Impact Of Preschool Education Financial Expenditures on The Number of Full-Time Preprimary Teachers in Rural Regions-- An Analysis Based on Chinese Provincial Panel Data, 2012-2021

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Abstract. Education is an essential problem concerning the whole society, creating citizens with well-educated is the foundation of a good country. Financial expenditure on education is the basic supplement and support of advanced education. However, preschool education has lower attention compared to other seminars. There is a certain gap in allocation. Therefore, the focus of this study is on how education spending affects the number of rural kindergarten teachers, using the quantitative analysis method, from the Economy Prediction System (EPS) database to collect the corresponding panel data of China's provinces during the decade 2012-2021 to analyze and hypothesize, and finally concludes as follows. The amount of kindergarten full-time teachers in rural areas is obviously and positively related to the total investment in preprimary education, and this relationship is more significant in the western region. The study also found that among the items of financial expenditures on preschool education. Spending on products and services, as opposed to pay, benefits, and assistance for individuals and families, had a greater impact on the amount of kindergartens full-time teachers in rural areas. Through the path analysis in the study, we can know that the educational financial expenditure can increase the number of full-time kindergarten teachers in rural areas by increasing the number of kindergartens and students.

Keywords: Preschool Education, Education Financial Expenditures, Full-time Teacher.

1. Introduction

The fundamental assurance and support for the expansion and advancement of the educational endeavor is financial support for education and is the foundation of all educational concepts and the development of the educational endeavor. At present, China's pre-school education is developing rapidly, but there are many problems. Starting from the impact of education financial expenditure on the number of full-time instructors in kindergarten, this study takes the rural group as the research object, using quantitative analysis method the research theme. Due to their lower educational status, rural residents pay less attention to preschool education than their urban counterparts, which leads to the poor advancement of preprimary education. Preprimary education in rural areas has also been hampered by a lack of funding, a dearth of rural kindergartens, and a quick loss of students. In this circumstance, this study uses the panel data of each province from 2012 to 2021 in China to analyze the impact of the above factors on how many full-time kindergarten teachers there are in remote areas.

This paper conducts a quantitative study and data analysis to explain the impact of the public financial expenditure on pre-primary education in rural areas, using the number of full-time kindergarten instructors in rural regions in each province and city of China in the Economy Prediction System (EPS) database as the dependent variable, and using the number of rural kindergartens, the number of children participating in rural kindergartens, as well as the number of rural kindergartens in the EPS database as the independent variables.

The amount of full-time pre-primary teachers in rural regions in each Chinese province and city found in the EPS database serves as the dependent variable in this paper's quantitative study, while the number of rural kindergartens, the number of children entering rural kindergartens, as well as the number of rural kindergartens encountered in the EPS database serve as the independent variables.

2. Literature Review

Scholars in China and elsewhere have recently carried out studies and drawn findings about the cost of preprimary education as well as the state of teacher teams in kindergartens.

Currently, many scholars have pointed out existing problems with regard to the State's expenditure on pre-school education. Generally speaking, China's pre-school financial education expenditure in all provinces is on an upward trend. In particular, after 2010, when the State Council of China issued its "Issues on the Current Development of Early Childhood Education," the Ministry of Finance emphasized the government's commitment to educational financial investment in the following year, and vigorously improved the level of preschool education development [1]. Unfortunately, however, providing preprimary schooling remains a serious challenge. According to Xin Zhou, less than 2% of China's total yearly spending on education is allocated to preprimary schooling, and there is a big difference between rural and urban areas [2]. Yang points out that although the share of financial expenditure on preschool education is rising under policy guidance, it is still insufficient [3]. He argues that if the number of school-age children is small and the returns are below the basic requirement of economies of scale, the market mechanism will become monopolistic to the detriment of families and children, and therefore government intervention is needed [3]. In addition, it can be found through the study of Tu, Lin & Zhang that the effectiveness of spending on early education in China is not high. Currently, government spending on preschool education is divided between urban and rural kindergartens, which could affect the effectiveness of the system [4]. The Government's financial efficiency is lower in rural kindergartens, where the demand for pre-school education is greater than the supply of kindergartens and teachers [5]. Tan mentions that the government's macro-decision making is important for the implementation of pre-school education policies and that there is a need to implement an effective financial input mechanism [6]. There has been a detailed study and data interpretation of the connection between economic development and education in the United Kingdom in the 19th and 20th centuries. It points out that education spending was fully involved in the long-term growth of all public spending in the UK. In fact, public spending on education increased from 6.6% in 1890 to 11.5% in 1999—a significant increase [7]. Prior to 1945, relative to other expenditures, it appears that educational costs rose during recessions and fell during expansions of the economy. However, after 1945, the situation changed [7]. Tan studied the development of pre-primary education in the Singapore region [8]. The majority of Singaporean children are currently enrolled in pre-school, which is offered solely by the commercial sector at the moment [8]. Childcare costs are universally subsidized by the government, and families who have difficulties also qualify for additional financial assistance from either non-governmental or governmental organizations. The kindergarten tuition is often lower, and programs providing financial assistance are also accessible for less fortunate children. Due to factors like a lack of kindergartens or teaching personnel, it seems kindergartens in rural areas tend to have a larger size of class [9].

