ISSN: 2710-0723

Study on the Measurement of New Quality Productive Forces and Regional Differences Across Chinese Provinces China

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Abstract

This paper constructs a theoretical framework for new quality productive forces. It explores the connotation of new quality productive forces from the perspectives of labor, production factors, and technological innovation. Using statistical methods such as the entropy method and the Dagum Gini coefficient method, it quantitatively evaluates the new quality productive forces levels of 30 provinces in China from 2012 to 2022. The study reveals that, overall, the new quality productive forces levels of these provinces have witnessed a significant increase. However, there are notable disparities among regions, with the eastern region having the highest level and the western region the lowest. There is no sign of convergence within the four major regions, and the inter -- regional differences continue to widen. In light of these findings, this paper proposes that policy - making should precisely target regional differences, strengthen coordinated regional development, promote the sustainable development of all regions, and establish a dynamic monitoring mechanism. The aim is to provide a theoretical basis and policy reference for the high - quality development of the Chinese economy.

Keywords

New Quality Productive Forces; Entropy Method; Dagum Gini Coefficient Method.

1. Introduction

With the profound transformation of the global economic landscape and the accelerated advancement of the scientific and technological revolution, the connotation and extension of productivity have been continuously expanding. As a key force driving the high - quality development of the economy, new quality productive forces have gradually become the focus of attention in academic and policy -- making circles. New quality productive forces emphasize achieving a qualitative change and leap in productivity through means such as technological innovation, optimal allocation of factors, and industrial structure upgrading, thus injecting new impetus into economic growth. However, due to the current unbalanced development of the regional economy in China, there are significant differences in the development levels of new quality productive forces in different regions. This not only affects the coordinated development among regions but also restricts the high - quality development of the national economy as a whole.

In recent years, China has made certain progress in the theoretical research and practical exploration of new quality productive forces. Scholars have explored the connotation of new quality productive forces from multiple dimensions such as labor, production factors, and technological innovation (Wang ,Wang ,2024), believing that it is the core driving force for promoting high - quality economic development. However, existing research mostly focuses on the theoretical level, lacking quantitative assessment of the level of new quality productive forces and systematic analysis of regional differences. Especially against the backdrop of

ISSN: 2710-0723

unbalanced regional economic development in China, how to accurately measure the new quality productive forces levels of various regions and formulate targeted policies to narrow regional gaps is an important issue that urgently needs to be addressed.

This paper aims to quantitatively evaluate the new quality productive forces levels of 30 provinces in China from 2012 to 2022 by constructing a theoretical framework for new quality productive forces and using statistical methods such as the entropy method and the Dagum Gini coefficient method. The research not only analyzes the changing trend of the overall new quality productive forces level across the country but also delves into the differences among regions and their dynamic change characteristics. Through a systematic analysis of the new quality productive forces levels in various regions, this paper reveals the current situation of regional imbalance in the development of new quality productive forces in China. Furthermore, it puts forward policy recommendations such as precisely focusing on regional differences, strengthening coordinated regional development, promoting the sustainable development of each region, and establishing a dynamic monitoring mechanism. These research findings are intended to provide a theoretical basis and policy reference for the high - quality development of China's economy, contributing to the realization of coordinated regional development and sustainable economic growth.

2. The Connotation of New Quality Productive Forces

Marx and Engels (2003) pointed out that productivity is the objective material force by which people utilize and transform nature to meet human needs in labor production. Productivity mainly consists of laborers, objects of labor, and means of production. The combination of the physical and mental strength of laborers with the objects of labor and means of production is a prerequisite for the realization of productivity.

2.1. The Object of Laborers in New Quality Productive Forces

The concept of labor talents under new quality productive forces encompass ideas, skills, and efficiency. Ideologically, it is to stimulate the creative enthusiasm of the public, instill a sense of innovation mission, and foster an innovative atmosphere. In terms of skills, it is about cultivating the skills of laborers to adapt to industrial transformation, thus forming human capital that promotes development. Regarding efficiency, it aims to increase labor productivity, ease the contradictions in China's development, and propel industrial upgrading.

