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Research on Efficiency of Allocation of Preschool Education Resources in China

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Abstract: ***Promote the optimal allocation of education resources and rational utilization is the breakthrough point of preschool education reform and development.This paper is based on 30 provinces (autonomous regions and municipalities directly under the central government) preschool education resource allocation, combined with DEA method of 2011to 2019 data analysis, it is concluded that the allocation of preschool education resources in China has the following characteristics: first, resource efficiency allocation efficiency fell year by year but the overall efficiency is good. Second, the structure of resource allocation is unreasonable, and the management level needs to be improved; third, the development is unbalanced among regions, and the efficiency of resource allocation in economically developed regions is generally low; fourth, the allocation of resources among some provinces and cities is redundant. In order to further improve the efficiency of resource allocation for pre-school education, it is necessary to strengthen the construction of high-quality teaching staff, pay attention to the construction of kindergartens of internal content, and develop a national-level policy of supporting urban and rural education.***

Keywords: Preschool education; DEA data envelopment analysis; Super efficiency model; Resource allocation efficiency**.**

1. Introduction

High-quality and sustainable preschool education resources are the top priority for balanced development of basic education reform in the new era[1]. Promoting inter-provincial "equalization" in preschool education development provides a necessary prerequisite for high-quality preschool education. The National Outline for Medium and Long-term Education Reform and Development Plan (2010-2020) clearly states the need to focus on improving the quality of preschool education. By 2020, one year of preschool education should be universalized, two years of preschool education should be basically universalized, and three years of preschool education should be universalized in regions with conditions permitting. The statistical bulletin on the implementation of national education funds in 2022 released by the Ministry of Education, National Bureau of Statistics, and Ministry of Finance shows that the total investment in preschool education was 101.98 billion yuan, an increase of 7.29% over the previous year. Among them, the Xinjiang Uygur Autonomous Region had the fastest growth (33.09%)[2]. Although the preschool education sector has been developing with the increase in fiscal investment, there are still differences in fund allocation among different regions, and the utilization efficiency is relatively low. Therefore, the optimization of fund allocation is a driving factor for the development of preschool education. Based on this, this article uses the super-efficiency DEA model to measure the dynamic changes in the allocation efficiency of preschool education resources in urban and rural areas nationwide from 2011 to 2019, identifies key factors, and finally provides suggestions for the stable and rapid growth of fiscal investment in preschool education and improving the allocation efficiency of preschool education resources.

2. Literature Review

Overseas research on the balanced development of preschool education has focused on the understanding and measurement of the balanced level of preschool education. UNESCO believes that preschool education is an education in which parents and kindergarten teachers make use of various methods and objects to systematically, systematically and scientifically stimulate children's brains so that the functions of various parts of the brain can be gradually perfected [3], and American scholar James Coleman believes that equalisation of preschool education is an inevitable requirement of historical development, and that equalisation of preschool education includes three aspects, namely, equal opportunities of access to preschool education, equal participation in the process of preschool education and equal enjoyment of the quality of preschool education. Equality in pre-primary education includes equality in access to pre-primary education, equality in participation in the process of pre-primary education, and equality in enjoyment of the quality of pre-primary education [4]. In terms of measuring the balanced level of preschool education, a very representative system is the OECD's education indicator system, which has the functions of systematic

decision-making, reflecting efficiency, process monitoring and comparability, and is of reference significance to the theory and content composition of China's education indicators [5]. In addition, Maas et al. used enrolment data to estimate the Gini coefficient of education in 16 East African countries, which solved the problem of how to determine and where to allocate investment in pre-school education to reduce inequality between and within countries [6], Yo-shimiChitose conducted a comparative study on the pre-school education of children of different nationalities in Japan, and the results showed that the differences in enrolment rates of children of different nationalities are driven by human, social and regional capital [7], Alessandro Balestrino et al. found the importance of quality control in preschool education through comparison, etc. [8].

