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Efficiency Evaluation and Influencing Factors Analysis of Governmental Expenditure on Preschool Education

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ABSTRACT

With the DEA-Tobit analysis method and based on the panel statistic of thirty-one provinces from 1998 to 2015 in China, this paper studies the efficiency upon local government expenditure of preschool education and its' influence factors. First, the efficiencies on preschool education spending of local governments, including the overall technical efficiency, scale technical efficiency and pure technical efficiency, were evaluated by the data envelopment analysis approach (DEA). Based on the research result from the 1st step, Tobit model was used to investigate the connection of the efficiency measurement outcomes and preschool education policy variable fiscal decentralization, the connection of the efficiency measurement outcomes and social factors, such as density of population, GDP per capita and the public education degrees and so on. With the explanation of the measurement outcomes, it is noticed that the expenditure efficiency on local government preschool education has improved and have showed significant differences in CN. The influences of degree of urbanization, the density of population and education degree upon the efficiency of governmental preschool education spending and GDP per capita are positive. After the control of population, social and economic factors, the influence of fiscal decentralization upon the efficiencies on preschool education public spending is negative, the efficiencies on preschool education spending of local government has been greatly improved by preschool education policy in China.

Keywords: governmental expenditure efficiency, preschool education, DEA-TOBIT, education policy, fiscal decentralization

INTRODUCTION

Preschool education has the characteristics of public welfare and externality. The government should assume the primary responsibility and obligation in the construction and development of preschool education. While ECEC (Early Childhood Education and Care) may consist of multiple fund resources, affluent government expenditure is necessary to support a sustainable, affordable and quality services system. In systems with well-functioning, governments establish clear and consistent strategies to effectively allocate resources, including infrastructure expenditure for long-term planning and ongoing quality initiatives in preschool education. If there aren't strong government expenditure and participations, it would be difficult to achieve high-quality teaching aims and broad system goals (social inclusion, gender equality, kids' health and well-being) (Bennett & Tayler, 2006). The role of government expenditure and participation cannot be separated from strong expenditure efficiency and comprehension of the factors which may play influences on expenditure efficiency.

Contribution of this paper to the literature

- There is a significant conclusive connection Density of population is positive related to the expenditure efficiency of preschool education, which validates Grossman's viewpoint that scale economy could account for this result.
- By adjusting the preschool education resources, preschool education policy enhances the application efficiency of preschool education resources in order to take a dynamic and active part in the preschool education improvement of a nation.
- To enhance the application efficiency of public finance funds, the government can change the initially full covered financial appropriation pattern of preschool education to the financial appropriation mode on the basis of preschool education service performance.

Due to the lack of strong government expenditure and involvements in preschool education during 1998 [1] to 2010 in China, the public has to face "the Kindergarten Crunch" which was that the public cannot enter a suitable kindergarten at an affordable level or had paid a high or unreasonable price for their children's early childhood education (Zhou, Li, Hu, & Li, 2017). Since 2010, Chinese government has promulgated a serious of policies such as National Education Reform and Development Planning in Medium and Long Term (2010-2020), Several Opinions of the State Council about the Development of Pre-school Education, etc. to strongly improve the development of preschool education (Gao & Zhang, 2017).The public finance expenditure on China's preschool education increased from RMB 20.05 billion in 2010 to RMB 11.01 billion in 2015. The average annual rate of growth of public finance expenditure on China's preschool education increased from 2010 to 2015 was 42.72%. The proportion of the public finance expenditure on China's preschool education to the total-fund expenditure on the preschool education (including the public finance expenditure and non-public finance spending upon preschool education) increased from 27.9% in 2010 to 46.16% in 2015. The proportion of the public finance expenditure on China's preschool education to total-fund spending upon education went up from 1.07% in 2010 to 3.19% in 2015 (Blankenau & Youderian, 2015). It could be seen that the scale of the public finance expenditure on preschool education has been greatly increased, so how about the efficiency of making use of these public funds? What factors affect the efficiency of the public finance expenditure on preschool education? This paper is beneficial to efficiency on preschool education funds by investigating the determinants of efficiency concerning governmental preschool education expenditure.

