Structural and regional research on per capita consumption expenditure of urban residents in China

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Abstract: In recent years, with the development of economy and the improvement of people's living standard, the per capita consumption expenditure in China has been increasing, especially the consumption expenditure of urban residents. The per capita consumption expenditure of urban residents is the main factor of social consumption demand and the direct factor of stimulating economic growth. It is an important index reflecting the living standard and quality of residents. The focus of residents' consumption gradually grows from being full too warm to paying attention to spiritual and healthy enjoyment. Although the total income of residents has increased rapidly, consumption expenditure has been increasing slowly. The imbalance of "high investment, high export and low consumption" of the national economic structure is very obvious. The main consumption demand is embodied in the survival consumption such as food, medical treatment and residence. With the different level of urban development, per capita consumption also presents regional characteristics. This paper uses factor analysis and cluster analysis to analyze the per capita consumption expenditure of urban residents in 31 provinces and cities in China. By factor analysis, the top 5 cities are Shanghai Beijing, Guangdong, Zhejiang and Fujian. Through cluster analysis, it is concluded that the per capita consumption expenditure level of urban residents in 31 provincial capitals is unbalanced. Finally, suggestions are made according to the results of the model analysis.

1. Index System Construction

1.1 Data sources

The study of 31 provinces and cities in China is based on the statistical yearbook of the National Bureau of statistics in 2019, which ensures the authenticity and reliability of the data. Combined with the social reality, it selects the appropriate evaluation index for the per capita consumption expenditure of urban residents in line with the actual requirements of this article.

1.2 Indicators Construction

Through the index system construction, the first-level index is the level of per capita consumption expenditure of urban residents. The second-level includes four aspects: basic consumption, service consumption, spiritual consumption and other consumption. The third one contains 8 targets, which are X1- Food and tobacco, X2-Clothing , X3- live X4- Traffic communication, X5- Daily necessities and services, X6- medical care, X7- ducational culture and entertainment, X8- Other supplies and services, as shown in Table 1.

Table 1 evaluation index system

First-level	Two- level	Three-level
Per capita consumption expenditure of urban residents	Basic consumption	Food and tobacco(X_1)
		Clothing (X_2)
		live (X_3)
		Traffic communication (X_4)
	Service consumption	Daily necessities and services (X_5)
		medical care (X_6)
	Spiritual consumption	ducational culture and entertainment (X_7)
	Other consumption	Other supplies and services (X_8)

2. Factor analysis

2.1 Applicability test of model

According to the index system of urban residents' per capita consumption expenditure, this paper collected and evaluated the sample data corresponding to the index system. Before conducting the analysis, we should first check the applicability of the sample data and test whether the data are suitable for factor analysis. The feasibility of factor analysis is based on the calculation of correlation coefficient matrix, KMO test and Bartlett spherical test. Among them, KMO test is used to compare the correlation coefficient and partial correlation coefficient between variables. The value of KMO is between 0 and 1. Kaiser gives the commonly used KMO metrics: 0.9 is more suitable; 0.8 is suitable; 0.7 is general; 0.6 is not suitable; 0.5 below is very inappropriate. The closer the KMO value is to 1, the stronger the correlation between variables is, and the more suitable the original variable is for factor analysis. The closer the KMO value is to 0, the weaker the correlation between variables is, and the more unsuitable the original variable is for factor analysis. The Bartlett spherical test is based on the correlation coefficient matrix. It is mainly used to check the distribution of data and the independent situation among variables. If the probability p value is less than 0.05 in SPSS, the correlation coefficient matrix of the factor is non-positive matrix. Factor analysis can be done. In this paper, the correlation coefficient matrix is calculated by SPSS 22 software, and the practicality test of KMO and Bartlett sphericity is carried out. The results are shown in Table 2 and table 3 respectively.

From table 2, we can see that most of the correlation coefficients are greater than 0.3, indicating that they have a certain correlation and can extract common factors from them and are suitable for factor analysis.