There have been more studies on the balanced aspects of preschool education in China, but they have mainly focused on the following aspects. First, research on the spatial distribution of preschool education facilities. For example, Hong Xiumin et al. used social surveys and GIS methods to analyse the spatial distribution of kindergartens in Beijing as an example, including the relationship between the distribution of kindergartens and the population, the density level of kindergartens and the service scope of kindergartens, and found that: at present, Beijing's kindergartens do not match the distribution of the preschool population completely, and the distribution is uneven between regions, failing to form a contiguous coverage network, with a high pressure of service, and if not adjusted in time If not adjusted in time, the contradiction between supply and demand of preschool education will be aggravated [9]. Jiang Yong and others to 'accessibility' as the basis for the construction of educational facilities layout equalisation quantitative evaluation model, from the 'utility accessibility', 'time accessibility', 'individual attribute accessibility', 'opportunity accessibility' and other aspects of evaluation [10]. Second, the study of regional differences in preschool education resource allocation. Lai Xiaoqian and Chen Ronghui used DEA and Malmquist index model to analyse the resource allocation efficiency and total factor productivity of preschool education in urban and rural areas in China from static and dynamic aspects, and the study shows that the overall performance of preschool education resource inputs is not high and rural areas are lower than urban areas; there are more obvious differences between urban and rural preschools in the east, middle and west [11]. Lu Chang'e and Wang Yong used the Sill index method to measure the preschool education in Anhui Province in the financial investment, teacher strength, school scale and other differences in the allocation of educational resources, the study found that the differences in financial resources in various regions are mainly embodied in the financial education public fees, human resources are mainly embodied in the differences in the number of full-time teachers, and the differences in the scale of the park is mainly embodied in the need to meet the needs of the young children to enter the park[12]. Third, the evaluation system research on the balanced level of preschool education resource allocation. Chen Yutang and Chen Huiling measured the efficiency of preschool education resource allocation in 31 provinces in China during the period of 2007-2013 based on the CCR model and BCC model, and pointed out that the efficiency of preschool education resource allocation in China is generally on the rise, but there are more obvious differences in different regions [13]. Bao Haiqin and Xu Dan took 180 urban kindergartens in the eastern region as the research object, and measured the efficiency of urban kindergartens in the eastern region of China based on the CCR model and BCC model on the basis of constructing the evaluation index system, and further analysed the influencing factors by using Tobit regression [14].

Comprehensively, the current research on balanced preschool education has four characteristics: 1) research object, most of the research on kindergartens as a unit of education supply, mainly from the interactive relationship between supply and demand to analyse the spatial characteristics of the distribution of preschool education facilities and problems; 2) from the content of the study, mostly to the balanced allocation of preschool education resources measurement model and balanced level evaluation system, and from a geospatial perspective The study of the spatial characteristics of educational resources from a geospatial perspective is relatively small; 3) from the data characteristics, mostly sample data or questionnaire data, the lack of large-sample data research; 4) from the scale of the study, most of the provincial, municipal, or county single-scale study, but the overall multi-scale analysis of the whole country and its comparisons are still relatively lack of. Based on this, this paper analyses the efficiency of preschool education resource allocation and regional differences based on large sample data from 30 provinces and cities across the country, aiming to explore the spatial characteristics of the balanced level of preschool education resources to provide suggestions.

3. Model and Indicator Selection

3.1 Model Selection

This paper employs the non-parametric statistical method (Data Envelopment Analysis, DEA) proposed by Charnes, Cooper (United States), et al. in 1978 to study the allocation of preschool education resources in urban and rural areas nationwide. This method is applied to linear programming and can evaluate the input-output efficiency and measure the relative efficiency of a set of decision-making units with the same inputs and outputs[15].

