

The Development Level of Rural Basic Education in China Under the Background of Rural Revitalization Strategy Analyzing —— Empirical Study Based on Panel Data Model

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Abstract. Rural revitalization is a strategic task proposed by the 19th National Congress of the Communist Party of China, and rural areas are the main battlefield of rural revitalization, but seeking the development of rural basic education is undoubtedly the booster for the smooth realization of the rural revitalization strategy. And the countryside needs education and prosperity. [1] In 31 provinces in China as the research object, using hierarchical analysis method and entropy method on the level of rural basic education development factors and weight analysis, get four explanatory variables, reuse panel data model to study the link between four explanatory variables and regional income gap index, analyze the basic education differences in eastern, central, western rural China, and according to the problems existing in the development of corresponding Suggestions.

Keywords: Panel data, Primary education, Theil index.

1. Introduction

Since the reform and opening up, China's rural revitalization basic education has made remarkable achievements in increasing the investment in educational resources, improving the teaching mode and allocating educational resources. However, there are still many problems in the aspects of cost, teachers and teaching forms in the development of rural basic education in China. On the basis of analyzing these problems, Li Junxia (2005) put forward the countermeasures to improve the current situation of rural basic education. [2] In view of the weak awareness of rural education, such as the weak ideology, the unbalanced investment of education funds, and the lack of professional teachers, Fang Dong (2016) proposed to increase the investment of rural education funds, promote the exchange of urban and rural teachers, train volunteers in normal colleges, and improve the level of rural education. [3] Wang Jing (2019) believes that to promote the all-round development of education in China, it is first necessary to make clear the root cause of the backward development of rural basic education, and to carry out targeted reform and innovation of. [4] Niu Yanjun (2019) believes that to improve the quality and scale of rural teachers, increase capital investment, to meet the needs of rural teachers, and use policies and measures to improve the teaching conditions of rural schools, so as to comprehensively promote the level of rural teaching to improve. [5] Gao Zhimin (2012) believes that the reasons for these phenomena and problems are not the problems in one province, but the common problems existing in rural areas all over the country, with both historical and realistic reasons. [6]

In addition, the main reasons for the limited development of rural education in China also include the imperfect distribution of rural education resources and the unbalanced development. Hao Shuizhi (2020) believes that to develop rural basic education and provide high-quality talents for the rural revitalization strategy, we should first vigorously develop the rural economy and ensure that the optimal allocation of basic education resources has sufficient material premise. [7] In addition, the lack of education funds, the low level of salary and welfare of rural teachers, and the uneven level of rural education schools have also affected the serious popularization and development of rural education. Scholar Yang Li (2007) believes that to solve these problems, it is necessary to reform from many aspects, such as increasing investment in rural education and improving the overall quality of teachers. [8]

2. Data sources

The original data are taken from 2011 to 2018 mainly obtained from the authoritative platforms of each province and other books such as National Bureau of Statistics, China Statistical Yearbook, China Education Statistical Yearbook and other e-books of China Education Funds under the determined indicators.

3. Variable selection

3.1. Selection of the explanatory variables

1) Hierarchical analysis method

(1) Construct the judgment matrix A of 15 three-level indicators

(2) Calculate the maximum eigenvalue of the matrix

$$\lambda_{\max} = \sum_{i=1}^{15} A_{wi} / 15w_i$$

(3) Conformance test of the judgment matrix

$$CR = \frac{CI}{RI} \qquad CI = \frac{\lambda_{\max} - n}{n - 1}$$

2) Entropy value method

The entropy method is used to calculate the objective weight of the relative change degree of the selected index on the overall system, If the degree of relative change is relatively large, then the greater the corresponding weight. The specific operation procedure is as follows:

