

## Analysis of regional economic differences in the process of new urbanization in China

Yu Zhang<sup>1,a</sup>, Jiaxian Chen<sup>2,b</sup>, Rixin Zhang<sup>3,c,\*</sup>, Sixi Peng<sup>2,d</sup>, Zhuotong Gu<sup>4,e</sup>

<sup>1</sup>College of International Education, South China Agricultural University, Guangzhou, 510630, Guangdong, China

<sup>2</sup>College of Economics and Management, South China Agricultural University, Guangzhou, 510630, Guangdong, China

<sup>3</sup>Guangzhou Institute of Science and Technology, Guangzhou, 510080, Guangdong, China

<sup>4</sup>Guangdong Baiyun University, Guangzhou, 510550, Guangdong, China

<sup>a</sup>a14704420523@163.com, <sup>b</sup>349701061@qq.com, <sup>c</sup>rxzhang@scau.edu.cn, <sup>d</sup>pengsixi@scau.edu.cn, <sup>e</sup>414755819@qq.com

**Keywords:** regional economic; new urbanization; economic differences

**Abstract:** As one of the largest developing countries in the world, China has experienced rapid urbanization in recent years. New urbanization is regarded as an important engine of China's economic development. However, this process is accompanied by significant regional economic differences. The purpose of this study is to explore the regional economic differences in the process of new urbanization in China, so as to understand the challenges and opportunities faced by different regions in the process of urbanization. This paper constructs a subsystem of the evaluation system from five dimensions: economic growth, employment and population, infrastructure and services, industrial structure, environment and social development, and finally selects 17 specific indicators to measure the level of regional economic development. Using Gini coefficient decomposition method and KDE(Kernel Density Estimation) method, this paper analyzes the regional differences, distribution dynamics and convergence of regional economic development level in China. It is found that the eastern coastal areas are still in a leading position in urbanization and economic growth, while the urbanization process in the western and central regions is relatively lagging behind. These differences are mainly influenced by historical reasons, uneven allocation of resources and policy implementation. Government policies have played an active role in reducing regional economic disparities. However, the fundamental solution to the disparities needs more structural reforms and long-term policy support.

### 1. Introduction

China's new urbanization is an important national strategy promoted by the China government, aiming at promoting the urbanization process, improving the living standards of urban and rural residents and achieving the goal of sustainable development. However, with the continuous advancement of urbanization, the problem of economic differences among regions in China has become increasingly prominent. These differences play a vital role in regional economy, affecting the development and social stability of different regions.

New urbanization is a new proposition based on China's national conditions. The research on new urbanization belongs to a typical Chinese interdisciplinary subject, and its connotation and extension are very rich. Literature[1] holds that new urbanization mainly embodies human nature, synergy, inclusiveness and sustainability. Literature[2-3] holds that the "newness" of new urbanization lies in people-oriented high-quality and inclusive development, covering environmental friendliness, fair distribution, resource sharing, reasonable layout, structural optimization and urban-rural integration. As a vast country, China has diverse geographical, demographic and resource characteristics. In the process of new urbanization, the urban economy in

some coastal areas and specific areas has risen rapidly, attracting a large number of people and investment, while other areas are relatively backward, facing problems such as population outflow and lack of resources[4]. These regional economic differences not only affect the quality of life of residents in China, but also have a far-reaching impact on the sustainable development of the country as a whole.

The purpose of this paper is to deeply analyze the regional economic differences in the process of new urbanization in China, and to explore its causes, influences and possible solutions. Through the comprehensive research on the data of urbanization process, economic growth, population migration and resource allocation in different regions, we will try to reveal the complex mechanism behind it, so as to provide powerful policy suggestions for the government and decision makers, and make contributions to the sustainable success of the urbanization process in China.