Researches show that the efficiency of preschool education expenditure with the data before 2013 was not high in China (Feng, 2015; Guo, 2016; Wang, 2012; Xu, 2015; Zhang, 2016). There may be several reasons to explain it as the followings. Firstly, the structure of government preschool education expenditure on public and private kindergarten would affect public expenditure efficiency. The public kindergartens that could receive much more financial subsidies from government than the private kindergartens would get better and better in quantity and quality of teachers and schoolhouse area. Charges of some public kindergartens were getting higher than before with its improvement of running condition. Most of the children who were able to enter this kind of kindergarten come from wealth families at the advantageous social level, and fewer and fewer children benefit from public finances. The undersupply of preschool education still needs an effective solution (Hu, 2015). A model of macroeconomic education was established using the data of preschool education expenditure from 1998 to 2008, it was found that in the field of preschool education responsible by public kindergartens, every 1% increase of government supporting percentage leads to 0.296% decrease of kindergarten enrollment (Zhang, 2016). Secondly, the urban and rural structure of preschool education government expenditure partial to urban kindergartens would influence the efficiency. The use efficiency of the government expenditure on rural kindergarten is lower than that on the urban kindergarten due to the number of rural kindergartens and kindergarten teachers which cannot meet the demand of rural preschool education and which need to increase (Tian, 2011). Thirdly, at different levels of government, the lack of clear division for responsibility about preschool education planning, public funds and regulation in preschool education affect the government preschool expenditure efficiency (Wang, 2012; Zhao, 2013). The efficiency of preschool education expenditure can be reflected in the distribution of benefits of preschool education expenditure. The region with highest per capita GDP and the eastern region were the biggest beneficiaries in preschool public expenditure in China, and other areas have suffered a loss of benefits. The biggest losers were not in the regions with lowest per capita GDP and western regions, but the region with lower per capita GDP and the central region. The benefit gap in different regions has shown a trend of expansion. Supporting the

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[1] With the large-scale reform of state-owned enterprises from 1998, many public kindergartens run by state-owned enterprises and public institution and provided services for the children from central and low income workers' families were closed down or amalgamate with the private. More and more private kindergarten substitute the public. Public funds supported for early childhood education has actually become less and less (Feng, 2010).

Table 1. Correlated Variables for Preschool Education Spending Efficiency with DEA-TOBIT

Input Variables	Output Variables	Factors Affecting Efficiency
• Public Expenditure on preschool education Personnel • Public funds Expenditure in preschool education • Capital construction Expenditure in preschool education	• Number of Kindergartens • Number of Classes in Kindergartens • Number of Preschool Children in Kindergarten • The number of full-time teachers served for per 10,000 children • The number of full-time teachers with bachelor degree • Average school dormitory area per student	• Population Density (per/square kilometre) • GDP per capita • Urbanization Level (Urban Population/Total Population) • The Level of Education • Change of Preschool Education Policy after 2010 • Fiscal Decentralization

development of private kindergartens turns out to be an efficient method to further enhance the efficiency of preschool public expenditure (Zhao, 2013).

Despite this recognition, the idea which efficiency on governmental preschool expenditure is not adequate. The measurement of the overall technical efficiency (OTE), scale technical efficiency (STE), pure technical efficiency (PTE) on local government preschool education spending and the influence factor of the efficiency are rarely mentioned. What's the efficiency of the public expenditure on preschool education in 31 local governments after 2010? What factors will exert influence on the governmental preschool expenditure efficiency? Consequently, we fail to have an unequivocal understanding of these questions. This study explores the efficiency measurement upon the governmental expenditure of preschool education and the influence factors of efficiency. The article is divided into four parts. We give introduction to the research theme and offer a literature review in the very beginning. Then we measure the expenditure efficiency on preschool education in 31 provinces. Next, the affecting factors are analyzed upon expenditure efficiency of preschool education. In the end, we come to conclusions and offer advice on how to enhance government expenditure efficiency upon preschool education.

PRESCHOOL EDUCATION EXPENDITURE EFFICIENCY MEASUREMENT

DEA Method and Data

DEA (Data Envelopment Analysis) presents the non-parametric data strategy applied to measure whether Decision Making Units (DMU) of the multi-input and multi-output with same kinds is technique efficient or not (Wei, 2001). This approach is mainly for deciding the relatively efficient production frontier by remaining input or output of DMU unchanged, based on statistic and mathematical programming. Each DMU is projected onto the production frontier of the DEA, and their relative effectiveness is measured by comparing the degree to which the decision unit deviates from the DEA frontier (Cooper, Seiford, & Zhu, 2004). So as to represent the changing condition about returns to scale, this article makes use of the BCC model. The subject in this article is the expenditure efficiency on preschool education in local government, so thirty-one provinces in China are chosen as 31 DMU. Preschool education in China has changed dramatically since the large-scale reform of state-owned enterprises since 1998, thus 1998-2015 is chosen as the research period.