3.1.1 BCC Model

This paper uses the DEA-BCC model for a static evaluation of the allocation efficiency of preschool education resources in China, and then incorporates a super-efficiency dynamic model to analyze the changing trends of different preschool education resource allocation efficiencies under variable returns to scale production conditions, avoiding the limitations of static models. With limited resources among different provinces, the comprehensive technical efficiency value (pure technical efficiency * scale efficiency) can reflect the ability of each province to reasonably utilize educational resources to improve educational levels. The BCC model, based on variable returns to scale, can use scale efficiency to measure the ability to improve and adjust the utilization rate of preschool education resources. (If the decision-making unit's input, output scale efficiency is effective, the overall

technical efficiency is 1, and a scale efficiency of 1 indicates effective scale.)

$$min\theta = V_p$$

$$\text{s.t.} \begin{cases} \sum_{j=1}^{n} \vartheta_j x_j + s^- = \vartheta x_0 \\ \sum_{j=1}^{n} \vartheta_j y_j - s^+ = y_0 \\ \sum_{j=1}^{n} \vartheta_j = 1 \\ s^- \geq 0, s^+ \geq 0, \vartheta_j \geq 0, j = 1,2,\cdots,n. \end{cases}$$

Where, S^- (S_1^-, S_2^-, ..., S_n^-) and S^+ (S_1^+, S_2^+, ..., Sn^+) are the slack variables for input and output, respectively, λ_j (j=1, 2, ..., n) are the planning decision variables, θ is the efficiency value, x_j and y_j are the input variables, and yj is the output variable.

3.1.2 Super-Efficiency Model

The difference between super-efficiency DEA and traditional DEA methods is that when evaluating a particular decision-making unit, the decision-making units with the same quantity in the same decision-making unit are not considered. When the value is greater than 1, it cannot be analyzed further. In the super-efficiency DEA model, the efficiency of the decision-making unit can still be compared using overall technical efficiency and scale efficiency. In the super-efficiency model, if the output-oriented efficiency of a decision-making unit is less than 1, it indicates the effectiveness of that decision-making unit; if it exceeds 1, it indicates the inefficiency of that decision-making unit. Furthermore, the lower the efficiency of that decision-making unit, the higher its efficiency. Traditional DEA methods only obtain "effective" decision-making units but cannot analyze effective decision-making units further (assuming all effective decision-making units have an effectiveness of 1).

$$min\left[\theta - \varepsilon\left(\sum_{j=1}^{m} s^- + \sum_{j=1}^{r} s^+\right)\right]$$

$$\text{s.t.} \begin{cases} \sum_{\substack{j=1 \\ j\neq j0}}^{n} x_j\lambda_j + s^- = \theta x_0 \\ \sum_{\substack{j=1 \\ j\neq io}}^{n} y_j\lambda_j - s^+ = y_0 \\ \lambda_j \geq 0, j = 1,2,\cdots,n \\ s^+ \geq 0, s^- \geq 0 \end{cases}$$

Where ε is a non-Archimedean infinitesimal quantity, and the rest is the same as above.

3.2 Indicator Selection

Data Envelopment Analysis (DEA) was proposed in 1978 by A. Charnes, W.W. Cooper, and E. Rhodes to measure the production efficiency of enterprises. It is a linear programming model, represented as the ratio of output to input, aiming to achieve a certain maximum efficiency. When applying the DEA method to the efficiency of preschool education resources.Input indicators generally include fiscal input, material input, and teaching staff input. Fiscal input generally reflects the local government's level of support and macroeconomic policies, such as per capita education expenditure and per capita general public budget education expenditure. Material input generally reflects building area and the number of books. Teaching staff input generally reflects the encouragement and support of external factors, such as the number of full-time teachers. This paper constructs input and output indicators for the allocation of educational resources (see Table 1) from the perspectives of human resources, financial resources, and material resources.