2.2. The Object of Labor in New Quality Productive Forces

In the dimension of the object of labor, new quality productive forces are embodied in new - quality industries and the ecological environment. For new - quality industries, international industrial transfer presents challenges. China needs to promote the coordinated and integrated development of industries and build a modern industrial system. As for the ecological environment, past economic development has given rise to environmental problems. New quality productive forces emphasize ecological awareness. During industrial transfer, efforts should be made to reduce ecological damage, and industrial upgrading and ecological cycles should be achieved through digitalization.

2.3. The Object of Production in New Quality Productive Forces

The means of production include physical and intangible resources. Physical resources consist of traditional and digital infrastructure. Digital infrastructure can efficiently process data and create economic value. Intangible resources are manifested through scientific and technological innovation and digitalization. Scientific and technological innovation lies at the core of new quality productive forces, highlighting the role of innovation in driving technological

ISSN: 2710-0723

transformation. Digitalization facilitates enterprise transformation and the development of the digital economy, and promotes the integration of digital technologies with the real economy.

3. Measurement of the Level of New Quality Productive Forces

3.1. Construction of the Evaluation Framework

Based on the definition of the connotation of new quality productive forces, and referring to the approach of Wang and Wang (2024), a comprehensive evaluation framework for new quality productive forces is constructed from three dimensions: laborers, objects of labor, and means of production:

3.1.1. Laborer Dimension

Seven indicators are employed to assess laborers. The average years of education per capita is utilized to represent the per capita educational attainment. Referring to the research approach of Fu (2010), the educational level of the labor force is categorized into five levels, and then the vector - angle method is applied to measure the human capital structure of laborers. The proportion of the number of college students in the total population is used to mirror the structure of college students. GDP per capita is adopted to gauge the relationship between economic output and the population. The average wage of on - the - job employees serves to indicate the per capita wage. The proportion of employees in the tertiary industry within the total employment is used to reflect the proportion of employees in the tertiary sector. The China Regional Innovation and Entrepreneurship Index (IRIEC) compiled by the Big Data Research Center for Enterprises at Peking University is used to measure the entrepreneurial activity. This index can objectively and in real - time showcase the innovation and entrepreneurship vitality of various regions in China from multiple perspectives.

3.1.2. Object of Labor Dimension:

It encompasses six indicators. Referring to the methods of Lü and Sun (2014), the proportion of emerging strategic industries is measured by the ratio of the added value of emerging strategic industries to GDP. The number of robots is determined by the ratio of the number of robots to the total population. The forest coverage rate is the proportion of forest area to the total land area. The intensity of environmental protection is reflected by the proportion of environmental protection expenditure in the government's public financial expenditure. Pollutant emissions are measured by the ratios of sulfur dioxide emissions, wastewater discharges, and the generation of general industrial solid waste to GDP. The treatment of industrial waste is also taken into account in the object of labor.

3.1.3. Means of Production Dimension

It includes eight tertiary - level indicators. Traditional infrastructure is measured by the length of highways and railways. Digital infrastructure is reflected by the length of optical fibers and the number of Internet broadband access ports per capita. Overall energy consumption is measured by the ratio of energy consumption to GDP. Renewable energy consumption is the ratio of the renewable energy power consumption to the total electricity consumption of the whole society. The number of patents per capita is the ratio of the number of authorized patents to the total population. R & D investment is measured by the ratio of R & D expenditure to GDP. Referring to the research of Zhao et al. (2020), the digital economy is measured from two dimensions: Internet development and digital financial inclusion. Enterprise digitalization is measured by using the keywords that appear in the annual reports of listed companies, locating the enterprises at the provincial level, and taking the average of the total word frequencies.