Selection of Variables

The decision concerning the variables indexes can be seen in **Table 1**. The input variables include Government Spending on Preschool Education Personnel, Public Funds Expenditure on Preschool Education and Capital Construction Expenditure in Preschool Education. The output variables contain Number of Kindergartens, Number of Classes in Kindergartens, Number of Preschool Children in Kindergarten, the Number of full-time Teachers Served for per 10,000 Children, the Number of Full-time Teachers with Bachelor Degree, and Average School Dormitory Area per Student. Related statistics are from China Finance Yearbook, China Education Statistical Yearbook, China Population Statistical Yearbook and the China Education Fund Statistics Yearbook.

Efficiency Measurement

On the basis of DEA model with the output orient, DEAP 2.1 was applied to gain the measurement outcomes of the average spending efficiency on preschool education in the provincial governments (**Figure 1**) (**Table 2**). Then, the measurement result of the OTE, PTE, and STE of the preschool education spending have been gotten analysis.
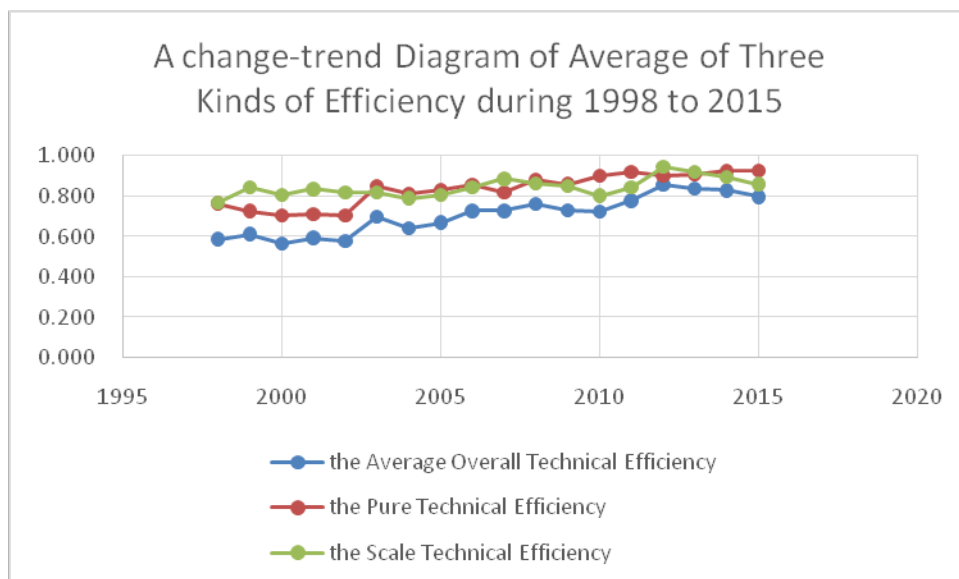
Figure 1. A Change-trend Diagram of Average of Three Kinds of Efficiency during 1998 to 2015

Table 2. Measurement Result of Preschool Education Spending Efficiency [2]

Province	crste	vrste	scale	rte
Beijing	0.5678	1	0.5678	drs
Tianjin	0.8735	0.9336	0.9356	irs
Jiangsu	0.6903	0.9362	0.7373	irs
Shanghai	0.5211	1	0.5211	drs
Zhejiang	0.6616	0.9228	0.7169	irs
Jilin	0.9351	1	0.9351	irs
Heilongjiang	0.7761	0.8623	0.9000	irs
Liaoning	0.8627	0.9326	0.9250	irs
Guangdong	0.8634	1	0.8634	drs
Hainan	1	1	1	-
Hebei	0.6115	0.7729	0.7912	drs
Anhui	0.6657	0.7456	0.8929	irs
Fujian	0.5716	0.7357	0.7770	irs
Shangdong	0.8556	0.9500	0.9006	irs
Jiangxi	0.8577	0.9240	0.9495	irs
Hubei	0.7249	0.8425	0.8604	irs
Henan	0.6274	0.7970	0.7872	drs
Hunan	0.8233	0.9500	0.8666	irs
Shanxi	0.6584	0.8445	0.8243	drs
Inner Mongolia	0.4629	0.7906	0.5855	irs
Guangxi	0.7584	0.8311	0.9125	irs
Chongqing	0.7240	0.8097	0.8941	irs
Sichuan	0.5277	0.7515	0.7022	irs
Guizhou	0.6103	0.7357	0.8295	irs
Yunnan	0.5080	0.6046	0.8402	irs
Tibet	0.7740	0.9208	0.8406	drs
Shanxi	0.4902	0.7536	0.6505	irs
Gansu	0.5019	0.6568	0.7642	drs
Qinghai	0.5992	0.7470	0.8021	drs
Ningxia	0.6513	0.7626	0.8541	irs
Xinjiang	0.2760	0.6305	0.4377	irs

