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A Study on the Evaluation of Logistics Efficiency in 22 cities of Guangxi and Yunnan

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광서성 및 운남성 22개 도시의 물류 효율성 평가에 관한 연구

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Abstract The logistics industry is a basic and strategic industry that supports the development of national economy and society. The purpose of this paper is to evaluate the logistics efficiency of 22 cities in Guangxi and Yunnan provinces in China, and to grasp the problems and constraints and present policy proposals to promote the transformation and upgrading of the industrial structure in Guangxi and Yunnan provinces. In this paper, five input indexes and four output indexes were selected and the data from 2016 to 2018 were analyzed through DEA method. According to the analysis, the logistics efficiency of Guangxi and Yunnan provinces is not bad overall, but the development of each region is not balanced and the level of logistics efficiency is quite different. And it is found that each city needs to further improve the level of scale because the input and production structure of logistics resources is unreasonable. The limitation of this study is that it is difficult to generalize the analysis results because only the data over the past three years have been analyzed. It is necessary to comprehensively implement longitudinal and transverse analyses by extending the future analysis period over a long period of time.

Key Words : DEA, Logistics Efficiency, Technical efficiency, Scale efficiency, One Belt and One Road

요 약 물류산업은 국민경제와 사회의 발전을 지원하는 기간산업이다. 본 논문은 중국 광시성 및 윈난성 22개 도시의 물류 효율을 평가하고, 문제점과 제약사항을 파악하여 광시성 및 윈난성 산업구조의 변혁과 고도화를 촉진하기 위한 정책제안을 제시하는 것을 목적으로 한다. 본 논문에서는 5개의 투입지표와 4개의 산출지표를 선정하고 2016년부터 2018년까지의 데이터를 DEA 방법을 통해 분석하였다. 분석결과 광시성과 윈난성의 물류 효율은 전반적으로 나쁘지 않지만 지역 간 발전이 균형이 맞지 않고 물류 효율의 수준도 상당히 다르다는 것을 알 수 있었으며, 각 도시별 물류자원의 투입-산출 구조가 불합리해 규모의 수준을 더욱 개선할 필요가 있는 것으로 파악되었다. 본 연구의 한계는 과거 3년간의 데이터만을 분석하여 분석결과를 일반화하기 어렵다는 것이다. 향후 분석기간을 장기간으로 확대하여 종적 및 횡적 분석을 종합적으로 시행할 필요가 있다.

주제어 : 자료포락분석, 물류 효율성, 기술효율성, 규모효율성, 일대일로

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1. Introduction

China's economy has shifted from a stage of rapid growth to a stage of high-quality development. The logistics industry, as a basic and strategic industry supporting national economic and social development, should also transform and upgrade, develop new logistics, and provide high-quality and efficient logistics support for economic development. On the whole, China's logistics industry ranks high in many indexes in the world. In terms of scale, China has become a global 'logistics power'. However, there are still some problems in China's logistics, such as low operation quality and efficiency, weak service supply capacity, insufficient infrastructure connectivity and innovation capacity, unbalanced and inadequate development, so the institutional and policy environment needs to be further improved[1].

The best way to evaluate a regional logistic development is to measure and assess the input and output of relevant logistic resources, then find out the shortcomings and constraints in the course of regional logistic operation, and put forward strategies of development and promotion, which will play an important role in improving the level of regional logistics. The evaluation of regional logistics efficiency has become an important part of studying regional economic development, and has significant significance for coordinating regional economic development[2].

In 2015, Guangxi and Yunnan in the southwest of China were identified as key provinces of 'One Belt And One Road'. Compared with other provinces, the development of logistics in these two provinces was relatively slow, and the operation efficiency of regional logistics was relatively low, which were not conducive to regional economic development[3]. In the context of the 'One Belt And One Road', the central government makes it clear that Guangxi province should give play to its advantages of being adjacent to ASEAN countries in land and sea. Beibu Gulf Economic Zone and the Zhujiang-Xijiang Economic Belt should be accelerated to be opened in development to build an international corridor facing ASEAN, create a strategic fulcrum of opening development in southwestern, central and southern regions and then form an important hub for the 21st century maritime Silk Road and Silk Road Economic Belt. Yunnan is a key node of the ancient 'Southern Silk Road', and the most convenient land transportation hub connected to South Asia and Southeast Asia, and also the only province that can lead to Indochina peninsula and South Asia. Yunnan is an international channel of both land silk road and maritime silk road, which is of great significance to the implementation of 'the Belt and Road' strategy[5].