ISSN: 2710-0723

3.2. Measurement Methods

3.2.1. Entropy Method

The Entropy method is an objective weighting method, which can be used to determine the weights of various indicators in the comprehensive evaluation index system. Its core idea is to use the concept of information entropy to determine the contribution of each indicator to the evaluation system by measuring the uncertainty and information content of the data. The smaller the entropy value, the greater the amount of information, indicating that the indicator contributes more to the system differences, and thus has a higher weight, and vice versa. Before performing the weighting operation on the indicators, it is necessary to preprocess the original indicator data. Referring to the research of Liu et al. (2020), this paper uses the range standardization method to process the indicator data.

For positive indicators:

$$x_{ij} = \frac{x_{ij} - \min(x_j)}{\max(x_j) - \min(x_j)} \tag{1}$$

For reverse indicators:

$$x_{ij} = \frac{\max(x_j) - x_{ij}}{\max(x_j) - \min(x_j)} \tag{2}$$

$$\omega_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \tag{3}$$

Calculate the information entropy of the indicator e_j, where m is the number of years of evaluation:

$$e_j = -\frac{1}{\ln m} \sum_{i=1}^{m} \omega_{ij} \ln \omega_{ij} \tag{4}$$

Calculate the redundancy of information entropy ρ_j:

$$\rho_j = 1 - e_j \tag{5}$$

And the required indicator weights λ_j:

$$\lambda_j = \frac{\rho_j}{\sum_{j=1}^{n} \rho_j} \tag{6}$$

ISSN: 2710-0723

Calculate the level of new quality productive forces based on the proportion of indicators ω_{ij} and the corresponding weights λ_j:

$$U_i = \sum_{j=1}^{m} \lambda_j \tag{7}$$

3.2.2. Dagum Gini Coefficient and its Decomposition Method

The Dagum Gini coefficient and its decomposition method is a method capable of measuring regional differences. The Gini coefficient can be decomposed into three parts: within -- region disparity, between -- region disparity, and trans -- var component (Zhang et al., 2022). In this paper, the above -- mentioned method is used to calculate and decompose the Gini coefficients of various regions in China respectively. The overall Gini coefficient is defined as shown in Equation (8), where k represents the number of regional divisions, n represents the number of provinces, $Y_{ji}(Y_{hr})$ represents the level of new quality productive forces of province i(r) in regionj(h), $n_j(n_h)$ represents the number of provinces in region j(h), and $\bar{Y}$ represents the average level of new quality productive forces of all provinces.

$$G = \frac{\sum_{j=1}^{k}\sum_{h=1}^{k}\sum_{i=1}^{n_j}\sum_{r=1}^{n_h}|Y_{ji}-Y_{hr}|}{2n^2\bar{Y}} \tag{8}$$

$$G_{jj} = \frac{\frac{1}{2\bar{Y}}\sum_{i=1}^{n_j}\sum_{r=1}^{n_j}|Y_{ji}-Y_{jr}|}{n_j^2} \tag{9}$$

$$G_{jh} = \frac{\sum_{i=1}^{n_j}\sum_{r=1}^{n_h}|Y_{ji}-Y_{hr}|}{n_j n_h(Y_j+\overline{Y_h})} \tag{10}$$

Equation (9) and Equation (10) represent the Gini G_{jj} coefficient of region j and the Gini G_{jh} coefficient between region j and region h respectively. Among them, $\bar{Y}_j(\overline{Y_h})$ it represents the average value of the new quality productive forces in region j(h).
The definitions of the following variables are:

$$P_j = \frac{n_j}{n} \tag{11}$$

$$S_j = \frac{n_j\bar{Y}_j}{n\bar{Y}} \tag{12}$$

$$M_{jh} = \int_0^{\infty} dF_j(Y) \int_0^{Y} (Y-x)dF_h(x) \tag{13}$$

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$$N_{jh} = \int_0^{\infty} dF_h(Y) \int_0^{Y} (Y - x) dF_j(x) \tag{14}$$

$$D_{jh} = \frac{M_{jh} - N_{jh}}{M_{jh} + N_{jh}} \tag{15}$$

D_{jh} represents the relative impact of new quality productive forces between region j and region h, and M_{jh} represents the difference in the level of new quality productive forces between regions, that is, in regions j and h , the mathematical expectation of the sum of all sample values where$Y_{ji} - Y_{hr} > 0$. N_{jh} represents the trans -- var first -- order density distribution function. The within -- region disparity G_w, the between - region disparity G_{nb}, and the trans - var component G_t are as follows:

