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# AN ASSESSMENT OF CHINA'S NEW URBANIZATION LEVEL - BASED ON THE VERTICAL AND HORIZONTAL LEVELS OF THE GRADE METHOD

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In this paper, we construct the six criterion layers evaluation index system of new urbanization, including population urbanization, land urbanization, economic urbanization, social urbanization, ecological civilization and overall planning of urban and rural areas. We use the horizontal and vertical levels of the grade method in order to determine the weight of each index, and then calculate the quality of the urbanization process at the provincial level in 2004-2013. The result shows that the overall comprehensive evaluation index of China has a trend of rising volatility. The quality of new urbanization has continuously been improving since 2004; the new urbanization process, however, shows significant differences between the regions and specific performances: eastern urbanization level is the highest, whereas the western is the lowest. The evaluation index, however, increases steadily during the studied period and the gap with other regions gradually narrows.

**Keywords**: new urbanization, index system, vertical and horizontal levels of the grade method, quality evaluation

JEL Classification: R12, C10

## INTRODUCTION

Since the reform and opening up, China's urbanization process has made remarkable achievements, which are unprecedented in human history both from the point of view of the scale and the speed. However, the rapid development of urbanization has resulted in a series of problems, such as the imbalance between industrialization and urbanization, land urbanization faster than population urbanization, the dualization of urban and rural areas, the worsening of the ecological environment of the city and the imbalance of public services (Hu Angang, Yan Yilong & Yang Zhusong, 2013; He Ping & Ni Ping, 2013; Shen Qingji, 2013).

The 17th National Congress of the Party put forward the road of urbanization with Chinese characteristics and the National New Urbanization Plan (2014-2020) put forward the road of new urbanization with Chinese characteristics, which is people-oriented, synchronous with modernization, optimizes the layout, ecological civilization and cultural heritage. From the above,

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it is evident that the Chinese government has put forward new requirements for the urbanization of our country, and that the government has gradually shifted from the previous requirement for quantity to a comprehensive requirement for quality (Li Nan, 2013). At the same time, in the important period of economic transformation and the upgrading and accelerating of socialist modernization, urbanization will be the driving force for the future development of China, and the objective evaluation of China's new urbanization process and the understanding of the status and the short board in the process of timely urbanization has important practical significance in China's future development of urbanization.

Domestic and foreign scholars have done a lot of research in urbanization. For the purpose of the evaluation of the quality of urbanization, domestic and foreign scholars have experienced a conversion process from the single index to the composite index. In the establishment of the index system, several indicators have been established (Wang Guogang, 2010; Lin Xueqin, Wang Dai, Ren Wangbing & Liu Yifeng, 2013; Shang Huping & Gao Lingling, 2016; Yu Li, 2016; Zhang Wenting & Wen Zongguo, 2016;). Scholars have different understanding of the connotation of urbanization and the evaluation results are also different. Although there is no recognized indicator system for the development of urbanization, scholars generally tend to select indicators from several aspects, such as economic development, the infrastructure, public services, urban and rural areas, the ecological environment and so on. In the method of the specific calculation of indicators, the main methods are the entropy method, the principal component analysis, the data envelopment analysis, the AHP and so forth (Jing Puqiu & Zhang Xiangyang, 2007; Liu Yachen, Chang Chunguang & Liu Ning, 2008; Tian Jing, 2012; Zeng Zhiwei, Tang Fanghua & Yi Chun, 2012; Wang Fuxi, Mao Aihua, Li Helong & Jia Minglu, 2013; Fan Hongjue & Liu Zuyun, 2014; Cheng Li & Zhou Zongshe, 2014; Zhan Guobin, 2016).

According to the current situation in China's new urbanization, this paper sums up the scientific connotation of new urbanization, constructs the evaluation index system from the different aspects of the population, the economy and society, uses the horizontal and vertical grade methods for measuring and achieving a dynamic comprehensive evaluation of the development of new urbanization and provides theoretical support and guidance for the development of new urbanization in China.

## THE COMPREHENSIVE EVALUATION SYSTEM OF NEW URBANIZATION

### The Evaluation System

In this paper, we draw on the existing research results and the description of the key indicators in the National New Urbanization Plan (2014-2020). Starting from the connotation of the new urbanization construction, we construct six dimensions including population urbanization, land urbanization, the economic structure, social development, ecological civilization and balanced urban and rural development, then according to the principle of scientific, systematic and feasible interpretation, the six criterion layers and the total of 27 indicators are interpreted (Table 1).

