032	0.037	0.041	0.040	0.060
Neijiang	0.020	0.041	0.043	0.055	0.048	0.046
Luzhou	0.025	0.029	0.033	0.037	0.041	0.043
Nanchong	0.031	0.035	0.039	0.062	0.047	0.043
Guang'an	0.021	0.022	0.022	0.027	0.036	0.040
Dazhou	0.034	0.029	0.029	0.030	0.032	0.040
Meishan	0.022	0.025	0.031	0.024	0.029	0.039
Leshan	0.021	0.025	0.024	0.027	0.029	0.037
Suining	0.019	0.022	0.030	0.029	0.030	0.036
Zigong	0.020	0.022	0.022	0.024	0.026	0.035
Panzhihua	0.024	0.026	0.023	0.023	0.025	0.029
Guangyuan	0.019	0.019	0.020	0.022	0.024	0.028
Ziyang	0.024	0.023	0.020	0.020	0.023	0.026
Bazhong	0.023	0.019	0.018	0.020	0.022	0.026
Ya'an	0.020	0.025	0.026	0.036	0.025	0.022
Yearly average	0.055	0.061	0.066	0.072	0.068	0.076

3.2. Levels of science and technology productivity, green productivity and digital productivity in Sichuan Province

Based on the trends in the three primary indicators shown in Table 3 and Figures 1 to 3, the level of scientific and technological productivity steadily increased from 2016 to 2019, declined in 2020, and recovered to the 2019 level in 2021. In terms of green productivity, there were no significant changes in Sichuan Province's green productivity from 2016 to 2019, fluctuating around the 0.18 level; however, from 2019 to 2021, green productivity levels showed a notable increase. In terms of digital productivity, except for a slowdown in growth in 2020, Sichuan Province's digital productivity maintained a consistent growth trend from 2016 to 2021. Sichuan Province has prioritized scientific and technological development, green growth, and digital infrastructure, implementing a series of policies and strategic initiatives. These efforts have yielded notable results in enhancing scientific and technological productivity, green productivity, and digital productivity.

Table 3. Subsystem Levels of New Productive Forces in Sichuan Province.

Year	Science and technology productivity	Green productivity	Digital productivity
2016	0.571 003	0.176 504	0.237 489
2017	0.643 538	0.179 946	0.288 053
2018	0.745 972	0.171 432	0.308 640
2019	0.818 082	0.184 093	0.334 621
2020	0.704 980	0.215 229	0.336 529
2021	0.831 417	0.246 013	0.350 850

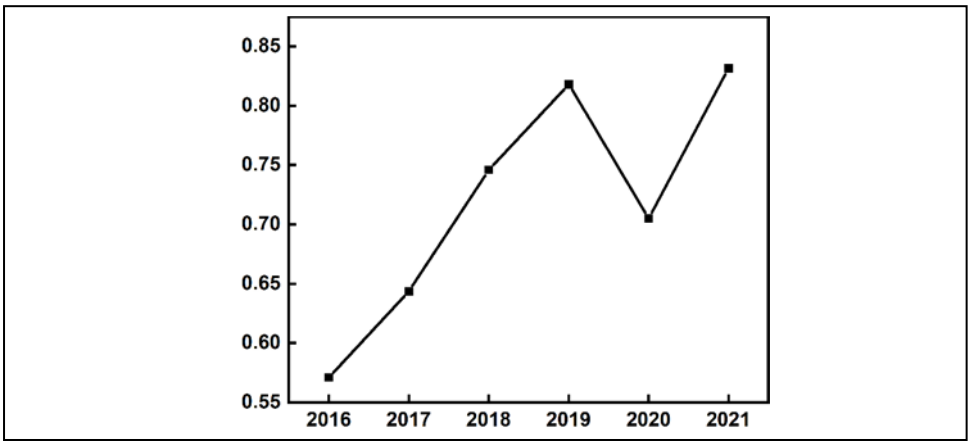

Figure 1. Science and technology productivity level in Sichuan Province.