Notes: crste: the OTE, vrste: the PTE, scale: the STE, rte: scale returns (drs: diminishing returns to scale, -: scale remuneration unchanged, irs: Increased scale returns, crste=vrste×scale

[2] Beijing, Tianjin, Shanghai and Chongqing are Municipalities.

Result and Discussion

The OTE presents a measurement of the whole efficiency of DMU. It's described in **Figure 1** that more than an seventeen-year process, the average value of OTE on preschool education expenditures in China was basically within a range of 0.5 to 0.6 before 2005, a range of 0.7 to 0.8 from 2006 to 2010, above 0.8 after 2011. The extent of variation was comparatively large before 2004, and it became small after that. It means that there was a steady upward trend on the expenditure efficiency of government preschool education.

Both the STE and PTE were fluctuating within a narrow margin prior to 2008. After 2008, though it was on the decline in some specific years, the whole variation was on the rise. In general, the average PTE, the average OTE and STE of preschool education spending of the provinces in China were all on the rise.

As to technical efficiency and scale efficiency, non-DEA efficient preschool education spending efficiency can be analyzed respectively. The OTE is acquired by STE and PTE. In other words, the non-DEA efficiency of OTE is decided by both STE and PTE for deeper reason explanation and applies to measure the loss of efficiency of preschool education spending, which also means that, to what degree, the loss of efficiency results from the STE or the PTE. With the precondition of fixed preschool education public spending scale, PTE indicates the degree of budget management and the local reasonable level of preschool education plan in government. On the premise of fixed input, STE represents the percentage of the output of the production frontier to that in the ideal scale. The higher the scale efficiency, the closer the production scale of DMU to the ideal production scale. Furthermore, by adjusting the limited condition, the kind of returns to scale of DMU could be measured through the alterable returns to scale in the data envelopment analysis model. When increasing returns to scale is appeared, it shows that DMU may enhance the production efficiency by the expansion in the scale of production. When decreasing returns to the scale is appeared, the input construction is required to be regulated to enhance the efficiency of production.

As for province differences, important difference was noticed in the OTE of preschool education spending in 31 provinces in **Table 2**. The OTE of Hainan province which is located in the eastern is one, and both the PTE and the STE are1, indicating that the DEA of this province was the most efficient which constitute the frontier of preschool education spending efficiency. The resource distribution of the preschool education spending of this province reaches the optimal outcome compare with other regions, and the efficiency was high. The average value of overall technical efficiency was 0.6784 in all 31 provinces. It's obvious that the preschool education spending of the most of provinces in China are relatively non-DEA effective from 1998 to 2015. The OTE of ten provinces is less than 0.6. Specifically, OTE of Shanxi and Xinjiang are lower than that of other 8 provinces. Besides, the majority of the west provinces' preschool education spending efficiency were comparatively lower than that of the other provinces. The mean value was 0.7468 for the east provinces [3], 0.6924 for the central part [4] and 0.5837 for the west part [5]. The average preschool education spending efficiency was comparatively high among the eastern part, comparatively low among the western part. The difference was significant between central and eastern provinces and western provinces.

From the **Table 2**, it can be concluded that the PTE of Beijing, Jilin, Shanghai and Guangdong were efficient while their scale technical efficiency is not high. It means that the relatively lower STE mainly resulted in the non-DEA efficiency of these four regions. Due to the exceeding from the optimal scale on the preschool education expenditure, the STE is supposed to be enhanced under the condition of remaining reasonable level of budget management and preschool education local plan at present. Tianjin, Jiangxi, Guangxi and Liaoning had the comparatively high measurement value in scale efficiency, which was approaching to the efficient scale efficiency. Although those places are in the situation of non-efficiency of PTE. It shows that the low OTE in the provinces was chiefly caused by the PTE. Therefore, it is supposed to pay attention to the improvement of the budget management abilities and the preschool education local plan abilities. Xinjiang has the lowest OTE in the all provinces, which was chiefly resulted from the PTE. The reason for comparatively low OTE in the majority of the western regions mainly lied in the loss PTE and the low of STE. It could be seen from **Table 3** that the scale inefficiency was the main influencing factor. In addition, as for the returns to scale, the majority of the preschool education spending of local governments are at the stage of diminishing returns scale, in other words, once the local preschool education spending increases the amount of the whole input resources by the same percentage, it will not improve efficiency. It might not be the most excellent decision to blindly seek for the increase of the scale in preschool education spending. Nevertheless, for local government, a larger proportion of input would obtain more returns by decreasing returns to scale.

