A Comparative Study on the Competitiveness of Chinese Cities in 2010 and 2020 Based on Principal Component Analysis

--Taking the data of 284 cities in China as an example

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Abstract. China is urbanizing rapidly, and the development of cities at all levels and in all categories is changing rapidly. Urban competitiveness evaluation is the main method to evaluate the quality of urban development. Since the 1990s, scholars at home and abroad have conducted research on urban competitiveness, and the definition of urban competitiveness has not yet been standardized. The development process of Chinese cities is different from that of the West, especially since the 18th Party Congress, China's economic development and urban development are facing transformation and upgrading, and the connotation and evaluation of urban competitiveness have also changed significantly. Therefore, this paper adopts the principal component analysis method to evaluate the competitiveness of 284 cities in China in the two years of 2010 and 2020 in six indicators of economic development, social development, science and technology innovation, eco-environment, infrastructure, and opening up to the outside world, and conducts inter-period comparisons, comparisons of the competitiveness of cities in different regions of East, Central and West and comparative analyses of the competitiveness of large, medium-sized and small cities in respect of the main components extracted, as well as gives the corresponding policy recommendations.

Keywords: Urban Competitiveness, China, Principal Component Analysis

P. Dou and K. Zhang (eds.), *Proceedings of the 2024 International Conference on Social Sciences and Educational Development (ICOSSED 2024)*, Advances in Social Science, Education and Humanities Research 912,
https://doi.org/10.2991/978-2-38476-382-5_52

1 Introduction

The concept of "urban competitiveness" can be traced back to the concept of national competitiveness put forward in Michael E. Porter's The Competitive Advantage of Nations, in which it is argued that national competitiveness is centered on the competitive performance of industries in the international marketplace, and it is pointed out that the concept of competitiveness is also applied to regions and cities, and that urban competitiveness is worth the productivity of the city. At the same time, it is pointed out that the concept of competitiveness also applies to regions and cities, and that the competitiveness of a city is worth its productivity. In the 1990s, scholars successively put forward the research on urban competitiveness. Research on urban competitiveness at home and abroad has experienced a gradual development process from single indicators to comprehensive indicators and from hard power to soft power, mainly focusing on the connotation and extension of urban competitiveness, characteristics, models and evaluation methods.

Around the world, the development of cities is changing rapidly, and the study of urban competitiveness has attracted extensive attention from economic organizations, academics and the business community around the world. For example, the Global Urban Competitiveness Report published annually since 2015 by the United Nations OECD organization and the Doing Business in Cities Report published by the World Bank have played an important role in promoting the development of cities around the world.

Although the study of urban competitiveness in China did not start as well as in Europe and the United States, with the accelerating process of urbanization in China, the study of urban competitiveness has made rapid development in China. The Global Urban Competitiveness Report, jointly published by the Institute of Finance and Economics and Strategy of the Chinese Academy of Social Sciences and the United Nations Human Settlements Programmed (UN-HABITAT), has not only attracted worldwide attention, but also aroused concern about the competitiveness of Chinese cities.

This paper uses principal component analysis to analyze the development data of 284 Chinese cities in the years 2010 and 2020, to rank the competitiveness of Chinese cities in 2010 and 2020 respectively, and to conduct a comparative analysis for the main changes in the competitiveness of cities in the two years, the changes in the East, Central and West regions, and the changes in the rankings of large, medium and

small cities. This paper is organized as follows: the first part is the introduction, the second part is the literature review, the third part is the research methodology and data sources, the fourth part is the evaluation and interpretation of China's urban competitiveness, and the fifth part is the conclusion.