Table 1: Input and Output Indicators for the Allocation of Preschool Education Resources under DEA Analysis

Destination layer	Criteria layer	variable
The input variables	Financial input	Per capita education expenditure
		Per capita general public budget education expenditure
	Material input	Building area
		Number of books
	Human input	Number of full-time teachers
		Number of teachers with bachelor's degrees
The output variables	Quality of teaching	Educational retention rate
		Primary school enrolment with pre-primary education
	Number of students	Number of graduates
		Number of enrollees

Note: Per-pupil expenditure on education, per-pupil general public budget expenditure on education come from the China Education Expenditure Statistical Yearbook, the area of school buildings, the number of books, the number of full-time teachers, the number of teachers graduating from undergraduate programmes, the number of primary school enrolments with pre-school education, the number of school leavers, the number of school entrants and the number of school entrants come from the China Education Statistical Yearbook, and the consolidation rate of education = the number of leavers/number of entrants.

4. Model and Indicator Selection

The high-quality development of preschool education is premised on the balanced allocation of preschool education resources. After establishing the indicator system, this paper uses the software deap2.1 to measure and decompose the comprehensive technical efficiency (TE), pure technical efficiency (PTE), and scale efficiency (SE) of 30 provinces in China (the sample does not include the Tibetan region), and to derive the reasonableness and effectiveness of the allocation of preschool education resources in each province and city.

4.1 Combined Technical Efficiency

Comprehensive efficiency is the product of pure technical efficiency and scale efficiency, which is influenced by both educational resources and school scale. According to the BCC model, the comprehensive technical efficiency value of the use of preschool education funds in China from 2011 to 2019 is about 0.9, which is a high efficiency. During the 9-year sample period, only 4 provinces (Hebei, Henan, Qinghai and Ningxia) maintained the average comprehensive technical efficiency of preschool education at 1, reaching the best level (13%). In addition, the average comprehensive technical efficiency of about 87% of preschool education resources is lower than 1, of which about 40% is lower than the national average (0.873), and the lowest are Beijing (0.492), Shanghai (0.557) and Zhejiang (0.609). The above data reflect the surplus of inter-provincial resource input factors and the situation of "polarization". (See Table 2).

4.2 Pure Technical Efficiency

Pure technical efficiency is influenced by factors such as the internal management of the kindergarten or the structure of the kindergarten teachers. As the higher the value of pure technical efficiency, the higher the efficiency of resource utilisation. According to the BCC model, the average value of pure technical efficiency of preschool education resource allocation in China increased from 0.939 to 0.970 from 2011 to 2015, and then decreased steadily to 0.941 in the following four years, with an overall upward trend. In the past 9 years, the utilisation rate of pre-school education resources in most provinces has been lower than 1, and the utilisation rate of the pure technical efficiency value in 10 provinces has been lower than the national average (0.954), which indicates that the utilisation rate of China's pre-school education resources needs to be improved. (See table 2.)

4.3 Scale Efficiency

Efficiency of scale is the ratio of combined efficiency to technical efficiency. The closer the scale efficiency is to 1, the higher the efficiency ratio of educational resources input and output of the decision-making unit. According to the BCC model, the average value of scale efficiency of preschool education in each province from 2011 to 2019 increased from 0.888 to 0.937, with an overall upward trend. Among them, six provinces, Hebei, Anhui, Henan, Yunnan, Qinghai and Ningxia, have been in an effective state of preschool education scale efficiency for nine consecutive years. From the point of view of the change of scale efficiency of each province, the scale efficiency of 10 provinces, namely Beijing, Tianjin, Liaoning, Jilin, Shanghai, Jiangsu, Zhejiang, Fujian, Jiangxi and Hunan, is in an overall upward trend, while 13 provinces, including Shanxi, Inner Mongolia, Heilongjiang, Shandong, Shaanxi and Gansu, are in an overall downward trend, and 6 provinces, namely Hebei, Anhui, Henan, Qinghai, Ningxia and Yunnan, are in an unchanged state of scale efficiency for 9 consecutive years. (See table 2.)