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[3] There are 17 provinces, municipalities and SAR in eastern China, which are Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, Shandong, Anhui, Hainan, Heilongjiang, Liaoning, Jilin, Hebei, Tianjin, Beijing, Hong Kong, Macao and Taiwan. We only count the front 14 provinces because we cannot get the complete data for the remaining 3 provinces.

[4] There are 6 provinces in central China, which are Henan, Hubei, Hunan, Jiangxi, Shanxi, and Inner Mongolia.

[5] There are 11 provinces and municipalities in western China, which are Shanxi, Ningxia, Gansu, Sichuan, Chongqing, Guizhou, Guangxi, Yunnan, Tibet, Qinghai, and Xinjiang.

Table 3. Returns to Scale in Provincial Preschool education Spending

	Increased Scale Returns (irs)	Scale Remuneration unchanged (-)	Diminishing Returns Scale (drs)
Province	Tianjin, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong	Hainan	Beijing, Hebei, Shanxi, Shanghai, Henan, Guangdong, Sichuan, Shanxi, Tibet, Gansu, Qinghai

INFLUENCE FACTOR ON EFFICIENCY ANALYSIS

The Fundamental Hypothesis

The factors influencing the preschool education spending efficiency of local government in **Table 1** can be seen based on previous literature [6] about the influence factors in expenditure efficiency. GDP per capita, the density of population, and the level of urbanization and education level are respectively selected as the economic, demographic and social factors influencing the expenditure efficiency. Moreover, the effect of fiscal decentralization and preschool education policy after 2010 are studied on preschool education spending efficiency of local government. It's obvious that on the basis of the analysis of the 2nd part, difference has obviously existence in the preschool educational spending efficiencies of the western, middle and eastern regions. The dummy variables of the western, middle and eastern provinces will be exactly introduced for in-depth demonstration [7]. Based on conclusion from previous study, this article puts forward the following hypotheses concerning the factors which might bring influence on the efficiency variance of local preschool education spending.

Hypothesis 1 (H1): Per capita GDP is positively correlated with the efficiency of preschool education expenditure. The higher the GDP per capita, the higher the standard of living, the more conducive to the healthy development of people's health. To a certain extent, it will enhance the management efficiency and the efficiency of the using on preschool education financial funds.

Hypothesis 2 (H2): The rate of urbanization shows positively related to the spending efficiency on the preschool education. The higher the degree of urbanization, the more powerful the urban public infrastructure acting on rural region, and the urbanization level exerts significant influence upon the integrated public goods supply in urban and rural, then influencing the spending efficiency (Lin, 2005).

Hypothesis 3 (H3): The density of population has positive relation with the preschool education spending efficiency. Because of the effect of scale economy, larger density of population is benefit to the reduction of the managing and supervising cost of governmental spending, and conductive to obtain scale economy of public service supply for the developing size of inhabitants, thus giving rise to the growth of the spending efficiency. It's found that the density of populations supposed to have the positive connection with efficiency of the governmental spending (Grossman, Mavros, & Wassmer, 1999). Furthermore, Athanassopoulos (2003) noticed that the density of population and the total amount of population show negative effect on the government efficiency.

Hypothesis 4 (H4): The education degree has positive connection with the preschool education spending efficiency. Inhabitants with better education degree have higher preschool education demands for them, their demands can be clearly expressed by a variety of channels. Correspondingly, the government has the pressure of increase the public spending and improve the efficiency in this area. Thus, the higher education degree of inhabitants is benefit to improvement of the local governments' spending efficiency (Milligan, Moretti, & Oreopoulos, 2004). The education degree is represent by average years of schooling.