In 2018, Guangxi's total export to South Korea reached 211.798 million yuan, an increase of 16.2% over 2017, and its total import to South Korea was 269.616 million yuan, an increase of 17.5% over 2017[6]. Yunnan's total exports to South Korea reached 97.696 million yuan, an increase of 9.2% over 2017, while its imports to South Korea totaled 3.2336 million yuan, an increase of 354.3% over 2017[7].

With the rapid development of economy, the logistics industry in Guangxi and Yunnan provinces has been developing rapidly, and the economies of scale have initially appeared. However, problems such as high cost and low efficiency of logistics operation, unbalanced development of cities and unreasonable distribution of logistics outlets have become increasingly prominent. At present, the low efficiency of logistics in Guangxi and Yunnan seriously restricts the development of logistics industry and the further expansion of foreign trade. The purpose of this paper is to establish reasonable inputs and outputs, use DEA model to evaluate the logistics efficiency of 22 cities in

Guangxi and yunnan provinces, find out the problems and constraints in the development of logistics in these two provinces, and put forward corresponding countermeasures, generate benign interaction of logistics industry between regions, and finally form the development of logistics industry to promote regional economic development.

2. Theoretical background

The logistics industry plays a very important role in promoting the transformation of the old economic drivers and driving regional economic growth. In recent years, China's provinces and cities continue to increase the input in the logistics industry, which makes the rapid development of the logistics industry. However, high logistics cost and low efficiency are still the bottleneck restricting the healthy development of logistics industry and even the whole national economy[1]. This is mainly embodied in the logistics industry agglomeration spillover effects not only can play professional effect, optimize the industrial structure, and promote the economic growth of adjacent areas[8], you can also through the linkage development of logistics industry and manufacturing industry, realize the long-term and stable development of regional economy[9], making the logistics development and the important interaction relationships formed between the industrial structure[10], the logistics industry has become a new kinetic energy to promote the development of national and regional economic rapid [11].

In recent years, more and more scholars begin to pay close attention to the logistics industry efficiency evaluation study. Through collecting literatures, we found that domestic experts and scholars concentrate on the evaluation methods of logistic operation efficiency and mainly use data envelopment analysis (DEA) and stochastic frontier analysis (SFA). The research perspective mainly explores and researches from three perspectives: enterprise, industry and region. From the perspective of enterprises, Lixiaomei and Bai xuefei used the super-efficiency CCR-DEA model to conduct empirical researches on the efficiency of 16 listed logistics companies in China, and the results show that there is no significant scale efficiency[12]. Nhu-ty Nguyen and thanh-tuyen Tran used DEA-Malmquist to calculate the efficiency of logistics enterprises in Vietnam[13]. Qi Lu studied the efficiency of agricultural products cold chain logistics of 29 listed enterprises in China, and found that enterprises should maintain or appropriately expand the scale of assets[14]. From industry point of view, such as Park In-Ho analyzed the logistics efficiency of 14 major airports in China, Japan and South Korea, and put forward establish operational strategies to improve airport management based on the excellent airport infrastructure.[15]. Wang jinfeng built an optimization model of logistic efficiency in coal mine production, and has verified the effectiveness and applicability of this mode through some experiments[16]. Jia shengqiang evaluated the efficiency of agricultural products logistics in central China with DEA method. He found that the fixed assets investment of agricultural products logistics industry was the most important factor affecting the efficiency of agricultural products logistics in six provinces in central China[17]. Another research perspective that experts and scholars focus on is the regional perspective. Li lei used DEA method to study the logistics efficiency of each city and state in Gansu province, and found that due to the non-effective pure technical efficiency, the logistics efficiency of each city and state in the province varies greatly[2]. Markovits et al. evaluated the logistics efficiency of 29 European countries by using DEA-PC measurement method, and verified the superiority of DEA-PC measurement method from multiple

