

Research on the selection of leading industries in Beijing based on input-output analysis

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Abstract. The correct selection of leading industries can promote the coordinated economic development of a region. This paper takes the input-output table of Beijing in 2012 as the basis, and carries out the research on the selection of leading industries in the region, by using the analysis method of input-output, which can provide a theoretical basis for the development of regional economy in Beijing, and put forward some suggestions.

Introduction

The input-output table reflects the relationship between input and output of various sectors of the national economy, which is the embodiment of the operation of the national economic system in a certain period. The input-output technique has been widely used in the field of production analysis, demand analysis, price and cost analysis, and energy and environmental analysis, and theoretical research is carried out in this paper on the selection of leading industries in Beijing, according to the input-output table of Beijing in 2012.

Empirical analysis of leading industries in Beijing

Analysis of the comprehensive ability of industries

The response coefficient, influence coefficient, technical coefficient, coefficient of economic benefit, coefficient of labor input structure and coefficient of industrial expansion are adopted in the paper.

$$\text{Response coefficient of an industry} = \frac{n \sum_j q_{ij}}{\sum_i \sum_j q_{ij}} \quad (1) \text{ Influence}$$

$$\text{coefficient of an industry} = \frac{n \sum_i q_{ij}}{\sum_i \sum_j q_{ij}} \quad (2) \text{ Technical}$$

$$\text{coefficient} = \frac{V_j + M_j}{X_j} \quad (3) \text{ Coefficient}$$

$$\text{of economic benefit} = \frac{N_j}{X_j} \quad (4)$$

$$\text{Coefficient of Labor input structure} = \frac{V_j}{X_j} \quad (5)$$

$$\text{Coefficient of industrial expansion} = \frac{N_j}{\sum_{i=1}^n N_j} \quad (6)$$

Among them, q_{ij} is the element of Leontief inverse matrix $(I - A)^{-1}$, X_j represents the total output, which is equal to the total input; V_j is the labor remuneration from the input-output table; M_j is the operating surplus; N_j is the increased value from the input-output table, and these values can be directly obtained from the gross added value part of the third quadrant in the input-output table. [1]

The influence coefficient, response coefficient, technical coefficient, coefficient of economic benefit, coefficient of labor input structure, and coefficient of industrial expansion are synthetically used, as well as the subjective weighting method to calculate the score of comprehensive index, and the index weighting scheme is referenced to that of Li Chongyang, which is as follows: the weighting coefficient of influence coefficient is 0.19, the weighting coefficient of response coefficient is 0.18, the weighting coefficient of technical coefficient is 0.15, the weighting coefficient of the coefficient of economic benefit coefficient is 0.22, the weighting coefficient of the coefficient of labor input structure is 0.10, and the weighting coefficient of the coefficient of industrial expansion is 0.16. The scores of comprehensive indexes of various sectors in Beijing by calculation are shown in table 1.

Table 1 The calculated score table of comprehensive indexes of various industries in Beijing