Hypothesis 5 (H5): Fiscal decentralization has relation with preschool education spending efficiency. Fiscal decentralization was the fundamental system arrangement in public finance after reform of tax sharing system in China in 1994. Fiscal decentralization could impact the size, structure, performance and efficiencies on local public fiscal spending. The mainstream theory in the theoretical circles about fiscal decentralization holds that the competition among local governments might inspire initiatives of the local governments to continuously take measure to enhance the providing efficiency on public goods and make contributions to the improvement of the overall social public welfare (Zhou, Sun, & Lee, 2017).The proportion of the provincial financial budget spending per capita in the total financial budget spending(include the provincial and the central) per capita is selected as the measurement index of fiscal decentralization [8]. At the same time, as to research the different influences of public

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[6] Some variable adopted by Han (2010) is used for Reference.

[7] The eastern region are taken as the reference region and the intercept coefficient of the constant term in the model as the average expenditure efficiency level of the eastern region to test the statistical significance of the efficiency variances between the three regions.

[8] The fiscal decentralization index adopted by Qiao (2005) is used for reference.

finance policy upon the eastern, middle and western regions. It would be used in the model for the interaction item of fiscal decentralization variables and three region dummy variables.

Hypothesis 6 (H6): Preschool education policy represents a significant factor influencing the efficiency on preschool education expenditure. In order to alleviate the increasingly prominent contradiction between supply and demand in preschool education, the Outline of the State Medium and Long-run Educational Reform and Development Planning from 2010 to 2020 promulgated in 2010 in China has pointed out that various channels should be adopted to increase investment in preschool education, and government preschool education funds should occupy a reasonable proportion of the funds for government education expenditure. Provinces (autonomous regions and municipalities) were explicitly required to formulate and implement a three-year preschool education plan (Chen, 2009). Here, we introduce annual dummy variables to represent changes in preschool education policies during this period. Taking into account the lag of policy, it is stipulated that dummy variables will be set one after 2010 and zero in other years. Meanwhile, for the sake of finding out the different impacts of preschool education policies on the eastern, western and central regions, it would be used in the model for the interaction term of the dummy variable including the preschool education policies and t the 3 regions as well. On the basis of the history of the development of preschool education, the article indicated that policy would also be a significant factor influencing the preschool education spending efficiency (Hong, Liu, Ma, & Luo, 2015). As a result, the effects of two policy variables, fiscal decentralization and preschool education policy, would be found out in the model.

Model and Empirical Result

On the basis of the above hypotheses, the following relate regression model could be obtained:

$$z_{it} = \beta_{i0} + \beta_{i1}\chi_{i1} + \beta_{i2}\chi_{i2} + \beta_{i3}\chi_{i3} + \beta_{i4}\chi_{i4} + \beta_{i5}D_{ij} + \varepsilon_{it} \tag{1}$$

z_{it} is the measurement result of OTE of 31 provinces on preschool education expenditure in CN from 1998 to 2015, χ_{i1}, χ_{i2}, χ_{i3} and χ_{i4} are the GDP per capita in every year of the research period (RMB per capita), the density of population (amount of population per square km),degree of urbanization (the percentage of amount of city population to whole amount of population), educational degree (represented by average years of schooling). Index of fiscal decentralization D_{ij} is the dummy variables which impact the overall technical efficiency on preschool education spending, involving the dummy variable for preschool education policies and the eastern, middle and western and the interaction item of the dummy region dummy variable and policy variable as well.

Due to the measurement value from 0 to 1 on OTE and for the sake of avoiding the biased error resulted from OLS measurement, the cross-section and time series data were made full use. The constrained panel data model with Tobit random-influence was adopted to make the regression analysis. Related data in this research is from Financial Statistics Yearbook of China and Statistical Yearbook of China in every year from 1999 to 2016. By applying Eviews 6.0 to Tobit analysis, the regression outcomes of the 5 models can be obtained from **Table 4**.

Table 4. The Empirical Result of Affecting Factors for the Spending Efficiency of Local Government Preschool Education