$$G_{ww} = \sum_{j=1}^{k} G_{jj} P_j S_j \tag{16}$$

$$G_{nb} = \sum_{j=2}^{k} \sum_{h=1}^{j-1} G_{jh} D_{jh} (P_j S_h + P_h S_j) \tag{17}$$

$$G_t = \sum_{j=2}^{k} \sum_{h=1}^{j-1} G_{jh} (P_j S_h + P_h S_j)(1 - D_{jh}) \tag{18}$$

3.3. Data and Explanation

The new quality productive forces indicator system consists of 27 sub - indicators. The sample scope is the panel data of 30 provinces in China (excluding Hong Kong, Macau, Taiwan, and Tibet) from 2012 to 2022. The data sources include the China Industrial Statistics Yearbook, China Energy Statistics Yearbook, China Environmental Statistics Yearbook, and the statistical yearbooks of various provinces, etc. Due to the presence of a small amount of missing data in the original data, in order to reduce sample loss, the missing data are processed using the analogical method or the interpolation method.

3.4. Estimation Results

Based on the data collection and processing done previously, and according to the comprehensive evaluation framework of new quality productive forces constructed above, the levels of new quality productive forces of 30 provinces across the country from 2012 to 2022 can be obtained, as shown in Table 1 below: In terms of the growth rate, the levels of new quality productive forces in all provinces have increased. Among them, Guangdong Province has the highest growth rate, reaching 168%, while Guangxi Province has the lowest level of new quality productive forces, at 35%. From the perspective of the average value, there are significant differences between regions. The eastern region has the highest level of new quality productive forces, and the western region has the lowest level of new quality productive forces.

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Table 1. The Levels of New quality productive forces of 30 Provinces across the Country from 2012 to 2022

		2012	2014	2016	2018	2020	2022	Growth Rate
Eastern Region	Beijing City	0.1633	0.1933	0.2277	0.2628	0.2945	0.417	155%
	Tianjin City	0.0983	0.1146	0.1321	0.1497	0.1763	0.206	110%
	Hebei Province	0.1	0.1119	0.1243	0.1447	0.1586	0.1762	76%
	Shandong Province	0.1266	0.1435	0.1607	0.1901	0.2259	0.292	131%
	Jiangsu Province	0.1794	0.1904	0.2129	0.2621	0.3172	0.4089	128%
	Shanghai City	0.1296	0.1426	0.1598	0.1981	0.2403	0.3477	168%
	Zhejiang Province	0.1732	0.1809	0.2224	0.2348	0.2799	0.3782	118%
	Fujian Province	0.1048	0.2999	0.1361	0.1559	0.1808	0.22	110%
	Guangdong Province	0.179	0.1982	0.2212	0.3006	0.3551	0.5093	185%
	Hainan Province	0.0416	0.0491	0.0598	0.0706	0.0829	0.1065	156%
	Regional Average	0.1296	0.1624	0.1657	0.1969	0.2311	0.3062	136%
Central Region	Shanxi Province	0.0845	0.0921	0.0926	0.1112	0.1183	0.1329	57%
	Anhui Province	0.0871	0.0961	0.1122	0.1364	0.1552	0.2149	147%
	Jiangxi Province	0.0785	0.0861	0.1038	0.1135	0.1378	0.1637	108%
	Henan Province	0.091	0.0955	0.1118	0.1338	0.1425	0.1653	82%
	Hubei Province	0.1226	0.1341	0.1501	0.169	0.1916	0.2424	98%
	Hunan Province	0.1065	0.109	0.115	0.1252	0.1449	0.187	76%
	Regional Average	0.095	0.1022	0.1143	0.1315	0.1484	0.1844	94%
Western Region	Inner Mongolia	0.0855	0.1005	0.1096	0.1176	0.1257	0.142	66%
	Guangxi Province	0.0835	0.0919	0.0906	0.0968	0.1038	0.1128	35%
	Chongqing City	0.0905	0.0964	0.1118	0.1275	0.14	0.1619	79%
	Sichuan Province	0.14	0.1581	0.1681	0.1932	0.2072	0.2362	69%
	Guizhou Province	0.0722	0.08	0.0864	0.0961	0.1081	0.1123	56%
	Yunnan Province	0.1145	0.1246	0.1391	0.1482	0.1483	0.1591	39%
	Shaanxi Province	0.0877	0.0995	0.1122	0.1328	0.1494	0.1861	112%
	Gansu Province	0.058	0.0699	0.0799	0.0919	0.1047	0.1143	97%
	Qinghai Province	0.0768	0.0809	0.094	0.1142	0.1224	0.1291	68%
	Ningxia	0.0451	0.055	0.0633	0.0903	0.0971	0.1148	154%
	Xinjiang	0.0695	0.0805	0.0868	0.0959	0.1007	0.1157	67%
	Regional Average	0.0839	0.0943	0.1038	0.1186	0.1279	0.144	72%
Northeastern Region	Liaoning Province	0.0959	0.1082	0.1122	0.1279	0.1392	0.1616	68%
	Jilin Province	0.0679	0.0813	0.0934	0.1016	0.1169	0.127	87%
	Heilongjiang Province	0.0723	0.0851	0.0887	0.0984	0.1086	0.1192	65%
	Regional Average	0.0787	0.0915	0.0981	0.1093	0.1216	0.1359	73%