industry	response coefficient(0.18)	influence coefficient (0.19)	technical coefficient (0.15)	coefficient of economic benefit(0.22)	coefficient of Labor input structure (0.10)	coefficient of industrial expansion (0.16)	total coefficient
Product and service of agriculture , forestry , animal husbandry and fishery	0.9472	0.8536	0.3156	0.3795	0.2597	0.0084	0.4908
Coal mining products	2.7716	2.3273	0.0389	0.0561	0.0178	0.0030	0.9615
Extraction products of Oil and gas	1.2480	0.4549	0.6028	0.7634	0.0908	0.0002	0.5786
Metal mining products	0.5626	1.2395	0.0928	0.1485	0.1056	0.0017	0.3942
Non-metallic minerals and other mining products	0.4122	0.7717	0.2984	0.4713	0.2985	0.0072	0.4003
Food and tobacco	0.7505	1.0360	0.0907	0.1761	0.0807	0.0101	0.3940
Textile	0.9073	1.2303	0.0710	0.1041	0.0525	0.0003	0.4359
Textile clothing, footwear, leather, down feather and its products	0.3712	1.0590	0.2085	0.2646	0.1328	0.0037	0.3714
Wood processed goods and furniture	0.5655	1.1593	0.1182	0.1729	0.0991	0.0012	0.3879
Papermaking and printing, stationery and sporting goods	1.1271	1.1081	0.1678	0.2370	0.1066	0.0048	0.5021
Petroleum, coking products and nuclear fuel processed products	1.0567	0.7294	0.0469	0.1560	0.0143	0.0072	0.3727
chemical product	2.6278	0.8755	0.2413	0.3238	0.1040	0.0270	0.7615
Non-metallic mineral products	0.6562	1.1160	0.1263	0.1875	0.0849	0.0061	0.3998
Metal smelting and calendaring processed products	5.0153	1.5702	0.0340	0.0766	0.0324	0.0015	1.2265
metal products	0.7116	1.4037	0.1126	0.1647	0.0736	0.0039	0.4559
General equipment	0.9657	1.2248	0.1321	0.1905	0.1068	0.0074	0.4801
Special equipment	0.5538	1.2194	0.1226	0.1735	0.1355	0.0060	0.4024
Transportation equipment	0.6931	1.1467	0.1190	0.1915	0.0495	0.0345	0.4131
Electrical machinery and equipment	0.8208	1.2697	0.1118	0.1538	0.0767	0.0072	0.4484
Communications equipment, computers and other electronic equipment	1.8022	1.3274	0.0651	0.1079	0.0541	0.0149	0.6179
Instrumentations	0.5264	1.1485	0.1685	0.2148	0.1143	0.0033	0.3975
Other manufactured products	0.3144	1.1977	0.1344	0.2041	0.1553	0.0008	0.3649
Waste products and materials	0.3903	0.5276	0.6622	0.6711	0.0231	0.0009	0.4199
Metal products, machinery and equipment repair services	0.7265	0.9241	0.2739	0.3697	0.2664	0.0010	0.4556
The production and supply of electricity, heating power	3.1524	1.4474	0.0465	0.1420	0.0308	0.0276	0.8882
Gas production and supply	0.4627	0.7439	0.1004	0.1273	0.0586	0.0017	0.2738
Water production and supply	0.3070	0.9627	0.1773	0.3113	0.1999	0.0010	0.3534
Constructions	0.4441	1.2323	0.1161	0.1840	0.1003	0.0428	0.3888
Wholesale and Retail	1.9475	0.5937	0.3429	0.5646	0.2168	0.1247	0.6807
Transportation, warehousing and postal services	1.9552	0.8876	0.1416	0.2566	0.1476	0.0457	0.6203
Accommodation and catering	0.6163	0.8936	0.2258	0.3128	0.2143	0.0209	0.4082

Information transmission, software and information technology services	0.5432	0.7621	0.3919	0.5102	0.2741	0.0904	0.4555
Finance	1.3912	0.5406	0.5500	0.6373	0.1751	0.1427	0.6162
Real estate	0.5992	0.5888	0.2817	0.5941	0.1655	0.0696	0.4204
Leasing and business services	1.4035	0.6478	0.4277	0.5490	0.4368	0.0742	0.6162
Scientific research and technical services	0.5935	0.8909	0.2804	0.3523	0.2335	0.0713	0.4304
Water conservancy, environment and public facilities management	0.3414	0.8859	0.2688	0.3345	0.2374	0.0057	0.3683
Residents services, repairs and other services	0.4063	0.8384	0.3547	0.4301	0.3453	0.0070	0.4159
Education	0.3352	0.6385	0.5210	0.5950	0.5078	0.0383	0.4476
Health and social work	0.2750	0.8982	0.3053	0.3334	0.3003	0.0202	0.3725
Culture, sports and entertainment	0.4076	0.8357	0.2751	0.3698	0.2494	0.0225	0.3833
Public administration, social security and social organization	0.2949	0.7913	0.3393	0.3838	0.3392	0.0318	0.3778

The total coefficient of metal smelting, calendaring products (1.2265), coal mining and mining products (0.9615), production and supply of electricity and heat (0.8882), chemical products (0.7615), wholesale and retail (0.6807) and others are larger, of which metal smelting and calendaring products has the highest score in the second industry and is ranked the first, the wholesale and retail industry has highest score in the third industry and is ranked the fifth, and there is none of the first industry.[2]

Analysis of industrial competitiveness

Analysis is carried out in the paper by using the proportion of output value and the location quotient. The formula are as follows:

$$\text{Proportion of an industry} = \frac{\text{The total output value of an industry}}{\text{The total output value of all industries}} \quad (7)$$

Location quotient=

$$\frac{\text{The proportion of output value of a certain section of a region in the regional total output value}}{\text{The proportion of output value of the section of the country in the national total output value}} \quad (8)$$

The calculated proportion of output value and location quotient are shown in table 2.