## 2. Analytical method

### 2.1. Construction of evaluation index system

Following the principles of scientificity, representativeness, availability and rationality, the evaluation index system of China's new urbanization level is constructed from three levels: target value, subsystem and index level[5-6], and the evaluation subsystem is constructed from five dimensions: economic growth, employment and population, infrastructure and services, industrial structure, environment and social development, and finally 17 specific indicators are selected to measure the level of regional economic development, as shown in Table 1. The data used in this paper are all from the Statistical Yearbook of China, and the research interval is from 2010 to 2020, excluding Tibet, Hong Kong, Macao and Taiwan.

Table 1 Evaluation index system of regional economic development level

subsystem	Indicator layer	describe
Economic growth dimension	GDP growth rate	The annual GDP growth rate in different regions reflects the economic growth rate.
	Per capita GDP	Per capita GDP in different regions reflects the living standards of residents.
	Industrial output value	The output value of the industrial sector reflects the level of industrial development.
	Agricultural output value	The output value of the agricultural sector reflects the economic situation in rural areas.
Employment and population dimensions	Urbanization rate	The proportion of urban population to the total population reflects the level of urbanization.
	employment rate	The employment rate in different regions reflects employment opportunities and labor market conditions.
	Population mobility	Population flow in different regions, including the people who moved in and out.
Infrastructure and service dimensions	Infrastructure construction	Including roads, bridges, power supply and other infrastructure construction level.
	educational level	Educational resources and educational level in different regions, including educational investment and education level.
	medical service	Medical resources and medical service level in different regions, including the number of hospitals and medical security.
Dimension of industrial structure	Proportion of primary industry	The proportion of agriculture in total output.
	Proportion of secondary industry	The proportion of industry in total output.
	Proportion of tertiary industry	The proportion of service industry in total output.
Environmental dimension	environmental quality	Environmental quality in different areas, including air quality and water quality.
	Resource utilization efficiency	The utilization efficiency of resources, including the consumption level of energy and natural resources.
Social development dimension	educational opportunities	Equality of educational opportunities in different regions, including the gap between urban and rural education.
	social security	Social security level in different regions, including pension and medical insurance.

## 2.2. EWM method

EWM(Entropy Weight Method) is a multi-criteria decision analysis method, which is usually used to determine the weights of different factors or decision-making schemes for comprehensive evaluation and decision-making. Its name comes from the concept of information entropy, which is used to measure uncertainty and confusion[7]. The main idea of EWM is that when a decision-making problem involves multiple factors or indicators, some factors may have greater influence on the decision-making results, while others may have less influence on the results. EWM calculates the entropy value of each factor to determine their importance in decision-making, and then converts these entropy values into weights, thus making a weighted comprehensive evaluation.

According to the connotation and characteristics of new urbanization, this paper selects EWM, which has a large data demand and complicated calculation but is more objective, as an evaluation method to measure the level of new urbanization in 30 provinces of China. The specific calculation steps are as follows:

First of all, the collected data of economic indicators of various provinces, such as GDP, per capita income, industrial output value, etc. These data usually have different scales and units, so they need to be standardized to the same scale range[8-9]. Standardization can be carried out using the following formula:

$$X_{ij} = \frac{X_{ij}}{\sum_{j=1}^m X_{ij}} \quad (1)$$

Among them,  $X_{ij}$  is the original value of the  $i$  province on the  $J$  index, and  $m$  is the number of indicators.

Next, calculate the entropy of each province on each index. The calculation formula of entropy value is as follows:

$$E_{ij} = \frac{X_{ij} \ln(X_{ij})}{\ln(m)} \quad (2)$$

Among them,  $E_{ij}$  represents the entropy value of the  $i$  province on the  $J$  index, and  $X_{ij}$  is the standardized data.

By calculating the entropy value of each index, the weight of each index can be determined. The weight calculation formula is as follows:

$$W_j = \frac{1 - E_j}{\sum_{j=1}^m (1 - E_j)} \quad (3)$$

Where  $W_j$  is the weight of the  $J$  index and  $E_j$  is the average entropy of the  $J$  index.

