

Evaluation Indicator System for Collaborative Development of the Three Industries and an Empirical Research on Sichuan Province

Qizhi Yang

College of Tourism, Sichuan Agricultural University
Chengdou 611830, China
Tel: 86-28-8711-5330

Feng Ye

College of Economic Management, Sichuan Agricultural University
Ya'an 625014, Sichuan, China
E-mail: yefengjust106@126.com

Fuhui Yan

College of Economic Management, Sichuan Agricultural University
Ya'an 625014, Sichuan, China

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Abstract

Collaborative development of the three industries is the target of pursuit for economic development of a country, and is also the requirement for economic harmony and sustainable development. It is a difficult issue how to measure collaboration of the three industries and conduct a quantitative study. However, it is a quite good choice to establish an evaluation indicator system and employ the comprehensive evaluation method. Establishment of the indicator system is able to make an evaluation on collaborative development of the three industries in more regions. Furthermore, its establishment may enhance the three industries' industrial structure on the basis of evaluation, and optimize and upgrade the industrial structure, which can better stimulate regional economic growth and sustainable development.

Keywords: Collaboration of the three industries, Evaluation indicator system, Comprehensive evaluation method, Factor analysis method

1. Introduction

Collaborative development of the three industries and formation of a highly rationalized industrial structure has great significance to the healthy and long-term development of the national economy and to formation of a core competitive strength of the country. After the reform and opening up of industrial structure in China, it has been continuously regulated and optimized, which has gained better process and has resolved some difficulties that have troubled the economic development of China. However, in the process of development, there still exist some unoptimistic situations. The structure of the three industries is still irrational, and the phenomenon of regional industrial convergence still exists. Within the industries, intra-industrial structure is irrational and the problem of inharmony is still serious. It is still open to improve the adoption rate of high and new technology, the economic contribution rate of the economy and the competitive strength of leading industries and dominant industries. How to transfer from a manufacturing power to an innovation power and to improve the ability of independent innovation is still an issue for development of economy and regulation of industrial structure.

In order to conduct a better research on the issue of industrial collaboration, a scientific definition of industrial collaboration and proposal of relevant measurement indicators becomes the primary issue to be resolved by

researchers. A general survey of scholarly literature by related academics both at home, it is found that, research of a qualitative perspective is done in a lot of literature, and even if there is any quantitative research, selection of indicators is little and unsystematic. In “Discussion on the Relations between Coordination of Industrial Structure and Harmony of Economy”, Lv Mingyuan (2009) expounds by definition the importance of industrial structure collaboration. According to him, only if industrial structure is coordinated, can harmony of economy be guaranteed. Wang Chuanxu, et al, (2002) analyzed rationalization of industrial structure from the view of input-output. Although the analysis was made from a quantitative perspective, it was lacking in an empirical study, so it was difficult to apply. Cheng Ruxuan et al, (2001), offered the statistical indicators for industrial structure optimization and upgrading, but they were nothing but simple indicator system, since they were lacking in relevant empirical support. Besides, there are quite a large number of researchers most of whose studies established indicator systems from the perspective of industrial competitive force, industrial structure optimization and regulation, or from the perspective of industrial collaboration of intra-county economy, but the indicator systems they established were lacking in empirical support, quite abstract and with poor applicability and reference strength.

Thus, it has quite realistic significance how to establish an evaluation indicator system from the perspective of coordination of three industries and to use a relevant comprehensive evaluation method and the indicator system established to evaluate industrial collaborative development in a certain region. An evaluation indicator system can evaluate the industrial collaboration situation of a certain area in a quantitative way, discover problems on the basis of evaluation and provide related policies and suggestions to better stimulate regional industrial collaboration, optimize and regulate industrial structure and promote intra-industrial collaborative development of the three industries.

2. Related theoretical basis of collaboration of the three industries

The theory of collaborative development of three industries calls for support of lots of theories, and what are closely interrelated mainly include industrial cluster theory, industrial transfer theory and industrial structure optimization and regulation theory.

The idea of industrial cluster can be dated back at the earliest to Adams Smith, Founder of Economics. The classical school of economics represented by Adams Smith indirectly explained the idea of industrial cluster mainly by analyzing that division of labor could improve labor productivity and generate increasing returns to scale. By contrast, Marshall expounded causes for formation of industrial cluster from the perspective of location theory. And traditional and modern economic geography discussed causes for formation of industrial cluster from the perspective of location theory, growth pole theory, industrial agglomeration theory and industrial complex theory.

