

A Study on the Provincial Distribution Characteristics of New-Quality Productivity in China

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Abstract

This study constructs an evaluation index system for new-quality productivity and employs the entropy method to measure the levels of new-quality productivity in 30 Chinese provinces from 2012 to 2022. Additionally, it analyzes the provincial distribution characteristics using the Dagum Gini coefficient decomposition method. The results show that the new-quality productivity in the eastern region is significantly higher than that in the central and western regions. Regional differences are primarily due to inter-regional disparities, but the overall trend is towards convergence. The β -convergence analysis indicates that there is no β -convergence phenomenon of new-quality productivity among Chinese provinces. The development speed of low-level regions is lower than that of high-level regions, leading to a continuous expansion of regional differences. This study provides theoretical basis and empirical references for formulating policies on regional coordinated development and high-quality economic growth.

Keywords

New-Quality Productivity; Dagum Gini Coefficient Decomposition Method; β -Convergence Analysis; Regional Differences; Distribution Characteristics.

1. Introduction

Driven by the dual forces of the digital economy and green transformation, the new-quality productive force has become a core element in reshaping global competitiveness. In September 2023, President Xi Jinping first proposed the concept of "new-quality productive force" during his inspection tour in Heilongjiang. In January 2024, he emphasized at the Central Political Bureau meeting that developing the new-quality productive force should be a key point in promoting high-quality economic development. Since then, the concept has been extensively explored in many important forums, attracting widespread attention and research from both domestic and international academic and policy circles. As the world's second-largest economy, China is at a critical juncture of economic structural adjustment and the transformation of growth drivers. Studying the distribution characteristics of interprovincial new-quality productive forces is of great significance for narrowing regional development gaps and formulating coordinated regional development strategies. Based on existing research, the measurement of productive forces mainly focuses on the decomposition and optimization of total factor productivity (TFP) (Gong & Yuan, 2024). Traditional TFP finds it difficult to cover the combined effects of new digital technologies and green development transformation. In recent years, scholars' interpretations of the connotation of new-quality productive force and the construction of evaluation index systems have mostly revolved around three dimensions: new-quality laborers, new-quality objects of labor, and new-quality means of production (Huang & Sheng, 2024). These studies have conducted detailed explorations of education levels, input

levels, social and economic benefits, economic development, and other aspects, providing important references for the construction of new-quality productive force index systems. Some scholars have also preliminarily constructed an evaluation index system for new-quality productive forces in innovative ecosystems (Chen et al., 2023), conducting relevant value assessments of the internal environment of productive force development. These studies mostly focus on the theoretical level, lacking empirical research at the provincial level and attention to the regional differences in the decomposition mechanism and convergence path of new-quality productive force development levels.

Based on this, this paper defines the connotation of new-quality productive force from three major dimensions: laborers, objects of labor, and means of production, and constructs a comprehensive evaluation index system. The study is mainly divided into three parts: First, the entropy method is used to measure the development level of new-quality productive force in 30 provinces of China from 2012 to 2022. Second, the regional differences in new-quality productive force are analyzed using the Dagum Gini coefficient and its decomposition method. Finally, the dynamic evolution trend of interprovincial new-quality productive force is examined through convergence analysis. The research in this paper aims to fill the gaps in existing studies and provide theoretical basis and empirical support for promoting coordinated regional development and achieving high-quality economic growth.

2. Measurement of the Level of New-Quality Productive Force

2.1. Construction of the Indicator System

Constructing a comprehensive and scientific integrated evaluation index system for measuring new-quality productive force is the foundation of this study. As a contemporary advanced productive force that drives high-quality economic development, optimizes the economic industrial structure, and achieves revolutionary technological breakthroughs, new-quality productive force is constructed based on Marxist political economy theory, focusing on three major dimensions: laborers, means of production, and objects of labor. After a systematic review of existing literature, this paper draws on the research achievements of Wang and Wang (2024) and combines the core definition of new-quality productive force to build an integrated evaluation index system. Following the three major dimensions, the system is further divided into 7 first-level indicators, 14 second-level indicators, and 21 third-level indicators to measure the level of new-quality productive force. This framework is used to comprehensively assess the development level of new-quality productive force in 30 provinces of China.