Finally, by applying the weight of each index to the standardized data, the comprehensive evaluation score of each province can be calculated:

$$S_i = \sum_{j=1}^m W_j \cdot X_{ij} \quad (4)$$

Among them,  $S_i$  represents the comprehensive evaluation score of the  $i$  province, and  $W_j$  is the weight of the  $J$  index.

## 2.3. KDE method

KDE(Kernel Density Estimation) is a nonparametric method for estimating probability density function, which is usually used to smooth the distribution of observation data. The goal of KDE is to generate a probability density estimate for each data point in the data set without relying on

specific distribution assumptions. This helps us to understand the distribution characteristics and density distribution of data, so as to analyze and visualize the data[10].

The basic idea of KDE is to use kernel functions (usually normal distribution or other smooth functions) to create a set of kernels around each data point, and then estimate the probability density of the whole data set by superimposing these kernels. In this paper, KDE method is used to analyze the distribution, shape and extensibility of new urbanization.

KDE the urban data to get the probability density function  $f(x, y)$ .

$$f(x, y) = \frac{1}{n} \sum_{i=1}^n K\left(\frac{x-x_i}{h}, \frac{y-y_i}{h}\right) \quad (5)$$

$f(x, y)$  is the estimated probability density at position  $(x, y)$ ,  $n$  is the number of city data points,  $(x_i, y_i)$  is the latitude and longitude coordinates of each city,  $K$  is the kernel function, and  $h$  is the bandwidth parameter.

Find the peaks of  $f(x, y)$ , which correspond to the high-density areas of urban distribution. According to the position of the peak, the concentrated area and distribution position of new urbanization can be determined. By analyzing the shape of  $f(x, y)$ , we can understand the morphological characteristics of urban distribution. According to the probability density distribution of  $f(x, y)$ , the area coverage of urban distribution can be calculated, or the ductility difference between high-density area and low-density area can be identified.

### 3. Result analysis

#### 3.1. Regional differences

In order to further identify the regional differences and sources of new urbanization in China, this paper uses the Dagum Gini coefficient decomposition method to determine the sources of regional economic differences in the process of new urbanization in China from 2010 to 2020. Figure 1 directly depicts the regional differences in the level of regional economic development.

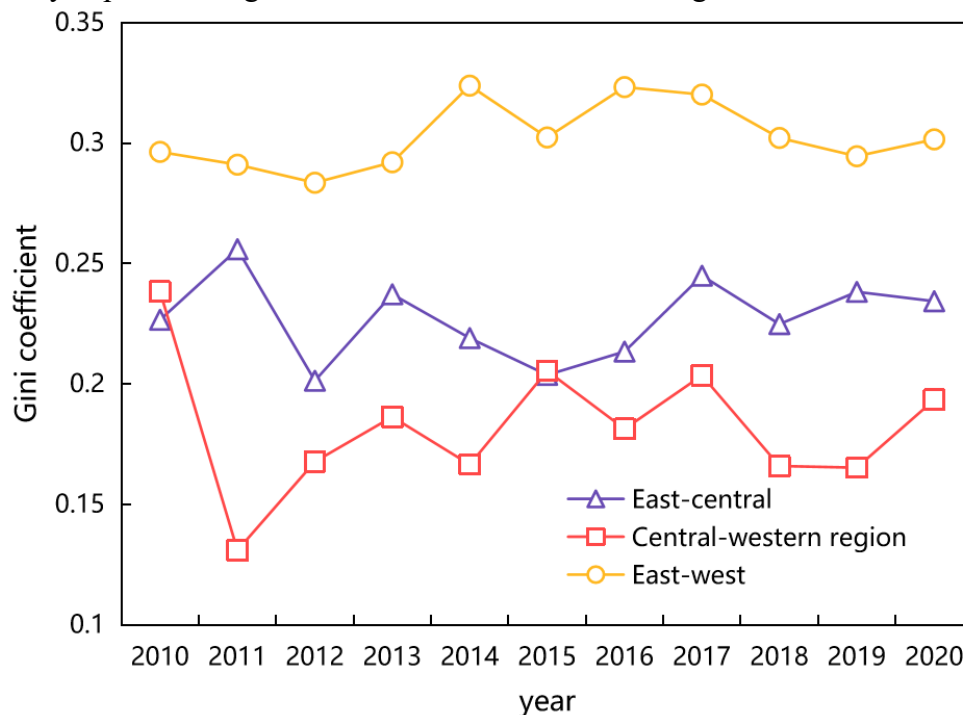


Figure 1 Regional economic differences in the process of new urbanization in China Judging from the Gini coefficient between regions, there is significant heterogeneity in the level