Table 2: Comprehensive technical efficiency, pure technical efficiency and scale efficiency of preschool education resource allocation in each province (data excerpt)

Province	Combined technical efficiency				Pure Technical Efficiency				Scale Efficiency			
	2011	2015	2019	Mean	2011	2015	2019	Mean	2011	2015	2019	Mean
Beijing	0.32	0.489	0.629	0.492	0.703	0.758	0.64	0.699	0.456	0.645	0.983	0.715
Tianjin	0.735	0.845	0.894	0.845	0.99	0.963	0.907	0.934	0.743	0.877	0.985	0.903
Hebei	1	1	1	1	1	1	1	1	1	1	1	1
Shanxi	1	1	1	0.982	1	1	1	0.995	1	1	1	0.987
Inner Mongolia	0.68	0.62	0.722	0.685	0.812	0.946	1	0.924	0.837	0.656	0.722	0.742
Liaoning	0.672	0.709	0.85	0.777	0.924	0.892	0.912	0.937	0.727	0.795	0.933	0.828
Jilin	0.683	0.878	0.999	0.87	0.749	0.888	1	0.886	0.912	0.989	0.999	0.981
Heilongjiang	1	0.875	0.878	0.914	1	0.976	0.952	0.964	1	0.897	0.923	0.948
Shanghai	0.422	0.553	0.62	0.557	0.843	0.988	0.855	0.919	0.501	0.559	0.725	0.607
Jiangsu	0.709	0.696	0.704	0.715	1	0.983	0.88	0.926	0.709	0.708	0.799	0.778
Zhejiang	0.499	0.558	0.646	0.609	1	1	0.824	0.956	0.499	0.558	0.783	0.641
Anhui	1	1	1	0.996	1	1	1	0.997	1	1	1	1
Fujian	0.771	0.793	0.829	0.835	0.967	0.976	0.842	0.966	0.797	0.813	0.984	0.865
Jiangxi	0.864	1	1	0.966	0.899	1	1	0.989	0.961	1	1	0.977
Shandong	1	0.845	0.776	0.855	1	1	0.806	0.959	1	0.845	0.964	0.893
Henan	1	1	1	1	1	1	1	1	1	1	1	1
Hubei	0.77	0.97	0.861	0.879	0.827	1	0.968	0.949	0.931	0.97	0.89	0.925
Hunan	0.874	1	1	0.953	0.912	1	1	0.983	0.959	1	1	0.969
Guangdong	0.887	0.918	0.809	0.845	1	1	1	0.981	0.887	0.918	0.809	0.862
Guangxi	1	1	1	0.958	1	1	1	0.98	1	1	1	0.974
Hainan	1	0.928	0.912	0.933	1	0.969	1	0.96	1	0.958	0.912	0.972
Chongqing	1	1	0.92	0.986	1	1	0.945	0.992	1	1	0.973	0.994
Sichuan	1	0.933	0.951	0.954	1	1	0.98	0.991	1	0.933	0.97	0.963
Guizhou	1	0.985	0.859	0.942	1	1	0.9	0.963	1	0.985	0.955	0.978
Yunnan	1	1	0.916	0.991	1	1	0.917	0.991	1	1	0.999	1
Shanxi	0.631	0.688	0.733	0.753	0.732	0.815	0.911	0.838	0.862	0.845	0.805	0.894
Gansu	0.806	0.929	1	0.913	0.906	0.935	1	0.951	0.89	0.994	1	0.961
Qinghai	1	1	1	1	1	1	1	1	1	1	1	1

Ningxia	1	1	1	1	1	1	1	1	1	1	1	1
Xinjiang	0.889	1	1	0.981	0.911	1	1	0.985	0.976	1	1	0.996
Mean	0.84	0.874	0.884	0.873	0.939	0.97	0.941	0.954	0.888	0.898	0.937	0.912