2.2. Measurement Method

2.2.1. Entropy Method

The entropy method avoids the interference of subjective factors and can objectively reflect the importance of an indicator in the comprehensive evaluation index system based on the degree of data dispersion. The smaller the degree of dispersion, the less influence the indicator has in the comprehensive evaluation index system, and thus the lower its weight. Since different indicators may have different units of measurement, the impact of units and other factors should be eliminated, that is, the dimensionality should be removed. Before this, data should be distinguished between positive and negative indicators. For positive indicators, a higher value indicates a better evaluation, while for negative indicators, the opposite is true.

First, the data of indicators are preprocessed using range normalization.

For positive indicators, the calculation is as follows:

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

For negative indicators, the calculation is as follows:

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

Calculate the proportion of the i-th sample ω_{ij} under the j-th indicator:

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

Calculate the information entropy of the indicator e_j , where m represents the number of years evaluated:

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

Then calculate the information entropy redundancy ρ_j :

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

And calculate the required indicator weight λ_j :

$$\lambda_j = \frac{\rho_j}{\sum_{i=1}^m \rho_j} \tag{6}$$

Calculate the level of new-quality productive force for each province based on the proportion of indicators ω_{ij} and the corresponding weights λ_j :

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

2.2.2. Dagum Gini Coefficient and Decomposition Method

The Dagum Gini coefficient can measure and decompose regional disparities. The overall Gini coefficient G is composed of the sum of within-group disparities, between-group disparities, and transvariation density. This paper uses this method to calculate and decompose the Gini coefficient for different regions in China. The calculation formula is as follows:

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

Calculate the Gini coefficient G_{jj} within region j:

$$G_{jj} = \frac{1}{2\mu_j n_j^2} \sum_{i=1}^{n_j} \sum_{r=1}^{n_j} |y_{ji} - y_{hr}| \tag{9}$$

Calculate the Gini coefficient between region j and region h:

$$G_{jh} = \frac{1}{n_j n_h (\mu_j + \mu_h)} \sum_{i=1}^{n_j} \sum_{r=1}^{n_h} |y_{ji} - y_{hr}| \tag{10}$$

Here, y_{ji} (y_{hr}) represents the level of new-quality productive force of province i (r) within region j (h), μ_j (μ_h) represents the average level of new-quality productive force of all provinces within region j (h), n denotes the number of provinces, k denotes the number of regions divided, and n_j (n_h) represents the number of provinces within region j (h).

The within-group disparity G_w , between-group disparity G_{nb} , and transvariation density G_t are as follows:

$$G_w = \sum_{j=1}^k G_{jj} P_j S_j \tag{11}$$

$$G_{nb} = \sum_{j=2}^k \sum_{h=1}^{j-1} G_{jh} D_{jh} (P_j S_h + P_h S_j) \tag{12}$$

$$G_t = \sum_{j=2}^k \sum_{h=1}^{j-1} G_{jh} (P_j S_h + P_h S_j) (1 - D_{jh}) \tag{13}$$

Here, $P_j = n_j/n$, $S_j = n_j \mu_j / (n\mu)$, D_{jh} represents the relative impact of the level of new-quality productive force between region j and region h.

2.2.3. Beta Convergence Model

The β convergence model is used to determine the steady-state condition of economic variables and has been widely studied in economics. This paper employs the β convergence model to

conduct a β convergence test on the development level of new-quality productive force nationwide,that is,to examine whether provinces with lower levels of new-quality productive force can narrow the gap with provinces that have higher levels.If β convergence is present,it indicates that,over time,regions with lower levels of new-quality productive force will grow faster compared to those with higher levels.Consequently,the disparities among regions will continuously diminish,and ultimately,all regions will reach a uniform steady state.Drawing on the approach of Barro and Sala-i-Martin(1992),this paper establishes a β convergence model:

$$(\ln Q_{it} - \ln Q_{i0})/T = \alpha + \beta \ln Q_{i0} + \varepsilon_{it} \tag{14}$$

Here, $\ln Q_{i0}$ and $\ln Q_{it}$ represent the natural logarithm of the level of new-quality productive force in province i at the initial year and year T , respectively. $(\ln Q_{it} - \ln Q_{i0})/T$ denotes the average growth rate of the level of new-quality productive force in province i over the period T . β is the convergence coefficient.If β is statistically significant and less than zero,it indicates that there is β convergence in the development level of new-quality productive force in China.

