

An Empirical Study of Multidimensional Poverty and Influencing Factors in Western China

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Abstract: In the post-poverty alleviation period, the focus of China's poverty alleviation work has also shifted from single-dimensional poverty to multi-dimensional poverty. This study uses panel data from the western region from 2014 to 2019, uses the entropy method to calculate the multi-dimensional poverty index, constructs an econometric model, and uses Stata software to conduct an empirical analysis of the multi-dimensional poverty influencing factors in the western region. The research results show that regional differences are one of the important factors affecting multi-dimensional poverty, and e-commerce participation has an important impact on the alleviation of multi-dimensional poverty. To this end, this article puts forward suggestions for increasing financial investment, cultivating core talents, paying attention to regional differences, and supporting poverty alleviation industries.

Keywords: Multidimensional poverty; Entropy method; Time-space analysis

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1. Introduction

Poverty is an important factor restricting the country's economic development. With the continuous economic and social development, countries all over the world are paying more and more attention to poverty. Eliminating poverty, improving people's livelihood, and achieving common prosperity are the basic rights and common ideals of people of all countries in pursuing a happy life. With the introduction and implementation of the targeted poverty alleviation strategy, the number of poor people will be reduced from 98.99 million at the end of 2012 to zero at the end of 2020. The effect of poverty alleviation has been a huge breakthrough, and China has made great contributions to the world's poverty alleviation. Multidimensional poverty refers to the measurement of poverty by other dimensional standards (such as health, education, social security, etc.) other than income. Ledic et al. ^[1] believe that the measurement of multidimensional poverty should include income, housing quality, material deprivation, and deprivation (basic deprivation) related to necessary living needs. Regarding multidimensional poverty, scholars have done the following research. Samy Katumba et al. ^[2] measured the multidimensional poverty index of South Africa. Pinaki Das et al. ^[3] constructed and measured India's multidimensional poverty index. Dagunga Gilbert et al. ^[4] believe that diversification of livelihoods can significantly reduce household poverty.

At present, most of the research on multidimensional poverty discusses the ways and measures of poverty reduction, and the related factors and influencing factors of multidimensional poverty. Few studies have used entropy method to construct multidimensional poverty index and analyze its influencing factors. This research intends to discover the evolutionary laws and internal motivations of multi-dimensional poverty based on the existing research by studying the influencing factors of multi-dimensional poverty, so

as to contribute to the improvement of related research.

2. Multidimensional poverty evaluation and evolution laws in Western China

2.1. Multidimensional poverty and measurement indicators

The United Nations Development Program's Multidimensional Poverty Index measures the three dimensions of human development through 10 main variables: health, education and deprivation of living standards. Based on previous studies on multi-dimensional poverty indicators, and considering the authenticity, validity and availability of data, this study selects the proportion of farmers' food expenditures in total expenditures, the number of people with minimum living allowances, the per capita disposable income of rural residents, and village clinics. The number, the number of township cultural stations, and the number of elderly care institutions are used to measure the multi-dimensional poverty dimension.

Table 1. Evaluation index system table

Primary indicators	Secondary indicators	Index nature
Life security	Minimum living allowance number	+
	Per capita disposable income of rural residents	-
	The proportion of food expenditure accounts for the total expenditure	+
social security	Number of village clinics	-
	Township cultural stations	-
	The number of elderly care institutions	-

This study first uses the entropy method to assign the weights of indicators that measure multi-dimensional poverty alleviation, and calculates the index of multi-dimensional poverty alleviation in various regions in China each year. Since the importance of each index is different, it is necessary to calculate the weight of the evaluation index and allocate the weight reasonably. The methods of calculating weights are generally divided into two categories, one is subjective weighting method, mainly based on analytic hierarchy process; the other is objective weighting method, mainly based on principal component analysis method and entropy weight method. In order to make the research method more objective, this research adopts the entropy method to calculate the index weight.

First, the data is dimensionless but processed. For positive indicators

$$r_{ij} = (X_{ij} - X_{\min}) / (X_{\max} - X_{\min})$$

For negative indicators

$$r_{ij} = (X_{\max} - X_{ij}) / (X_{\max} - X_{\min})$$

Calculate entropy

$$H_j = -K \sum_{i=1}^n f_{ij} \ln f_{ij}$$

$$f_{ij} = r_{ij} / \sum_{i=1}^n r_{ij}$$

$$K = 1 / \ln n$$

Calculate the weight

$$W_j = (1 - H_j) / (n - \sum_{j=1}^m H_j)$$

According to the weight, calculate the multidimensional poverty index.

