

Research on the Spatial Difference of Public Goods Supply Performance in Jiangsu Province Based on DEA and Malmquist Index

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Abstract— With the development of Jiangsu, the improvement of the use of public goods supply performance is very important for Jiangsu's economic development. This paper first uses data envelopment analysis to analyze and evaluate the public goods supply performance in Jiangsu region in 2015, and then uses Malmquist index method to analyze the serial data of 13 cities in Jiangsu Province from 2010 to 2015. The study found that Jiangsu's public goods supply performance is generally good, but there are still large differences between cities, reflected in scale returns, scale efficiency, and technical efficiency. Based on the results of DEA analysis and Malmquist index analysis of the use of public goods supply performance.

Keywords— Public goods supply; performance; DEA analysis; Malmquist index.

I. INTRODUCTION

The existence of public goods is of great significance to the market mechanism, because public goods are non-exclusive and non-competitive, and there is a "free rider" motivation in the consumption of public goods. Economic agglomeration and the supply of local public goods promote each other, and the supply of local public goods plays a great role in promoting regional economic development. As one of the most economically developed regions in China, Jiangsu has regional advantages and industrial advantages, and is one of the important regions for economic agglomeration. However, due to the geographical environment, government policies, economic basis and other reasons, there are significant differences in the supply of public goods in the 13 cities of Jiangsu province. Therefore, it is of great theoretical and practical significance to study the differences in the supply of public goods in various regions of Jiangsu province for the overall economic development level of Jiangsu province and the promotion of sound and fast economic development of Jiangsu province. Therefore, this paper firstly USES DEA method to analyze and evaluate the supply of public goods in 13 cities of Jiangsu province in 2015. Then the Malmquist total factor productivity index was used to analyze the time series data from 2010 to 2015 to evaluate the development trend and existing problems of public goods supply in Jiangsu Finally, put forward the corresponding province. countermeasures and Suggestions. Performance, from the management point of view, is to organize the desired results, is the organization to achieve its goal and show the different level of effective output, can also be defined as an organization or individual in a certain period of the input and output, input refers to the human and material resources, material resources such as time, output refers to the task in terms of quantity, quality and efficiency of completion. The performance of public goods is the result of the quantity, quality and efficiency of the inputs and outputs of public goods in a certain period of time. The relationship between the performance of the public good and the economic benefits it brings. That is, DEA analysis method and Malmquist index were used to evaluate the performance of Jiangsu public goods.

TABLE	1:	input	and	outr	out i	indicators	of	Jiangsu	in	2015
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		Inpu	Output	
Area	Year	Industrial power consumption	Fixed assets investment	Economic activity
Nanjing	2015	300.54	5425.98	0.0332
Zhenjiang	2015	165.33	2541.07	0.2019
Changzhou	2015	325.49	3398.97	0.0772
Wuxi	2015	472.24	4888.55	0.1306
Suzhou	2015	1074.2	5965.44	0.0704
Yangzhou	2015	152.49	2856.82	0.0691
Taizhou	2015	172.53	2693.75	0.1028
Nantong	2015	253.05	4376.03	0.0429
Xuzhou	2015	254.36	4266.12	0.5297
Huaian	2015	108.89	2203.24	0.5584
Suqian	2015	106.04	1838.97	0.7289
Yancheng	2015	206.28	3372.89	0.9505
Lianyungang	2015	116.57	2077.35	0.3553

Data source: Jiangsu statistical yearbook (2016)

II. EMPIRICAL ANALYSIS OF THE PERFORMANCE OF JIANGSU PROVINCE

1. Indicator selection and data source

The index variables are the supply level of public goods and the degree of economic agglomeration. This paper USES the method of public goods spending measures in different parts of the public goods supply level, considering the coverage of the concept of public goods and data availability, fixed asset investment (one hundred million yuan) selected area, industrial electricity consumption (million kilowatt hour) on behalf of the public goods supply in a region level, because these two kinds of citizens' lives are more important and occupying most of public expenditure, best represents public spending. The economic activity per unit space is used to measure the degree of regional economic agglomeration, and the added value of the output value of the secondary and



tertiary industries in a certain region is divided by the construction area of the region. On the one hand, the added value of the secondary and tertiary industries can effectively represent the characteristics of public goods, and on the other hand, it can fully reflect the amount of economic activities.