Qin & Wang point out that in terms of the number of all-time kindergarten teachers, China has formulated and implemented many policies during the 2010-2020 decade [10]. In this context, China's pre-school education has developed rapidly, but it is still unable to satisfy the demands of early childhood teachers. With the liberalization of the two-child policy, the market demand for early childhood education will still increase. At the same time, the scale of pre-school teacher training has not kept pace. The shortage of teachers has resulted in a serious shortfall in the number of teachers per pupil, which is even lower in rural areas [11]. As the national "two-child policy" develops, the quantity of kindergarten teachers is seriously insufficient to meet the demand for ECE under the policy, pointing out that urban and rural preschool teachers are weak in the west and a serious shortage

of preschool instructors in the ethnic regions occurs; ethnic kindergartens are facing problems such as insufficient establishment of kindergarten teachers and a shortage of full-time teachers [12]. Due to a shortage of parents in preprimary areas, many kindergartens in big cities also enroll youngsters per class exceeding the laws allow [9]. In other areas, the number of teachers has actually been decreasing, referred to as teacher wastage. This is a very serious problem that needs to be addressed urgently. Buchanan conducted a study on early career teacher turnover, as cited in Manuel's research study [13]. Buchanan attempts to use the career turnover rates of early career teachers in the first three to five years to demonstrate that turnover is a considerable problem [13]. In Turkey, its conclusion suggests that teacher turnover is higher in provinces with lower socioeconomic development levels [14]. Yet, individual reasons also play a part, and under many circumstances, instead of a single factor, many factors altogether cause challenges. It's an as much of these causes are likely connected with the features of this profession and the local school situation in which new teachers are engaged [15].

Generally speaking, both domestic and overseas researchers have conducted multi-dimensional and multi-faceted discussions and research on the financial expenditures for pre-school education and the number of teachers in service. The majority of scholars have drawn the conclusion that preprimary education system is in China still short of resources financially and in terms of teachers. The ambiguity of the government's responsibility and the marketization of the financial mechanism are also problems in preprimary education in China. Comparing the development of preprimary education in different economic regions, research can also see the current situation and shortcomings of rural preschool education. However, other regions are also facing the problems of financial expenditure and loss of teachers.

Moreover, scholars have overlooked the problem that there is no focused study of the relationship between financial expenditure on education and the amount of all-time kindergarten teachers in rural regions, so this paper focuses on this topic to fill the gaps in the research.

3. Research Hypothesis

Currently, with the development of society, there is an increase in the total amount of China's financial expenditure on public education, and expenditure on preschool education in all provinces of China is on an upward trend. However, early in China's policymaking and later in the transition to a market economy, preschool education was classified as a market-oriented development and led to a change in the total fiscal expenditure. In terms of policies to support growth in rural and urban regions, preschool education should be implemented and financial resources to support the development in rural kindergartens. The number of teachers is an important indicator of the development of kindergartens, among which the number of full-time instructors in kindergarten is a direct indicator of the preprimary education growth in the region, as well as of the funding for education. On this basis, the first hypothesis can be seen in the following paper.

H1 Controlling for other factors, the amount of total Chinese government financial expenditure on preschool education has an obvious and positive influence on the number of rural kindergarten teachers.

H2 Controlling for other factors, the amount of total government expenditure has a greater impact on preschool education and the number of teachers in rural kindergartens in the western region than of the eastern and central regions.