of regional economic development among regions. The regional differences of regional economic development level are fluctuating, and the regional differences are characterized by "down-up-down" fluctuation. Specifically, the regional difference between the east and the west is the largest, and it shows a decreasing trend, while the regional difference between the middle and the west is the smallest, and the difference shows a decreasing trend, which shows that the regional economic development level of the middle and the west is similar, so the regional difference is the smallest. To sum up, the regional economic development level difference between eastern and western regions is the largest, followed by eastern and central regions, and central and western regions is the smallest.

### 3.2. Dynamic distribution of regional economic development level in China

In order to explore the dynamic distribution characteristics of regional economic development level in China, this paper uses KDE method to analyze the distribution position, shape, extensibility and polarization of regional economic development level in the whole country, and the specific results are shown in Figure 2.

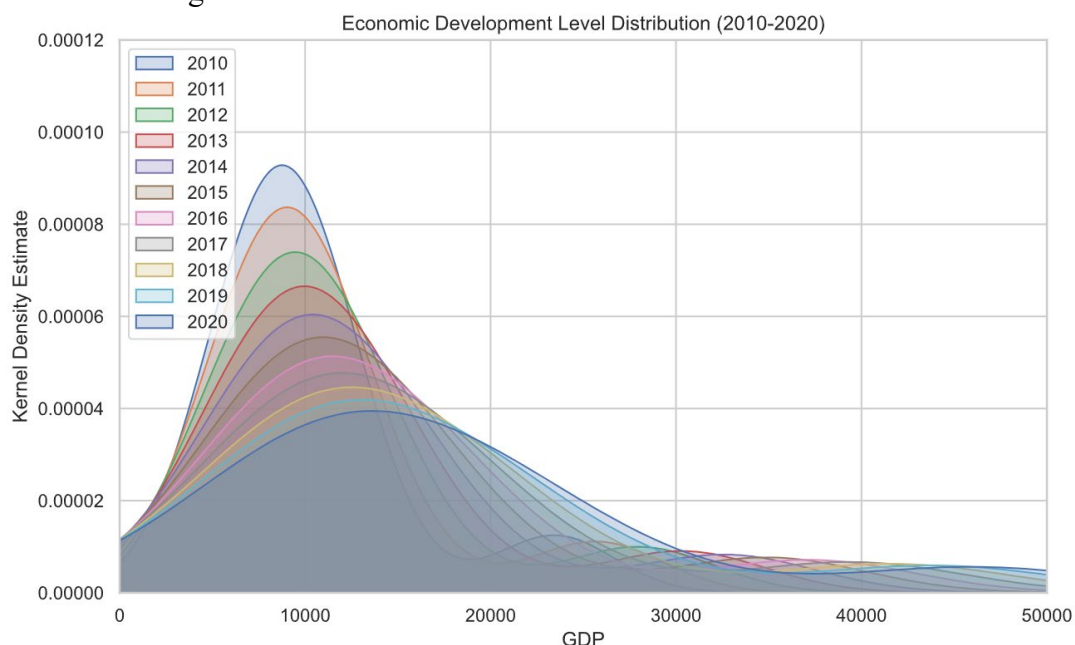


Figure 2 Dynamic distribution of regional economic development level in China

From the movement of the peak, the main peak position of the distribution curve of the national regional economic development level keeps moving to the right, which shows that the national regional economic development level is constantly improving; The height of the main peak is increasing, the width is narrowing, and the ductility of the right tail is widening, reflecting that the imbalance of regional development is narrowing; And there are two peaks, and the position of the main peak and the lateral peak is enlarged, which shows that the polarization trend of China's regional economic development level is becoming more and more obvious, that is, polarization phenomenon has appeared.