2.2. Multidimensional poverty evaluation and evolution laws in Western China

This study takes the western regions (except Tibet Autonomous Region) where the poor population is relatively concentrated in China as the research object. The number of elderly care institutions is used as a measure of multi-dimensional poverty alleviation indicators. These six indicators are all from the 2015-2019 China Rural Statistical Yearbook and China Statistical Yearbook.

Table 2. Descriptive statistics table

Variable	Observed	Mean	Standard error	Minimum	Maximum
Fin	66	4282.489	1971.85	1000.45	10348.17
Hum	66	0.116	0.026	0.073	0.202
Mec	66	2450.453	1217.782	440.9	4682.3
Ele	66	1370.188	1212.33	60.4	5368

Table 3. Index weight table

Minimum living allowance number	Disposable income of agricultural celebrities	Farmers' food expenditure as a percentage of total expenditure	Number of village clinics	Number of township cultural stations	Number of elderly care institutions
00.16527	0.165922	0.165692	0.171033	0.165981	0.166103

Table 4. Multi-dimensional Poverty Index Table

Province	2014	2015	2016	2017	2018	2019
Inner Mongolia	5.903463	5.856337	5.874091	5.888637	5.877779	5.98489
Shaanxi	6.154855	6.047957	6.009153	5.956711	5.942383	5.967997
Gansu	5.988243	5.997037	5.921608	5.90479	5.844216	5.78889
Chongqing	5.795951	5.725134	5.761295	5.774929	5.786213	5.809741
Sichuan	6.951625	6.896513	6.883471	6.894821	6.811878	6.877563
Qinghai	5.088915	4.747148	4.849564	4.901951	4.835249	4.878231
Guizhou	6.051698	6.236834	6.232135	6.218743	6.203838	6.208256
Yunnan	6.115889	6.045163	6.068857	6.038585	6.048042	6.180102
Guangxi	5.977104	5.958151	5.968985	5.778431	5.708669	5.894002
Xinjiang	5.848465	5.691213	5.717518	5.760693	5.756325	5.748747
Ningxia	4.800771	4.844213	4.836664	4.830856	4.821269	4.847936

According to the entropy method, the multi-dimensional poverty index of the western region in each year is shown in **Table 4**. It can be seen that the region with the highest multi-dimensional poverty index in 2014 is Sichuan, followed by Guizhou, and the provinces with the lowest multi-dimensional poverty index are Ningxia and Qinghai. By 2019 The annual multidimensional poverty index is still the highest in Sichuan, followed by Guizhou, and the lowest is still Ningxia and Qinghai. Although from an individual point of view, the multidimensional poverty in most provinces has been alleviated, but on the whole, the areas with the most severe multidimensional poverty It remains unchanged, indicating that although poverty

alleviation efforts have been increased in various regions, individual provinces still need to make further efforts to ensure that they are equal to or catch up with other provinces.

3. An empirical analysis of the influencing factors of multidimensional poverty in Western China

3.1. Influencing factors and research hypotheses of multidimensional poverty

The investment in agricultural mechanization can free farmers from heavy agricultural manual labor, so as to obtain enough time and energy to engage in other sideline jobs or learn cultural knowledge, enrich their leisure life, and thereby improve farmers' personal income and living standards. Therefore, it is assumed that the improvement of the level of agricultural mechanization significantly positively affects the performance of multi-dimensional poverty alleviation.

H1: The increase in the level of agricultural mechanization significantly negatively affects multidimensional poverty.

The government's increased financial investment can not only significantly increase the income level of poor households, but also improve the corresponding medical system, education system, and other social security. Therefore, it is assumed that the government's financial investment can significantly negatively affect multidimensional poverty.

H2: The government's financial investment can significantly negatively affect multidimensional poverty.

Precision poverty alleviation is inseparable from the training of poverty alleviation talents, and multi-dimensional poverty alleviation is even more inseparable from the training of talents in all aspects. Human capital obviously plays an important role in multi-dimensional poverty alleviation. Therefore, suppose that the increase in human capital significantly negatively affects multidimensional poverty.

H3: The increase in human capital significantly negatively affects multidimensional poverty.

Nowadays, the development of e-commerce is in full swing. People have gradually shifted from physical consumption to virtual consumption. The development of e-commerce in many areas has led to the development of poverty alleviation projects. The relevant government departments have provided policy support and encouragement. The development of e-commerce has enriched the lives of poor households and expanded A way to get rich. Therefore, it is assumed that the development of e-commerce significantly negatively affects multi-dimensional poverty.