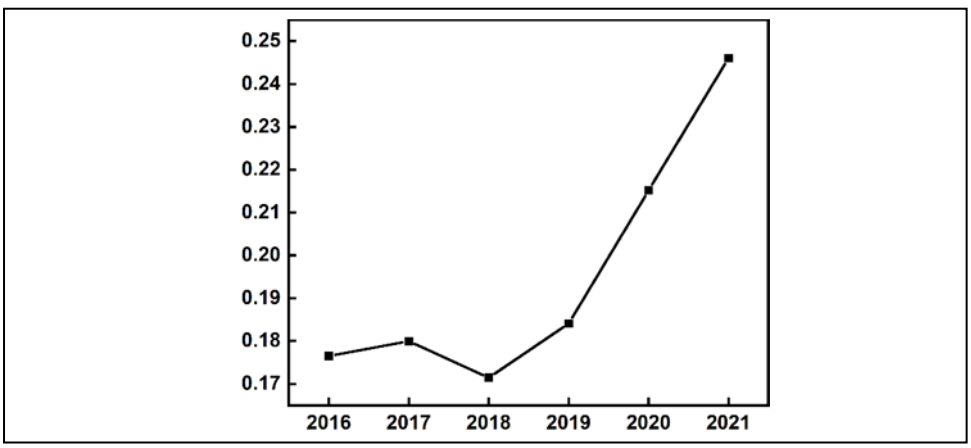

Figure 2. Green productivity level in Sichuan Province.

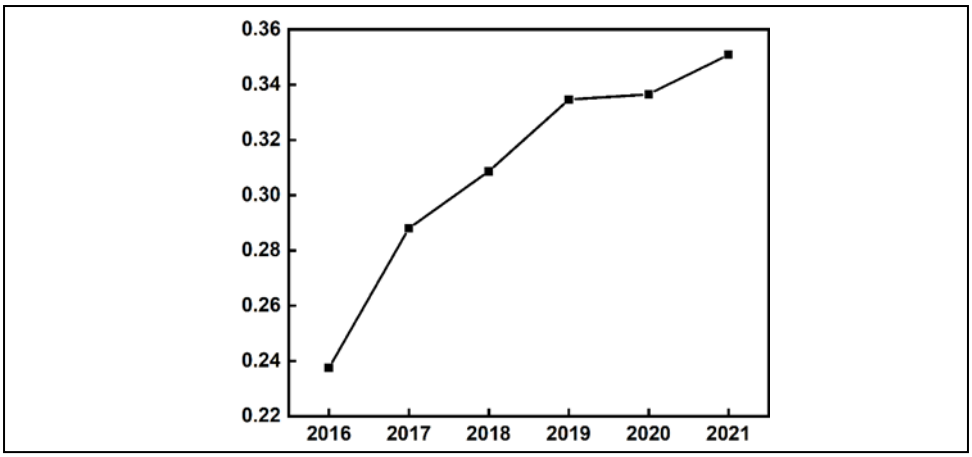

Figure 3. Digital productivity level in Sichuan Province.

4. Conclusions and recommendations

4.1. Conclusions

This paper constructs an evaluation index system for new-quality productive forces and employs the entropy-weighted TOPSIS method to measure the levels of new-quality productive forces in 18 prefecture-level cities in Sichuan Province from 2016 to 2021. The measurement results indicate that the overall levels of new-quality productive forces in prefecture-level cities across Sichuan Province have shown an upward trend, but experienced a certain decline in 2020. Among the cities that experienced a decline in new-type productive capacity in 2020, Chengdu, Mianyang, and Nanchong were the most notable. Analysis of the first-level indicators of new-type productive capacity revealed that the levels of scientific and technological productive capacity, green productive capacity, and digital productive capacity in Sichuan Province's prefecture-level cities all showed an upward trend from 2016 to 2021.

