Evaluation Research on Logistics System of Cheng Yu urban Agglomeration Based on Super Efficiency CCR-DEA

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Abstract: Using the super efficiency model (CCR-DEA), the paper analyzes the logistics efficiency of 16 cities in Cheng Yu urban agglomeration, and finds that there is a significant difference between the logistics efficiency of each city. The city is divided into three groups according to the logistics efficiency, and the measures to improve the logistics efficiency are put forward.

Keywords: Chengdu Chongqing urban agglomeration; logistics system; super efficiency model

1. Introduction

Chengdu Chongqing city group is China's most important city in the western region, undertakes the important task of western development; at the same time, Chengdu Chongqing city agglomeration of the Yangtze River economic belt is the strategic support of China's economic growth and the "fourth pole", undertakes the important task of economic growth. In order to better promote the development of logistics and economic construction, it is necessary to evaluate the current situation of logistics development of Chengdu Chongqing urban agglomeration, and find out the shortcomings of logistics development.

The logistics system is defined as a logistics system including logistics nodes, logistics channels, logistics enterprises and other logistics facilities and logistics policies. And from the logistics nodes, logistics channels, logistics enterprises in three aspects of the Chengdu Chongqing Urban Agglomeration Logistics System evaluation

2. Evaluation Index Selection

With the help of DEA model, there are more literatures on the evaluation of urban logistics efficiency. For example, Liao Zhigao, Xu Minghui and Xu Jiuping (2014) [1] applied DEA model to analyze and evaluate the logistics development of the three major cities of the Beibu Gulf, the Yangtze River Delta and the Pearl River delta. Li Mengtao (2013) [2] used the DEA method to empirically investigate and analyze the cities in China's sub provincial level from the economic dimension, social dimension and environmental dimension. Wang Lei (2014) [3] used DEA analysis method to analyze the logistics efficiency of northern Xinjiang. Xiao Jia (2015) [4] used DEA method to evaluate the efficiency of urban logistics operation in the middle reaches of the Yangtze river.

However, the existing literature on the input and output indicators, choose more single input indicators of transport, storage and post employment, transportation, warehousing and postal industry fixed assets investment, highway mileage, number per 100 mobile and fixed telephone number, output indicators generally to GDP , freight, freight turnover etc.

The above indexes generally reflect the development level of city logistics, but don't specific to the logistics system of city group of the elements of evaluation, the evaluation of the logistics system of city group from the three aspects of logistics nodes, logistics channel and logistics enterprises.

Logistics node is the starting point and terminal point of logistics channel. It is the junction of all logistics channels. It is also a place where materials storage, loading and unloading, packaging,circulation, processing and information activities are carried out. The common logistics nodes are logistics park, logistics center, logistics distribution station and so on. In this paper, the input indicators are the post office and the number of fixed assets investment in transportation. The output indexes are freight volume, freight turnover and GDP.

The logistics corridor is the line connecting the nodes in the logistics network, including railways, highways, waterways, aviation and multimodal transport corridors. The input indexes of this paper are highway route mileage, inland waterway mileage and highway density. The output indexes are freight volume, freight turnover, port cargo throughput and GDP.

The logistics enterprise is the main part of the logistics market, and it is responsible for the entity flow in the logistics network. The major assets of the transportation enterprises are all kinds of means of transportation, and

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the most active ones are employees. The investment index chosen in this paper is the number of carriers, the number of road freight cars, the number of employees in transportation, storage and postal industry. The output index is the average wage, freight volume, freight turnover and express service income of employees engaged in transportation, warehousing and postal service.

For the overall logistics evaluation of the city, the input indicators include Postal Bureau, the number of transportation, fixed assets investment, and the output indicators include freight volume, freight turnover and so on.

3. Empirical Study

3.1. Collect Data

This paper selects the data of 16 cities in Cheng Yu urban agglomeration in 2014 to study, and the data sources are statistical yearbook of each city in 2014.

Main data sources: Statistical Yearbook of each city in 2014, China's urban statistical yearbook, Sichuan statistical yearbook, Sichuan transportation yearbook.

Table 1. Evaluation of the Original data of the Development Level of Logistics Nodes

City	Input index		Output index		
	Post office	Investment in fixed	The volume of freight	Rotation volume of freight	GDF
Chongqing	1720	1436	97287	25888734	14263
Chengdu	480	277	27092	2322248	10057
Deyang	178	29	9749	541032	1516
Yaan	123	41	5417	635693	462
Mianyang	448	93	4733	674954	1580
Leshan	264	101	10857	1206467	1208
Meishan	232	81	5526	520767	954
Ziyang	354	93	5448	482740	1196
Neijiang	214	53	2817	324903	1157
Yibin	253	86	6465	787461	1444
Luzhou	254	102	8799	2287887	1260
Zigong	174	48	4837	545753	1073
Suining	135	44	3923	447626	810
Nanchong	531	104	6664	877743	1432
Guangan	202	95	4068	307661	920
Dazhou	426	86.22	1183	1177089	1437.8