In the past several decades, with rapid development of economy in all countries across the world and with acceleration of the step of industrial structure regulation and optimization, industrial cluster has acquired vigorous development. Researchers from many countries have thrown deep interest in study on industrial cluster. It has become an issue that has to be taken into consideration for economic development of all countries how to generate a better pattern and formulate rationalized and hierarchical industrial space to industries of the countries through industrial cluster.

It can be said that industrial transfer theory has been accompanied with development of industrial cluster. When the national economy is developed, industrial regulation is accelerated and new types of industries come forth continuously, it is necessary to be involved in transition and transfer of traditional industries and modern industries. Industrial transfer involves industrial transfer between developed nations and underdeveloped nations and between different regions. In order to make more investment in new types of industries, high-technology industries and innovative industries and enlarge their industrial chains, developed countries would transfer traditional manufacturing industry and elementary processing industry into developing countries and underdeveloped countries and formulate international division of labors and international cooperation, and more rational and coordinated industrial structure. In the meanwhile, industrial differences and gaps of economic development also exist between different regions within the country. Regions that are rapidly developed tend to focus on industries with high value-added content of products and increase investment in modern service industry. In order to expand industrial space and enlarge industrial development scale, these regions will choose to transfer traditional processing industries to underdeveloped regions, whereas underdeveloped regions will take advantage of the low-cost labor force resources and natural resources transferred from developed regions and accelerate the rapid developed of the regional economy.

Industrial structure optimization and regulation is a process that has to be undertaken by each country in its

economic development, and both Europe and Japan have undergone the process of industrial structure regulation and optimization in their economic development. Industrial structure can be optimized according to the standard industrial structure by Chenery. According to him, the proportion of production value of the three industries, namely, the primary industry, the secondary industry and the tertiary industry, will be regulated continuously in the economic development. At the initial phase of the economic development, both the production value and the employment value of agriculture occupy a large proportion. However, with development of economy and with acceleration of industrialization progress, the proportion of the three industries takes a change. The proportion of the primary industry gradually declines, and the proportion of industry increases continuously. Simultaneously, the proportion of the three industries increases. With continuous reinforcement of industrialization, acceleration of urbanization progress, emergence of new types of industries and appearance and development of network economy and modern service industry, the proportion of the three industries continues to be enlarged and even takes a leading position in some developed countries. Industrial structure optimization and regulation is a dynamic and stable process, in which certain balance is pursued in changes.

Industrial cluster theory, industrial transfer theory and industrial structure regulation and optimization theory are the related theories of collaborative development of the three industries and can provide rational theoretical interpretations for collaborative development of the three industries. In order for the three industries to achieve collaborative development, it will necessarily involve rational industrial cluster and effective industrial transfer. In the same time, it will involve intra-industrial optimization and regulation and optimization and regulation within the industries. Collaborative development of the three industries can be only stimulated based on perfect industrial cluster and completion of industrial transfer.

3. Establishment of indicator system of the three industries

3.1 The principles for establishment of an evaluation indicator system for collaborative development of the three industries

Establishment of evaluation indicator system for collaborative development of the three industries has to follow several principles. Thus, we have to attempt to search for typical measurement indicators which can comprehensively reflect collaborative degree of the three industries and meanwhile reflect internal coordination of each industry. Establishment of indicators should be based on comparability and elimination of differences due to different units. Industrial coordination is a dynamic regulation process and is a continuous regulation and optimization process. Thus, indicators selected ought to be able to be regulated in a dynamic way, be flexible and be handled in a better way.

3.1.1 Principle of comprehensiveness

For establishment of evaluation indicator system, we have to select as many indicators as possible in the hope of reducing loss of data and bring all useful data into the indicator system so as to make a comprehensive and systematic evaluation on industrial coordination of the three industries. The more comprehensive the content of evaluation, the more conviction it carries.

3.1.2 Principle of comparability

most indicator data come from different areas, and since bases of population are varied, economic indicator in different regions may vary greatly. Thus, we have to conduct more calculation on the specific value of the indicators in hope of attaining comparability of indicators. Most data will be processed with the method of non-dimensionalization so as to strengthen comparability of data.