(1) Dimensionless method of basic education indicators

Because each index is different in the unit of measurement and the order of magnitude, which is not comparable between each index, so the index needs to be dimensionless processing. [9]

$$X'_{ij} = \frac{x_{ij} - \min(x_j)}{\max(x_j) - \min(x_j)}$$

(2) Calculate the information entropy of basic education indicators

Under the i th index of basic education, the proportion of the j th region in the i th index is p_{ij} , the calculation formula is:

$$p_{ij} = \frac{y_{ij}}{\sum_{j=1}^n y_{ij}}$$

The information entropy of the basic education index is recorded as follows e_i , the calculation formula is:

$$e_i = -\frac{1}{\ln n} \sum_{j=1}^n p_{ij} \ln p_{ij}$$

The difference coefficient of the basic education index is recorded as follows g_i , the calculation formula is:

$$g_i = 1 - e_i$$

(3) Calculate the weight of basic education indicators. The weight calculation formula is as follows:

$$w_j = \frac{g_i}{\sum_{g=1}^n g_i}$$

3) Selection and weight of the index system

Using the entropy method and the hierarchical analysis method, the final index system and the corresponding weight are shown in the following table:

Table 1. Index system and weight

first-level indicator	Comprehensive weight	Secondary indicators	AHP	Entropy method	Comprehensive weight
economic factors	0.1777	National financial education in primary schools	0.0543	0.0959	0.0751
		National financial funds for junior high school	0.0935	0.0930	0.0933
		Junior high school donation income	0.0147	0.0040	0.0093
		Total fixed assets of junior high school	0.1055	0.0820	0.0938
		Number of computers in junior high school	0.0214	0.0805	0.0510
		Number of junior high school classrooms	0.0534	0.0671	0.0602
		Junior high school books	0.0174	0.0617	0.0395
Teaching conditions	0.4142	Gross fixed assets of primary school elementary school computer	0.0825	0.0775	0.0800
		Primary school classrooms	0.0109	0.0640	0.0374
		Junior high school teacher education	0.0445	0.0600	0.0523
		Primary school teacher education	0.2041	0.0724	0.1383
Faculty	0.3359	Number of full-time teachers in primary schools	0.1349	0.0762	0.1056
		Primary school staff	0.1174	0.0667	0.0920
school management	0.0723	Primary school administrative staff	0.0234	0.0529	0.0381
			0.0222	0.0460	0.0341

3.2. Selection of the explained variable

1) Thiel index

To analyze the income differences between and within the eastern, central and western regions, the Tyre index was used to measure them. In general, the Tyre index is valued between 0 and 1. If the index approaches to 0, the more balanced the income difference between regions or within regions; if the index approaches to 1, the higher the income difference inequality degree is:

$$T_r = T_w + T_b$$

Among, T_r represents the total Tyre index, T_w represents the Tyre index within the region, T_b represents the Tyre index between regions.

The specific expression of the Tyre index formula is:

$$T_b = \sum_{i=1}^3 \left(\frac{Y_i}{Y} \times \ln \frac{\frac{Y_i}{N_i}}{\frac{Y}{N}} \right)$$

$$T_w = \sum_{i=1}^3 \left(\frac{Y_i}{Y} \left(\sum_{j=1}^{31} \frac{Y_{ij}}{Y_i} \ln \frac{\frac{Y_{ij}}{N_{ij}}}{\frac{Y_i}{N_i}} \right) \right)$$

Among, Y_i (i=1,2,3) represents the GDP of the eastern, central and western regions, respectively; Y_{ij} (j=1, 2, 3,..., 31) indicates the regional GDP of the jth province within the ith region. N_i (i=1, 2, 3) represents the total population of the eastern, central and western regions; N_{ij} (j=1, 2, 3,..., 31)

indicates the total population of the j th province within the i th region. Y means the gross domestic product, and N means the total national population. [10]

According to the formula, the Tyre index is as follows:

Table 2. Tyre Index by Region 2011-2018

Years	Total Tyre value	Inter-regional Tyre values	Tyre value in the region	Central Region (between regions)	Western Region (between regions)	East area (between regions)
2011	0.2878	0.2504	0.0374	0.0375	0.0698	0.1431
2012	0.2535	0.2363	0.0172	0.0359	0.0665	0.1339
2013	0.2645	0.2305	0.0341	0.0361	0.0643	0.1300
2014	0.2581	0.2239	0.0342	0.0352	0.0628	0.1259
2015	0.2599	0.2246	0.0353	0.0352	0.0631	0.1263
2016	0.2580	0.2200	0.0380	0.0343	0.0622	0.1234
2017	0.2584	0.2207	0.0378	0.0357	0.0613	0.1237
2018	0.2498	0.2124	0.0374	0.0341	0.0598	0.1186

4. Empirical model test

4.1. Board data stability test

Because the panel data has two dimensions: time series and cross section, we cannot directly find out whether it is a unit root situation. Therefore, in the time series analysis, in order to avoid the problems of false regression or false regression in the later analysis, it is necessary to test the stationarity of the data by the unit root test, mainly to ensure the effectiveness of the results. Levin, Lin and Chu methods (LLC test) and PP test following results in table 3 and table 4.