Although China's current financial expenditure on education is relatively large, education funding is still unsatisfied, and this discrepancy is very obvious in two places, one being the difference between cities and villages, and the other being the difference between different regions of the country. The impact of fiscal expenditure on the number of teachers is also different in the western and eastern areas with economic development of different levels. The increase in the amount of financial investment has a greater influence on the treatment and salary of teachers in the western region, which leads to more teachers coming to the western region, and the teacher turnover rate will also decrease.

During the 13th Five-Year Plan, staff salaries and benefits are the number one expenditure in the State's financial education expenditure, with the proportion remaining at around 61%. Especially in recent years, local governments have conscientiously implemented the requirements of the central authorities to safeguard the salaries and wages of teachers engaged in compulsory elementary education according to the law, and to ensure that the average salaries and incomes of those teachers are not less than those of civil servants in the local area [16]. The importance of wage and benefit expenses cannot be overstated. While there is a need to strengthen public funding to support preschool education for low-income families, the impact of spending on school goods and services and personal and family assistance on rural kindergarten teachers is not as significant as compared to welfare spending, which is related to the composition of teachers' salaries directly. Therefore, this paper proposes the third hypothesis:

H3 Controlling for other factors, expenditures on wages and benefits are more relevant to the quantity of instructors in rural kindergarten than expenditures on goods and services and assistance to individuals and families in the entire public financial spendings on preschool education.

The size and growth of the school-age population affect the size of education and investment in education in a country or region [17]. The rising number of students and kindergartens has caused a social demand for kindergarten instructors. The policy that promotes rising total investment in preprimary education may affect the number of kindergarten students and kindergartens. Among them, the number of kindergartens, especially that of public inclusive kindergartens, will increase. At the same time, the improvement in kindergarten facilities, teachers and other conditions will attract more young children to kindergarten. This paper therefore proposes a fourth hypothesis:

H4 Controlling for other factors, the total investment in preschool policy can significantly raise the amount of teachers in rural kindergartens by increasing the number of preprimary students and kindergartens.

4. Research Design.

4.1. Quantitative Analysis Method

The financial expenditure on early childhood education, the number of early childhood schools, the number of preprimary students in kindergartens, and other variables are statistically analyzed in this study for various government years in China as well as for various rural locations. It mainly studies the impact of rural preschool financial expenditure on the amount of kindergarten full-time instructors in the countryside through quantitative analysis.

This paper selects data about preschool investment in 31(Taiwan, Hong Kong and Macao excluded) provinces in the 10-year period from 2012 to 2021. With preschool education financial expenditure in different rural regions, expenditures on wages and benefits, expenditures on subsidies to individuals and families, expenditure on goods and services, number of kindergartens, and number of kindergarten students as explanatory variables to do a panel regression, this paper analythe zes impact of financial expenditure and other indicators on The number of full-time kindergarten teachers in weak socio-economic areas through SPSSAU.

4.2. Model Selected

The formula for the random effects model of panel data is $Yit = \alpha i + \beta Xit + \varepsilon it$, where αi denotes the random effect of individual i, β refers to the coefficient of the independent variable Xit, and εit denotes the error term.

The model of path analysis is: $y = XB + E$. y represents the dependent variable, X represents the matrix of independent variables, B represents the matrix of regression coefficients, and E represents the error term.

The following is the general form of the regression formula in path analysis:

$$Y = \beta 1X1 + \beta 2X2 + ... + \beta nXn + \varepsilon \quad (1)$$

The formula for the Pearson correlation coefficient is:

$$r=\sum(X-X^{-})(Y-Y^{-})\sum(X-X^{-})2\sum(Y-Y^{-})2 \quad (2)$$

4.3. Study Variables:

Dependent variable: Number of full-time rural teachers in each province and city in China

Independent variable: Educational financial expenditures on rural kindergartens by provinces and cities in China

Independent variable: Number of rural kindergartens in each province and city in China

Independent variable: Number of rural kindergarten students enrolled in kindergartens in each province and city in China.