3.1.3 Principle of objectivity

Operation of an economic system has its rule since it has lots of indicators to measure. However, more objective selection of data is required for establishment of the indicator system. Qualitative explanation to some data is feasible which are not qualified for selection in establishment of the indicator system, because these data are not objective and are not appropriate to be applied in measurement of industrial coordination of the three industries. Thus, selection of data ought to be objective and operable and it is better to diminish difficulties in data collection, classification and application.

3.1.4 Principle of representativeness

A pattern of collaborative development in coordination of the three industries can't be formed until economy is developed to a certain extent. Coordination of the three industries not only involves intra-industrial coordination, but also is concerned with internal coordination of each industry. Hence, there might be quite a lot of measurement indicators. However, in actual establishment of the indicator system, there is no way to use up all

indicators, so selection of indicators should follow the principle of representativeness and indicators selected are expected to better measure and reflect the condition of collaborative development of the three industries.

3.1.5 Principle of hierarchy

Coordination of the three industries can be measured from the three perspectives of overall economic development, intra-industry and internal industry and there will be lots of indicator variables established. Thus, establishment of an indicator system has to follow the principle of hierarchy. That is, we further divide all indicators respectively from the three aspects of overall indicator of economic development, indicator of intra-industrial coordination of the three industries and indicator of internal coordination of each industry when reflecting the target of industrial coordination of the three industries, for which distinct hierarchy and clear-cut train of thought is necessary. In such way, it is possible to better establish an indicator system and meanwhile better apply the indicator system in practice.

3.2 Selection of indicators

In this system, in order to better evaluate industrial coordination of the three industries, authors mainly establish the indicator system from five aspects, namely, indicator of economic aggregate, indicator of internal coordination of the primary industry, indicator of internal coordination of the secondary industry, indicator of internal coordination of the tertiary industry, intra-industrial coordination of the three industries. Only when economy is developed to a certain extent and more newly emerging industries turn up, can we accelerate regulation and optimization of industrial structure and enable former industrial structure of the three industries to be continuously changed, including indicators of proportion of industries, proportion of employment and proportion of exportation, etc. Even if an economically underdeveloped area achieves the standard industrial structure defined by Chenery, it is still at a low level, not a dynamically optimized industrial structure in its real sense, and it will necessarily be continuously optimized and upgraded with regulation on economy. In the meanwhile, coordination of the three industries is also indispensable to collaborative development of the three industries. Only if internal coordination of the three industries is realized, can it be guaranteed to better optimize the industries and better promote industrial coordination on the basis of intra-industrial coordination of the three industries. Hence, on the basis of what has been mentioned above, authors establish the indicator system shown as below.

Insert Table 1 Here

3.3 Explanation of indicators

In order for the three industries to realize collaborative development, first of all, economy has to be developed to a certain extent. Only when economy is developed to a certain degree, can industrial aggregation and intra-industrial transfer be fulfilled, and can enough energy be put to regulate and upgrade industrial structure. Thus, there are mainly five major categories of indicators for selection of indicators.

(1) Economic aggregate indicator. Economic aggregate indicator reflects the overall situation of regional economy. The stronger of overall economic strength, the more possible it is to realize industrial coordination of the three industries. This indicator mainly includes GDP, amount of investment of fixed assets, local financial revenue, local financial expenditure, per capita net income of rural residents and urban per capita disposal income.

(2) Indicator of internal coordination of the primary industry. This indicator mainly reflects the situation of internal development of the primary industry, and internal coordination of the industry provides good foundation for intra-industrial coordination. This indicator mainly includes production value of the primary industry, proportion of the plant industry, proportion of the animal husbandry and fishery industry, proportion of agriculture service, value added of town and township enterprises, total power of agricultural machinery, and rural power consumption.

(3) Indicator of internal coordination of the secondary industry. This indicator mainly reflects the situation of internal development of the secondary industry. Development of the secondary industry mainly includes industry and construction. Coordinated development of the two can lay good foundation for coordination of the secondary industry. This indicator mainly includes production value of the secondary industry, value added of the industry and total production value of construction industry.