2.3. Data and Explanations

The comprehensive evaluation index system for the level of new-quality productive force includes a total of 27 types of indicator data.The sample scope consists of panel data from 30 provinces in China(excluding Hong Kong,Macao,Taiwan,and Tibet).The data sources for this study include the China Industrial Statistical Yearbook,the China Environmental Statistical Yearbook,statistical yearbooks of individual provinces,and the CSMAR database,among others.Additionally,to compensate for missing data,this paper employs interpolation methods for data completion.

3. Measurement Results and Analysis

3.1. Level of New-Quality Productive Force

Based on the data collection and processing described earlier,and according to the comprehensive evaluation index system for new-quality productive force,the levels of new-quality productive force for the 30 provinces nationwide can be obtained,as shown in Table 1.In terms of growth rates,since 2012,the levels of new-quality productive force in all provinces have increased.Guangdong has the highest growth rate at 148.00%,while Guangxi has the lowest growth rate at 33.78%.In terms of regional averages,there are significant differences in development.Guangdong has the highest level of new-quality productive force in the country at 0.3629,while Hainan has the lowest level at 0.0921.

Table 1. The Results of the Measurement of the New-quality Productivity Levels in 30 Provinces across the Country from 2012 to 2022.

| Progress | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | Mean | Growth rate |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|-------------|
| Shanghai | 0.17 | 0.17 | 0.18 | 0.19 | 0.20 | 0.23 | 0.25 | 0.26 | 0.30 | 0.37 | 0.40 | 0.25 | 140.95% |
| Yunnan | 0.15 | 0.15 | 0.16 | 0.17 | 0.18 | 0.18 | 0.19 | 0.20 | 0.19 | 0.20 | 0.20 | 0.18 | 38.04% |
| Inner Mongolia | 0.11 | 0.13 | 0.13 | 0.14 | 0.14 | 0.15 | 0.15 | 0.16 | 0.16 | 0.18 | 0.18 | 0.15 | 61.77% |
| Beijing | 0.20 | 0.22 | 0.24 | 0.26 | 0.28 | 0.29 | 0.31 | 0.32 | 0.35 | 0.44 | 0.47 | 0.31 | 131.67% |
| Jilin | 0.09 | 0.11 | 0.11 | 0.11 | 0.12 | 0.12 | 0.13 | 0.14 | 0.15 | 0.16 | 0.16 | 0.13 | 72.92% |
| Sichuan | 0.18 | 0.19 | 0.20 | 0.21 | 0.22 | 0.23 | 0.25 | 0.26 | 0.26 | 0.29 | 0.29 | 0.24 | 61.80% |
| Tianjin | 0.13 | 0.14 | 0.15 | 0.16 | 0.17 | 0.17 | 0.19 | 0.21 | 0.22 | 0.25 | 0.25 | 0.18 | 95.40% |
| Ningxia | 0.06 | 0.07 | 0.08 | 0.08 | 0.09 | 0.11 | 0.12 | 0.12 | 0.13 | 0.14 | 0.15 | 0.10 | 129.49% |
| Anhui | 0.12 | 0.13 | 0.13 | 0.14 | 0.15 | 0.16 | 0.18 | 0.19 | 0.20 | 0.24 | 0.26 | 0.17 | 122.82% |
| Shandong | 0.17 | 0.18 | 0.19 | 0.21 | 0.22 | 0.23 | 0.25 | 0.26 | 0.29 | 0.33 | 0.36 | 0.25 | 109.88% |
| Shanxi | 0.11 | 0.12 | 0.12 | 0.12 | 0.12 | 0.13 | 0.15 | 0.15 | 0.16 | 0.17 | 0.17 | 0.14 | 52.95% |
| Guangdong | 0.24 | 0.25 | 0.26 | 0.27 | 0.29 | 0.33 | 0.38 | 0.41 | 0.43 | 0.55 | 0.58 | 0.36 | 148.00% |
| Jiangxi | 0.11 | 0.11 | 0.12 | 0.13 | 0.12 | 0.12 | 0.13 | 0.13 | 0.14 | 0.15 | 0.15 | 0.13 | 33.78% |
| Xinjiang | 0.09 | 0.10 | 0.11 | 0.11 | 0.12 | 0.12 | 0.13 | 0.13 | 0.13 | 0.15 | 0.15 | 0.12 | 60.02% |
| Jiangsu | 0.24 | 0.25 | 0.25 | 0.27 | 0.28 | 0.31 | 0.34 | 0.36 | 0.40 | 0.47 | 0.49 | 0.33 | 108.13% |
| Jiangxi | 0.11 | 0.11 | 0.12 | 0.13 | 0.14 | 0.14 | 0.15 | 0.17 | 0.18 | 0.20 | 0.21 | 0.15 | 95.37% |