### The Evaluation Methods

This paper adopts the „vertical and horizontal levels of the grade method", proposed by Guo Yajun, and sets the evaluation function of urbanization:

$$y_i(t_k) = \sum_{j=1}^{m} \omega_j x_{ij}(t_k) \tag{1}$$

where, $y_i(t_k)$ stands for the comprehensive evaluation value in the $t_k$ period; $\omega_j$ is the weight of the index; $x_{ij}(t_k)$ is the $j$ evaluation index of the $i$ province in the $t_k$ period. The determination principle of $\omega_j$ is the biggest embodiment of the individual difference between the evaluation units among the panel data, namely $y_i(t_k)$'s sum of the squares of the deviations $\sigma^2$ maximum. The formula can be expressed as:

$$\sigma^2 = \sum_{k=1}^{N} \sum_{i=1}^{n} (y_i(t_k) - \bar{y})^2 \tag{2}$$

Because the original data $\{x_{ij}(t_k)\}$ is for a non-dimensional treatment, then

**Table 1** The evaluation index system for the development of new urbanization

| Target layer | Criterion layer | Index layer | Index attribute | Unit |
|---|---|---|---|---|
| | Population urbanization | The urban resident population accounts for the proportion of the total population | positive index | % |
| | | The non-farm population accounts for the proportion of the total population | positive index | % |
| Comprehensive development level of new urbanization in China | Land urbanization | The urban construction land area | positive index | square kilometer |
| | | The urban population density | positive index | human /km² |
| | | The ratio of the urban land growth rate to the urban population growth rate | neutral index | % |
| | Economic urbanization | *Per capita* GDP | positive index | yuan |
| | | Industrial added value accounts for GDP | positive index | % |
| | | One-third of the industrial output value accounted for GDP | positive index | % |
| | | The second or third industrial workers accounted for the proportion of the population of the economic activity | positive index | % |
| | Social urbanization | The urban resident population, basic old-age insurance coverage | positive index | |
| | | The urban resident population, basic medical insurance coverage | positive index | % |
| | | The water penetration rate | positive index | % |
| | | The gas penetration rate | positive index | % |
| | | The daily urban sewage treatment capacity | positive index | ten thousand cubic meters |
| | | Garbage disposal | positive index | ten thousand tons |
| | | Public transport vehicles per one million people | positive index | standard car |
| | | The road area *per capita* | positive index | square meter |
| | | The expenditure on education accounts for the proportion of the local fiscal expenditure | positive index | % |
| | | The Internet broadband access subscribers | positive index | ten thousand |
| | | The users of the mobile phone | positive index | ten thousand |
| | Urban-rural harmonious development | The gap between urban and rural *per capita* disposable income | reverse index | yuan |
| | | The comparison of the consumption level between urban and rural areas | reverse index | |
| | | The urban built-up area green-space rate | positive index | % |
| | Ecological civilization | The urban *per capita* park green space | positive index | |
| | | The completion of investment in industrial pollution control | positive index | ten thousand yuan |
| | | The comprehensive utilization rate of industrial solid waste | positive index | 2% |
| | | The discharge standard rate of industrial waste water | positive index | % |

*Source*: Authors

$$\overline{y} = \frac{1}{N}\sum_{k=1}^{N}\left(\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{m}\omega_j x_{ij}(t_k)\right) = 0$$

the formula (2) can be expressed as:

$$\sigma^2 = \sum_{k=1}^{N}\sum_{i=1}^{n}(y_i(t_k))^2 = \sum_{k=1}^{N}[\omega^T H_k \omega] = \omega^T \sum_{k=1}^{N} H_k \omega \qquad (3)$$

where $\omega = (\omega_1, \omega_2, ..., \omega_m)^T$, $H = \sum_{k-1}^{N} H_k$ for $m \times m$ order symmetric matrix,

$H_k = A_k^T A (k = 1, 2, \ldots, N)$, and

$$A_k = \begin{bmatrix} x_{11}(t_k) & \cdots & x_{1m}(t_k) \\ \vdots & \ddots & \vdots \\ x_{n1}(t_k) & \cdots & x_{nm}(t_k) \end{bmatrix}$$

If it is assumed $\omega^T\omega = 1$, that can be the maximum

value when $\omega$ is the characteristic vector corresponding to the maximum eigenvalue $\lambda_{max}(H)$ of the matrix $H$, $\sigma^2$ obtains the maximum value, while having $\max_{\|\omega=1\|} \omega^T H\omega = \lambda_{max}(H)$.

**The Evaluation Procedure**

*Data Standardization*. Different dimensions and orders of magnitude do not have additives, so the original data is needed to carry out a non-dimensional treatment. There are the standard processing method, the extreme value method, the linear method, the normalization method and the vector norm method, the efficacy coefficient method and the difference method have a greater impact on the evaluation results; therefore, the method of the greatest difference between the evaluation elements is adopted. In this paper, the linear proportion method is adopted.

We set, $\{x_{ij}(t_k)\}$ representing the numerical value of the $j$ index of the sample $^i$ in the $t_k$ period, and obtain the following:

$$x_{ij}^*(t_k) = x_{ij}(t_k)/m_j \tag{4}$$

In the formula (4), $x_{ij}^*(t_k)$ stands for the standard value; $x_{ij}(t_k)$ indicates the original index value; $m_j$ is the minimum value of the $j$ index in the studied period.