4.4 Scale Efficiency

In order to overcome the fact that the preschool education resource allocation efficiency of the provinces with a comprehensive efficiency value of 1 cannot be compared, this paper uses the software DEA-SOLVER Pro5.0 to differentiate and rank the super-efficiency values of the decision-making units. As can be seen from Table 3, in the study of preschool education resource allocation efficiency, Henan and Ningxia are in the top two places, and the super-efficiency rankings of Hebei, Anhui, Guangxi, Qinghai and Chongqing provinces have reached equilibrium. The efficiency of preschool education resource allocation in western provinces is generally higher than that of eastern and central provinces, and the efficiency value of the eastern provinces is the lowest, even if the efficiency value of Hainan and Shandong are higher than the national average of 0.784, only ranked 17th and 19th. The western provinces of pre-school education resources are scarce, but can be a reasonable allocation of limited resources and effective use of resources allocation efficiency; eastern provinces of pre-school education resources are abundant, but some provinces have serious waste of resources, resulting in resource inefficiency.

Table 3: Super-efficiency value and ranking of preschool education resource allocation in all provinces from 2011 to 2019

Province	2011	2012	2013	2014	2015	2016	2017	2018	2019	mean	rank
Beijing	0.153	0.164	0.206	0.22	0.236	0.236	0.269	0.284	0.293	0.229	30
Tianjin	0.39	0.412	0.425	0.454	0.481	0.481	1.006	1.002	0.419	0.563	23
Hebei	1.05	1.01	1.019	1.026	1.025	1.025	1.032	1.041	1.207	1.048	4
Shanxi	1.008	1.025	0.721	0.647	1.008	1.008	1.03	1.059	1.068	0.953	11
Inner Mongolia	0.42	0.443	0.452	0.458	0.441	0.441	0.46	0.514	0.568	0.466	26
Liaoning	0.465	0.486	0.465	0.481	0.501	0.501	0.653	0.74	0.65	0.549	24
Jilin	0.494	0.575	0.513	0.551	0.565	0.565	0.707	1.008	0.802	0.642	20
Heilongjiang	1.069	1.018	0.581	0.591	0.665	0.665	0.688	1.01	0.685	0.775	16
Shanghai	0.19	0.205	0.273	0.302	0.303	0.303	0.332	0.363	0.36	0.292	29
Jiangsu	0.537	0.518	0.523	0.522	0.484	0.484	0.471	0.475	0.472	0.498	25
Zhejiang	0.499	0.551	0.533	0.412	0.431	0.431	0.396	0.39	0.398	0.449	27
Anhui	1.007	1.011	1.014	1.01	1.005	1.005	1.001	1.002	1.007	1.007	7
Fujian	0.502	0.513	0.628	0.614	0.614	0.614	0.65	0.661	0.619	0.602	22
Jiangxi	0.665	1.013	1.017	1.009	1.026	1.026	1.033	1.031	1.015	0.982	8
Shandong	1.134	0.626	0.641	0.667	0.684	0.684	0.634	0.627	0.583	0.698	19
Henan	1.2	1.307	1.417	1.275	1.342	1.342	1.547	1.412	1.358	1.356	1
Hubei	0.566	0.613	0.655	0.647	0.891	0.891	1.006	0.812	0.721	0.756	18
Hunan	0.597	0.649	1.002	1.009	1.066	1.066	1.119	1.111	1.058	0.964	9
Guangdong	0.609	0.585	0.609	0.608	0.663	0.663	0.563	0.626	0.635	0.618	21
Guangxi	1.227	1.271	1.151	1.213	1.194	1.194	1.116	1.144	1.105	1.179	3
Hainan	1.068	1.072	0.568	0.603	0.704	0.704	0.664	0.687	0.745	0.757	17
Chongqing	1.106	1.111	1.075	1.126	1.064	1.064	1.044	1.002	0.753	1.038	6
Sichuan	1.033	0.805	0.857	0.751	0.778	0.778	0.722	0.679	0.736	0.793	15
Guizhou	1.161	1.112	1.013	1.013	0.886	0.886	0.764	0.722	0.661	0.913	13
Yunnan	0.8	1.006	1.01	1.005	1.022	1.022	1.008	1.002	0.696	0.952	12
Shanxi	0.408	0.384	0.397	0.383	0.404	0.404	0.461	0.467	0.508	0.424	28
Gansu	0.614	1.002	0.62	0.628	0.688	0.688	1.013	1.028	1.019	0.811	14
Qinghai	1.016	1.024	1.038	1.101	1.079	1.079	1.018	1.004	1.065	1.047	5
Ningxia	1.508	1.328	1.293	1.092	1.088	1.088	1.11	1.138	1.064	1.190	2
Xinjiang	0.489	0.632	1.007	1.063	1.046	1.046	1.11	1.143	1.041	0.953	10
Mean	0.766	0.782	0.757	0.749	0.779	0.779	0.821	0.839	0.777	0.784	