Table 2. Logistics Channel Development level Evaluation of Raw Data

City	Input index			Output index			
	Highway Length	Inland Waterway Mileage	Highway Density	The Volume of Freight Transport	Rotation Volume of Freight Transport	Port Cargo Handling Capacity	GDP
Chongqing	127392	4451	155	97287	25888734	146647800	14263
Chengdu	22789	177	188	27092	2322248	8310365	10057
Deyang	8165	707	98	9749	541032	8310365	1516
Yaan	6286	707	42	5417	635693	8310365	462
Mianyang	19887	646	98	4733	674954	8310365	1580
Leshan	11658	976	92	10857	1206467	2344576	1208
Meishan	7532	768	105	5526	520767	8310365	945
Ziyang	14804	506	186	5448	482740	6530000	1196
Neijiang	10136	745	188	2817	324903	3190000	1157
Yibin	18301	963	138	6465	787461	14271100	1444
Luzhou	13516	927	110	8799	2287887	31337497	1260
Zigong	6456	560	147	4837	454753	2390000	1073
Suining	8805	453	165	3923	447626	2752500	810
Nanchong	22466	707	180	6664	877743	5466824	1432
Guangan	10366	522	163	4068	307661	5175646	920
Dazhou	19510	866	118	11835	1177089	3679722	1438

Table 3. Evaluation of the Original data of the Development Level of Logistics Enterprises

City	Input index			Output index			
	There are several	Truck for road opera-	Number of employees engaged in	Average wages of employees in	The volume of freight	Rotation volume of	Express revenue

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	ships in transit	tion	transportation, warehousing and postal service	transportation warehousing and postal services	transport	freight trans- port	
Chongqing	3531	271343	415700	56039	97287	25888734	201100
Chengdu	96	129018	223046	64626	27092	2322248	351300
Deyang	338	29415	11550	41442	9749	541032	9713
Yaan	4	21081	3023	38262	5417	635693	2445
Mianyang	81	33749	11488	43239	4733	674954	1700
Leshan	401	18945	11200	39769	10857	1206467	9300
Meishan	173	24891	4407	34379	5526	520767	6817
Ziyang	320	19189	9174	38379	5448	482740	6137
Neijiang	259	12900	9064	38003	2817	324903	6027
Yibin	359	14991	11932	35594	6465	788461	8200
Luzhou	378	23559	14692	37167	8799	2287887	12800
Zigong	432	16254	15681	40802	4837	545753	5300
Suining	144	15349	3220	32733	3923	447626	6200
Nanchong	854	33736	12500	41126	6664	877743	10800
Guangan	309	11589	5277	41622	4068	307661	4600
Dazhou	587	27316	10366	32701	11835	1177089	6497

3.2. Processing Data

Because the DEA evaluation model requires that the index data should be different and not less than zero. Therefore, the raw data of 2004 in each table is reduced and transformed first. Specific treatment methods are as follows:

Transportation investment in fixed assets divided by 10; inland waterways, transportation vessels, road density, post office number divided by 102; freight volume, GDP divided by 103; highway truck operations, highway mileage, transportation, storage and postal industry staff average wages, transportation, warehousing and the postal industry practitioners number by 104; freight turnover divided by 105; the port cargo throughput divided by 10^6.

3.3. Evaluation Result Analysis

DEA was used for analysis and evaluation, and the results were as follows.

Table 4. Evaluation Results of Urban Logistics Efficiency of Chengdu Chongqing Urban

	Chongqing	Chendu	Deyang	Yaan	Mianyang	Leshan	Meishan	Ziyang
S node ev	1.67	2.46	2.58	0.83	0.40	0.74	0.43	0.33
Corridor	8.03	17.73	1.14	0.97	0.37	0.84	0.75	0.38
Nterprise	1.15	19.04	0.83	16.69	0.66	1.35	0.93	0.77
S node ev	Neijiang	Yibin	Luzhou	Zigong	Suining	Nanchong	Guangan	Dazhou
Corridor	0.49	0.56	1.23	0.66	0.61	0.41	0.36	0.66
Nterprise	0.34	0.45	1.89	0.68	0.42	0.29	0.40	0.58
S node ev	0.96	0.97	1.59	0.80	1.36	0.62	1.43	1.02

Table 5. Sorting of Urban Logistics Efficiency in Chengdu Chongqing Urban Agglomeratio

City	Logistics node Evsluation	Logistics Corridor Evaluation	Logistics enterprise evaluation
Chongqing	3	2	7
Chengdu	2	1	1
Deyang	1	4	12
Yaan	5	5	2
Mianyang	14	14	15
Leshan	6	6	6
Meishan	12	7	11
Ziyang	16	13	14
Neijiang	11	15	10
Yibin	10	10	9
Luzhou	4	3	3
Zigong	8	8	13
Suining	9	11	5
Nanchong	13	16	16
Guangan	15	12	4