4.2. Recommendations

Based on the above conclusions, this paper proposes policy recommendations centered on the three dimensions of new-quality productive forces: technological productivity, green productivity, and digital productivity.

1) Regarding technological productivity. Strengthen the construction of the science and technology innovation system, leverage Sichuan Province's advantages as a major hub for science, education, and research, and accelerate the development of a science and technology innovation center with national influence. Cultivate and expand strategic emerging industries and future industries, adhere to innovation-driven development, accelerate the growth of new-quality productive forces, and actively nurture and expand strategic emerging industries and future industries. Accelerate the construction of a modern industrial system with Sichuan's unique

characteristics and advantages to expand the scale and capabilities of new-type productive forces.

2) Regarding green productive forces. Strengthen the construction of a green manufacturing system, promote green manufacturing technologies, and achieve green production. Intensify research and development of green products and accelerate the phasing out of outdated machinery and equipment and technologies. Enhance green financial support, develop financial products such as green loans and green bonds, and support green projects and green enterprises. Improve the green policy system, provide tax incentives and financial support to green enterprises, and encourage enterprises to actively participate in green production.

3) In terms of digital productivity. Strengthen the construction of digital infrastructure, accelerate the construction and optimization of 5G networks, ensure 5G network coverage throughout the province, and provide a solid infrastructure foundation for the development of digital productivity. Build data centers in key regions of Sichuan, such as Chengdu and Mianyang, to form an efficient, secure, and reliable data center system that meets the data storage and computing needs of digital productivity. Promote the development of the digital industry, leverage Sichuan's advantages in the electronics and information technology sector, and strengthen the development of the electronics manufacturing industry and software and information services industry to cultivate globally competitive electronics and information technology industry clusters.

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References

[1] Zhang Lin and Pu Qingping. (2023) The Connotative Characteristics, Theoretical Innovations, and Value Implications of New Quality Productivity. Journal of Chongqing University (Social Sciences Edition), 29(06), 137-148.

[2] Pu Qingping and Xiang Wang. (2024) The Connotative Characteristics, Internal Logic, and Implementation Pathways of New Quality Productivity: A New Engine for Advancing Chinese-Style Modernization. Journal of Xinjiang Normal University (Philosophy and Social Sciences Edition), 45(01), 77-85.

[3] Zhou Wen and Xu Lingyun. (2023) On New-Quality Productivity: Its Core Characteristics and Key Focus Areas. Reform, (10), 1-13.

[4] Yang Guangyue. (2024) The Current Status and Prospects of Research on New Quality Productivity. Economic Issues, (05), 7-17.

[5] Gong Xiaoying and Yan Yujun. (2024) The Basic Implications, Implementation Mechanisms, and Practical Pathways of New Quality Productivity. Henan Social Sciences, 32(04), 15-22.

[6] Jia Ruoxiang and Dou Hongtao. (2024) New Quality Productivity: Core Characteristics, Significant Implications, and Development Priorities. Journal of the Beijing Administrative College, (02), 31-42.

[7] Li Zheng and Liao Xiaodong. (2023) The Generative Logic, Original Value, and Practical Pathways of the Theory of New Quality Productivity. Jianghai Academic Journal, (06), 91-98.

[8] Xu Zheng, Zheng Linhao, Cheng Mengyao. (2023) The Internal Logic and Practical Vision of New Quality Productivity Empowering High-Quality Development. Contemporary Economic Research, (11), 51-58.

[9] Zhang Min. (2025) A Study on the Measurement and Influencing Factors of the Resilience of China’s High-Tech Industrial Chain. Statistics and Decision Making, 41(03), 118-123.

[10] Lu Jiang, Guo Ziang, Wang Yuping. (2024) Development Level, Regional Differences, and Improvement Pathways of New Quality Productivity. Journal of Chongqing University (Social Sciences Edition), 30(03), 1-17.