(4) Indicator of internal coordination of the tertiary industry. Internal coordination of the tertiary industry requires that all industries within the tertiary industry be fully developed, which can offer infinite impetus for development of economy and for fulfillment of coordination of the tertiary industry. This indicator mainly includes investment in real estate, sales amount of commercial residential building, finance and insurance,

transportation and warehousing and post and telecommunications industries, total expenditures for scientific and technological activities, tourism revenue, hotels and Catering Services and wholesale and retail industry.

(5) Intra-industrial coordination of the three industries. When the economic aggregate is substantially increased and internal coordination of the three industries is realized, economic foundation for intra-industrial coordination of the three industries is formulated. Intra coordination of the three industries is mainly viewed from the three aspects of structure of production value, contribution rate and employment structure, which can be further classified into nine indicators. These nine indicators are respectively: proportion of the primary industry, proportion of the secondary industry, proportion of the tertiary industry, contribution rate of the primary industry to GDP, contribution rate of the secondary industry to GDP, contribution rate of the tertiary industry to GDP, employment proportion of the primary industry, employment proportion of the secondary industry and employment proportion of the tertiary industry.

3.4 Evaluation methods for coordination of the three industries

Coordination of the three industries is a comprehensive evaluation process, which is concerned with establishment of a multi-indicator system. A general survey on existing comprehensive evaluation methods, there are mainly the following several ones: grey correlation analysis, fuzzy mathematics evaluation, analytic hierarchy process, principal component analysis and factor analysis method, etc. This article will employ factor analysis method. Factor analysis is relatively objective in calculation of indicator weight and is able to avoid subjective factors in fuzzy comprehensive evaluation and analytic hierarchy process, which may result in unconvincing results. Through factor analysis, we can get weight of each principal component and obtain total score of industrial coordination of the three industries in all areas. That area with higher score can be proved to be comprehensively better in industrial coordination of the three industries, and those areas with low scores are still open for improvement. They ought to find out items with low scores that affect factors of industrial coordination, and then improve those factors and improve condition of industrial coordination.

3.5 Evaluation procedure for coordination of the three industries

3.5.1 Collection and classification of second-class indicator data

At this step, we mainly collected statistical yearbook of the country, provinces and regions to get relevant data, and we got all indicators data according to relevant data collected and the requirement of the indicator system.

3.5.2 Non-dimensionalization handling of data

This indicator system is not only concerned with proportion indicator, but is also concerned with aggregate indicator. Since their units are different, we have to process relevant data by non-dimensionalization to reconcile statistical threshold for better operation and grading.

3.5.3 Calculation of total scores

Calculation of total score mainly adopts weighted mean calculation, which is mainly done by summarizing weight of first-class indicators and weighting of scores of all factors. After having got total scores, we could measure in which area collaborative development of the three industries is better according to ranking of total scores.

4. Empirical research --- a case study of Sichuan Province

4.1 Collection of data

Data in this paper are mainly collected from "Sichuan Statistical Yearbook" and "Statistical Bulletin of All Cities & Prefectures in Sichuan Province". In order to obtain relevant indicators, authors might process relevant data, such as, totaling and dividing these data, etc. Besides, in view of post-disaster influences of the earthquake in Sichuan Province in 2008, we chose data of cities and autonomous prefectures in Sichuan Province in 2007, since a normal year may better measure situation of industrial changes and any problem that might exist.

4.2 Modeling

We built the following model according to principal component analysis and conditions known:

$$X = AF + a_j \varepsilon \quad (1)$$

Where: $X = (X_1 \cdots X_p)$ refers to p original variables, F refers to m common factor variables, $m \leq p$; A is the factor loading matrix of $p \times m$; a_{ij} stands for the i^{th} original variable and relevant coefficient of j^{th} common factor variable. The bigger a_{ij} , the more stronger the common factor F_j and the original variable X_i ; ε is a specific factor, standing for the part that of original variables that can't be explained by common factor variable and amounting to the residual part in multiple regression analysis. (Note 1)

4.3 Results of the model

Through SPSS calculation, we get variance explained:

Insert Table 2 Here

In the mean time, after rotation, we get the score matrix of common factors with better explanation degree.