2 Literature Review

Since the rise and development of cities, scholars at home and abroad have elaborated on urban competitiveness from different perspectives, and there has not yet been a unified definition, this paper collects the following findings from previous literature:

The term "competitiveness" was firstly put forward by Michael E. Porter of the United States in "National Competitive Advantage", who believed that national competitiveness was centered on the competitive performance of industries in the international market, and in the field of enterprise competitiveness, he put forward the famous "diamond model"[1]. In the field of enterprise competitiveness, he put forward the famous "diamond model". Kresl argues that the essence of urban competitiveness is a city's ability to create wealth value, and Douglas Webster and others focus on firms in defining urban competitiveness, arguing that urban competitiveness is primarily a function of a city's firms' ability to produce and export, and that if a city is competitive, it should be able to provide good goods and services as well as non-transactional labor services. Douglas Webster and others focus on firms in defining the concept of urban competitiveness, arguing that urban competitiveness is primarily a function of the production and export capacity of firms in a city, and that if a city is competitive, it should be able to provide good product services and non-transactional labor services[2]. Edward argues that urban competitiveness focuses on the ability of cities to attract investment and employment.

Domestic scholars' research on urban competitiveness started in the 1990s, and Hao Shouyi, a professor at Nankai University, pointed out that urban competitiveness refers to the actual and potential ability of a city to create wealth on its own and to promote the creation of more social wealth for the region, the country, or the world compared with other cities in domestic and international markets, and comprehensively reflects the city's production capacity, quality of life, overall social progress, and external influence[3]. Zhou Zhenhua and others believe that urban competitiveness refers to the ability to efficiently allocate and utilize production requirements and resources by virtue of the city's economic strength, so as to obtain a

kind of market right. Ni Pengfei believes that urban competitiveness is a relative concept, which refers to the ability of a city to create wealth and value gains faster and better than other cities in the process of competitive development. According to Ninh Viet Minh et al., urban competitiveness is created and maintained under the combined effect of several factors, such as social and economic structures, values, culture, institutional policies, etc., and the ability of a city to optimize the allocation of resources in the larger region to which it belongs for its own development, thus obtaining sustained growth in the city's economy. According to Yu Taifang et al., urban competitiveness is a city's ability to produce goods, create wealth and provide services to meet the needs of regional, national or international markets, as well as to increase net income, improve the quality of life and promote sustainable social development, which comprehensively reflects the city's productive capacity, quality of life, overall social progress and its external impact.

Although the existing research on the competitiveness of Chinese cities has made rapid progress, there are still some shortcomings and deficiencies, which is the direction that this study should continue to deepen [4-5]. The marginal contributions of this paper are mainly reflected in the following aspects: first, this study evaluates the competitiveness of Chinese cities in 2010 and 2020 respectively, and compares the changes in the competitiveness of Chinese cities from a dynamic perspective; Especially since the 18th Party Congress, there have been significant changes in the evaluation of China's economic development as well as the evaluation of urban development, and the introduction of two years of data, 2010 and 2020, in the study of this paper can better show this change; secondly, this paper selects six major categories of indicators, namely, economic development, social development, scientific and technological innovation, ecological environment, infrastructure, and opening up to the outside world, which is able to more comprehensively show the evaluation of urban competitiveness compared with the previous studies, especially the inclusion of ecological environment indicators; Third, the data selected for this paper are the indicators of 284 cities in two years, 2010 and 2020, including different cities in the East, Central and West, as well as first-tier, second-tier as well as third-tier and fourth-tier cities, which can comprehensively show the competitiveness of different regions and categories of cities in China[6].

3 Research Methodology and Data Sources

3.1 Research Methods

(1) Principal component analysis method

Principal Component Analysis (PCA) is a multivariate statistical method for examining the correlation between multiple variables, which can effectively avoid multicollinearity. Principal Component Analysis (PCA) is a method to derive a few principal components from the original variables so that they retain as much information as possible about the original variables and are uncorrelated with each other.

(2) Construction of Indicator System

Based on the development process of Chinese cities and synthesizing the existing studies at home and abroad, this paper selects six categories and 21 items of indicators to study the competitiveness of cities.