2. Performance evaluation of public goods supply in Jiangsu province based on DEA model

DEAP software is used to construct DEA model. In setting parameters, variables and selected models, this paper adopts fixed scale benefit CSR, adopts more accurate multi-stage calculation method for relaxation calculation, and selects output-led model. The comprehensive results are shown in table 2.

TABLE 2: comprehensive analysis table of public goods performance of 13 cities in Jiangsu in 2015

Area	Industrial electricity consumption target value	Fixed asset investment target value	Target value of economic activity
Nanjing	4.828	83.725	0.0330
Zhenjiang	29.376	509.438	0.2020
Changzhou	11.231	194.769	0.0770
Wuxi	19.001	329.52	0.1310
Suzhou	10.24	177.579	0.0700
Yangzhou	10.051	174.307	0.0690
Taizhou	14.96	259.432	0.1030
Nantong	6.243	108.269	0.0430
Xuzhou	77.063	1336.439	0.5300
Huaian	81.226	1408.634	0.5580
Suqian	106.04	1838.97	0.7290
Yancheng	138.266	2397.844	0.9500
Lianyungang	51.693	896.48	0.3550

Based on 13 cities in Jiangsu province on the performance of public goods supply data analysis, it can be seen that many leading cities in economic development in rational handling of relationship between input and output may be constrained because of various objective reasons, because of the economic activity is the secondary and tertiary industries increment's point of view, therefore, in recent years, north Jiangsu city performance to some extent, the public goods supply is higher than that of Jiangsu and middle of the city. From the perspective of comprehensive efficiency analysis, the slack variables of industrial electricity consumption and fixed asset investment in Suqian are both zero. Therefore, the economic activity quantity is considered from the perspective of the increment of secondary and tertiary industries, Sugian has reached the optimal state. The technical efficiency of Nanjing and Suzhou is very low. Nanjing and Suzhou belong to the south of Jiangsu, while Xuzhou and Suqian belong to the north of Jiangsu. As the capital of Jiangsu province, Nanjing enjoys unique political advantages and a favorable investment environment, which makes the performance of the supply of public goods remarkable in the early stage and is now in a stable stage. Suzhou, as the economic development leader of Jiangsu province, has made outstanding achievements in the supply of public goods. Both cities show a trend of decreasing efficiency of scale. Suqian, Xuzhou, Yancheng and other industrial cities, on the one hand, have the advantages of mechanical and electrical industry and high-tech industry, with high technical content and broad market prospects, which promote the development and supporting of the industrial chain and form a large manufacturing base. On the other hand, the government has increased the supply of public goods and increased support for policies, land and services. In recent years, the performance of public goods supply is relatively significant. Generally speaking, there is still a gap between the situation in north Jiangsu and that in south Jiangsu. However, from the perspective of increment performance, the cities in south Jiangsu need to strengthen urban construction and improve the quality of public goods supply.

3. Performance evaluation of Jiangsu public goods based on Malmquist index

Using DEAP2.1 software, Malmquist productivity index analysis was performed on the sequence data of 13 cities in Jiangsu province from 2010 to 2015, and the total factor productivity index and its decomposition results were obtained.