Independent variable: Expenditures on wages and benefits

Independent variable: Expenditures on assistance to individuals and families

Independent variable: Expenditures on goods and services

5. Result

5.1. Descriptive Statistics Situation of the Data

Table 1. Descriptive statistics situation of the data

name	Sample size	minimum value	maximum values	Average	Standard deviation	Median
Number of full-time preprimary teachers in rural areas	310	430.000	62222.000	11966.055	11598.199	9839.500
Total financial expenditure on education in rural kindergartens (millions of yuan)	310	18.724	1386.449	424.719	329.093	321.439
Salary and welfare expenses (millions of yuan)	310	2.248	827.648	231.844	201.350	166.492
Expenditures on assistance to individuals and families (millions of yuan)	310	0.126	176.718	21.850	23.889	16.057
Expenditures on goods and services (millions of yuan)	310	1.798	350.111	90.361	74.025	71.072
Number of pupils in rural kindergartens	310	12151.000	1738470.000	344631.645	332636.767	262469.000
Number of rural kindergartens	310	46.000	10437.000	2740.587	2405.141	2038.000

For this analysis, statistics on China's education and education spending for 31 provinces and cities in China (apart from Hong Kong, Macau, and Taiwan) from 2012 to 2021 were chosen from the EPS database. There are 310 samples for each variable, and the descriptive statistics situation for these data in Table 1 makes it clear that the data are all distinct.

5.2. Panel Model Analysis of Hypothesis 1

Table 2. Test summary (n=310)

Type of test	purpose of inspection	test value	Test Conclusion
F-test	FE and POOL modeling options compared	*F* (30,276)=35.179,p=0.000	FE model
BP test	RE and POOL modeling options compared	χ2(1)=736.373,p=0.000	RE model
Hausman test	FE and RE modeling options compared	χ2(2)=20.136,p=0.000	FE model

From Table 2, the panel model for this study was built using the total sum spent on education in rural kindergartens, the number of preprimary students in rural regions, the number of rural preschools, and the amount of full-time preprimary teachers in rural areas as the explanatory variables. The panel model consists of 3 parts: a mixed POOL model, a fixed effect model, as well as a random effect model. To choose the best one, the table above shows a model test done firstly: The F-test shows the significance of F (30,276)=35.179 at the degree of 5%, p=0.000<0.05, indicating the FE model is more advanced than the POOL one. The BP test indicates that the RE model exceeds the POOL one at the degree of 5% (chi(1)=736.373, p=0.000<0.05). The Hausman test indicates that the FE model exceeds the RE one at the degree of 5% (chi(2)=20.136, p=0.000–0.05). FE model is the best and was produced as a result, taking the previously discussed evaluation into focus.

Table 3. Summary of panel model results

classifier for principles, items, clauses, tasks, research projects etc	POOL model	FE Model	RE model
intercept (the point at which a line crosses the x- or y-axis)	-2246.515** (300.533)	-3452.923** (535.508)	-3097.199** (645.001)
Total financial expenditure on education in rural kindergartens (millions of yuan)	11.881** (0.721)	12.073** (0.625)	12.189** (0.599)
Number of pupils in rural kindergartens	0.017** (0.001)	0.014** (0.002)	0.014** (0.001)
Number of rural kindergartens	1.192** (0.147)	1.974** (0.160)	1.885** (0.152)
R 2	0.927	0.916	0.920
R 2 (within)	0.854	0.877	0.877
sample size	310	310	310
inspect	F (3,306)=1298.747,p=0.000	F (3,276)=657.725,p=0.000	χ2(3)=2359.947,p=0.000
Dependent variable: amount of full-time preprimary teachers in rural areas			
* p<0.05 ** p<0.01 Bracketed standard deviation values			

The FE model is the study's end outcome, which is taken from Table 3. As seen in the above table, the total amount spent on education in rural kindergartens has a significance at the degree of 0.01 (t=19.307, p=0.000<0.01) and the regression coefficient value is 12.073>0, implying this will have

an obvious and positive impact on the number of full-time preschool teachers in rural regions. This suggests that the amount of money spent overall on education in rural kindergartens affects the amount of full-time schoolteachers there favorably. The regression coefficient for the number of preprimary students in rural regions is 0.014>0 and obvious at the 0.01 level (t=12.322, p=0.000<0.01), a sign that the amount of rural preschool students profoundly positively interferes with the amount of full-time preprimary teachers in rural regions. According to the regression coefficient value of 1.974>0 and a 0.01 probability level (t=12.322, p=0.000<0.01) for the number of rural kindergartens, the amount of full-time rural preschool teachers is greatly improved by the number of rural kindergartens.

It shows that the total financial spending on preprimary education in rural regions has a significant positive impact relationship on the number of full-time rural preschool teachers so hypothesis 1 is valid.