Table 2 correlation coefficient matrix

		Food and tobacco X_1	Clothing X_2	live X_3	Traffic communication X_4	Daily necessities and services X_5	medical care X_6	re Educational cultuand entertainment X_7	Other supplies and services X_8
mutually shut system number	Food and tobacco X_1	1.000	.177	.715	.523	.597	.222	.542	.704
	Clothing X_2	.177	1.000	.295	.562	.565	.495	.256	.551
	live X_3	.715	.295	1.000	.664	.799	.544	.804	.837
	Traffic communication X_4	.523	.562	.664	1.000	.719	.591	.631	.720
	Daily necessities and services X_5	.597	.565	.799	.719	1.000	.457	.719	.762
	medical care X_6	.222	.495	.544	.591	.457	1.000	.638	.694
	Educational culture and entertainment X_7	.542	.256	.804	.631	.719	.638	1.000	.792
	Other supplies and services X_8	.704	.551	.837	.720	.762	.694	.792	1.000

Table 3 test of KMO and Bartlett

Kmo and Bartlett test		
Kmo sampling Appropriateness.		.782
Sphericity test of Bartlett	Last read card	203.030
	Freedom	28
	Saliency	.000

According to table 3, it can be concluded that the probability p value of KMO =0.782>0.7 and Bartlett sphericity is 0.000 < 0.05, indicating that the sample data are suitable for factor analysis and the sample data are all from the normal distribution. Therefore, further analysis and model establishment can be carried out.

2.2 Extraction of factors

The principal component analysis method is used to extract the main factors. First, the total variance interpretation factor of the extraction factor is calculated and analyzed. From table 4, it can be concluded that the main factor extracted from the 8 indexes is 2 initial eigenvalues greater than 1, among which the first 2 eigenvalues are 5.241 and 1.066 respectively, and the cumulative variance contribution rate of the 2 main factors is 78.837%, covering most of the information of the evaluation index data. It can basically reflect the average per capita consumption expenditure of urban residents selected in 31 provinces and municipalities.

Table 4 interpretation of total variance

Interpretation of total variance									
assembly	Initial eigenvalue			Extracting load sum of squares			Quadratic sum of rotational loads		
	Total	Variance percentage	Cumulative%	Total	Variance percentage	Cumulative%	Total	Variance percentage	Cumulative%
1	5.241	65.516	65.516	5.241	65.516	65.516	3.766	47.078	47.078
2	1.066	13.321	78.837	1.066	13.321	78.837	2.541	31.759	78.837
3	.687	8.588	87.425						
4	.362	4.530	91.955						
5	.314	3.925	95.880						
6	.159	1.993	97.873						
7	.107	1.337	99.210						
8	.063	.790	100.000						

2.3 Establish factor load matrix.

The orthogonal rotations of factor loading matrix are carried out. The maximum variance method is adopted. The result of rotated component matrix is shown in Table 5, which can be seen from table 5. F_1 Have a large load on $X_1.X_3$. $X_5.X_7.X_8$, and the common factor is known after analysis.F_1 Represents the content of diet and life service, so it is named "diet and life service". F_2 Have a large load on X_2 . X_4 . X_6. The index F_2 reflects the content of clothing communication entertainment, so this article will be named "spiritual consumption".

Table 5 component matrix after rotation

Rotated component matrix [a]		
index	assembly	
	1	2
Food and tobaccoX_1	.881	-.005
ClothingX_2	.054	.898
liveX_3	.897	.294
Traffic communicationX_4	.575	.634
Daily necessities and servicesX_5	.719	.506
medical careX_6	.336	.747
Educational culture and entertainmentX_7	.794	.360
Other supplies and servicesX_8	.769	.550

2.4 Factor score

In this paper, regression method is used to estimate the factor score coefficient, and the component score coefficient matrix is obtained. The result is shown in Table 6.