Western provinces pre-school education resource input is very limited or even in the state of supply shortage, but can be limited resource input rational allocation, effective use, pre-school education resource allocation efficiency is high; Eastern region, although the resource input rich pre-school education resources, but some provinces there is a waste of resources, resulting in the supply of low efficiency. Overall, the economic super-efficiency scores of the north-west, remote and less developed provinces and regions are generally higher than those of the eastern seaboard. A large part of the reason for this phenomenon is that none of these regions has a high level of economic development compared to the economically developed provinces, where investment in education and the number of students can be achieved, to some degree, in harmony.(See table 3.)

5. Conclusion and Recommendation

5.1 Conclusions

First, the overall efficiency of China's preschool education resource allocation is generally high, with a stable trend of change; the comprehensive technical efficiency of China's preschool education resource allocation from 2014 to 2023 was above 0.8 per year. Pre-school education as a weak link in the development of education, the efficiency of its resource allocation directly affects the overall quality of the development of local early childhood education, deepening the reform of pre-school education must be tailored to the local conditions, to avoid the 'absolute average' and 'one-size-fits-all' behaviour is the long-term strategy.

Second, preschool management organisations are set up irrationally, with low scale efficiency. Scale efficiency rose from 0.88 in 2011 to 0.937 in 2019, but each year's pure technical efficiency is higher than the scale efficiency value of that year. It is imperative to innovate the preschool education management system and optimise kindergarten self-management to ensure that preschool education provision operates healthily under a regulatory system.

Thirdly, the resource allocation efficiency of preschool education has obvious redundancy and unbalanced development between provinces. Henan, Guangxi, Ningxia and other places have relatively high efficiency values, while Zhejiang, Tianjin, Jiangsu, Shanghai, Beijing and other provinces have greater room for improvement, and the efficiency of interprovincial pre-school education funding shows regionalised characteristics, making it difficult to realise interprovincial sharing of pre-school education resources and opportunities.

5.2 Suggestions

First, co-ordinate the deployment of educational resources and strengthen the construction of high-quality pre-school teachers. Based on the results of the DEA method of measurement, it can be seen that although the overall efficiency of the national pre-school education resource input is high in 9 years, only 23% of the provinces with super-efficiency rankings have reached the equilibrium state, and in order to continue to improve the utilisation rate of the resources, a more perfect system of education resource allocation should be established at the national level and within the kindergartens. The central government should assume the main responsibility for promoting equity in preschool education, widely publicise the policies and measures for the reform and development of preschool education, and increase the expansion of support for remote, ethnic and poverty-stricken areas; provincial governments should widely raise funds, encourage enterprises, social groups and individuals to donate, and carry out the supervision mechanism and performance evaluation of special preschool education funds; county-level governments should establish and improve the County-level governments should establish and improve a preschool education guarantee system that 'guarantees basic education, broad coverage, quality, and complete distribution' to ensure that every young child has access to adequate educational resources. At the same time, emphasis should be placed on the construction of a high-quality teaching force, such as through the systematic 'social recruitment examination', 'transfer of primary and secondary school teachers', and 'publicly-funded teacher-training students in pre-school education', 'College Students Volunteer to Serve in the West' and 'Special Teachers for Pre-school Education' to attract more young people to work as kindergarten teachers and ensure the stability of kindergarten teachers from the source; deepen the reform of the personnel system of pre-school education, in terms of job allowances, title evaluation, advanced assessment, training and learning, etc. to the first-line teachers, and to the first-line teachers, and to the second-line teachers. Deepen the reform of the personnel system of pre-school education, tilt the position allowance, title, advanced appraisal, training and learning moderately towards front-line teachers, and guide the whole society to form a good culture of respecting early childhood educators; establish a practical and feasible resource base of quality pre-school teachers, and help the balanced allocation of human capital and cross-provincial sharing based on data collection, software processing, and regional education carrying capacity assessment, so as to achieve the maximum utilisation of educational resources, and to push forward the balanced development of inter-provincial pre-school education.