In addition to the said, in the index system constructed in the thesis, there are three types of indicators: „very large", „very small" and „intermediate". So, the consistent processing of the evaluation index types needs to be done, or otherwise the final comprehensive evaluation value may be impossible to compare.

For the „very small" index $x$, we set:

$$x^* = M - x \tag{5}$$

where $M$ is the upper bound of the index $^x$.

For the „intermediate" index $^x$ ,we set:

$$x^* = \begin{cases} 2(x-m), m \le x \le \dfrac{M+m}{2} \\ 2(M-x), \dfrac{M+m}{2} \le x \le M \end{cases} \tag{6}$$

In the above formula, $m$ is the lower bound of the index and $M$ is the upper bound of the index. Through the conversion of formula (5) and formula (6), all the „very small" and „intermediate" indices are transformed into the „very large" index.

*Calculate the real symmetric* matrix $H_k$.

$H_k = A_k^T A_k (1, 2, \ldots, N)$, in addition:

$$A_k = \begin{bmatrix} x_{11}'(t_k) & \cdots & x_{1m}'(t_k) \\ \vdots & \ddots & \vdots \\ x_{n1}'(t_k) & \cdots & x_{nm}'(t_k) \end{bmatrix} k = 1,2,\ldots,N \tag{7}$$

*Solve the maximum eigenvalue of the real symmetric matrix and the corresponding standard feature vector* $\lambda', H = \sum_{k=1}^{N} H_k$

*Calculate the weight*. The normalized feature vector is normalized in order to determine the combined weight vector.

Use Formula (2) to *calculate the composite index*.

## THE DYNAMIC COMPREHENSIVE EVALUATION OF CHINA'S NEW URBANIZATION DEVELOPMENT LEVEL

**Weight Determination**

We adopt the new urbanization evaluation index system, after the consistent and non-dimensional treatment of the data, using the „vertical and horizontal" method to deal with the data of the Chinese 30 provinces and cities in the period from 2004 to 2013 so as to obtain the weight of each index in the evaluation system. The specific weight results are shown in Table 2.

First of all, from the criterion layer, social urbanization relates to many public services indicators and infrastructure indicators; so, the cumulative weight of social urbanization is the highest in the six layers, reaching 43.37, and the average of the index weight is 3.94. The five-indicator cumulative weight of the construction of ecological civilization is ranked the second, amounting to 21.98, the average weight being 4.4. The cumulative

weight of the economic development level is 18.37, the average weight being 4.59. Among the remaining three criteria levels, the two-indicator cumulative weight of urban-rural harmonious development is 9.48, the mean weight being 4.74; the three-indicator cumulative weight of land urbanization is 8.11, the average being 2.7; the three-indicator cumulative weight of population urbanization is the lowest, reaching 6.24, the average weight being 3.12.

**Table 2** The index weight of the new urbanization evaluation index system

| Target layer | Weight | Criterion layer | Weight | Index layer | Weight |
|---|---|---|---|---|---|
| Comprehensive development Level of new urbanization In China | 100 | Population urbanization | 6.24 | The urban resident population accounts for the proportion of the total population | 3.28 |
| | | | | The non-farm population accounts for the proportion of the total population | 2.97 |
| | | Land urbanization | 8.11 | The urban construction land area | 3.06 |
| | | | | The urban population density | 2.97 |
| | | | | The ratio of the urban land growth rate to the urban population growth rate | 2.08 |
| | | Economic urbanization | 18.37 | *Per capita* GDP | 2.93 |
| | | | | Industrial added value accounts for GDP | 5.88 |
| | | | | The third industrial output value accounted for GDP | 2.18 |
| | | | | The second or third industrial workers accounted for the proportion of the population of the economic activity | 4.42 |
| | | Social urbanization | 43.37 | The urban resident population, basic old-age insurance coverage | 2.96 |
| | | | | The urban resident population, basic medical insurance coverage | 2.14 |
| | | | | The water penetration rate | 6.01 |
| | | | | The gas penetration rate | 5.92 |
| | | | | The daily urban sewage treatment capacity | 2.61 |
| | | | | Garbage disposal | 2.58 |
| | | | | Public transport vehicles per one million people | 2.44 |
| | | | | The road area *per capita* | 4.15 |
| | | | | The expenditure on education accounts for the proportion of the local fiscal expenditure | 4.64 |
| | | | | The Internet broadband access subscribers | 2.97 |
| | | | | The users of the mobile phone | 2.35 |
| | | Urban-rural harmonious development | 9.48 | The gap between urban and rural *per capita* disposable income | 4.60 |
| | | | | The comparison of the consumption level between urban and rural areas | 4.88 |
| | | Ecological civilization | 21.98 | The urban built-up area green-space rate | 4.56 |
| | | | | The urban *per capita* park green space | 3.83 |
| | | | | The completion of investment in industrial pollution control | 2.43 |
| | | | | The comprehensive utilization rate of industrial solid waste | 4.91 |
| | | | | The discharge standard rate of industrial waste water | 6.25 |