Table 1. System of urban competitiveness indicators

Level 1 Indicators	Secondary indicators		Tertiary Indicators	Level 1 Indicators	Secondary indicators		Tertiary Indicators
Economic development	Total Economic Indicators	x1	Gross Regional Product	Ecological environment	Greening status indicators	x11	Greening coverage of built-up areas
		x2	RMB deposit balance of financial institutions			x12	Green space per capita

	Per capita economic indicators	3	x GDP per capita			13	x Harmless treatment rate of domestic garbage
		4	x Total retail sales of consumer goods per capita		Hardware facility	14	x Total road mileage per capita
	Industrial Structure Indicator	5	x Share of secondary industry	Infrastructure	Transport level	15	x Total Passenger Transportation
		6	x Tertiary Industry			16	x Total freight transportation
	Economic Development Vitality Indicator	7	x Average GDP growth rate	Science, Technology and Innovat	talent level	17	x Number of students enrolled in general higher education institutions per 10,000 persons

	Education Level Indicator	x 8	Teachers in secondary schools per 10,000 people	ion		x 18	Expenditure on science and technology
	Health Level Indicator	x 9	Number of health center personnel per 10,000 people		investment	x 19	Number of foreign direct investment enterprises
Social development		x 10	Number of hospital beds per 10,000 people	open to the outside world	trade	x 20	Total Imports
						x 21	Total exports

3.2 Data Sources

In this paper, principal component analysis is used to downsize the data of 21 indicators to avoid multicollinearity, and transform them into fewer principal components while maximizing the preservation of the original information, each principal component is a linear combination of the original variables after centering, and the principal components are uncorrelated with each other. Selected from 2010 China Urban Statistical Yearbook, 2020 China Urban Statistical Yearbook, 2010 China Statistical Yearbook, 2020 China Statistical Yearbook, and 2010 and 2020 National Economic and Social Development Statistical Bulletins of selected cities.

4 Evaluation of the Competitiveness of Chinese Cities

4.1 Empirical Analysis

(1) Feasibility Test.

In this paper, we use spss22.0 to analyze the raw data, and analyze the data by KMO test and Bartlett test, and standardize the data in order to eliminate the effect of unit inconsistency among different variables. The feasibility of the data was tested by KMO test. KMO test is an important index used to measure the strength of correlation between variables, mainly obtained by comparing the correlation coefficient and partial correlation coefficient of two variables, the KMO value is between 0 and 1, the higher the KMO value, the stronger the commonality of variables, the more suitable for the principal component analysis, the general criteria are as follows: 0~0.49 is unacceptable; 0.5~0.59 is very poor; 0.6~0.69 is barely acceptable; 0.7~0.79 is acceptable; 0.8~0.89 is relatively good; 0.9~1 is very good. 0.69 is barely acceptable; 0.7~0.79 is acceptable; 0.8~0.89 is better; 0.9~1 is very good. As can be seen through Table 2, the KMO value of the 2010 urban data is 0.824, with a large chi-square value and a significance level of 0.00, and the correlation between the indicators is strong, applying the principal component analysis method. The KMO value for the 2020 city data was 0.785, with a large chi-square value and a significance level of 0.00, again indicating a strong correlation between the indicators and the application of principal component analysis.

Table 2. Feasibility test for 2010 urban data

KMO and Bartlett's test		
Kaiser-Meyer-Olkin sampling appropriateness		0.824
Bartlett Spherical Detection	chi-square (math.)	6165.575
	Degree of freedom	210
	Significance	0.00

Table 3. Feasibility test for 2020 urban data

KMO与Bartlett test	
Kaiser-Meyer-Olkin sampling appropriateness	0.785

Bartlett Spherical Detection	chi-square (math.)	5023.613
	Degree of freedom	210
	Significance	0.00

(2) Primary factor determination.

In this paper, SPSS22 was used to extract principal components from the data of 21 indicators of 284 cities in 2010 and 2020. 6 principal components were extracted in 2010 and 2020 respectively, and the initial eigenvalue of each principal component was greater than 1, of which the cumulative variance accounted for 78% of the total in 2010, and the cumulative variance accounted for 73.5% of the total in 2020.