5.3. Correlation Analysis of Hypothesis 2

Table 4. Pearson Correlation - Standard Format

	Number of full-time preprimary teachers in rural regions (west)	Number of full-time preprimary teachers in rural areas (central)	Number of full-time preprimary teachers in rural regions (east)
(Total financial spendings on preprimary education in rural regions (West) (millions of yuan)	0.841**	0.041	0.368*
(Central) Total financial expenditure on education in rural kindergartens (millions of yuan)	0.197	0.830**	0.225
(Total financial expenditure on education in rural kindergartens (east) (millions of yuan)	0.138	0.090	0.766**
* p<0.05 ** p<0.01			

Comparing rural kindergartens in the west to those in the east and the centre of the nation, Table 4 reveals that the correlation coefficient between the amount of total government spending on pre-school education and the amount of full-time kindergarten instructors is the greatest. This indicates that, even when controlling for other factors, the amount of total government spending on pre-school education has a greater impact.

5.4. Correlation Analysis of Hypothesis 3

Table 5. Pearson correlation-detailed format

		Number of full-time preprimary teachers in rural regions
Salary and welfare expenses (millions of yuan)	correlation coefficient	0.777**
	p-value	0.000
	sample size	310
Expenditures on assistance to individuals and families (millions of yuan)	correlation coefficient	0.424**
	p-value	0.000
	sample size	310
Expenditures on goods and services (millions of yuan)	correlation coefficient	0.816**
	p-value	0.000
	sample size	310
* p<0.05 ** p<0.01		

Table 5 presents that correlation analysis is used to investigate the relationship between the amount of full-time rural preschool teachers and expenditures for salaries and benefits, assistance for individuals and families, and purchases of goods and services. Pearson correlation coefficients are then used to determine how strong the relationship is. One may find a detailed study here:

It is significant at the 0.01 level, and the correlation coefficient between the number of full-time rural preschool teachers and salary and welfare expenditures is 0.777, showing a substantial positive link between the two variables. The amount of full-time rural preschool instructors and the amount spent on aid to people and families show an essential and positive link, illustrated by the 0.424correlation coefficient, which exhibits significance at the 0.01 level. Given that the correlation coefficient between the amount of full-time rural preprimary teachers and the expenditure on goods and services is 0.816 and demonstrates significance at the 0.01 level, a significant and positive connection between the two variables becomes obvious.

It is because expenditures on goods and services have a higher correlation coefficient in total preschool financial expenditures compared to expenditures on salaries and benefits and assistance to individuals and families, suggesting that expenditures on goods and services have a greater impact on the number of full-time rural teachers than the other two, therefore, hypothesis 3 is not valid.

5.5. Path Analysis for Hypothesis 4

The goal of this research is to determine if boosting the number of preschool students and kindergartens in rural regions can tremendously increase the number of rural preschool teachers by using path analysis and regression equation calculations.

Table 6. Model for summarizing regression coefficients

X	→	Y	Unstandardized path coefficients	SE	z (CR value)	p	Standardized path factor
Total financial spendings on preprimary education in rural regions (millions of yuan)	→	Number of rural kindergartens	4.749	0.294	16.179	0.000	0.677
Total financial spendings on preprimary education in rural regions (millions of yuan)	→	Number of pupils in rural kindergartens	604.908	40.593	14.902	0.000	0.646
Number of rural preschools	→	Number of full-time teachers in rural kindergartens	2.010	0.224	8.963	0.000	0.382
Number of pupils in rural preschools	→	Number of full-time teachers in rural kindergartens	0.019	0.002	11.401	0.000	0.486
Note: → indicates path influence relationships							

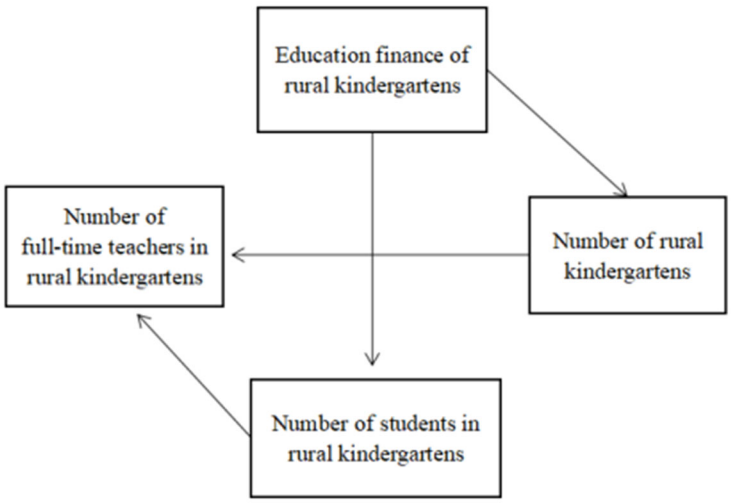

Fig.1: Path analysis model (Picture credit: Original)