perspectives[18]. Lei xunping and liu sifeng used DEA model to analyze the input-and-output data of the logistics industry of 31 provinces and cities in China in 2008, and make an empirical study on the efficiency of the logistics industry, they found that 16 provinces and cities represented by Beijing had input redundancy, while the less developed regions such as Neimenggu had insufficient input and low output efficiency[19]. DEA method is used in many fields for efficiency analysis. The operation efficiency of listed companies in retail industry, university research efficiency, and urbanization efficiency all use DEA method[20-22]. Through literature review, it is found that in many studies on logistics efficiency, scholars mainly adopt data envelopment analysis (DEA) to evaluate the operating efficiency of logistics in economically developed regions, but there are few studies on such economically underdeveloped regions as Guangxi and Yunnan, in particular there is almost no research on the logistics efficiency of the combined analysis of Guangxi and Yunnan by DEA method. Because of DEA analysis method can analyze whether DEA non-efficiency is caused by pure technical efficiency or scale efficiency while calculating the comprehensive technical efficiency of regional logistics. Meanwhile, it can carry out projection analysis on the non-effective regions of DEA and put forward corresponding improvement strategies. Based on this, this paper chooses to conduct a comprehensive study on the logistics efficiency of 22 cities in these two provinces, and through horizontal comparison, analyzes the input and output performance of the logistics industry, and identifies the advantages and disadvantages of the development of the logistics industry in each city.

3. Analyze Method

3.1 DEA model

Data envelopment analysis(DEA) is an efficiency evaluation method for multiple input and output based on the concept of relative efficiency, proposed by the American scholar Charens and Coppeer proposed in 1978. DEA method is derived from the linear programming problem in operations research. It is a method to compare the relative efficiency of decision making units by using mathematical programming model and to evaluate the decision making units. It is also a new interdisciplinary field of operations research, management science and mathematical economics. This paper selects the most widely applicable models in the DEA model of CCR model and BCC model. The assumptions between the two are different. CCR model assumes constant return to scale and is mainly used to evaluate the effectiveness of DMU comprehensive technical efficiency(TE). The CCR model is restructured to minimize input or maximize output under the condition that the ratio of output to input of all DMU does not exceed 1, and the weight of each element is greater than 0. BCC model assumes variable return to scale and is mainly used to evaluate the effectiveness of pure technical efficiency(PTE). The BCC model assumes the scale of profit, constancy, and diminishing returns. Scale efficiency can be measured by using the difference between the production change of the CCR model that assumes constant-scale profits and the production change of the BCC model that assumes variable-scale profits. The technical efficiency(TE) measured through the CCR model can be decomposed into pure technical efficiency (PTE) and scale efficiency (SE) excluding the effects of scale. Returns to scale(RTS) describe what happens to long run returns as the scale of production increases, when all input levels including physical capital usage are variable.

3.2 Input and output index

Table 1. Input and output indexes used in the evaluation of regional logistics efficiency (DEA) in China

Author	Title	Input	Output
Lilei	Research on the Measurement and Promotion Path of Logistics Efficiency in Gansu Province under the Background of"One Belt and One Road"	totalinvestmentoftraffic, transport, storag eandpost.personsemployedoftraffic, trans port, storageandpost.gradedhighwaylength	added value of logistics industry. freight traffic. rotation volume of goods transport.
Jinshunji & Nie shuangshuang	Analysis of Pure Technical Efficiency of Key Provinces and Cities Along"the Belt and Road"Based on DEA	totalinvestmentoftraffic, transport, storag eandpost.personsemployedoftraffic, trans port, storageandpost.linelength	added value of traffic, transport, storage and post. rotation volume of goods transport. gross regional product
Zhaolili	Analysis of Logistics Efficiency in Guangxi based on DEA model	logistics industry employed. logistics industry fixed assets investment. total mileage of transportation routes	output value of logistics industry. rotation volume of goods transport.
Leixunping, Robin Qiu&LIU Sifeng	Empirical Research on the Efficiency Measurement of Logistics Industry Based on DEA Model——Based on Input-output Data in 2008 from 31 Provinces Cities and Autonomous Regions of China	line length investment in transportation and postal warehousing. number of employees investment in transportation and postal warehousing in the proportion of basic investment and construction .proportion of employees	freight traffic. rotation volume of goods transport, GDP, value added of transportation and postal storage, the value added of transportation and postal storage to GDP