Table 4. Principal components extracted from 2010 urban data

	Initial eigenvalue			Extract the sum of the squares of the loads		
	Total	Percentage of variance	Percentage of cumulative variance	Total	Percentage of variance	Percentage of cumulative variance
1	8.727	41.558	41.558	8.727	41.558	41.558
2	2.447	11.655	53.212	2.447	11.655	53.212
3	1.661	7.908	61.12	1.661	7.908	61.12
4	1.506	7.173	68.293	1.506	7.173	68.293
5	1.089	5.185	73.479	1.089	5.185	73.479

6	.023	4.87	78.349	.023	4.87	78.349
7	0.991	4.717	78.201			
8	0.854	4.069	82.27			

Table 5. Principal components proposed for the 2020 city data

	Initial eigenvalue		Extract the sum of the squares of the loads			
	total	Percentage of variance	Percentage of cumulative variance	total	Percentage of variance	Percentage of cumulative variance
1	7.517	35.797	35.797	7.517	35.797	35.797
2	2.219	10.568	46.365	2.219	10.568	46.365
3	1.99	9.475	55.839	1.99	9.475	55.839
4	1.46	6.953	62.792	1.46	6.953	62.792
5	1.183	5.634	68.425	1.183	5.634	68.425
6	1.062	5.058	73.484	1.062	5.058	73.484
7	0.991	4.717	78.201			
8	0.854	4.069	82.27			

(3) Principal Component Decomposition.

Using principal component analysis, the extraction of China's urban development data in 2010 found that principal component 1 accounted for the highest proportion of X4, X1 and X2, focusing more on economic development indicators; principal component 2 accounted for the highest proportion of X8, X5 and X9, focusing more on social development indicators; principal component 3 accounted for the highest proportion of X5, X19 and X16; principal component 4 accounted for the highest proportion of X14, X8 and X21; principal component 5 has the highest percentage of X7, X14 and X3; and principal component 6 has the highest percentage of X13, X14 and X8.

Table 6. Indicators of principal component extraction in 2010

	Indicators	F1	F2	F3	F4	F5	F6
X1	Gross Regional Product	0.30	-0.17	0.15	-0.06	0.05	-0.04
X2	Balance of deposits in financial institutions at the end of the year	0.29	-0.25	0.06	0.02	0.14	0.00
X3	GDP per capita	0.23	0.29	0.17	-0.16	0.20	0.06
X4	Total retail sales of consumer goods per capita	0.31	0.16	-0.06	-0.04	-0.04	-0.01
X5	Value Added of Secondary Industry as % of GDP	-0.01	0.36	0.59	-0.08	-0.02	-0.05

X6	Value Added of Tertiary Industry as % of GDP	0.18	-0.18	-0.54	-0.14	0.12	0.06
X7	GDP growth rate	-0.08	0.16	0.06	0.05	0.54	-0.55
X8	Number of teachers in general secondary schools per 10,000 people	0.13	0.37	-0.14	0.28	-0.01	0.19
X9	Number of beds in health institutions per 10,000 people	0.24	0.32	-0.11	-0.10	0.15	0.00
X10	Number of health center staff per 10,000 people	0.24	0.30	-0.16	-0.01	0.07	0.00
X11	Green space per capita	0.24	0.24	-0.09	0.16	-0.14	-0.13
X12	Green coverage rate of built-up areas	0.11	0.22	-0.15	0.21	-0.53	-0.16
X13	Harmless treatment rate of domestic garbage	0.08	0.08	0.17	-0.37	-0.07	0.61
X14	Total road mileage per capita	-0.10	0.10	-0.10	0.34	0.35	0.33

X15	Road Passenger Transportation	0.24	-0.07	-0.02	0.03	-0.28	-0.22
X16	Road freight transportation	0.18	-0.16	0.19	-0.32	-0.16	-0.23
X17	General higher education students per 10,000 people	0.18	0.06	-0.26	-0.50	0.16	-0.08
X18	Science Expenditures	0.27	-0.25	0.12	0.18	0.16	0.05
X19	Number of foreign-invested enterprises	0.25	-0.15	0.19	0.13	0.07	0.10
X20	Import of goods	0.29	-0.19	0.09	0.25	0.09	0.05
X21	Exports of goods	0.29	-0.07	0.11	0.26	-0.02	0.04