*Source*: Authors, based on *China Statistical Yearbook, China's Population and Employment Statistics Yearbook*

In view of a single indicator, we have calculated that the average weight of a single index is 3.7. The index higher than the average value indicates that it significantly affects the evaluation of new urbanization, including industrial added value, accounting for the GDP (5.88), the second or third industrial workers, accounting for the proportion of the population of the economic activity (4.42), the water penetration rate (6.01), the gas penetration rate (5.92), the road area *per capita* (4.15), the expenditure on education that accounts for the proportion of the local fiscal expenditure (4.64), the gap between urban and rural *per capita* disposable income (4.60), the comparison of the consumption level between urban and rural areas (4.88), the urban built-up area-green space rate (4.56), the urban *per capita* park-green space (3.83), the comprehensive utilization rate of industrial solid waste (4.91), the discharge standard rate of industrial waste water (6.25), which gives the total of 12 indicators.

## Overall Ealuation

According to the „vertical and horizontal" evaluation method used to determine the weight of each index, the evaluation results of the 30 regions in the period 2004 to 2014 are as follows (Table 3).

**Table 3** Dynamic comprehensive evaluation results of new urbanization in China, 2004-2014

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Beijing | 68.42 | 61.13 | 60.78 | 60.43 | 57.15 | 57.95 | 59.20 | 59.29 | 58.40 | 59.98 | 59.37 | 60.19 |
| Tianjin | 59.84 | 57.99 | 61.52 | 57.13 | 62.53 | 54.88 | 58.46 | 61.41 | 60.48 | 62.27 | 62.43 | 59.90 |
| Hebei | 50.07 | 50.76 | 49.42 | 47.19 | 52.90 | 53.83 | 54.54 | 54.90 | 55.41 | 54.97 | 55.35 | 52.67 |
| Shanxi | 41.67 | 38.81 | 39.13 | 41.45 | 44.62 | 41.61 | 47.52 | 47.69 | 50.09 | 51.70 | 51.23 | 45.05 |
| Inner Mongolia | 28.90 | 30.73 | 33.63 | 34.18 | 28.65 | 31.06 | 34.38 | 36.36 | 37.96 | 43.32 | 43.75 | 34.81 |
| Liaoning | 47.76 | 49.95 | 51.09 | 48.37 | 50.03 | 44.23 | 47.04 | 47.21 | 46.04 | 45.91 | 46.08 | 47.61 |
| Jilin | 34.89 | 35.85 | 40.19 | 40.06 | 37.84 | 36.82 | 39.20 | 39.87 | 37.97 | 42.05 | 42.45 | 38.84 |
| Heilongjiang | 42.79 | 44.59 | 45.91 | 41.72 | 42.09 | 43.27 | 44.87 | 44.61 | 44.96 | 46.51 | 45.98 | 44.30 |
| Shanghai | 75.98 | 65.56 | 66.52 | 66.40 | 64.17 | 58.39 | 61.85 | 59.59 | 56.61 | 57.33 | 57.89 | 62.75 |
| Jiangsu | 60.70 | 67.60 | 60.13 | 65.62 | 69.93 | 67.21 | 68.20 | 69.11 | 67.14 | 68.48 | 68.76 | 66.63 |
| Zhejiang | 66.47 | 62.77 | 48.37 | 61.71 | 60.20 | 60.51 | 61.86 | 63.42 | 63.28 | 65.18 | 65.54 | 61.76 |
| Anhui | 41.55 | 41.32 | 43.36 | 39.29 | 44.26 | 43.80 | 45.38 | 47.85 | 48.83 | 50.79 | 51.08 | 45.23 |
| Fujian | 53.26 | 53.45 | 46.78 | 50.02 | 52.01 | 52.82 | 54.31 | 51.76 | 54.45 | 54.51 | 54.65 | 52.55 |
| Jiangxi | 37.85 | 39.74 | 40.99 | 38.80 | 44.78 | 45.25 | 46.39 | 49.00 | 48.53 | 48.82 | 49.08 | 44.48 |
| Shandong | 54.13 | 54.62 | 65.77 | 63.80 | 67.15 | 65.41 | 65.22 | 67.60 | 67.41 | 67.86 | 67.98 | 64.27 |
| Henan | 44.42 | 43.81 | 44.21 | 42.27 | 41.46 | 41.37 | 41.25 | 43.21 | 43.51 | 44.64 | 45.34 | 43.23 |
| Hubei | 39.28 | 41.37 | 47.62 | 45.31 | 49.40 | 47.19 | 48.52 | 48.65 | 50.25 | 50.49 | 51.25 | 47.21 |
| Hunan | 37.40 | 39.48 | 42.15 | 40.61 | 43.18 | 41.58 | 42.55 | 40.45 | 43.81 | 44.37 | 45.43 | 41.91 |
| Guangdong | 64.88 | 63.79 | 55.05 | 57.86 | 61.19 | 63.17 | 62.74 | 66.00 | 64.84 | 64.39 | 64.79 | 62.61 |
| Guangxi | 33.80 | 32.76 | 34.51 | 36.95 | 36.42 | 40.37 | 39.02 | 36.89 | 39.30 | 40.18 | 40.87 | 37.37 |
| Hainan | 42.41 | 42.79 | 40.09 | 28.10 | 35.71 | 32.99 | 40.10 | 40.20 | 40.48 | 41.40 | 41.74 | 38.73 |
| Chongqing | 29.24 | 28.15 | 29.56 | 35.73 | 37.29 | 38.34 | 40.37 | 42.52 | 42.86 | 42.28 | 42.38 | 37.16 |
| Sichuan | 40.73 | 41.47 | 39.13 | 35.07 | 36.79 | 37.72 | 37.27 | 39.04 | 39.01 | 40.11 | 40.45 | 38.80 |
| Guizhou | 22.35 | 28.17 | 24.50 | 22.59 | 22.92 | 20.36 | 23.19 | 19.49 | 22.08 | 26.31 | 25.76 | 23.43 |
| Yunnan | 28.26 | 23.14 | 23.89 | 32.76 | 33.67 | 32.43 | 32.07 | 29.32 | 30.23 | 30.81 | 31.47 | 29.82 |
| Shaanxi | 34.83 | 35.15 | 38.29 | 39.53 | 45.16 | 45.50 | 48.41 | 47.04 | 46.88 | 46.69 | 47.34 | 43.17 |
| Gansu | 31.45 | 28.09 | 29.79 | 28.05 | 25.65 | 23.55 | 23.53 | 22.47 | 23.92 | 25.30 | 24.65 | 26.04 |
| Qinghai | 35.01 | 28.54 | 32.77 | 34.91 | 34.12 | 33.30 | 35.08 | 38.37 | 40.44 | 38.35 | 39.76 | 35.51 |
| Ningxia | 26.53 | 23.32 | 34.27 | 34.59 | 36.04 | 38.88 | 40.72 | 36.05 | 28.70 | 36.37 | 36.34 | 33.80 |
| Xinjiang | 41.86 | 41.56 | 38.26 | 43.10 | 37.48 | 45.29 | 45.63 | 46.15 | 47.53 | 49.36 | 49.42 | 44.15 |