Influence Factor	Model 1	Model 2	Model 3	Model 4	Model 5
Density of Population	0.0001*** (0.280)	0.00083*** (0.035)	0.00006** (0.001)	0.00009 (0.0039)	0.00021** (0.041)
GDP Per Capita	0.0699*** (0.028)	0.0138*** (0.275)	0.0703*** (0.051)	0.0986** (0.286)	0.0623** (0.043)
The Level of Urbanization	0.0818* (0.005)	0.0676* (0.0006)	0.00023** (0.000)	0.00093** (0.000)	0.00638*** (0.000)
Educational	0.01097***	0.00336**	0.01651**	0.0113***	0.00695*
Level	(0.0002)	(0.000)	(0.0009)	(0.0011)	(0.0003)
Fiscal		-0.50038**		-0.31386***	-0.39198***
Decentralization		(0.016)		(0.000)	(0.003)
Western dummy Variable (D2)	0.31041*** (0.000)	-0.41506** (0.001)		-0.35681** (0.000)	0.29568*** (0.0003)
Central dummy Variable	-0.51682** (0.000)	-0.42563*** (0.000)		-0.29865** (0.000)	-0.43657** (0.000)
Preschool education Policy dummy Variable (P)				0.21392*** (0.003)	
D1×Fd			-0.43976** (0.012)		
D2×Fd			-0.36597 (0.325)		
D3×Fd			-0.61723*** (0.005)		
D1×P					0.13254*** (0.003)
D2×P					0.043035 (0.379)
D3×P					0.064966** (0.031)
Constant Term	1.10564*** (0.000)	1.503518** (0.000)	0.69638*** (0.000)	0.92364*** (0.000)	1.95896*** (0.000)
Effects of Individual Standard	0.46589*** (0.000)	0.30576*** (0.000)	0.35786*** (0.000)	0.31289*** (0.000)	0.31685*** (0.000)
Deviations Interference Item Standard	0.080235*** (0.000)	0.089564*** (0.000)	0.092567*** (0.000)	0.095893*** (0.000)	0.086891*** (0.000)
Deviation Likelihood-ratio Test (Chi-square)	389.561	302.352	295.468	294.475	316.297
rho	0.879521	0.838965	0.831479	0.830454	0.842412
Log Likelihood	231.487	238.663	240.418	243.535	256.456

Note: "***", "**" and "*" indicate the pass the pattern specification tests at the Significant degrees 0.01, 0.05 and 0.1

Discussion

From **Table 4**, it's clear for middle and western region dummy variables that the coefficients are negative dummy in the first, second, fourth and fifth Model. For the central area, the second and fourth Model are significant on the five percent level, the rest whereat the one percent level. For the western region with the exception of the second Model, which is exactly significant at the one percent level. The other models are clearly significant at the five percent level. The results indicate that the central and western regions have comparatively less governmental preschool education expenditure efficiency compared to the eastern region, this further reflects the above analysis results of the OTE on preschool education spending.

It suggests from the results that the density of population has positive relation with the spending efficiency of preschool education and significantly in line with the null hypothesis. Obviously, two of the five models indicate a significant and relatively positive connection of the degree of urbanization and the preschool education spending efficiency. The result shows that the greater the degree of urbanization is, the more powerful the capability of production elements transfer between city and rural and the higher influence of preschool education are. There is a significant conclusive connection the density of population is clearly positively related to the spending efficiency of preschool education, which validates Grossman's viewpoint that scale economy could account for this result (Grossman & Zhang, 1993).

The second, fourth and fifth Model all contain fiscal decentralization variable. In the second Model it was found that, at the 5% significance level, a relation between the fiscal decentralization variable and preschool education expenditure efficiency is negative. However, when the preschool education policy variable was involved in the fourth and fifth Model, the influence of fiscal decentralization upon the preschool education spending efficiency remains clearly negative and obviously significant at one percent level. The significance turns out to be clearer,

showing that good robustness has been in the result. Such result is deviated from the fiscal decentralization mainstream theory of which is that fiscal decentralization is positive correlative with government spending efficiency. It could be understood through Chinese fiscal decentralization mechanism.

Chinese fiscal decentralization is not so as the other nations, it has close connection with the centralized political mechanism, in which the most vital performance target for local government is rate of economic growth, the officials in local government hold greater motivation, which is to improve the size and efficiency of financial spending, and to obtain great output in short-term, but the fiscal preschool educational spending and the efficiency that could not be simply enhanced in short time is frequently neglected.

Although there is a clear legal requirement on expenditure on education, the budget for education within the budget increases in accordance with the law, and the goal of 4% of the total government expenditure on education is required. Local governments pay more attention to ensuring compulsory education, high school education and college education expenditure, while the fiscal expenditure laws and regulations in preschool education is seriously lagged behind and cannot be clearly determined (Wu, 2014).

So as to have in-depth investigation about the difference effects of fiscal decentralization upon the preschool education spending efficiency from different regions, the interaction item, which could be reflected fiscal decentralization and dummy variables of the central, western and eastern region, gets involved in the third Model. The outcomes indicate from **Table 4** that, the influence of fiscal decentralization upon preschool education spending efficiency of central and western region is much better than the eastern region. At the same time, the significance of the influence is five percent and one percent respectively for the central part and west part, while not clear for the eastern part. This conforms to the earlier outcome of efficiency accounting, indicating that the overall technical efficiency of local preschool education spending in China is relatively high in the eastern part, and comparatively low in the western and central region (Han & Miao, 2010). As a result, moderate financial centralization might be adopted so as to bridge the efficiency differences among the eastern, central and western parts.