According to Table 6 and Figure 1, statistics on China's education and education spending for 31 provinces and cities in China (apart from Hong Kong, Macau, and Taiwan) from 2012 to 2021 were chosen from the EPS database. There are 310 samples for each variable, and the descriptive statistics situation for these data in Table 1 makes it clear that the data are all distinct.

The effect of total educational spending on the number of students in rural kindergartens is shown by a standardized coefficient value of the path 0.646>0. The path exhibits significance at the degree of 0.01 ($z=14.902$, $p=0.000<0.01$). This suggests that total educational spending will significantly increase the number of students in rural kindergartens. Kindergartens have a substantial beneficial influence on the number of kindergarten pupils.

The standardized coefficient value of the path for the relationship between the number of rural kindergartens and the amount of full-time rural preschool teachers is 0.382>0. The relationship is significant at the degree of 0.01 ($z=8.963$, $p=0.000<0.01$), implying the number of rural kindergartens will significantly increase the quantity of full-time rural preschool teachers.

When the quantity of rural preschool students influences the amount of rural preschool full-time teachers, the standardized coefficient value of the path is 0.486>0. The path exhibits significance at the degree of 0.01 (z=11.401, p=0.000<0.01), implying an obvious and positive relationship between the number of rural preschool students and the quantity of rural preschool full-time instructors.

As a result, the calculations of the path analysis show that, if other factors are not taken into account, increasing the number of students and kindergartens can increase the amount of full-time rural preschool teachers, supporting hypothesis 4.

6. Conclusion

Four conclusions may be derived from this study. When adjusting for other variables, there is a strong positive link between the total amount spent on rural preschool education and the quantity of rural preschool full-time teachers. In terms of geographical influences, it is important to note that the western area has a bigger impact on the amount of rural preschool full-time teachers than the eastern and central regions do when other influences are taken into account. Additionally, different fiscal spending determinants have various effects on preschool instruction. It can be determined that, when controlling for other variables, the impact of spending money on goods and services on the quantity of rural preschool full-time teachers is greater than the impact of spending money on wages and benefits and assistance for individuals and families. In addition, by expanding the amount of rural preschool as well as the enrollment of rural preschools, the overall fiscal spending on rural preschool education can increase the amount of full-time rural preschool teachers.

This study shows the following innovations in population, methods and sectors. This study pays special attention to full-time rural preprimary teachers. Most studies on full-time rural preschool teachers are qualitative. This paper uses a quantitative research method to process the panel data on this topic, hoping to find more research results and research direction. Scholars' research on the impact of education-related fiscal expenditure are mostly used to study secondary education, higher education and education in developed areas, while this study applies relevant theoretical innovations to the study of preschool education in rural China.

Therefore, this study has the following limitations in terms of missing data. There is a serious lack of statistics on part-time teachers in rural kindergartens in China, so this paper studies the quantity of part-time rural preschool teachers. There is a serious lack of statistical data on part-time teachers in rural preschools in different Chinese provinces and cities, so the research on the number of rural preschool teachers in this paper is mainly limited to the amount of full-time rural preschool teachers. There is a lack of clear research data on the population of 3-6-year-old preschool children in rural areas of various provinces and cities in China. Due to the severe lack of data, a more comprehensive analysis was not possible in this study. It is hoped that future researchers can break through the research nature of this study and find more data and updated interpretation angles.

Regarding aspirations for the future, this study believes that China will be able to give future researchers accurate population data on rural preschoolers and pay close attention to statistics on the number of rural part-time kindergarten instructors. This research establishes an essential and positive connection between rural preschool education and preschool spending. As a result, it is hoped that the state would boost its financial support for rural preschool education, prevent the departure of rural preschool educators, enhance the teacher structure of rural preschool educators, and foster the growth of the rural preschool education sector. The research aims to lay a foundation for future research on the financial analysis of preschool education and the loss of preschool instructors in rural regions, with the goal of advancing the equality of rural education.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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