For the data of China's urban development in 2020(table 7), the principal component extraction analysis found that the highest proportion of principal component 1 is X1, X18 and X2, focusing on economic indicators and science and technology expenditures; and the highest proportion of principal component 2 is X9, X10 and X6, focusing on health expenditures and the proportion of the service industry; The highest percentage of principal component 3 is X5, X3 and X11, focusing on industrial structure and green coverage; the highest percentage of principal component 4 is X14, X9 and X11; the highest percentage of principal component 5 is X15, X16 and X8; and the highest percentage of principal component X6 is X7, X11 and X8.

Table 7. Principal component extraction and indicator shares in 2020

	Indicators	F1	F2	F3	F4	F5	F6
X1	Gross	0.35	-0.0	-0.1	0.01	0.07	-0.0

	Regional Product		4	2			4
X2	Balance of deposits in financial institutions at the end of the year	0.32	0.03	-0.21	0.08	-0.01	0.00
X3	GDP per capita	0.27	-0.12	0.35	0.15	0.04	-0.04
X4	Total retail sales of consumer goods per capita	0.29	-0.04	0.26	-0.01	0.00	-0.07
X5	Value Added of Secondary Industry as % of GDP	0.01	-0.40	0.44	0.17	0.29	-0.06
X6	Value Added of Tertiary Industry as % of GDP	0.19	0.36	-0.19	-0.27	-0.28	0.10
X7	GDP growth rate	0.02	-0.02	0.05	-0.19	0.22	0.82
X8	Number of teachers in general secondary schools per 10,000 people	-0.21	0.05	-0.21	0.15	0.30	0.24
X9	Number of	0.01	0.49	0.16	0.25	0.14	-0.0

	beds in health institutions per 10,000 people						8
X10	Number of health facility personnel per 10,000 population	0.14	0.46	0.20	0.18	0.09	-0.01
X11	Green space per capita	0.14	0.10	0.33	0.22	-0.11	0.25
X12	Greening coverage rate of built-up areas	0.00	-0.04	-0.04	-0.20	0.18	-0.09
X13	Harmless treatment rate of domestic garbage	0.03	-0.28	0.12	-0.31	-0.44	-0.07
X14	Total road mileage per capita	-0.18	0.09	-0.19	0.27	0.10	-0.31
X15	Passenger Transportation on Roads	0.13	0.07	-0.06	-0.38	0.48	-0.15
X16	Volume of highway freight transportation	0.21	0.00	-0.01	-0.36	0.39	-0.20
X17	Number of students enrolled in general higher education per 10,000 people	0.17	0.29	0.32	-0.28	-0.16	-0.05

X18	Science Expenditure	0.33	-0.03	-0.20	0.11	0.00	0.00
X19	Number of foreign-invested enterprises	0.28	-0.16	-0.14	0.18	0.00	0.04
X20	Import of goods	0.31	-0.06	-0.26	0.20	-0.03	0.06
X21	Exports of goods	0.31	-0.16	-0.17	0.14	-0.01	0.06

4.2 Empirical Findings

(1)Spatial differences in the competitiveness of Chinese cities.

By using principal component analysis to analyze the development data of 284 Chinese cities in 2010 and 2020, it can be seen from Table 8 that most of the top 40 cities in China's overall urban competitiveness rankings are dominated by the eastern coastal cities, and the top three are still Beijing, Shanghai, and Shenzhen, except that the positions of the three cities in 2010 and 2020 are swapped. The top 40 cities include fewer cities in the Midwest and most are provincial capitals.

As can be seen from Table 9, among the cities in the bottom 40 of China's overall urban competitiveness rankings, there are most cities in the central and western parts of the country, and very few in the eastern part of the country.

(2) Temporal changes in the competitiveness of Chinese cities from 2010 to 2020.