Table 6 component score coefficient matrix

Component score coefficient matrix		
index	assembly	
	1	2
Food and tobaccoX_1	.403	-.318
ClothingX_2	-.296	.586
liveX_3	.303	-.122
Traffic communicationX_4	.035	.222
Daily necessities and servicesX_5	.146	.084
medical careX_6	-.114	.383
Educational culture and entertainmentX_7	.233	-.041
Other supplies and servicesX_8	.153	.096

$$F_1 = 0.403X_1^* — 0.296X_2^* * + 0.303X_3^* + 0.035X_4^* + 0.146X_5^* — 0.114X_6^* + 0.223X_7^* + 0.153X_8^*$$

$$F_2 = -0.318X_1^* + 0.586X_2^* — 0.122X_3^* + 0.222X_4^* — 0.084X_5^* + 0.383X_6^* — 0.041X_7^* + 0.096X_8^*$$

Based on the variance contribution rate of the 2 principal factors, the weighted comprehensive evaluation model of urban competitiveness is obtained.

$$F = \frac{65.516}{78.837} F_1 + \frac{13.321}{780837} F_2$$

By calculating the scores of two common factors and the comprehensive score and ranking, the results are shown in Table 7.

Table 7 factor score ranking

Factor score ranking			
Region	F_1 ranking	F_2 Ranking	total
Shanghai	1	6	1
Beijing	2	1	2
Guangdong	3	30	3
Zhejiang	4	7	4
Fujian	5	28	5
Tianjin	6	3	6
Hainan 7317			
Jiangsu	8	13	8
Hunan	9	17	9
Sichuan	10	22	10
Liaoning	11	5	11
Guangxi	12	29	12
Shanxi	13	27	13
Hubei	14	16	14
Shandong	15	11	15
Chongqing	16	14	16
Jiangxi	17	26	17
Yunnan	18	24	18
Anhui	19	25	19
Tibet	20	23	20
Xinjiang	21	4	21
Gansu	22	16	22
Guizhou	23	20	23
Hebei	24	17	24
Henan	25	21	25
Inner mongolia	26	2	26
Qinghai	27	9	27
Ningxia	28	10	28
Jilin	29	8	29
Heilongjiang	30	12	30
Shanxi	31	15	31

2.5 Result analysis

According to the score ranking of the 2 factors, we can see that in the public factorF_1, the 5 cities in Shanghai, Beijing, Guangdong, Zhejiang and Fujian ranked the top, that is, the average consumption level of the urban residents in these 5 provincial capitals is higher than that in the urban areas.F_2, The 5 cities of Beijing, Inner Mongolia, Tianjin, Xinjiang and Liaoning rank the top, that is, these 5 provincial capitals have higher consumption per capita in terms of mental consumption.

According to the comprehensive level evaluation and total rankings, Shanghai, Beijing, Guangdong, Zhejiang and Fujian are located in the top 5, indicating that the per capita consumption

expenditure of urban residents in these 5 cities is the highest, and their economic development and living conditions are superior. Qinghai, Jilin, Ningxia, Heilongjiang and Shanxi are among the last 5 cities. It shows that the per capita consumption expenditure of urban residents in these 5 cities is relatively low, and the economic development and living conditions need to be improved.

3. Cluster analysis

In order to further analyze the difference of the per capita consumption expenditure level of 31 urban residents, we use cluster analysis to classify 31 provincial capital cities in China, which are mainly divided into three categories: high level consumption cities, high level consumption cities, and low consumption livable cities. The clustering results are shown in Figure 1.For the first category of high level consumer cities, there are 2 cities in Beijing and Shanghai, indicating that the average per capita consumption expenditure of urban residents in these two cities is the highest, with the highest level of economic development and the best living conditions. For second categories of high level consumer cities, including Tianjin, Zhejiang, Jiangsu and Fujian, it shows that the average consumption expenditure of urban residents in these four cities is relatively high, and the economic development is the same.