The 22 cities in Guangxi and Yunnan provinces are used as DEA evaluation DMU. As there are autonomous prefectures of ethnic minorities in Yunnan province, ethnic autonomous areas enjoy a high degree of self-management power, and their finance and taxation need not be handed over to the state as a whole. According to the principle of unified coverage and comparability, 8 autonomous prefectures of Yunnan province are excluded in this paper.

Through literature review, it is found that after 2000, many scholars began to use DEA method to calculate the operation efficiency of logistics in various regions or industries in China. The relevant review contents are shown in table 1.

The specific definition of logistics industry in China is not clear, the current academic circles generally use the traffic, transport, storage and post instead of modern logistics industry[2]. In the analysis of the logistic industry, this paper also uses the indexes of transport, storage and post. In this paper, the evaluation index system of logistics efficiency is constructed according to the results of previous studies and is highly professional, so Delphi method is not used. Based on the representativeness, reliability and data availability of the indexes, on the basis of previous research results. the indexes of logistics efficiency evaluation in this paper are as follows (Table 2)

Table. 2 Input and output indexes for DEA Analysis

Index	Index name	Unit
Input (X)	gross regional product	10,000 yuan
	persons employed of traffic, transport, storage and post	person
	average earning of employed in traffic, transport, storage and post	yuan
	area of city paved roads at year-end	10,000 sq.m
	length of highways	km
Output (Y)	highway freight traffic	10,000 tons
	business volume of postal services	100 million yuan
	import volume of goods	10,000 yuan
	export volume of goods	10,000 yuan

In the input indexes, in terms of financial input, the gross regional product is taken as the evaluation index. In terms of labor force input, persons employed of traffic, transport, storage and post and their average earning are taken as evaluation indexes. In terms of material factor input, area of city paved roads at year-end and the length of highways are taken as evaluation indexes. In the output indexes, considering that some cities do not have water freight traffic and air freight traffic, so they use highway freight traffic and business volume of postal services as the evaluation indexes of scale output. The

Table 3. Descriptive statistics of input-output indexes in 2018

index	Index name	Max	Min	Avg	Sd.
Input (X)	gross regional product	41256820	1154358	8376919	10365693
	persons employed of traffic, transport, storage and post	114443	1935	12496.86	24181.39
	average earning of employed in traffic, transport, storage and post	102527	51279	66574.23	11955.34
	area of city paved roads at year-end	6107	208	1386.27	1459.6
	length of highways	22166	2978	11547.18	5364.88
Output (Y)	highway freight traffic	34299	2118	10892.68	8837.52
	business volume of postal services	49.44	1.54	6.97	9.86
	import volume of goods	6169230	46	1213510	1891872
	export volume of goods	10931551	8218	1207743	2306128

import volume of goods and export volume of goods are used as indexes of economic output. The data in this paper are from the China City Statistical Yearbook (2017-2019), Guangxi Statistical Yearbook (2017-2019) and Yunnan statistical yearbook(2017-2019). Dea-solver 8.0 was used to conduct data analysis guided by the outputs of CCR and BCC models.

As we can see in table 3, there are large differences among individual indexes in each city. In the input index, the maximum, minimum, average and standard deviation of Persons Employed of Traffic, Transport, Storage and Post(person) are respectively 114443, 1935, 12496.86 and 24181.39, with a difference of 59 times, the number of the length of highways(km) are respectively 22166, 2978, 11547.18 and 5364.88, respectively with a difference of 7 times. In the output index, the maximum, minimum, average and standard deviation of Business Volume of Postal Services (100 million yuan) are 49.44, 1.54, 6.97 and 9.86, with a difference of 32 times, the number of exports volume of goods(10,000 yuan) are 10931551, 8218, 1207743 and 2306128, with the gap as much as 1330 times. It can be seen that there is a huge difference between the input and output of the logistics industry in each city.