## 4. Conclusions

This study makes an in-depth analysis of the regional economic differences in the process of new urbanization in China, and finds that the regional economic differences still exist despite a series of measures taken by the China government in the new urbanization policy. The eastern coastal areas still maintain a relatively high level of economic development, while the development of the western and central regions is relatively backward. This difference is mainly caused by historical reasons, resource distribution, industrial structure and policy implementation. The difference between urban and rural areas is also an important issue in the process of new urbanization in China.

Urban areas attract a large number of migrant workers and capital, but compared with rural areas, cities still face challenges such as limited land resources, housing problems and social security. The reduction of urban-rural differences needs more policy coordination and reform. The regional economic disparity in the process of new urbanization in China is a complex and long-term problem, which needs to be paid more attention to and solved. Government policy, structural reform, scientific and technological innovation and coordinated development between urban and rural areas will be the key factors to reduce these differences. Future research and policy formulation should pay more attention to continuous monitoring and promoting balanced development across the country, so as to ensure a fairer and more sustainable urbanization process in China.

## **Acknowledgements**

The authors acknowledge the Guangdong Provincial Philosophy and Social Science Planning Project - "Research on the 'Cross border' Co construction and Sharing Mechanism of Industry-University-Research Resources in the Guangdong-Hong Kong-Macao Greater Bay Area "(Grant: GD23XGL100);Guangdong Provincial Education Science Planning Project - "Research on the Excellent Talent Training Mechanism of Agricultural and Forestry Universities in the Guangdong-Hong Kong-Macao Greater Bay Area for Rural Revitalization "(Grant: 2023GXJK251).

## **References**

- [1] Liu Jian. (2013). Analysis of labor human capital investment and urban-rural income difference under new urbanization-taking six central provinces as an example. *Enterprise Economy*, 32(5), 5.
- [2] Wang Hongxia. (2018). Urban differences, three-sector economy and new urbanization in China in the new era. *Shanghai Economic Research* (4), 11.
- [3] Sun Xuetao, Yu Ting, & Yu Fawen. (2022). The influence of new urbanization on common prosperity and its mechanism-based on the analysis of 281 cities in China. *Journal of Guangdong University of Finance and Economics*, 37(2), 17.
- [4] Yuan Dan, Wang Chunyan, & Wang Shujian. (2016). Analysis of regional differences of industry promoting new urbanization from the perspective of "flow space". *Business Economic Research* (9), 2.
- [5] Zhao Lei, & Fang Cheng. (2019). Regional Differences and Driving Mechanism of New Urbanization Development Level among Provinces in China. *Quantitative Economic, Technical and Economic Research*, 36(5), 21.
- [6] Gao Jinlong, Bao Jingwei, Liu Yansui, & Chen Jianglong. (2018). Regional differences and influencing factors of land urbanization in China county. *Journal of Geography*, 73(12), 16.
- [7] Chen Wen. (2017). Spatial-temporal measurement and influencing factors of regional ecological efficiency in China —— Based on the perspective of new urbanization. *Journal of Fujian Normal University: Philosophy and Social Sciences Edition* (3), 8-15.
- [8] Yang Jun. (2016). The Impact of New Urbanization Development on Agricultural Industrial Structure in China. *Economic Jingwei*, 33(6), 6.
- [9] Liu Yue, Yuan Xuejiao, & Ye Yumei. (2016). Interactive Effect and Path of Informatization and New Urbanization. *Urban Problems* (6), 9.
- [10] Mou Lingling, Yin Sai. (2019). Study on the development level of new urbanization in Beijing, Tianjin and Hebei based on social network analysis —— Taking xinyi city as an example. *Modern City Research*, 000(006), 95-101.