| | | | | | | | | | | | | | |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|---------|
| Hebei | 0.14 | 0.14 | 0.15 | 0.16 | 0.17 | 0.18 | 0.19 | 0.21 | 0.21 | 0.22 | 0.23 | 0.18 | 67.31% |
| Henan | 0.13 | 0.13 | 0.13 | 0.14 | 0.15 | 0.17 | 0.18 | 0.19 | 0.19 | 0.21 | 0.22 | 0.17 | 70.55% |
| Zhejiang | 0.22 | 0.23 | 0.23 | 0.25 | 0.28 | 0.27 | 0.30 | 0.33 | 0.35 | 0.42 | 0.45 | 0.30 | 100.31% |
| Hainan | 0.06 | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 | 0.10 | 0.10 | 0.11 | 0.13 | 0.14 | 0.09 | 131.21% |
| Hubei | 0.16 | 0.17 | 0.17 | 0.19 | 0.19 | 0.20 | 0.22 | 0.23 | 0.24 | 0.28 | 0.30 | 0.21 | 85.87% |
| Hunan | 0.14 | 0.14 | 0.15 | 0.15 | 0.15 | 0.16 | 0.17 | 0.18 | 0.19 | 0.21 | 0.23 | 0.17 | 65.30% |
| Gansu | 0.08 | 0.09 | 0.09 | 0.10 | 0.11 | 0.11 | 0.12 | 0.13 | 0.14 | 0.14 | 0.15 | 0.11 | 84.00% |
| Fujian | 0.14 | 0.14 | 0.23 | 0.16 | 0.18 | 0.19 | 0.20 | 0.21 | 0.23 | 0.27 | 0.28 | 0.20 | 98.77% |
| Guizhou | 0.10 | 0.09 | 0.11 | 0.11 | 0.11 | 0.12 | 0.13 | 0.14 | 0.14 | 0.15 | 0.15 | 0.12 | 51.87% |
| Liaoning | 0.13 | 0.14 | 0.14 | 0.15 | 0.15 | 0.15 | 0.17 | 0.17 | 0.18 | 0.20 | 0.20 | 0.16 | 59.15% |
| Chongqing | 0.12 | 0.12 | 0.13 | 0.14 | 0.15 | 0.15 | 0.17 | 0.17 | 0.18 | 0.20 | 0.21 | 0.16 | 71.31% |
| Shaanxi | 0.12 | 0.12 | 0.13 | 0.14 | 0.15 | 0.15 | 0.17 | 0.19 | 0.19 | 0.22 | 0.23 | 0.16 | 96.75% |
| Qinghai | 0.10 | 0.11 | 0.11 | 0.12 | 0.12 | 0.13 | 0.15 | 0.16 | 0.16 | 0.16 | 0.16 | 0.13 | 62.26% |
| Heilongjiang | 0.10 | 0.11 | 0.11 | 0.12 | 0.12 | 0.13 | 0.13 | 0.13 | 0.14 | 0.15 | 0.15 | 0.13 | 50.05% |