4. The Empirical Analysis

4.1 Efficiency analysis

In this paper, DEA-solver LV8.0 software was used to calculate the input and output indexes of the logistics industry of 22 cities in Yunnan, Guangxi province in 2018 by using CCR and BCC models in an output-oriented way. The results are shown in table 4. The analysis results mainly include: technical efficiency(TE), pure technical efficiency (PTE) and scale efficiency(SE). Technical efficiency is calculated by the CCR model and Pure technical efficiency by BCC model The pure technical efficiency evaluation is the output capacity that can be achieved in a certain input direction. The scale efficiency reflects the development scale of the rating object. In the DEA analysis method, an efficiency value of 1 indexes that the relative efficiency is optimal, and an efficiency value less than 1 indexes that DEA is not effective.

According to the data analysis in table 4, the average technical efficiency value of the 22 cities in 2018 is 0.7935, which is a relatively high average, indicating that the average input and output efficiency of the logistics industry in each city in 2018 is relatively good. Specific analysis shows that the technical efficiency value of Nanning, Beihai, Fangchenggang, Yulin, Chongzuo, Kunming, and Qujing is 1, through the comparison of the logistics efficiency of each city, the DEA of these 7 cities is relatively effective, and the technical efficiency value of the remaining 15 cities is less than 1, the DEA

was in a non-effective state. Except for Liuzhou, Qinzhou, Baise, Yuxi, Lijiang and Lincang, the technical efficiency values of nine cities, including Guilin and Wuzhou, are lower than the average level, indicating that the logistics input and output efficiency of the above cities is significantly lower than that of other cities in 2018.

Table 4. Evaluation results of logistics efficiency in 2018

DMU	TE	PTE	SE	RTS
Nanning	1	1	1	CRS
Liuzhou	0.8552	0.986	0.8673	IRS
Guilin	0.5486	0.6234	0.8800	CRS
Wuzhou	0.5603	1	0.5603	IRS
Beihai	1	1	1	CRS
Fangchenggang	1	1	1	CRS
Qinzhou	0.8188	0.8284	0.9884	CRS
Guigang	0.7489	0.8295	0.9028	IRS
Yulin	1	1	1	CRS
Baise	0.872	1	0.872	IRS
Hezhou	0.7001	1	0.7001	IRS
Hechi	0.5902	0.9999	0.5903	IRS
Laibin	0.3824	0.9999	0.3824	IRS
Chongzuo	1	1	1	CRS
Kunming	1	1	1	CRS
Qujing	1	1	1	CRS
Yuxi	0.9539	1	0.9539	IRS
Baoshan	0.4476	0.7009	0.6386	IRS
Zhaotong	0.5567	0.5591	0.9957	IRS
Lijiang	0.9254	1	0.9254	IRS
Puer	0.6267	0.7658	0.8184	IRS
Lincang	0.8703	1	0.8703	IRS
Average	0.7935	0.9224	0.8612	

It can be seen from Table 4 that the average pure technical efficiency value of each city in 2018 is 0.9224 and the average scale efficiency value is 0.8612. The pure technical efficiency value of Nanning, Wuzhou, Beihai and other 13 cities is 1, indicating that the input and output structure of logistics resources of these 13 cities is relatively reasonable, and the optimization allocation of logistics resources is basically realized. Among them, the pure technical efficiency value of Wuzhou is 1, and the scale efficiency value is 0.5603, indicating that the input and output scale of Wuzhou logistics industry has not achieved the optimal level, and the scale level needs to be further improved. The value of pure technical efficiency and scale efficiency of the remaining cities are all less than 1, indicating that the optimal allocation of logistics resources has not been realized in these regions, and the scale of input and output of the logistics industry has not been optimized.

Further analysis of the types of returns to scale of logistics efficiency in Table 4 shows that the rewards to scale of nanning, Beihai, Fangchenggang and other 9 cities remain constant, indicating that the rewards to scale are at a relatively reasonable level. The remaining 13 cities, including Liuzhou and Wuzhou, showed an increasing trend of rewards to scale, indicating that continued reasonable increase of utilization of input factors would bring higher level of output.