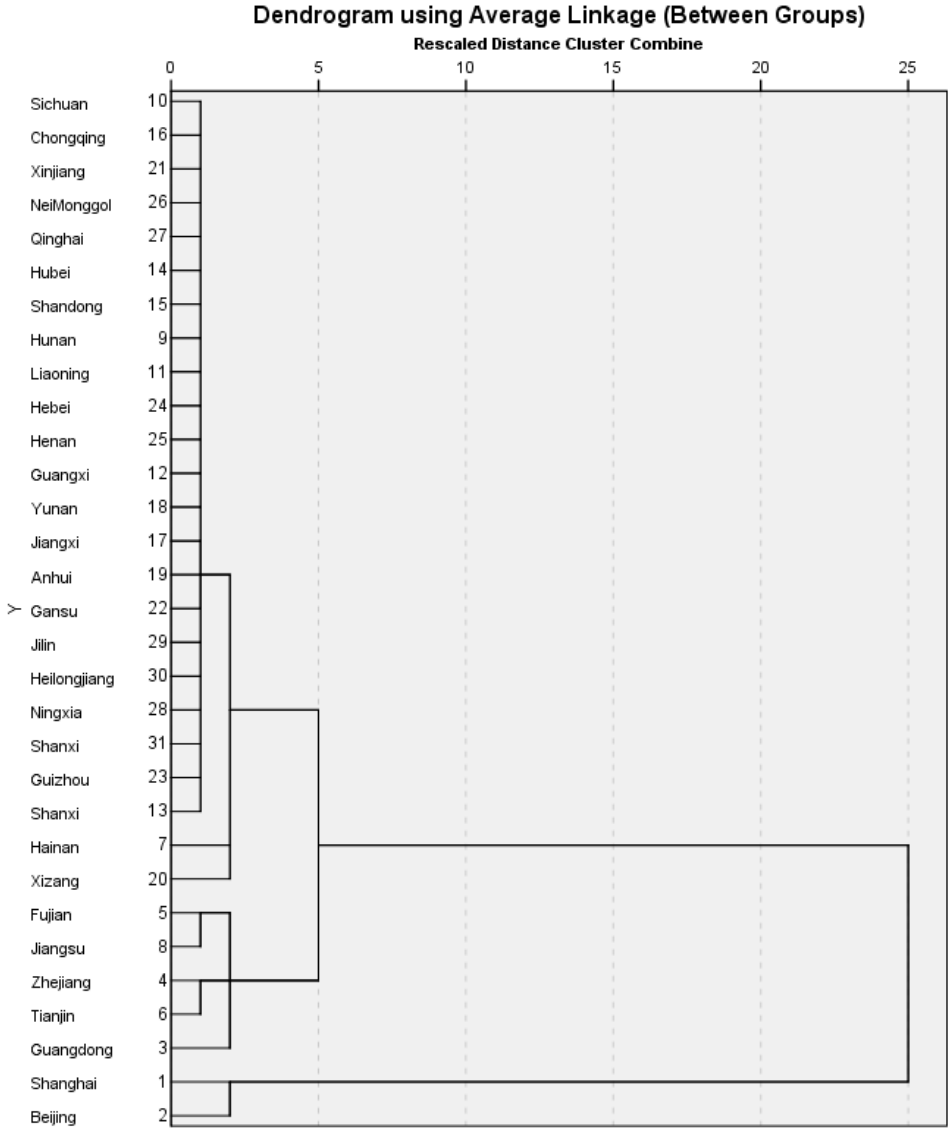

Fig. 1 dendrogram of cluster analysis

The other 25 cities are low-level consuming cities, which indicates that the per capita consumption expenditure of urban residents in these 25 cities is relatively low, the level of economic

development is relatively low, the living conditions are relatively general, and the situation needs to be improved.

4. Conclusions and recommendations

According to the results of factor analysis and cluster analysis, the consumption level of Beijing and Shanghai is the highest on the level of per capita consumption expenditure of urban residents; the consumption level of Tianjin, Zhejiang, Jiangsu and Fujian is general; and the consumption level of 25 cities such as Hainan and Tibet is relatively low, which indicates that the level of per capita consumption expenditure of urban residents in 31 provincial capitals is unbalanced. It is because of the difference in the level of urban economic development.

Therefore, based on the above results, we put forward the following policy recommendations: first, we should give full play to the leading role of high level consumption cities and encourage them to promote the development of other cities. Second, to improve the level of urban development, we must raise the level of economic development of the city. Third, for cities with low consumption level, the state needs to provide relevant policy support to assist the economic development of the region and stimulates consumption.

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