Insert Table 3 Here

We can find out which indicators determine each principal component from the above initial factor loading matrix table. The first factor F1 has heavy loading on x1 (GDP), x2 (amount of investment of fixed assets), x3 (local financial revenue), x4 (per capita annual net income of rural residents), x5 (urban per capita disposable income) and x6 (local financial expenditure), reflecting indicator of economic aggregate; the second principal factor F2 has heavy loading on x7 (production value of the primary industry), x8 (proportion of the plant industry), x9 (proportion of the animal husbandry and fishery industry), x10 (proportion of agriculture service), x11 (value added of town and township enterprises), x12 (total power of agricultural machinery) and x13 (rural power consumption), reflecting internal coordination of the primary industry; the third principal factor F3 has heavy loading on x14 (production value of the secondary industry), x15 (value added of the industry) and x16 (total production value of construction industry), reflecting internal coordination of the secondary industry; the fourth principal factor F4 has heavy loading on x17 (investment in real estate), x18 (sales amount of commercial residential building), x19 (finance and insurance), x20 (transportation and warehousing and post and telecommunications industries), x21 (total expenditures for scientific and technological activities), x22 (tourism revenue), x23 (hotels and catering services) and x24 (wholesale and retail industry), reflecting internal coordination of the tertiary industry; the fifth principal factor F5 has heavy loading on x25 (proportion of the primary industry), x26 (proportion of the secondary industry), x27 (proportion of the tertiary industry), x28 (contribution rate of the primary industry to GDP), x29 (contribution rate of the secondary industry to GDP), x30 (contribution rate of the tertiary industry to GDP), x31 (employment proportion of the primary industry), x32 (employment proportion of the secondary industry) and x33 (employment proportion of the tertiary industry), reflecting internal coordination of the three industries.

In addition, we get scores of single factors in sample areas as below:

Insert Table 4 Here

We take the variance contribution rate of the principal factors as the weight and substitute it into the model, getting:

$$Y=61.594\%F1+14.446\%F2+7.547\%F3+4.259\%F4+3.587\%F5$$

Then, we substitute scores of factors into the model and get total scores of factors as below:

Insert Table 5 Here

5. Conclusions and recommendations

5.1 Conclusions

(1) Considering the overall score, ranking of factor overall score is high in the six areas of Chengdu, Deyang, Mianyang, Yibin, Leshan and Nanchong, whereas the overall score in Ngawa Tibetan and Qiang Autonomous Prefecture, Bazhong and Garzê Tibetan Autonomous Prefecture is relatively low. Thus, according to the situation of score, it can be proved that industrial coordination in the areas ranking the first six positions is better, whereas industrial coordination in the three cities and autonomous prefectures is still open for improvement.

(2) Considering the economic aggregate, from the single factor scoring table, it can be found, the overall economic strength is strong in Chengdu, Mianyang, Deyang and Nanchong, whereas the local overall economic strength in such minority areas as Ngawa Tibetan and Qiang Autonomous Prefecture and Garzê Tibetan Autonomous Prefecture is relatively weak. In order to realize the target of intra-industrial coordination of the three industries, these areas should give priority to develop the local overall economy, which calls for more poverty alleviation and open policies.

(3) Considering the internal coordination of the primary industry, the situation in Nanchong and Ziyang is better, whereas the situation is still open for improvement in Zigong, Ya'an and Panzhihua.

(4) Considering the internal coordination of the secondary industry, development in Panzhihua and Deyang is more coordinated, whereas development in Bazhong, Ngawa Tibetan and Qiang Autonomous Prefecture and Garzê Tibetan Autonomous Prefecture is relatively less coordinated.

(5) Considering the internal coordination of the tertiary industry, development of the tertiary industry in Chengdu and Zigong ranks high, whereas the speed of development in Panzhihua and Meishan is relatively slow.

Of course, for more accurate and timely results, we have to continue to track development of these areas. Only actual development situation can verify whether the above conclusions are correct or not. Authors of this article will also continue to pay attention to study on this in the hope that we could provide a more distinct idea about collaborative development of the three industries.

5.2 Recommendations

(1) The primary task in intra-industrial coordination of the three industries autonomous areas, underdeveloped areas, such as Bazhong and impoverished areas is to expand current economy, improve the living standard of human being, make full use of current resources, explore underlying developmental potential, actively bring in projects, and improve the overall economic development level and economic aggregate by means of carrying out poverty alleviation and development policies.

(2) Such areas as Mianyang and Deyang with solid industrial foundation should make full use of their advantages to stimulate upstream and downstream industrial development, improve development of industries related with industrial development, such as, service industry, logistics industry and relevant supporting industries and finally formulate the new pattern of collaborative development of the three industries by mutual interaction and mutual assistance.