From the extracted indexes of principal component analysis, the indexes that accounted for the largest proportion in 2010 were economic development and social development indexes, and the indexes that accounted for the largest proportion in 2020, in addition to economic indexes, the proportion of public health services and ecological environment indexes in social development have been greatly improved, which can be confirmed a lot from the reality and is in line with the actual view; In addition, many of the resource-based cities that were among the top ranked cities in 2010, such as Ordos and Karamay, are no longer among the top ranked cities in the 2020 ranking. This reflects a change in the way China's economy has grown over the past 10 years, and the competitiveness rankings of the cities confirm this change.

(3) Heterogeneity of changes in the competitiveness of Chinese cities.

Compared with 2010, newly emerging regional center cities such as Nanjing, Hangzhou, Chongqing and Wuhan, as well as Chengdu, have significantly improved their rankings and occupied the top 10 of the 2020 competitiveness ranking, indicating that the competitiveness of these cities has been significantly improved under the influence of national strategic support and new principal component indicator evaluation factors, which is consistent with our actual observation of urban development; Whereas in 2010, in addition to resource-based cities at the forefront, processing and manufacturing cities represented by Dongguan and Foshan also occupied the top 10, by 2020, the competitiveness of these cities has lagged behind significantly. It shows that the era of processing and manufacturing as the driving force of economic growth has passed, and cities with new advantages such as science and technology innovation and talent gathering are rising. For example, Guiyang, although located in the western province of Guizhou, is supported by green transformation and big data development to create a competitive advantage of the city. In 2020, it reached the top 20 in terms of competitiveness.

Table 8. Top 40 Cities in China in terms of Comprehensive Competitiveness, 2010 and 2020

City	2010	City	2020
Shenzhen	8.19	Shanghai	7.72
Shanghai	7.1	Beijing	7.06
Beijing	6.06	Shenzhen	5.18
Dongguan	4.55	Suzhou	4.79
Suzhou	4.36	Guangzhou	4.32
Guangzhou	3.77	Nanjing	3.78
Tianjin	2.46	Hangzhou	3.28
Foshan	2.08	Chongqing	2.58
Hangzhou	1.94	Wuhan	2.53
Wuxi	1.93	Chengdu	2.43
Ningbo	1.91	Qingdao	2.37
Ordos	1.79	Tianjin	2.33
Zhuhai	1.74	Ningbo	2.3
Nanjing	1.73	Guiyang	2.08
Xiamen	1.66	Wuxi	2.04

Dalian	1.62	Zhengzhou	2.02
Zhongshan	1.61	Hefei	2
Qingdao	1.58	Jinan	1.96
Chengdu	1.31	Changsha	1.91
Yantai	1.28	Dongguan	1.76
Daqing	1.26	Zhuhai	1.67
Weihai	1.25	Xiamen	1.65
Dongying	1.24	Taiyuan	1.57
Shenyang	1.16	Xi'an	1.49
Karamay	1.14	Kunming	1.47
Wuhan	1.14	Fuzhou	1.39
Urumqi	1.08	Zhoushan	1.36
Changsha	1	Shenyang	1.35
Chongqing	0.98	Urumqi	1.35
Baotou	0.95	Changzhou	1.2
Changzhou	0.93	Nantong	1.16
Jiayuguan	0.91	Dalian	1.13
Zibo	0.91	Nanchang	1.08
Taiyuan	0.9	Foshan	1.03
Jiaxing	0.75	Yantai	0.92
Jinan	0.73	Shaoxing	0.91
Shaoxing	0.69	Changchun	0.9
Hefei	0.67	Lanzhou	0.87
Nantong	0.6	Shijiazhuang	0.86

Table 9. Table of Cities Ranked in the Bottom 40 of China's Comprehensive Urban Competitiveness in 2010 and 2020

City	2010	City	2020
Weinan	-0.82	Tianshui	-0.7
Fangchenggang	-0.84	Ziyang	-0.7
Baocheng	-0.85	Neijiang	-0.71
Baoshan	-0.85	Yunfu	-0.72
Pingliang	-0.86	Chuzhou	-0.73