3.2. Regional Differences and Sources of New-Quality Productive Force

This section will use the Dagum Gini coefficient and its decomposition method to further explore the overall differences and sources of differences in the level of new-quality productive force among the four major regions of China. To enrich the research levels of new-quality productive force, the 30 provinces are divided into four major regions based on geographical location and economic development level: Eastern Region (Shanghai, Beijing, Tianjin, Shandong, Guangdong, Jiangsu, Hebei, Zhejiang, Hainan, Fujian); Western Region (Yunnan, Inner Mongolia, Sichuan, Ningxia, Guangxi, Xinjiang, Gansu, Guizhou, Chongqing, Shaanxi, Qinghai); Central Region (Anhui, Shanxi, Jiangxi, Henan, Hubei, Hunan); and Northeastern Region (Jilin, Liaoning, Heilongjiang).

3.2.1. Overall Differences in New-Quality Productive Force

Figure 1 shows the trend of the Gini coefficient of new-quality productive force levels in China's four major regions. Over the sample period, the relative differences in new-quality productive force levels in China gradually increased. The overall Gini coefficient of new-quality productive force levels fluctuated between 0.123 and 0.140, showing an upward trend overall. Specifically, the Gini coefficient decreased from 2012 to 2014 but rebounded in 2015 and 2016 without reversing the downward trend. From 2017 to 2022, the Gini coefficient rose overall, despite a slight decline in 2020. The coefficient increased from 0.135 in 2012 to 0.140 in 2022, a rise of about 3.70%. During 2017–2022, the increase was approximately 13.82%.

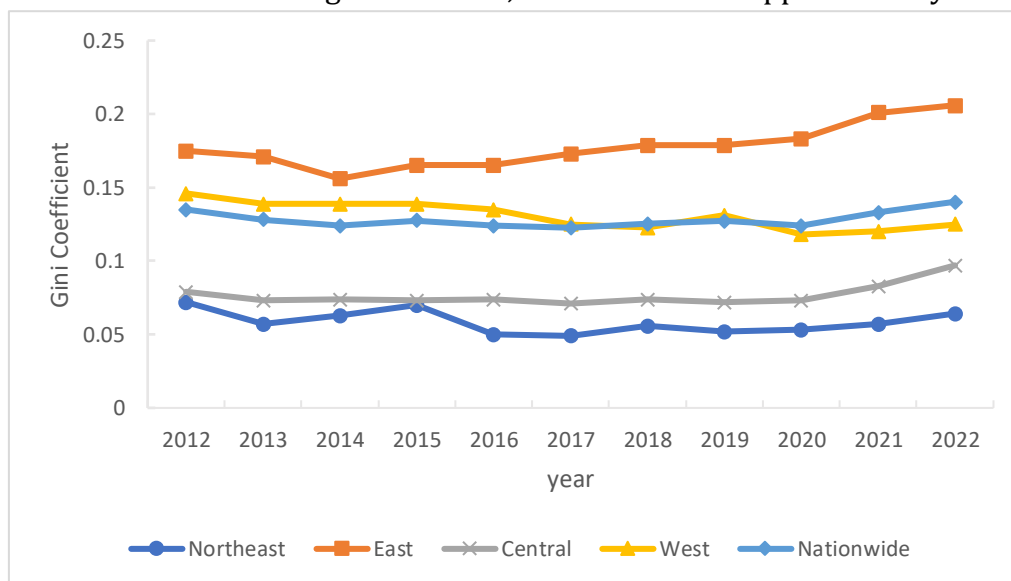


Figure 1. The Evolutionary Trend of Regional Differences in New-Quality Productivity

3.2.2. Within-Region Differences in New-Quality Productive Force

Figure 1 shows the trend of the Gini coefficient of new-quality productive force levels in China's four major regions from 2012 to 2022. Overall, the Gini coefficients in the eastern and central regions increased, while those in the northeastern and western regions slightly decreased.