(3) Such areas as Chengdu and Zigong with prominent development in the tertiary industry should continue to strengthen and expand the tertiary industry, attract foreign investment to make development of the tertiary industry form a complete and ordered chain, and drive collaborative development of logistics industry, catering industry, tourism industry and comprehensive service industry.

(4) Such areas as Nanchong and Ziyang with solid primary industrial foundation ought to continue to give full play to their advantages and strengthen agricultural competitive force by continuously bringing in high agricultural technology and new agricultural technique. In the same time, these areas should develop intensive processing of agricultural products, enrich varieties of agricultural products, innovate the famous brand of agricultural products, and realize harmonious and collaborative development by promoting industry with agriculture and interacting agriculture and industry.

(5) Other areas also should take into consideration of local reality, make use of existing resources, strengthen and expand characteristic and competitive industries, stimulate all industries with one industry, enable several industries to develop collaboratively and finally realize the collaborative development of the three industries.

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Note

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Table 1. Evaluation indicator system for collaborative development of the three industries

First-class indicators	Second-class indicators	Notes
Economic aggregate indicator	GDP	
	Amount of investment of fixed assets	
	Local financial revenue	
	Per capita annual net income of rural residents	
	Urban per capita disposable income	
	Local financial expenditure	
Internal coordination of the primary industry	Production value of the primary industry	
	Proportion of the plant industry	
	Proportion of the animal husbandry and fishery industry	Totally proportion of production value of animal husbandry and fishery industry
	Proportion of agriculture service	
	Value added of town and township enterprises	
	Total power of agricultural machinery	
	Rural power consumption	
Internal coordination of the secondary industry	Production value of the secondary industry	
	Value added of the industry	
	Total production value of construction industry	
Internal coordination of the tertiary industry	Investment in real estate	
	Sales amount of commercial residential building	
	Finance and insurance	Totaling of bank loan and deposit and premium revenue and expenditure
	Transportation and warehousing and post and telecommunications industries	
	Total Expenditures for Scientific and Technological Activities	
	Tourism revenue	
	Hotels and Catering Services	
	Wholesale and retail industry	Totaling of wholesale and retail industry
Intra-coordination of the three industries	Proportion of the primary industry	
	Proportion of the secondary industry	
	Proportion of the tertiary industry	
	Contribution rate of the primary industry to GDP	
	Contribution rate of the secondary industry to GDP	
	Contribution rate of the tertiary industry to GDP	
	Employment proportion of the primary industry	
	Employment proportion of the secondary industry	
	Employment proportion of the tertiary industry	

Table 2. Variance contribution table

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	20.326	61.594	61.594	18.759	56.845	56.845
2	4.767	14.446	76.040	5.265	15.953	72.798
3	2.490	7.547	83.587	2.220	6.727	79.525
4	1.405	4.259	87.845	2.017	6.113	85.637
5	1.184	3.587	91.432	1.912	5.795	91.432

Extraction Method: Principal Component Analysis.

Table 3. Initial factor loading matrix

	Component				
	1	2	3	4	5
GDP	.979	.166	-.004	.102	-.006
Amount of investment of fixed assets	.974	.084	.072	.107	-.078
Local financial revenue	.967	.147	.101	.119	-.068
Per capita annual net income of rural residents	.548	.701	-.278	.175	.191
Urban per capita disposable income	.563	.561	.441	.109	.043
Local financial expenditure	.982	.020	.047	.115	-.010
Production value of the primary industry	.771	-.087	-.429	.032	.301
Proportion of the plant industry	.284	.327	-.201	.867	.010
Proportion of the animal husbandry and fishery industry	-.169	-.225	-.172	-.934	.044
Proportion of agriculture service	.057	-.078	.826	.010	.019
Value added of town and township enterprises	.925	.275	-.109	.135	.060
Total power of agricultural machinery	.793	-.102	-.360	.041	.288
Rural power consumption	.899	.242	-.033	.059	.157
Production value of the secondary industry	.958	.253	.021	.115	.019
Value added of the industry	.935	.323	.019	.092	.049
Total production value of construction industry	.970	.131	.032	.098	-.123
Investment in real estate	.971	.111	.074	.076	-.122
Sales amount of commercial residential building	.973	.106	.076	.080	-.118
Finance and insurance	.976	.125	.063	.100	-.097
Transportation and warehousing and post and telecommunications industries	.947	.205	.053	.091	.126
Total Expenditures for Scientific and Technological Activities	.898	.224	.038	.072	-.021
Tourism revenue	.955	.180	.171	-.018	-.079
Hotels and Catering Services	.982	.156	.006	.077	-.021
Wholesale and retail industry	.985	.122	.000	.090	-.043
Proportion of the primary industry	-.331	-.757	-.436	-.256	.004
Proportion of the secondary industry	-.088	.884	.158	.250	.252
Proportion of the tertiary industry	.628	-.390	.367	-.050	-.431