Table 2 The calculated results of proportion and location quotient of each industry in Beijing

industry	proportion of an industry	location quotient
Product and service of agriculture , forestry , animal husbandry and fishery	0.0075	0.1350
Coal mining products	0.0185	1.3170
Extraction products of Oil and gas	0.0001	0.0119
Metal mining products	0.0039	0.4983
Non-metallic minerals and other mining products	0.0052	1.3180
Food and tobacco	0.0195	0.3555
Textile	0.0010	0.0447
Textile clothing, footwear, leather, down feather and its products	0.0047	0.2546
Wood processed goods and furniture	0.0023	0.2007
Papermaking and printing, stationery and sporting goods	0.0069	0.3760
Petroleum, coking products and nuclear fuel processed products	0.0157	0.6276
chemical product	0.0284	0.3753
Non-metallic mineral products	0.0110	0.3796
Metal smelting and calendaring processed products	0.0065	0.0939
metal products	0.0081	0.4043
General equipment	0.0133	0.5037
Special equipment	0.0117	0.6001
Transportation equipment	0.0613	1.5182
Electrical machinery and equipment	0.0159	0.5100
Communications equipment, computers and other electronic equipment	0.0471	1.1645
Instrumentations	0.0052	1.5123
Other manufactured products	0.0014	0.8902
Waste products and materials	0.0004	0.1672
Metal products, machinery and equipment repair services	0.0010	1.6160
The production and supply of electricity, heating power	0.0661	2.1732
Gas production and supply	0.0044	2.2821
Water production and supply	0.0011	1.0263
Constructions	0.0792	0.9148
Wholesale and Retail	0.0752	1.6693
Transportation, warehousing and postal services	0.0606	1.5660
Accommodation and catering	0.0227	1.5589
Information transmission, software and information technology services	0.0603	3.8508
Finance	0.0762	2.0690
Real estate	0.0399	1.5241
Leasing and business services	0.0460	2.1415
Scientific research and technical services	0.0689	4.4235
Water conservancy, environment and public facilities management	0.0058	1.4986
Residents services, repairs and other services	0.0056	0.5655
Education	0.0219	1.5931

Health and social work	0.0206	1.5899
Culture, sports and entertainment	0.0207	4.7418
Public administration, social security and social organization	0.0282	1.3415

The industries with higher proportion of output value in Beijing are building (0.0792), finance (0.0762), wholesale and retail (0.0752), scientific research and technical services (0.0689), production and supply of electricity, heat (0.0661) and others, of which the third industries have the largest proportion, with the stronger absolute competitiveness in Beijing.[3]

The table shows that the number of industries in Beijing with location quotient larger than 1 are 22, while the top 5 are culture, sports and entertainment (4.7418), scientific research and technical services (4.4235), information transmission, software and information technology services (3.8508), gas production and supply (2.1732), and leasing and business services (2.1415), and there are 7 industries with the location quotient larger than 2, and 3 industries with the location quotient larger than 3, and the location quotients of culture, sports and entertainment are larger than 4, which indicates that they have the very strong competitiveness. It can be found that the vast majority of these industries are the third industries, which shows the relatively strong competitiveness of the third industry in Beijing.

Conclusion of empirical research

According to the above analysis, it shows that the response coefficient and influence coefficient of metal smelting and calendaring products, coal mining products, the production and supply of electricity, heat, communication equipment, computers and other electronic equipment, paper making, printing and stationery, and sports goods are larger than 1, which have the sensitive response to the increasing speed of economy, and are in the strategic position, with the top 11 in the ranking of total coefficient; but in terms of the location quotient, the values of paper making, printing, goods of education and sports, metal smelting and calendaring products are smaller, which are not suitable to be the leading industries, while the location quotients of production and supply of electricity and heat, coal mining and selecting products, communication equipment, computers and other electronic equipment, are larger than 1, which have the relative competitive advantage, and can be selected as the leading industries; but these industries are traditional industries, some other industry should be selected as a supplement.[4]

The location quotients of culture, sports and entertainment are very large, which have the relatively strong competitive advantage of location, compared with that of other places in the country. Beijing is the center of scientific research, and has the higher location quotient and proportion of output value of scientific research and technical services, with the obvious competitive advantage. Furthermore, finance, wholesale and retail, leasing and business service industry have the larger response coefficient, with the top 10 in the ranking of total coefficient, and their location quotient and proportion of output value are also in the top 10, with the larger developing potential, which are suitable as the leading industries.

To sum up, the production and supply of electricity and heat, communications equipment, computers and other electronic equipment, culture, sports and entertainment, scientific research and technical services, finance, wholesale and retail, leasing and business services and the exploring industry of coal mining can be selected as the leading industries.[5]

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