Specifically: In the western region, the Gini coefficient generally decreased from 2012 to 2020, with a slight rebound in 2018–2019, but it began to rise again in 2021. The coefficient decreased by about 14.38% from 2012 to 2022. In the northeastern region, the Gini coefficient fluctuated in a "W" shape and increased from 2012 to 2018, then rose slowly from 2019 to 2022. The coefficient decreased by about 11.11% from 2012 to 2022. In the eastern region, the Gini coefficient decreased from 2012 to 2014, then gradually increased from 2015 to 2022 with an expanding rise. The coefficient increased by about 17.71% from 2012 to 2022. In the central region, the Gini coefficient had minor fluctuations from 2012 to 2020, then increased significantly after 2020. The coefficient increased by about 29.33% from 2012 to 2022.

In terms of average Gini coefficients, the eastern region (0.178) and western region (0.131) were higher than the northeastern region (0.058) and central region (0.077). This indicates that the eastern region has the most significant internal imbalances in new-quality productive force levels, followed by the western region, while the northeastern and central regions are relatively more balanced. This disparity may stem from the large gaps in new-quality productive force levels among provinces within the eastern region.

3.2.3. Between-Region Differences in New-Quality Productive Force

Figure 2 shows the trends in relative differences in new-quality productive force levels between each pair of the four major economic regions from 2012 to 2022. The results indicate that the difference between the Northeast and Eastern regions is the largest and increasing, while the difference between the Northeast and Western regions is slightly narrowing. Except for the Northeast-Western region, the Gini coefficients between other regions are rising.

Specifically: The relative gap between the Northeast and Eastern regions is generally increasing, with a brief decline in 2013 that had limited impact. The Gini coefficient between the Eastern and Western regions is similar to that between the Northeast and Eastern regions, with a brief decline in 2015 and overall small changes. The relative gap between the Eastern and Central regions is generally increasing, with brief declines in 2015 and 2019. The relative gap between the Central and Western regions is gradually widening, with a brief decline in 2020 followed by further expansion. The relative gap between the Northeast and Western regions is narrowing, with brief increases in 2015 and 2019, but expanded after 2020. The Gini coefficient between the Northeast and Central regions showed a "W"-shaped fluctuation upward from 2012 to 2019, with a significant decline in 2020 and a rebound afterward.

In terms of changes: The Gini coefficient between the Northeast and Central regions had the largest increase, rising from 0.107 to 0.155 (44.86%). The Northeast-Eastern region increased from 0.257 to 0.371 (44.36%). The Eastern-Western region increased from 0.257 to 0.351 (36.58%). The Eastern-Central region increased from 0.199 to 0.265 (33.17%). The Central-Western region increased from 0.131 to 0.155 (18.32%). The Northeast-Western region decreased from 0.120 to 0.104 (-13.33%).

In terms of values: The average Gini coefficients between the Northeast-Eastern, Eastern-Western, Eastern-Central, Central-Western, Northeast-Western and Northeast - Central regions are 0.2947, 0.2821, 0.2247, 0.1277, 0.1053, 0.1098, respectively. The highest Gini coefficient is between the Northeast and Eastern regions, while the lowest is between the Northeast and Western regions. In 2017, the Gini coefficient between the Northeast and Western regions first fell below that between the Northeast and Central regions, with further narrowing afterward. The Gini coefficient between the Central and Western regions is low but shows a slight expansion trend.