Secondly, the development of preschool education should be transformed, and emphasis should be placed on the construction of kindergartens of substance. The reason for the low efficiency of preschool education resource allocation in most provinces is that pure technical efficiency and scale efficiency are low, and scale efficiency is less than pure technical efficiency. Instead of focusing only on the supply of resources such as kindergarten facilities, capital investment, and teacher quality, preschool education should, on this basis, change the development mode of preschool education, focus on the key issues of universality, fairness, and efficiency, and improve the pure technical and scale efficiencies to become a positive factor in fuelling the three-child policy and releasing the willingness to give birth. We should carry out real-time supervision of the special funds for preschool education, summarise the information on children's attendance and departure, as well as the number and qualifications of teachers, and order non-compliant kindergartens to rectify the situation within a certain period of time, so as to reasonably adjust the matching degree of preschool education resources, and put an end to the 'vacuum zone' in the management of preschool

education. The optimal allocation of preschool education resources, the creation of a 'home and community' tripartite collaborative parenting mechanism, a comprehensive and systematic assessment of the environment, teacher training, teacher-child interaction, parental satisfaction is a key factor in the connotative development of preschool education, not only to enhance parental understanding of early childhood education and support, but also conducive to mobilising the whole society on early childhood education. Teaching and learning are closely coordinated, and to a certain extent, it enhances the professional identity and professional happiness of early childhood teachers, and promotes the professional development of early childhood teachers.

Thirdly, the construction of inclusive kindergartens should be accelerated to ensure a rational allocation of resources between urban and rural areas. The level of regional economic development and the rate of urbanization have an impact on the quality of preschool education development; the fundamental reason for this is that the old, small, border and poor provinces have serious funding problems, leading to the loss of outstanding teachers and the failure to guarantee the quality of public services in preschool education. The equalization of public products for preschool education is configured to ensure that every child of school age can enjoy fair, high-quality preschool education without discrimination. While increasing financial transfer payments for preschool education, the government should establish and improve a multi-level supervision mechanism for preschool education resource allocation and accountability system for wasted funds, and severely punish such malpractices as the withholding and misappropriation of funds. The government has made the kindergarten enrollment rate of school-age children one of its performance appraisal standards, opened inclusive kindergartens, increased the scope of public kindergartens, and treated children of migrant workers in and out of the district "without discrimination," so as to realize the rational flow and efficient use of pre-school education resources. Encourage kindergartens with good conditions in urban areas, early childhood teacher training units and relevant research units to provide unpaid or low-paid "counterpart" support, which can be in the form of financial and equipment assistance, as well as business guidance or vocational psychological counseling, in order to improve the professionalism of rural early childhood teachers. Drawing on the experience and practices of developed countries abroad, a special fund for the development of preschool education in impoverished rural areas has been set up to help disadvantaged young children gain access to information-managed educational opportunities and growth environments, and to establish a system of compensation for preschool education that will benefit social equity, eliminate exclusion from education, and interrupt the intergenerational transmission of poverty.

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