*Source:* Authors, based on *The statistical yearbook of 30 provinces from 2005 to 2013*

At the same time, in order to observe the space of the comprehensive evaluation index of new urbanization, we use the Arcgis software to draw the spatial distribution map of China's comprehensive evaluation index of new urbanization. As can be seen from Figure 1, China's comprehensive evaluation index of new urbanization shows a more obvious concentration of distribution in the eastern, middle and western regions.

Beijing (60.19), Tianjin (59.90), Shanghai (62.75), Zhejiang (61.76), Shandong (64.27) and Guangdong (62.61) as the representatives of the higher areas mainly concentrate in the coastal areas. Among them, in Beijing and Shanghai, as the largest cities and the political and financial centers of our country, the population urbanization rate has exceeded 80%, the resident population urbanization rate of Shanghai being 89%, and the urbanization process has entered its mature stage, already having shifted from pursuing an increase in the urbanization rate to pursuing the quality improvement stage. The urbanization pattern of Zhejiang Province is a typical internal model based on the economic output and the industrial cluster in Zhejiang Province. In the past 20 years, not only has the number of cities rapidly increased, but the urban scale has also been subjected to the substantial expansion of Shandong Province and the urban population has accelerated aggregation, especially the Shandong Peninsula city group, which has gradually risen because the process of urbanization in Shandong Province has had a great influence on that. At the same time, as the gap between the urban and the rural areas in Shandong Province has gradually narrowed, transportation has become convenient, public service security has been at a relatively high level, leading to the higher level of the comprehensive evaluation results of new urbanization in Shandong Province. Guangdong Province's urbanization relies on the geographical advantages for the achievement of leapfrog development after the reform and opening up, and the Pearl River Delta city group in Guangdong Province is one of the three major city groups in China. In addition to the said, the pulling effect of the real estate industry and the construction industry on the urbanization is relatively large.

The evaluation results less than 35 are mainly related to the western, less developed areas, including: Gansu (26.04), Ningxia (33.80), Inner Mongolia (34.81) and Yunnan (29.82). Due to its geographical conditions, historical conditions and backward economic development level, not only is the population urbanization rate of this area low, but its social development, urban and rural relations, ecological construction and other aspects are also lagging behind the national average. The low level and the poor quality of urbanization make the comprehensive evaluation scores the lowest.