Based on the log likelihood value from the five models showed in the **Table 4**, it can be seen that the fourth model and the fifth model fit greater than the previously three models, indicating that preschool education policy variables introduced into the model are significant factors affecting preschool education expenditure efficiency. In order to check the effect of preschool education policy upon the preschool education expenditure efficiency around 2010, the dummy variables of preschool education policy are included in the fourth model. The results validate the hypothesis that preschool education policies around 2010 have significantly increased the efficiency of preschool education in China. The interactive item of the dummy variable of preschool education policy and the dummy variable of the eastern, middle and western regions gets involved into the fifth Model. The results show that preschool education policy can significantly promote the preschool education spending efficiency in eastern and middle regions of China, while the western region is positive but not obvious. Therefore, the following conclusions can be drawn: preschool education policies around 2010 can reduce the difference in government preschool education expenditure efficiency among eastern, central and western parts (Qiao, Fan, & Feng, 2005).

CONCLUSIONS

This article uses the DEA 2-step approach to measure the three type of efficiency of the governmental preschool education spending in 31 Chinese provinces from 1998 to 2015. The research outcomes indicate that, there is a local difference on preschool education expenditure efficiency in China, and the efficiency on local preschool education spending in the eastern part is larger than the west and middle regions. Most of the loss of overall efficiency is chiefly resulted from the scale efficiency. It might not be the most excellent decision to improve efficiency through blindly pursuing the expansion of the size of preschool education spending for the diminishing returns scale province. In the future, it is necessary to optimize the structure of preschool expenditure (Yue et al., 2018).

According to the measurement outcomes of overall efficiency of preschool education costs, the random influence Tobit model is deeply applied to explain the factors influencing provincial governmental preschool education expenditure efficiency and the following and obviously conclusion is shown: GDP per capita, degree of urbanization, density of population and education degree all have positive correlation with influence upon the efficiency of preschool education spending.

The impact of fiscal decentralization upon the efficiency on preschool education spending is relatively negative after the control of the factor about society, economy and population. Moderate financial centralization could be taken to reduce the efficiency difference among the east, central and west parts. The practice of preschool education policies can significantly promote the expenditure efficiency of local government preschool education in middle and western regions of China, and the present preschool education policy is able to be constantly carried out to decrease the efficiency difference among the governmental preschool education spending of the east, middle and west parts.

From the viewpoint of public finance policy, relatively moderate financial centralization in the current economic system is helpful for enhancing the government expenditure efficiency. Moreover, local governments which show decreasing returns to scale should adjust and optimize spending structure on preschool education to get rid of the loss of efficiency, while for those which show increasing returns to scale, the government is supposed to increase preschool education expenditure to enhance the efficiency. To enhance the application efficiency of public finance funds, the government can change the initially full covered financial appropriation pattern of preschool education to the financial appropriation mode on the basis of preschool education service performance, i.e., the pattern of particular public funds for preschool education services can be applied, and the particular public funds for preschool education improvement in private kindergarten and rural kindergarten. Besides, various financial support patterns should be taken for various kinds of preschool education products. For the pure preschool education products and services that the social strengths are frequently reluctant to provide, the government administration department is supposed to take the full responsibility. For the quasi-public products and services that the social strengths are capable but reluctant to offer, the department is supposed to take the form of government purchases; for products and services of preschool education the social forces are willing and capable of offering such as self-managed preschool education organizations the government should give appropriate subsidies through rewards.

From the preschool education policy perspective, continuously deepening the reform of preschool education development strategy and arranging a variety of local preschool education resources more suitably are also significant approaches to enhance the efficiency of the governmental preschool education spending. It's necessary to improve information disclosure mechanism in use of preschool education funding. Specifically, regularly government funding information for preschool education and specific directions, and the details of expenditures of the user of government funds on preschool education both should be disclosed. Meanwhile, it is supposed to strengthen preschool education funding supervision and evaluation mechanism (Pan, Wang, & Li, 2018). By adjusting the preschool education resources, preschool education policy enhances the application efficiency of preschool education resources in order to take a dynamic and active part in the preschool education improvement of a nation. As a result, it is necessary to further deepen the reform of preschool education system.

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