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Dazhou	7	9	8

As can be seen from the above table, in the evaluation of logistics nodes, Deyang, Chengdu, Chongqing and Luzhou belong to the most efficient logistics nodes in the city. Nanchong, Mianyang, Guang'an and Ziyang are the last four cities to be ranked

From the evaluation of logistics channel, Chengdu, Chongqing, Luzhou and Deyang belong to several city logistics channel efficiency evaluation of the highest, and the few city developing roads, railway and waterway transportation inseparable. Ziyang, Mianyang, Neijiang and Nanchong are the latter four cities with low logistics corridors.

In the evaluation of logistics enterprises, Chengdu, Ya'an, Luzhou and Guang'an are the four cities with the highest input and output efficiency, showing that the logistics enterprises in four cities are developing at a faster speed with better benefits. Zigong, Ziyang, Mianyang and Nanchong are the latter four cities, and the logistics enterprises are developing at a slower pace and less efficient than the top ranked cities.

Using entropy method to determine weights Calculate the comprehensive logistics efficiency of each city.

Table 6. Index Weights Determined by Entropy Method

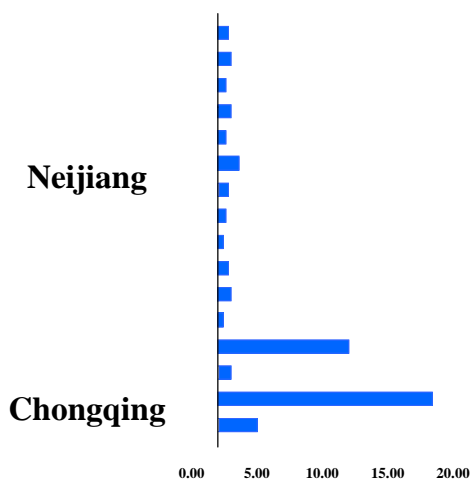|	Logistics node Evaluation	Logistics Corridor Evaluation	Logistics Enterprise Evaluation
Weight	0.1607	0.274	0.5653

Compre be Nsive Evaluation Value

Figure 1. The Comprehensive Efficiency of Cheng Cheng urban Agglomeration.

As can be seen from Figure 1, although all belong to the Chengdu Chongqing urban agglomeration, the logistics efficiency gap of each city is relatively large, which is divided into three distinct groups:

In the first group, Chengdu scored 16.02, ranked first, Ya'an scored 9.03, ranked second, and Chongqing scored 3.12, ranking third. Chengdu is flat, with a large population, rapid economic development, and a strong momentum in the development of the transportation industry. After the reconstruction of Ya'an, traffic and transportation construction took the first place, and the reconstruction of highway and railway has made rapid progress. Chongqing, relying on the "golden waterway", is developing rapidly in the context of rapid economic development and strong demand for logistics.

The second group, including Luzhou, Leshan, Deyang and other three cities, scored close to the concentration of 1.12 to 1.61, away from the first group, competition between each other is fierce. Luzhou is located along the river along the city belt, relying on the Luzhou port to develop water transport and multimodal transport. Leshan and Deyang in Chengdemian Le City with the smooth development of the logistics industry.

The third group includes Dazhou, Guang'an, Nanchong, Suining, Zigong, Yibin, Neijiang, Ziyang, Meishan, Mianyang City, the city logistics performance is lower than 1, each level of logistics development gap is not big, but the geographical position of Yibin City, Nanchong good logistics industry development potential.

4. Conclusion

Chongqing and Chengdu, as the core city of Chengdu Chongqing urban agglomeration, should continue to strengthen the logistics construction, control the number of logistics nodes, and strengthen the quality of logistics node development. We will continue to promote the construction of logistics channels such as highways, railways, waterways and aviation. At the same time, the government will provide a more fair and equitable market environment, improve the relevant logistics policies, and promote the development of logistics enterprises.

Ya'an, Luzhou, Leshan and Deyang City, logistics logistics evaluation with high efficiency, good momentum of development, should take the initiative to seize the country to vigorously develop Chengdu Chongqing city agglomeration opportunities, increase construction in logistics nodes, logistics channels, through the promotion of related infrastructure construction, continue to improve the overall logistics network, promote the development of the logistics industry.

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The cities with lower equivalent rates in Leshan and Nanchong should first take the initiative to strengthen their understanding of the importance of logistics development and formulate and improve the logistics development plan. Secondly, we should increase investment in the logistics industry, and promote the construction of logistics infrastructure. Support the development of local industrial and commercial enterprises, expand the demand for logistics, and cultivate or introduce relevant logistics enterprises to promote the development of local logistics industry.

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