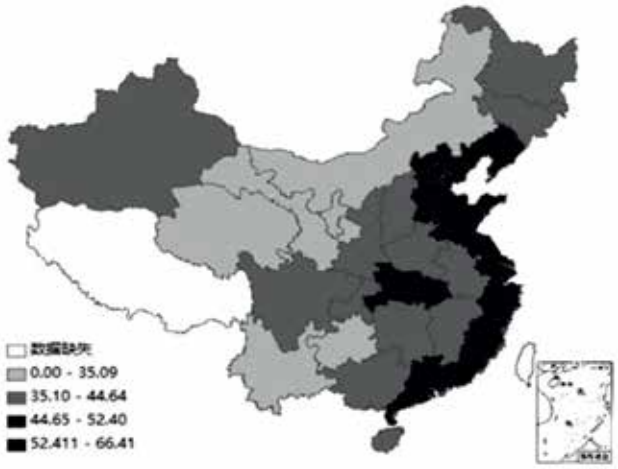


**Figure 1** China's comprehensive evaluation index of new urbanization - the space distribution map

*Source*: Authors

However, in comparison with the ten years' trends of change, the result shows the opposite. As shown in Figure 2, we can see that the three eastern provinces, characterized by a high evaluation index of new urbanization, show a downward trend in the period from 2004 to 2005. Zhejiang Province's comprehensive evaluation index of new urbanization fell by more than ten units in the period from 2005 to 2006, reaching its lowest point in ten years. The main reason is related to the changes in the city scale system, and the city's population density increased significantly, whereas the popularity of the public infrastructure was significantly decreased while the total steadily improved, because the population increase index,

the *per capita* public transportation index and the green area index are far lower than in 2004. From 2007 to 2014, the comprehensive evaluation index of new urbanization in Zhejiang Province gradually stabilized and showed a slow upward trend. While the comprehensive evaluation index of new urbanization is relatively low in the western provinces, it showed a trend of rising volatility in the ten years. At this point, we can preliminarily determine that in the new urbanization process in China there are obvious regional differences, namely the overall level of the eastern region is higher, whereas the overall level of the western, underdeveloped areas is generally low; in the development trend, the western provinces showed a more obvious upward trend.

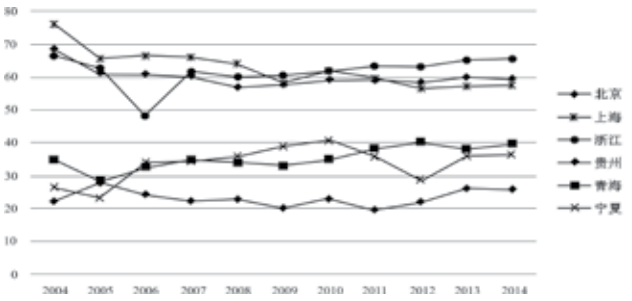


**Figure 2** The change in the comprehensive evaluation index of the representative provinces in the east and the west

*Source*: Authors

## Zoning Evaluation

In order to better study the new urbanization process in different regions, in this paper the research study is carried out in four directions, namely in the four regions: the eastern, the middle, the western and the northeastern, where the northeastern region includes Liaoning, Jilin and Heilongjiang (3 provinces); the eastern region includes Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan (10 provinces); the middle region includes Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan (6 provinces); the western region includes Guangxi, Inner Mongolia, Chongqing, Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang (11 provinces), the municipalities and the autonomous regions. The evaluation index of new urbanization in the whole country or in its different regions is the weighted average value of the GDP in the same year, which is the weight of the whole of the country or the region. Table 4 shows the change in the trajectory of the northeastern, the eastern, the central and the western regions of the comprehensive evaluation index of new urbanization from 2004 to 2014.

**Table 4** The evaluation index of new urbanization in 2004-2014

| | The whole country | Northeast | East | Middle part | West |
|---|---|---|---|---|---|
| 2004 | 50.80 | 43.50 | 60.95 | 40.77 | 33.79 |
| 2005 | 50.99 | 45.25 | 60.56 | 41.26 | 33.19 |
| 2006 | 49.82 | 47.10 | 57.30 | 43.42 | 33.73 |
| 2007 | 50.78 | 44.48 | 59.80 | 41.64 | 35.00 |
| 2008 | 52.38 | 44.91 | 62.12 | 44.27 | 34.96 |
| 2009 | 51.59 | 42.23 | 61.23 | 43.27 | 36.28 |
| 2010 | 52.59 | 44.63 | 62.12 | 44.67 | 37.39 |
| 2011 | 53.16 | 44.78 | 63.31 | 45.52 | 37.33 |
| 2012 | 52.96 | 43.84 | 62.60 | 46.89 | 38.09 |
| 2013 | 53.87 | 45.15 | 63.27 | 47.81 | 39.63 |
| 2014 | 54.32 | 46.12 | 64.24 | 47.56 | 39.87 |

*Source*: Authors

As can be seen in this studied period, the comprehensive evaluation index of China's new urbanization shows a rising trend in the overall fluctuation. It says that the overall quality of China's urbanization has improved, showing certain time regularity.