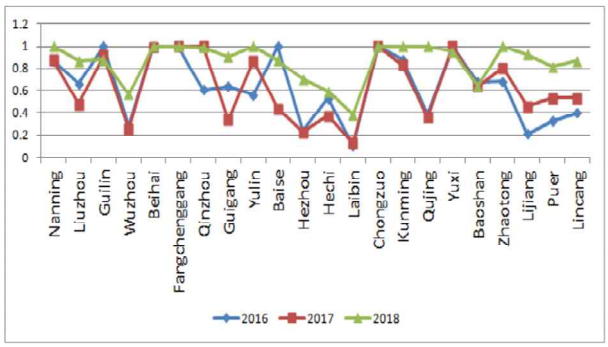

Fig. 1. Trend of scale efficiency from 2016 – 2018

From Figure 1, we can see the changes in the scale efficiency of 22 cities from 2016 to 2018. For example, the scale efficiency of Yulin is increasing year by year, indicating that the optimal allocation of logistics resources is increasingly reasonable. The scale efficiency of Guilin decreases year by year, indicating that there is a waste between the input and output of logistics resources, so the input should be reduced. In the case of Liuzhou, the input factors were reasonably utilized in 2018.

4.2 Projection analysis

The input and output redundancy analysis can clearly describe the resource utilization efficiency and corresponding input and output capacity of the cities under evaluation, and help us to clarify the underlying reasons for the decision of logistics efficiency. In order to further analyze the specific situation of input redundancy and output shortage of inefficient decision making units, and to provide support basis for subsequent suggestions, this paper selected 15 cities whose comprehensive efficiency value did not reach 1 for projection analysis.

As can be seen from table 5, from the perspective of input redundancy, there is significant redundancy in the revised ratio of Gross regional product of Liuzhou, indicating that compared with other cities, there is resource waste between the input amount and output of logistics resources. There is significant redundancy in the index of logistics workers in Puer, which index that compared with other cities, the input and output of logistics workers are inefficient. In the indexes of Area of City Paved Roads at Year-end and length of highways, the correction ratio of Liuzhou, Guilin, Guigang, Zhaotong and Puer is relatively high, indicating that the road infrastructure in these five regions does not match the logistics output.

It can be seen from table 6 that Guilin, Qinzhou, Guigang, Baoshan, Zhaotong and Puer are the most prominent cities with insufficient output. Combined with the actual development of each city, it can be seen that the above six regions are affected by multiple factors such as topography, economic development level, and industrial structure, and the operational efficiency of the logistics industry is at a relatively low level.

5. Conclusion

This paper uses DEA method to calculate the logistics efficiency of 22 cities in two provinces of Guangxi and Yunnan from 2016 to 2018, and draws the following two conclusions. Firstly, the overall development of logistics operation efficiency in Guangxi and Yunnan is not bad, but

Table 5. Projection analysis of input indexes in 2018

	DMU	Gross regional product	Persons Employed of Traffic, Transport, Storage and Post	Average Earning of Employed in Traffic, Transport, Storage and Post	Area of City Paved Roads at Year-end	Length of Highways
		Diff.(%)	Diff.(%)	Diff.(%)	Diff.(%)	Diff.(%)
input redundancy	Liuzhou	-69.5	0	0	-55.295	0
	Guilin	-24.663	0	-14.049	-24.56	-25.815
	Wuzhou	-0.002	-0.001	0	0	0
	Qingzhou	-8.934	0	0	-0.001	0
	Guigang	-15.583	0	-6.108	-30.989	-3.446
	Baise	0	-0.005	0	-0.001	-0.005
	Hezhou	-0.001	0	-0.001	-0.001	-0.001
	Hechi	0	-0.002	0	-0.002	0
	Laibin	0	0	0	-0.001	-0.002
	Yuxi	-0.002	0	-0.001	-0.001	-0.002
	Baoshan	0	0	-4.31	-10.291	-21.973
	Zhaotong	-2.558	-1.017	-12.545	0	-57.683
	Lijiang	0	-0.001	-0.001	0	-0.001
	Puer	0	-23.535	-11.745	-32.312	-45.982
	Lincang	0	-0.001	-0.001	0	-0.001