Contribution rate of the primary industry to GDP	.011	-.005	.116	-.108	.760
Contribution rate of the secondary industry to GDP	.018	.681	-.065	.138	.516
Contribution rate of the tertiary industry to GDP	.074	-.438	.418	-.156	-.663
Employment proportion of the primary industry	-.470	-.805	.133	-.064	.136
Employment proportion of the secondary industry	.258	.810	-.374	.056	-.113
Employment proportion of the tertiary industry	.637	.480	.318	.052	-.119

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

Table 4. Scores of single factors in sample areas

No.	Areas	FAC1_1	FAC2_1	FAC3_1	FAC4_1	FAC5_1
1	Chengdu	4.20448	0.37843	0.47331	0.38002	-0.63835
2	Zigong	-0.35234	0.87996	-0.33794	-0.21398	-0.9904
3	Panzhihua	-0.90317	2.18375	0.72688	2.18563	-0.70413
4	Luzhou	-0.21348	0.23087	-0.27854	0.08534	0.14411
5	Deyang	0.06454	1.14578	0.12686	0.18846	0.83446
6	Mianyang	0.30342	0.39736	-0.59316	-0.20685	0.04777
7	Guangyuan	-0.28305	-1.01249	-0.38333	0.66614	-0.83282
8	Suining	-0.27082	0.4495	-1.12148	-1.79562	-1.2906
9	Neijiang	-0.34493	0.68102	-0.58299	-0.07492	-0.38155
10	Leshan	-0.15433	1.30152	-0.18864	-1.73509	0.39965
11	Nanchong	0.13747	-0.88616	-1.07694	0.21168	0.2984
12	Meishan	-0.21874	0.10651	-0.36601	-0.27392	0.83379
13	Yibin	0.09276	0.09564	0.59545	-0.42914	3.24531
14	Guang'an	-0.20232	-0.47086	0.30322	0.19182	-0.42671
15	Dazhou	0.03705	-1.00324	-0.89184	0.8679	0.68818
16	Ya'an	-0.64252	0.24825	0.05357	1.58036	-0.49911
17	Bazhong	-0.12954	-1.74985	-0.57489	-0.56429	-0.9272
18	Ziyang	-0.17791	0.26112	-0.63727	-0.97316	0.4629
19	Ngawa Tibetan and Qiang Autonomous Prefecture	-0.43115	-0.41337	3.44431	-0.90771	-0.35143
20	Garzê Tibetan Autonomous Prefecture	-0.4106	-1.30859	1.33001	-0.65153	-0.76531
21	Liangshan Yi Autonomous Prefecture	-0.10483	-1.51515	-0.02058	1.46888	0.85304

Table 5. Total factor scores and ranking

Placename	Total score	Ranking of total score
Chengdu	2.673384	1
Deyang	0.278951	2
Mianyang	0.272916	3
Yibin	0.204804	4
Leshan	0.069118	5
Nanchong	0.012098	6
Dazhou	-0.02474	7
Luzhou	-0.05361	8
Ziyang	-0.06098	9
Meishan	-0.06538	10
Neijiang	-0.09523	11
Zigong	-0.09882	12
Panzhihua	-0.13728	13
Liangshan Yi Autonomous Prefecture	-0.15457	14
Guang'an	-0.16405	15
Suining	-0.18892	16
Ya'an	-0.27477	17
Guangyuan	-0.28639	18
Ngawa Tibetan and Qiang Autonomous Prefecture	-0.34082	19
Bazhong	-0.35414	20
Garzê Tibetan Autonomous Prefecture	-0.46142	21