First of all, there was a more obvious decline in 2006, when the index was less than 50, reaching the minimum value of the studied time range. The reason for that is that the fact that the eastern region's comprehensive evaluation index experienced a significant decline, which accounted for the GDP of the whole of the country of 47.63% in 2006. Although the comprehensive evaluation index of the northeastern, the western and the central areas showed an upward trend in the same period, the eastern proportion was large, resulting in a small decline in the overall presentation.

Then, from 2006 to 2008, China's comprehensive evaluation index of new urbanization gradually rose and became stable. The reasons for the said lie in the

fact that the rural surplus transferred labor to the city during the period, the household registration system reformed, the city labor absorption capacity increased, the level of the urbanization of the population simultaneously continued to rise and the investment in the construction of the urban infrastructure increased. At this stage, China's overall condition of new urbanization was good and it was the most rapid phase of the comprehensive evaluation index within the scope of this research.

From 2008 to 2014, China's comprehensive evaluation index increased slightly in fluctuation. Specific performance in the 2009 fell to 0.8 units, only to rise in 2010 and 2011 to 53.16, after which there was a small decline in 2012, only to rebound in 2013, reaching the highest point in the period of ten years. These changes are consistent with the practice of urbanization in China. Since 2006, the quality and transformation development of China's urbanization draw the country's high attention. „Chinese Characteristic Urbanization" was put forward at the Party's 17th meeting in 2007, when China's new urbanization construction stepped into a new stage. Ten measures to expand domestic demand and promote steady economic development were launched in China in November 2008. By the end of 2010, investment had reached about 4 trillion, and nearly one-half of the funds were invested in the transportation infrastructure and the urban and rural power grid construction, and to a certain extent, eliminated the constraints on the urbanization of China's infrastructure construction lag.

Simultaneously, China's State Environmental Protection Administration upgraded in 2008 and established the Environmental Protection Ministry, thus improving the importance of the ecological environment in the decision-making system. Besides, we shut down more than 100 thousand high energy consumption and „five small" high pollution enterprises. The ecological environment of urban human settlements improved and the life quality of urban residents improved as well. Under the influence of various factors, the comprehensive evaluation index of new urbanization in China is steadily rising.

From a regional perspective, the comprehensive evaluation index of new urbanization for various regions showed significant differences. The comprehensive evaluation index of new urbanization for the eastern region was the highest, which indicates that the new urbanization level was the highest in China. The other three regions, including the northeastern, the western and the central regions were lower than the national average, and the lowest was the western index, but otherwise, it was also the most stable area with the comprehensive evaluation index increasing year by year and the gaps with other regions being reduced year by year. The central and the northeastern development trend was basically the same in the period from 2004 to 2009, and in the period from 2004 to 2006, it experienced a rapid rise, only to experience fluctuations and a decline three years later. In 2009, the comprehensive evaluation index of new urbanization in the central region was higher than the northeastern one, showing a steady upward trend after 2010 and being characterized by the widening of the gap between the northeastern and the central regions.

As can be clearly seen from Figure 3, the comprehensive evaluation index of the eastern region was faced with a rapid decline in 2006, mainly due to the impact of the four provinces, namely: Guangdong, Fujian, Zhejiang and Jiangsu: e.g. Zhejiang focused on the development of small cities and the central town; in 2006, Zhejiang accounted for nearly one-third of the national thousand strong town and, due to the early implementation of the „central town cultivation project", it resulted in a sharp rise in urban population density and the infrastructure construction lagged behind the population gathering speed, whereas the penetration rate of the *per capita* public-service facilities decreased, simultaneously affecting the overall evaluation results of new urbanization. From 2007 to 2014, the urbanization level of the eastern region generally exceeded 60% and the development pressure of each big city group, such as the Eastern Pearl River Delta and the Yangtze River Delta, continued to increase. According to the international experience, we have stepped into a period of slow urbanization and this trend can be expected to continue.

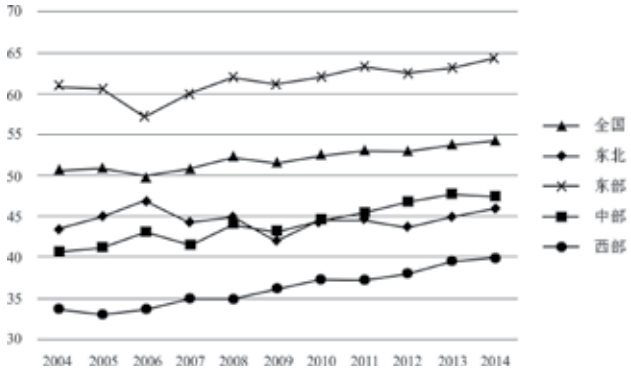


**Figure 3** The trend of change in the evaluation index of new national urbanization in 2004-2014

*Source*: Authors

The comprehensive evaluation index of new urbanization for the northeastern region is fluctuating most. China released the revitalizing of the northeastern old industrial base strategy in 2003, focusing on supporting the economic and social development of the Northeast, strengthening the adjustment of the industrial structure, when the Chinese urbanization process showed a rapid increase, with the index rapidly rising from 2004 to 2006. However, due to the ecological environment and the history policy, that led to the establishment of strong correlation between its industrialization and urbanization and a lack of comprehensive urbanization. Under the background of the revitalization of the northeastern region's old industrial base, the urbanization driven by high investment is not persistent, either.