Tongliao	-0.86	Kaifeng	-0.73
Wuzhong	-0.86	Shaoyang	-0.73
xinyang	-0.86	Ankang	-0.74
Yulin	-0.86	Fangchenggang	-0.74
Chaoyang	-0.87	Laibin	-0.74
Hechi	-0.87	Luzhou	-0.74
Baise	-0.9	Meishan	-0.74
Yan'an	-0.91	Shanwei	-0.75
Heihe	-0.92	Huanggang	-0.76
Meizhou	-0.92	Xiaogan	-0.76
Bazhong	-0.94	Yulin	-0.76
Huludao	-0.94	Yongzhou	-0.79
Hezhou	-0.96	jieyang	-0.8
Tianshui	-0.96	jingzhou	-0.8
Tieling	-0.96	Pu'er	-0.8
Xinzhou	-0.96	Hechi	-0.81
Jieyang	-0.97	Hezhou	-0.81
Yunfu	-0.97	Zhongwei	-0.82
Guang'an	-0.99	Baoshan	-0.83
Pu'er	-0.99	Dazhou	-0.84
Dingxi	-1.02	Guyuan	-0.84
chaozhou	-1.03	zhoukou	-0.86
Guigang	-1.03	Suihua	-0.87
Shanwei	-1.04	Qinzhou	-0.91
Laibin	-1.05	Anshun	-0.93
Heyuan	-1.07	bazhong	-0.95
Baiyin	-1.08	Dingxi	-0.96
Suihua	-1.1	Lincang	-0.96
Ankang	-1.12	Zhangjiajie	-0.96
Qingyang	-1.16	Guigang	-0.99
Lincang	-1.18	suzhou	-0.99
Lvliang	-1.19	Bozhou	-1.04
zhongwei	-1.19	Chongzuo	-1.04

Longnan	-1.21	Fuyang	-1.04
Shangluo	-1.21	Zhaotong	-1.05
Zhaotong	-1.22	Longnan	-1.21

5 Conclusions

5.1 From 2010 to 2020, the factors accounting for the evaluation of urban competitiveness have changed slightly

This paper adopts the principal component analysis method to rank the competitiveness of Chinese cities based on the data of two years, 2010 and 2020. From the perspective of principal component extraction, the principal component share factors in 2010 focus more on economic development and social development; In 2020, in addition to economic development, there are factors such as the ecological environment and public health services, which is consistent with the changes that have occurred in the evaluation indicators of economic and social development since the 18th National Congress of the Party, in addition to the impact of the epidemic in 2020, the public health services have been strengthened to varying degrees in different parts of the country, which is consistent with the actual changes.

5.2 Decline in the competitiveness of resource- and export-oriented cities, accompanied by changes in the mode of economic development and the concept of development

The competitiveness ranking shows that between 2010 and 2020, the competitiveness of resource-based cities represented by coal and oil, as well as cities based on export substitutes, declined significantly, while some regional central cities implementing national strategies have continued to create centers of science and technology and talent concentration, with high-tech and advanced manufacturing industries, and the competitiveness of the cities has increased significantly, which is in line with the actual observation.

5.3 The pattern of ranking the competitiveness of cities as strong in the east and weak in the west has not changed.

Although the western region with the help of the Belt and Road, regional center city and other national strategies, formed Chongqing, Guiyang, represented by the competitiveness of the city representative of the continuous improvement, but also did not change the pattern of the competitiveness of the western city is weak.

5.4 Continuously enriching and improving the urban competitiveness index system by taking into account the characteristics of China's economy and urban development.

China's economy and urban development have their own characteristics, and the indicator system for urban competitiveness evaluation should be up-to-date and in line with the actual situation, so that it can accurately reflect the real state of urban competitiveness.

5.5 Driving the competitiveness of cities in the western region based on the implementation of the new development concept and national strategies

The western region lags behind the eastern part of the country in terms of industrial layout and infrastructure, which is a result of natural geographical conditions and development history. However, with the implementation of the new development concept and the implementation of the National Belt and Road and Regional Center City Development Strategy as an opportunity, the western cities can still come out of a different development path to improve competitiveness with the eastern cities.

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