Table 3. Panel data units and test results

variable	inspection order	level value	
	Testing method	LLC inspection	PP inspection
jj	t-Statistic	-1.74157	-1.74157
	Prob.**	0.0408	0.0408
jx	t-Statistic	-3.77653	-3.77653
	Prob.**	0.0001	0.0001
s	t-Statistic	-15.9455	12.3795
	Prob.**	0.0000	0.054
xxgl	t-Statistic	-0.62276	1.36287
	Prob.**	0.2667	0.9681
tr	t-Statistic	-3.19192	14.7451
	Prob.**	0.0007	0.0223

Note: In this article, jj indicates economic factors, jx indicates teaching conditions, sz indicates faculty strength, $xxgl$ indicates school management, and tr indicates tyl index.

Table 4. Results of panel data Unit 1

variable	inspection order	level value	
	Testing method	LLC inspection	PP inspection
jj	t-Statistic	-6.19121	27.5417
	Prob.**	0.0000	0.0001
jx	t-Statistic	-4.80064	17.705
	Prob.**	0.0000	0.007
s	t-Statistic	-6.08711	18.2643
	Prob.**	0.0000	0.0056
xxgl	t-Statistic	-3.57802	14.6209
	Prob.**	0.0002	0.0234
tr	t-Statistic	-4.86345	22.2558
	Prob.**	0.0000	0.0011

Note: The test mode contains an intercept term; * * indicates the probability of the PP test using the asymptotic chi-square distribution to calculate the Fisher test, and the LLC test assumes the asymptotic normal to calculate the P-value.

The unit root test was performed using the LLC and PP tests. According to the test results, the P value of the variables of the above test is less than 0.05, so the null hypothesis can be rejected, that is, it can be considered stable between the test variables.

4.2. Panel data cointegration relationship inspection

The results of the unit root test show that the panel data is the order 1 single consolidation, so it is considered that there is a co-integration relationship between each variable, so the co-integration test can be carried out. The Kao test method was adopted, and the test results are shown in table 5.

Table 5. Panel data cointegration test results

Testing method	statistic name	t-Statistic	Prob.
Kao test	ADF	-3.638712	0.0001

According to table 5, the post-test P-value is 0.0001, less than 0.05, so the null hypothesis is rejected, that is, a long-term cointegration relationship between the various variables can be considered.

4.3. Likelihood ratio test

From the likelihood ratio test that the P value is less than 0.05, the null hypothesis is rejected, so a fixed effect was chosen.

Table 6. The likelihood ratio test results

Effects Test	Statistic	d.f.	Prob.
Cross-section F	490.109835	(2, 17)	0.0000
Cross-section Chi-square	97.722186	2	0.0000

Null hypothesis:

$$H_0 : \beta_1 = \beta_2 = \dots = \beta_N; H_1: \alpha_1 = \alpha_2 = \dots = \alpha_N; \beta_1 = \beta_2 = \dots = \beta_N$$

Formula for calculating the statistics:

$$\begin{cases} F_1 = \frac{(S_2 - S_1) / [(N-1)k]}{S_1 / (NT - N(k+1))} \sim F[(N-1)k, N(T-k-1)] \\ F_2 = \frac{(S_3 - S_1) / [(N-1)(k+1)]}{S_1 / (NT - N(k+1))} \sim F[(N-1)(k+1), N(T-k-1)] \end{cases}$$

In the formula: S is the sum of residual squares, k is the number of explanatory variables, T is the total number of observed periods of each cross-section member, N is the number of individuals in the cross-section, α_i As a constant term, β_i As a coefficient vector, $i = 1, 2, \dots, N$.

4.4. Model regression analysis

According to the results of the variable intercept model, we found that the P-value of some explanatory variables was greater than 0.05, which did not meet the requirements of the significance level. We accepted the null hypothesis, so the insignificant variables were removed, and the final panel variable intercept regression model was as follows:

$$tr = -0.092979 - 0.002729jx_{it} + 0.030183xxgl_{it} + \varepsilon_{it}$$

And obtained $R^2 = 0.996556$, $\bar{R}^2 = 0.995830$, so the model regression fit is great. $F = 1374.260$, the significance probability is 0.000, indicating that the selected variables can explain the overall level than high.