The development trend of the central region is the same as the whole trend of change in the country's index. „The Central Region Rise" Plan was proposed in 2006 for the purpose of accelerating the adjustment of the industrial structure, upgrading the industry level and promoting industrialization and urbanization. After a year's adjustment in 2007, the comprehensive evaluation index of the central area began to steadily increase.

The western region shows a low level, but a steady rising trend in the studied range. The population urbanization level of the western region did exceed 50%, and the urbanization process would maintain a high growth rate in the long term, even showing an accelerated trend in the period from 2008 to 2010. The reason for the advancement of the comprehensive evaluation index of new urbanization for the western region lies in the fact that the city group of the eastern part was faced with population and high industry concentration pressures and its development space and potential became limited, while at the same time the city group in the central and the western regions formed the preliminary show form, such as the Wuhan City Group, the Jianghuai City Group, the Central Plains City Group and the Guanzhong City Group, playing an important role in the promoting of the gathering of various elements in the central and the western regions. Therefore, the central and the western regions became the main bearers of China's future urbanization and the absorption of a new urban population, which is also the realistic foundation of „solving the issue of the urbanization of one hundred million people in the nearest town", proposed by the Central Government.

## CONCLUSION

The accurate and objective evaluation the development of China's new urbanization level is the foundation for the establishment of a new urban development policy and a future direction. Only by correctly and comprehensively understanding the current situation in the development of new urbanization in China can we understand the development direction and formulate effective development policies. So, the following conclusions are drawn in this paper:

- In the analysis of the index weights, we can find out that social urbanization occupying the majority of the indices has the largest impact on the evaluation index of urbanization quality, which is only followed by ecological civilization, economy urbanization, urban-rural harmonious development land urbanization and population urbanization.
- According to the index weights results, the new urbanization level of 30 provinces, autonomous regions and municipalities was assessed in the

period from 2003 to 2014, and the results showed significant regional differences. The specific performance of the Jiangsu Province (66.63) of the eastern region had the highest score, whereas the lowest score was recorded in the Guizhou Province (23.43) of the western. As can be seen from the overall distribution map, the score higher than 60 was recorded in the eastern region, whereas the mean result below 30 was mainly found in the middle and the western underdeveloped regions.

- On the basis of the GDP of each particular province and municipality as the weight to calculate the weighted average value, the four regions' and the whole of country's comprehensive evaluation index of new urbanization changed its trajectory. Generally speaking, China's comprehensive evaluation index has showed a rising trend in volatility and proved that the quality of China's urbanization has improved since 2004. The new urbanization level of the eastern region is higher than the national average, whereas the central, the northeastern and the western regions are at a lower level than the national average. The western region has the lowest index, but the trend is the most stable, and the rapid growth of the western region has made the gap with the other regions decrease year by year. The new urbanization level of the central region exceeded the northeastern for the first time in 2009, when it showed a rapid upward trend. It was related to the special background of the old industrial base in the Northeast, and the northeastern region is characterized by the strongest volatility, but yet it does not demonstrate the law of dynamic rising. All in all, the promotion of the construction of new urbanization must be based on the basic conditions of the socialist primary stage and follow the laws of economic development and make urbanization become the general trend of the development process. At the same time, the regions should draw up policies for the development of their own urbanization so as to speed up the process of urbanization and narrow the gap between regional urbanization and promote regionally coordinated development.

This paper is based on the research in new urbanization in China conducted by the experts and scholars. The paper evaluates the new urbanization level of 30 provinces in China and makes a further analysis of the regional differences of new urbanization. In view of the limited time and energy, the index system constructed in this paper is not perfect, specifically not so when the choice of specific indicators is concerned; there is still a certain degree of subjectivity and the indicators reflecting the criterion level are not given in detail and comprehensive. At the same time, when the data collection is concerned, the data span is not large enough, and information is not accurate to reflect the dynamic process. Therefore, in the next step of research, the paper also needs to be further improved.

Firstly, and first of all, in the construction of the index system, it should be a more objective and comprehensive reflection of the connotation of China's new urbanization and the indicators selected should be more authoritative and representative.

Secondly, in the data collection, as many indicators as possible should be collected in order to analyze the process of dynamic change process in the new urbanization level in our country from a broader perspective.

Finally, when speaking about using the methods, although the vertical and horizontal levels of the grade method are used to determine the weight of each index, a future research study could try to use different research methods in order to find the best evaluation method.

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