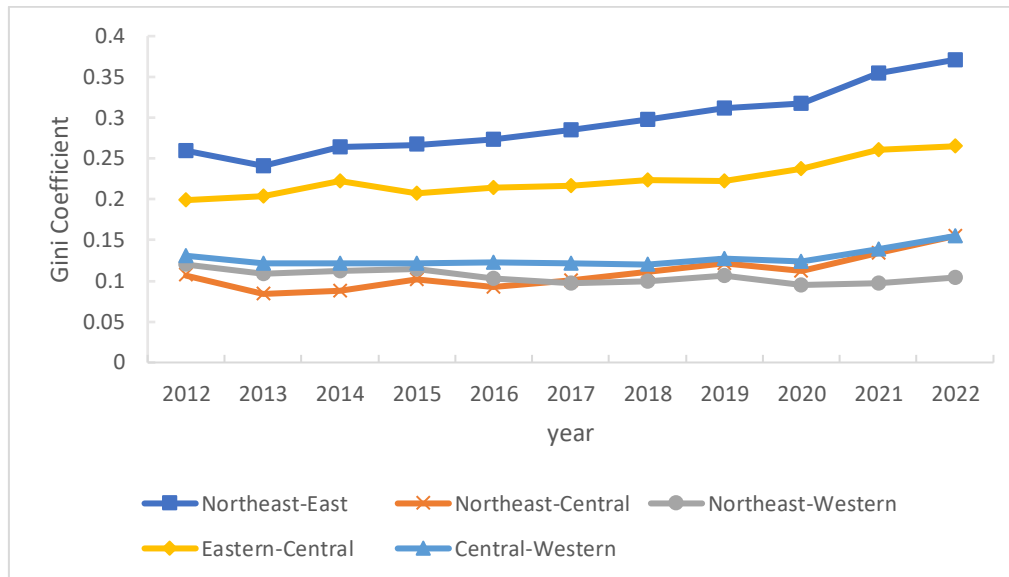


Figure 2. Evolutionary Trends of Relative Differences in New-Quality Productivity Levels among Regions

3.2.4. Sources and Contributions of Differences in New-Quality Productive Force

Figure 3 analyzes the sources and trends of contributions to the relative differences in the level of new-quality productive force nationwide from 2012 to 2022. The results show that the gaps in new-quality productive force levels between regions are the main factor in the overall differences. In terms of sources, within-region differences fluctuate less, while between-region differences and transvariation density fluctuate more. The contribution of between-region differences to the overall relative difference slightly increases, while the contributions of within-region differences and transvariation density generally show a downward trend. Specifically, from 2012 to 2022, the contribution of between-region differences significantly increased, with a slight rebound in 2015 but no change in the overall upward trend; the contribution of within-region differences changed little, with an increase in 2015 but an overall downward trend; the contribution of transvariation density decreased year by year, with a larger decrease after 2015. In terms of changes, the contribution of between-region differences increased from 55.09% in 2012 to 70.25% in 2022, an increase of about 27.57%; the contribution of within-region differences decreased from 23.96% in 2012 to 20.57% in 2022, a decrease of about 14.15%; the contribution of transvariation density decreased from 20.95% in 2012 to 9.18% in 2022, a decrease of about 56.18%. This indicates that the impact of between-region differences on the overall differences in new-quality productive force in China is increasing. In terms of contribution rates, between-region differences, within-region differences, and transvariation density contribute 61.81%, 22.23%, and 15.97% respectively to the overall differences in new-quality productive force. Therefore, between-region differences are the main source of overall differences in new-quality productive force in China, followed by within-region differences, with the smallest contribution from transvariation density. This reflects that the overall differences in new-quality productive force in China are mainly due to the level gaps between different regions.