4. Analysis of the Level of New Productive Forces

4.1. Temporal Trends and Regional Differences in the Level of New Productive Forces

4.1.1. Analysis of the Overall Level of New Productive Forces

From 2012 to 2022, the level of new productive forces in the 30 provinces of China showed a significant overall increase, with a growth rate of 155%. This growth reflects China's achievements in economic transformation, green development, and technological innovation. New productive forces not only represent the improvement in economic efficiency across provinces but also demonstrate efforts in optimizing economic structures and promoting high-quality development. Overall, the productivity levels in all provinces have significantly

ISSN: 2710-0723

improved over the past decade, especially in innovation-driven and green low-carbon sectors, where notable progress has been made. In general, the growth rate is positive across all provinces, indicating the positive outcomes China has achieved in its economic transformation. In terms of absolute growth values, provinces in the eastern region generally show higher levels, while the central, western, and northeastern regions exhibit faster growth, reflecting local efforts in adjusting economic structures and accelerating the development of emerging industries.

In terms of regional differences, although there is overall growth, the growth rates vary significantly across regions. The eastern region generally shows stable but slower growth, while the central, western, and northeastern regions have more significant increases. This is closely related to the intensified efforts in these regions to upgrade industries, improve infrastructure, and promote green transformation.

4.1.2. Analysis of the Level of New Productive Forces in the Four Major Regions

According to the geographical division, the 30 provinces of China are categorized into four regions: Eastern, Central, Western, and Northeastern. Each region's development trend of new productive forces is examined separately. Based on the data collected and the previous charts, it is evident that from 2012 to 2022, the development level of new productive forces in the four regions has shown an upward trend year by year. According to the data in the table, the following conclusions can be drawn: The development level of new productive forces in all four regions has generally been increasing year by year. Among them, the level of new productive forces in the Eastern region is significantly higher than the national average, rising from 0.1296 in 2012 to 0.3062 in 2022, with a notable increase. In contrast, the new productive forces level in the Central, Western, and Northeastern regions is below the national average, but different differentiation trends are also evident across these regions. For the Northeastern region, the level of new productive forces increased from 0.0787 in 2012 to 0.1359 in 2022. Between 2012 and 2014, the level of new productive forces in the Northeastern region was similar to the national average, but from 2014 onwards, it gradually diverged from the national average and was surpassed by the Central and Western regions after 2018. For the Central and Western regions, the overall level of new productive forces was low. Between 2012 and 2014, the two regions had similar development levels, but since 2015, their trends started to diverge. The Central region's new productive forces developed more rapidly, gradually surpassing the Western region.