TABLE 3: TFP index and decomposition of public goods performance in 13

cities of frangsu from 2010 to 2015					
Area	PECH	SECH	TFPCH		
Nanjing	1.022	1.078	1.248		
Zhenjiang	1.025	1.096	1.289		
Changzhou	1.058	1.176	1.4		
Wuxi	1.032	1.15	1.293		
Suzhou	1.006	1.138	1.296		
Yangzhou	0.971	1.089	1.217		
Taizhou	0.797	0.807	0.755		
Nantong	1	1	1.189		
Xuzhou	1.026	1.024	1.236		
Huaian	1.012	1.022	1.18		
Suqian	0.992	1.045	1.187		
Yancheng	0.95	1.035	1.11		
Lianyungang	0.978	0.974	1.098		

It can be concluded from the TFP index and analysis of the public goods supply performance of each city in Jiangsu province in the past six years that the public goods supply performance of each city in Jiangsu province is relatively outstanding. Except for the low performance of Taizhou, other cities have maintained good public goods performance. It can be seen from pech that there are technical problems in Yangzhou, Taizhou, Lianyungang, Suqian and Yancheng. In terms of the efficiency of scale (sech), only Taizhou and Lianyungang need to expand their scale to get closer to the optimal scale, while other cities should focus on the rational allocation of resources instead of blindly expanding their scale and develop steadily.

TABLE 4: TFP index and decomposition of public goods supply performance in 13 cities of Jiangsu from 2010 to 2015

Year	PECH	SECH	TFPCH
2011	1.088	1.402	0.483
2012	0.787	0.808	2.172
2013	1.44	0.835	0.606
2014	0.716	1.225	4.722
2015	1.065	1.074	0.766

Note: since DEAP cannot calculate the TFP index in the first year in the calculation of the Malmquist index analysis method, the table



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only provides the annual TFP index and decomposition index for the utilization of public goods in 13 cities in Jiangsu province from 2011 to 2015.

From the perspective of the overall average level of public goods supply performance in Jiangsu province, the public goods supply performance showed a fluctuating growth trend during the six years from 2010 to 2015 with a large range. Over a six-year period, public goods performance hit 4.722 in 2014, before declining in 2011, 2013 and 2015. From the perspective of technical efficiency change (effch), efficiency also presents the characteristic of periodic fluctuation, and there are some problems in management. The change of technical efficiency is the main reason for the improvement of TFP. On the whole, the technical efficiency of public goods supply performance in 13 cities of Jiangsu fluctuates and is unstable. After further decomposition of technical efficiency, pure technical efficiency (pech) presents synchronous increase and decrease with technical efficiency. The efficiency of scale (sech) indicates that the overall scale of public goods supply in Jiangsu province is reasonable and gradually approaching the optimal scale.

III. CONCLUSION

From the above analysis, the performance difference of public goods among regions in Jiangsu is relatively large. In addition to the geographical differences, there are also significant social and economic factors. The development momentum of north Jiangsu City is more rapid, in the growth rate is better than south Jiangsu City. According to the status quo of public goods performance in Jiangsu, some Suggestions are put forward.

1. Change the way public goods provided

With the speeding up of urbanization, the next few years, more and more public gathers to the city, city scale of public goods supply will present blowout expansion, such as still in accordance with the current supply mechanism of urban public goods supply, "city disease" will be more prominent in our country, therefore to seek a more effective way of public goods supply is imminent. First, each city in Jiangsu should analyze its own regional characteristics, such as transportation, labor quality and regional industry characteristics, to transform the supply of public goods. Second, we need to fully consider the spatial spillover effect of public goods supply.

2. Actively guide the supply and demand mechanism of public goods.

In today's society, the problem of demand preference display still exists. As an information system, the supply mechanism of urban public goods is faced with the problem that "the current mechanism cannot guarantee citizens' expression of demand". In order to optimize the supply mechanism of urban public goods, the first step is to smooth the channel of demand expression and then achieve the balance of supply and demand. It is necessary to improve the existing system and develop new channels

3. Strengthen the role of local governments in improving the performance of public goods supply.

Relevant policies of local governments provide a political environment for improving the performance of public goods. First of all, we should improve the support system for the supply of public goods, pay attention to the consistency of government science and technology policies, strengthen the coordination between science and technology policies and fiscal budgets, and improve the efficiency of resource allocation. Secondly, local governments should also be guided by policies and regulations to formulate policies that are conducive to improving the performance of public goods in this municipality. Finally, local governments should also consider speeding up the pace of their markets, keep them competitive, and coordinate and resolve conflicts and problems in the development process in a timely manner.

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