Table 6. Projection analysis of output indexes in 2018

	DMU	Highway Freight Traffic	Business Volume of Postal Services	Import Volume of goods	Export Volume of goods
		Diff.(%)	Diff.(%)	Diff.(%)	Diff.(%)
Insufficient output	Liuzhou	2.771	1.421	2.446	1.421
	Guilin	123.739	60.399	517.395	60.399
	Wuzhou	0.006	0.004	0.067	0.083
	Qingzhou	20.717	113.289	20.717	192.549
	Guigang	41.755	20.549	20.549	119.727
	Baise	0.001	0.007	0.012	0.001
	Hezhou	0.001	0.001	0.001	0.005
	Hechi	0.006	0.007	0.006	0.221
	Laibin	0.018	0.007	0.204	0.04
	Yuxi	0	0.007	0.047	0
	Baoshan	42.673	57.538	42.673	247.791
	Zhaotong	78.849	78.849	5617714	89157.5
	Lijiang	0	0	2.629	0.048
	Puer	30.579	30.579	30.579	1207.001
	Lincang	0	0.001	0	0.008

the regions development is not balanced , and the level of logistics efficiency is quite different, and the difference is significant. Through the previous analysis, it can be seen that 15 cities did not reach DEA efficiency in 2018. Secondly, further analysis of the 15 cities where DEA is not effective can be seen that the initial ineffectiveness of DEA is due to low pure technical efficiency level, which indexes that the investment and increase structure of logistics resources in each city and state is unreasonable, and the scale level needs to be further improved. From the absolute value of comprehensive technical efficiency, the gap between Laibin and Baoshan is the most significant. All the 15 non-effective cities have significant output deficiency, and the return of scale is increasing, which indexes that the logistics industry is in diseconomies of scale, so the resource input of logistics industry should be increased, so as to improve the scale level.

Through the above analysis, we can get the following implications. Firstly, on the basis of previous studies, combined with the actual situation of Guangxi and Yunnan provinces, this paper selected indexes to conduct a comprehensive evaluation of logistics efficiency, thhrough the analysis of logistics efficiency, the main reasons affecting logistics efficiency were obtained, which enriched the content of relevant studies and had certain academic significance.

Secondly, DEA effective cities should play a pulling role to further optimize the efficiency of regional logistics resource allocation. Strengthen regional cooperation, integrate logistics resources and accelerate the construction of logistics informatization. Establish and improve the logistics industry cooperation mechanism between local governments, build regional logistics alliance and logistics public information platform. Further optimize the traffic environment, encourage logistics enterprises to integrate logistics resources. Develop multimodal transport, optimize the distribution of logistics resources, and get draw on each other's strengths.

Thirdly, DEA invalid city should use the experience of effective logistics area for reference to optimize and adjust, find out the problems of input and output, give play to the

advantages of each region, and formulate the logistics promotion strategy according to local conditions. To be specific, Guilin, Hezhou and Lijiang have weak industrial foundation and rich cultural tourism resources, therefore, they should take the cultural tourism industry as their characteristics and build featured business logistics. Liuzhou, Laibin, Yuxi and other places should strengthen the role of industry in logistics efficiency construction, and promote the improvement of logistics efficiency with industry. Baise, Hechi, Guigang and Zhaotong should strengthen the role of non-ferrous metal smelting and processing, agricultural products processing and other industries to drive the development of logistics industry.

Fourthly, speed up the development and application of logistics technology, increase the logistics personnel training efforts, and improve high pure technical efficiency. The empirical study shows that technological progress plays an important role in the growth of logistics efficiency, so the two provincial governments should introduce professional logistics talents to improve the level of enterprise information management, promote the development and application of logistics technology, reduce logistics costs and improve logistics efficiency.

The limitation of this study is that the evaluation index system needs to be improved, the data analyzed in this paper is from 2016 to 2018, and the research interval is too short, so the research interval needs to be enlarged in the future.

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