Table 2 shows the Gini coefficients for the development levels of new productive forces in the Eastern, Central, Western, and Northeastern regions of China from 2012 to 2022. The Eastern region's new productive forces level is relatively high and exhibits a trend of fluctuation year by year. The Gini coefficient was 0.181 in 2012 and increased to 0.224 in 2022. Despite the small overall fluctuation, there was a decrease to 0.171 in 2015, with a recovery in 2021, indicating some volatility in certain years. The new productive forces level in the Central region is relatively low and stable. The Gini coefficient was 0.085 in 2012 and increased to 0.109 in 2022, with a small increase. Overall, the development of new productive forces in the Central region is relatively balanced, but it reached a low point of 0.074 in 2017 and gradually recovered afterward. The new productive forces level in the Western region fluctuated greatly and remained low. The Gini coefficient was 0.158 in 2012 and decreased to 0.134 in 2022, showing a downward trend. Overall, the changes in the new productive forces in the Western region were more drastic, with the lowest point of 0.133 reached in 2016 and a slight recovery afterward. The new productive forces level in the Northeastern region has remained consistently low. The Gini coefficient was 0.079 in 2012 and decreased to 0.069 in 2022. The overall trend shows a decline, with the lowest point of 0.053 reached in 2015 and a slight recovery thereafter. In summary, the Eastern region has a relatively high level of new productive forces but exhibits significant fluctuations. The Central region is relatively stable but

ISSN: 2710-0723

at a lower level. The Western region has large fluctuations and remains at a low overall level, while the Northeastern region has consistently been at a low level. These results indicate that there are significant differences in the development of new productive forces across different regions of China, with each region exhibiting distinct development patterns.

Table 2. Dagum Gini Coefficients of New Productive Forces Development Levels in the Four Major Regions of China from 2012 to 2022

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Eastern Region	0.181	0.176	0.211	0.171	0.173	0.181	0.188	0.188	0.193	0.218	0.224
Central Region	0.085	0.080	0.079	0.077	0.078	0.074	0.077	0.075	0.079	0.093	0.109
Western Region	0.158	0.150	0.149	0.149	0.144	0.133	0.130	0.139	0.125	0.127	0.134
Northeastern Region	0.079	0.059	0.065	0.073	0.053	0.049	0.060	0.055	0.056	0.060	0.069

Based on the table data, the main sources of the new productive forces differences in the four major regions are the inter-regional gap (Gb), intra-regional gap (Gw), and super-variable density (Gt). Among them, the inter-regional gap (Gb) contributes the most, with an average value of 0.1320, accounting for 62.47%; the intra-regional gap (Gw) is the second-largest contributor, with an average value of 0.0474, accounting for 23.97%; and the super-variable density (Gt) contributes the least, with an average value of 0.0332, accounting for 21.36%.In terms of temporal changes, the intra-regional gap remains stable and shows a "U"-shaped fluctuation; the inter-regional gap has increased year by year, indicating that the regional disparities are widening; and the super-variable density has gradually decreased, suggesting that the impact of fluctuating factors on new productive forces differences is weakening.

Table 3. Dagum Decomposition of New Productive Forces Development Levels in the Four Major Regions of China from 2012 to 2022

year	Regional Gap			Contribution Rate(%)			Dagum Gini Coefficient
	Gw	Gb	Gt	Gw	Gb	Gt	
2012	0.0474	0.1081	0.0422	23.97%	54.67%	21.36%	0.1977
2013	0.0453	0.1037	0.0416	23.78%	54.39%	21.83%	0.1906
2014	0.0515	0.1318	0.0389	23.16%	59.34%	17.50%	0.2222
2015	0.0448	0.1082	0.0395	23.28%	56.21%	20.51%	0.1924
2016	0.0446	0.1155	0.0353	22.83%	59.10%	18.07%	0.1954
2017	0.0443	0.1197	0.0337	22.39%	60.55%	17.07%	0.1977
2018	0.0455	0.1270	0.0315	22.31%	62.27%	15.42%	0.2040
2019	0.0464	0.1340	0.0297	22.08%	63.80%	14.12%	0.2101
2020	0.0461	0.1451	0.0267	21.16%	66.57%	12.27%	0.2179
2021	0.0517	0.1749	0.0223	20.77%	70.27%	8.96%	0.2489
2022	0.0541	0.1843	0.0233	20.68%	70.40%	8.92%	0.2617
Mean	0.0474	0.1320	0.0332	23.97%	62.47%	21.36%	0.2126