4.5. Results analysis

From the coefficient of the variable intercept regression model, the influence of teaching conditions and school management on the eastern, central and western China is quite different. Among them, the coefficient of teaching conditions and school management is -0.002729 and 0.030183, respectively, which indicates that teaching conditions show a negative correlation, and school management and Thiel index show a positive correlation. That is, when assuming that the remaining variables remain constant, the teaching conditions are decreased by 0.002729 and increased by 0.030183 for each unit raised in school management.

The fixed effects of the eastern, central, and western regions were 0.046294, -0.032338, and -0.013956, respectively, which indicates that there are regional differences in basic education between the eastern, central, and western regions. The fixed effect of central and western China is negative, indicating that the Til index can be reduced when improving teaching conditions in eastern and western China, while the benefit of the central region is greater than the western region. [10]

5. Enlightenment and Suggestions

5.1. Revelation

As one of the important parts of China's education system, basic education for rural revitalization plays an important role in cultivating primary talents in primary and secondary schools and virtually exploring and encouraging talents. It is the first step for talents to receive education, but also an important step for the inheritance of knowledge and cultural and moral education. We are well aware that the popularization of basic education in rural primary and secondary schools needs to be achieved through standard specifications and a certain number, but the specifications required here include teaching conditions and teaching management system, and a certain number includes the number of educators and educators and their teaching facilities and equipment. The supply plan of rural basic education in China Model to a certain extent is closely related to the growth of national economic income, however, to the national economic system as a starting point, the contemporary economic market urgently need graduates, and the market to get more college students, must grab from the grassroots education, under such a strong demand, constantly promote the economic market supply, also promote the government continuously improve China's rural basic education resources, under the support of the government, more public schools, education incentives also increased, and indirectly increased the individual demand for Chinese rural revitalization of basic education. From the above visible, Chinese township It has become inevitable that the high positive correlation between the supply scale of village basic education and the national economic income.

It is under such an inevitable trend that the government should be able to give full play to the role of excellent quality and reasonable money, and use it efficiently, scientifically and reasonably under

the limited education investment. By this paper on eastern, central and western China education difference and income difference results analysis, eastern obviously better than central and western, so the government in order to practice the principle of reasonable and scientific distribution of regional education resources, need and necessary to increase the central and western China rural basic education resources investment, efforts to promote eastern, central and western China education balance.

In addition, the results of this paper show that rural primary and secondary education management has a significant impact on the regional income gap, and it is particularly important to improve the internal management mechanism in central and western China. It can increase the number of internal workers, create a beautiful, civilized and tidy campus environment for students, increase the number of administrative staff, improve the school administration system, and create a fair and open learning environment for students, so as to balance the east, central and western regions.

5.2. Suggestions

Through empirical research on basic education in rural areas, the national economic income in eastern, central, and western China in eastern China is significantly higher than in central and western China, and in basic education work, including teaching conditions and school management on eastern, central and western China. However, there is a close correlation between the income gap and the development of basic education. In order to achieve the balanced distribution of basic education resources in the east, central and west, the following suggestions are put forward:

(1) needs and needs to increase the total investment in primary and secondary school basic education resources in central and western villages, and strive to promote the balance of education in eastern, central and western China;

(2) appropriately increases the number of internal workers in central and western schools to improve the internal management mechanism of primary and secondary schools in central and western China;

(3) appropriately increases the number of internal administrators in the central and western schools, to create a fair, just and open learning environment, so as to strive to balance the school management system in the eastern, central and western regions;

(4) appropriately increases the government's investment in the total value of fixed assets, primary school computers in primary schools and primary school classrooms, so as to improve the teaching conditions of primary and secondary schools in the central and western regions;

(5) When employs junior middle school teachers, it suggests that the central and western schools improve the requirements for teachers' academic qualifications, so as to provide a favorable guarantee for the students from the central and western regions to obtain more professional teaching knowledge.

Acknowledgments

This work was Guangxi Normal University College students innovation and entrepreneurship Training Program.

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