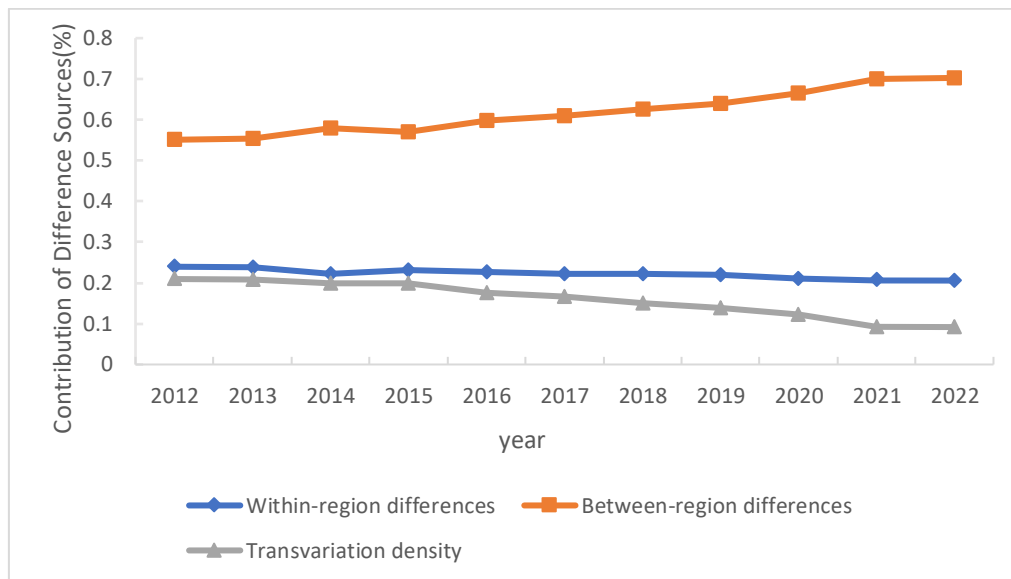


Figure 3. Evolutionary Trends of Contributions to Overall Relative Differences in New-Form Productivity Levels

3.3. Analysis of β -Convergence Results for the Whole Country and Four Major Regions

Table 2 presents the β -convergence test results for the whole country and the Northeast, East, Central, and West regions. The overall β -coefficient for the country is significantly positive, indicating that provinces with higher levels of new-form productivity are growing faster, leading to a slow but persistent widening of regional disparities. This aligns with some existing studies and reflects China's overall upward trend in new-form productivity with a significant "East-high, West-low" pattern. The Northeast region has a significantly negative β -coefficient, showing β -convergence where lower-level provinces are gradually catching up with higher-level ones, albeit at a slow pace. The East, Central, and West regions all have positive β -coefficients, suggesting that internal regional disparities in these areas will continue to expand slowly. Specifically, the East, despite its high economic development, fails to narrow the gap with other regions; the West, due to insufficient infrastructure and policy support, struggles to reduce regional differences; and the Central region, in the midst of industrial transformation, grows rapidly but lacks innovative technologies and the capacity for industrial upgrading, failing to shrink regional disparities.

Table 2. β -Convergence Test Results of New-Form Productivity Development Levels for the Whole Country and Four Major Regions

| Region | Nationwide | Northeast | East | West | Central |
|---------------|---------------------|---------------------|---------------------|--------------------|---------------------|
| β | 0.027*** [0.005] | -0.059** [0.022] | 0.039*** [0.009] | 0.005** [0.009] | 0.048*** [0.005] |
| Constant term | 0.104*** [0.009] | -0.063** [0.044] | 0.122*** [0.013] | 0.062** [0.017] | 0.133*** [0.010] |
| Sample size | 300 | 30 | 100 | 110 | 60 |
| R-squared | 0.014 | 0.211 | 0.001 | 0.053 | 0.225 |

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.

4. Conclusions and Implications

This paper examines the distribution characteristics of new-form productivity across Chinese provinces from 2012 to 2022 and draws the following main conclusions: First, China's new-form productivity shows a slow upward trend overall, but significant regional disparities exist, with the eastern region higher than the western, central, and northeastern regions. Second, in terms of within-region disparities, the Gini coefficients of the eastern and central regions change the most, followed by the western region, with the northeastern region showing the smallest change. Inter-regional disparities are the main source of overall national differences in new-form productivity. Finally, new-form productivity in the whole country and in the eastern, central, and western regions does not exhibit β -convergence, suggesting that regional disparities may continue to widen; however, the northeastern region shows β -convergence, indicating that regional disparities there are likely to narrow.

Based on the above conclusions, this paper proposes the following recommendations: First, to promote coordinated regional development by formulating differentiated policies according to local resource endowments and industrial foundations. The eastern region should focus on innovation, supporting industrial upgrading in the central and western regions and the revitalization of the Northeast. The central and western regions should strengthen infrastructure and promote industrial transformation. The Northeast should upgrade traditional industries and increase R&D investment to narrow regional gaps. Second, to enhance innovation-driven development by improving fiscal, financial, and talent policies, reforming the science and technology system, and activating innovation activities in enterprises and research institutions. Encourage university-enterprise cooperation to improve the conversion rate of scientific and technological achievements. Third, to foster regional cooperation by establishing mechanisms for cooperation and exchange, conducting industrial docking activities, and encouraging intra-regional industrial cooperation to achieve complementary resources and mutual benefits. These recommendations provide theoretical basis and policy references for promoting coordinated regional development of new-form productivity and high-quality economic growth in China.

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