4.2. Convergence Analysis of the Level of New Productive Forces

In order to assess whether there is a convergence characteristic in the overall development level of new productive forces across the country, this study draws on the approach of Sun and Guo (2024) and employs the β-convergence model for analysis. The β-convergence model is primarily used to examine whether provinces with a lower development level of new

ISSN: 2710-0723

productive forces can reduce the gap with provinces having a higher development level at a certain convergence rate.

The β-convergence test results are shown in Table 4. The test results indicate that the β estimated coefficient is significantly positive, which suggests that the overall development level of new productive forces in the country does not exhibit β-convergence characteristics. In other words, provinces with a lower level of new productive forces are unable to quickly catch up with provinces at a higher level, leading to an ongoing expansion of regional disparities. However, the absolute value of the coefficient estimate is close to 0.1, indicating that this expanding trend is slow. The main reason for this result is the significant differences in economic development levels, policy environments, resource allocation, and market conditions across different regions, and these differences are likely to persist over a long period.

Table 4. β-Convergence Test Results of the National New Productive Forces Development Level

Region	National
β	0.1005*** (0.0171)
N	300
R^2	0.1041

Note: The values in square brackets are the standard errors of the regression coefficients. *, **, and *** indicate significance at the 10%, 5%, and 1% levels respectively.

5. Conclusion and Suggestions

This paper constructs a multi - dimensional comprehensive evaluation indicator system for new quality productive forces, and uses a variety of statistical analysis methods to quantitatively evaluate the new quality productive forces levels of 30 provinces in China from 2012 to 2022. The research shows that the new quality productive forces levels of all provinces in the country have been growing continuously as a whole, but there are significant differences in growth rates. The eastern region has a high level with fluctuations, the central region has a relatively low but stable level, the western region has large fluctuations and a low overall level, and the northeastern region has been relatively low, with significant regional differences. In the convergence analysis, the development levels of new quality productive forces in 30 provinces in China do not show β-convergence. This result indicates that due to significant differences in economic development levels, policy environments, resource allocation, and market conditions among different regions, and the long - term existence of these differences, the gap in the new quality productive forces levels among regions will continue to expand, although the expansion rate is relatively slow.

Based on the above research findings, to promote the high - quality development of new quality productive forces in China, it is recommended to implement a differential regional development strategy. The eastern region should focus on innovation and upgrading, the central region should strengthen industrial transformation, the western region should develop characteristic economies, and the northeastern region should accelerate the transformation of traditional industries. At the same time, promote regional coordination, facilitate the flow of technology, capital, and talent among the eastern, central, and western regions, and strengthen cross -- regional industrial cooperation. Increase investment in scientific and technological innovation, promote the integration of industry, academia, and research, and accelerate the transformation of achievements. Optimize the mechanisms for talent cultivation and introduction. Promote green and low - carbon development, improve fiscal, tax, and financial support policies, and

ISSN: 2710-0723

optimize the business environment. Strengthen international scientific and technological cooperation, participate in the global innovation network, and enhance competitiveness. Establish a dynamic monitoring and evaluation mechanism, adjust policies regularly to ensure the continuous and healthy development of new quality productive forces.

Acknowledgments

This study was supported by the Undergraduate Innovation and Entrepreneurship Training Program of Anhui University of Finance and Economics (202410378313) and the Undergraduate Teaching Quality and Reform Project of Anhui University of Finance and Economics (acjyyb2024056).

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