H4: The development of e-commerce significantly negatively affects multidimensional poverty.

3.2. Empirical analysis

In this study, the degree of agricultural mechanization (Mec), financial investment (Fin), human capital (Hum), and e-commerce participation (Ele) were used as explanatory variables to construct a model to identify important factors affecting multi-dimensional poverty. Among them, α_i is the individual effect, γ_t is the time effect, and μ_{it} is the random disturbance term.

$$P_{it} = \beta_1 \ln Mec_{it} + \beta_2 \ln Fin_{it} + \beta_3 \ln Hum_{it} + \beta_4 \ln Ele_{it} + \alpha_i + \gamma_t + V_{it}$$

First of all, assume that the marginal influence of all explanatory variables on the explained variables is independent of the region, and perform a mixed regression of the model. The results are shown in Table 4. The fiscal investment is significant in the models (1), (2), and (3). The performance reached 1%, indicating that financial investment has a large impact on the multi-dimensional poverty alleviation in various regions, and human capital is not significant in the three models, indicating that the effect of human capital investment in the western region is not very good. It did not play a role in solving multi-dimensional poverty, and the increase in human capital did not achieve the expected results. E-commerce participation

significantly negatively affects the multi-dimensional poverty level, which is consistent with the hypothesis, indicating that e-commerce has promoted farmers' income to a certain extent.

Table 5. Table of the operation results of the mixed regression model

	Model (1)	Model (2)	Model (3)
Fin	-0.931*** (0.054)	-0.669*** (0.105)	-0.696*** (0.158)
Hum	0.109 (-2.42)	0.044 (0.122)	0.048 (0.125)
Mec		0.233*** (0.082)	0.225** (0.088)
Ele			-0.012*** (0.052)
_cons	-1.609*** (0.127)	-1.358*** (0.489)	-1.437** (0.594)
R2	0.8274	0.8475	0.848

Note: *, **, *** represent the significance level of 1%, 5%, and 10% respectively, and the standard errors are in parentheses.

Considering that there are differences between regions, which are related to regional factors, this study adopts a fixed or random effect model. According to Hausmann's test, the p value is equal to 0.0003. Therefore, it strongly rejects the null hypothesis and believes that a fixed effect model should be adopted instead of a random effect model. The running results of the model show that the fit is good.

Table 6. Table of the results of the fixed-effects model

	Model (4)	Model (5)	Model (6)
Fin	-0.094 (0.064)	-0.918 (0.065)	-0.043 (0.074)
Hum	-0.127* (0.075)	-0.131* (0.077)	-0.11* (0.078)
Mec		0.022 (0.105)	0.018 (0.104)
Ele			-0.034* (0.025)
_cons		6.7*** (0.984)	6.522*** (0.983)
R2	0.7522	0.5863	0.6174

Note: *, **, *** represent the significance level of 1%, 5%, and 10% respectively, and the standard errors are in parentheses.

It can be seen from the results that, taking into account the differences between regions, human capital investment has played a significant effect, with a significance level of 10%, indicating that human capital does play a role in considering regional differences (Table 6). Especially after getting rid of absolute poverty, the issue of relative poverty has been put on the agenda. The increased investment in human capital has improved the overall quality of the population in the western region, and the ways and means to solve multidimensional poverty have become more diversified. The supplement of various types of talents has

provided the region Economic, cultural and even other aspects of construction provide better development prospects. The results of model (3) and model (6) both show that e-commerce participation significantly affects the level of multi-dimensional poverty, indicating that taking into account regional differences, e-commerce participation still alleviates multi-dimensional poverty to a certain extent. Comparing model (5) and model (6) with models (2) and (3), it is found that taking into account the differences between regions, the degree of agricultural mechanization is no longer the main factor affecting multi-dimensional poverty. Due to the different degrees of agricultural mechanization in each region, Although the degree of agricultural mechanization is high in some areas, the main source of income for farmers is not agricultural income, but income from migrant workers. Therefore, the degree of agricultural mechanization is no longer the main factor affecting multidimensional poverty when considering regional differences.

3.3. Robustness test

In order to ensure the reasonableness and robustness of the results, this study adopts a robustness test. The indicator of the degree of agricultural mechanization was replaced from the total power of machinery at the end of the year to the total power of large and medium-sized tractors at the end of the year, and the fiscal investment indicator was replaced from general public budget expenditure to general public service expenditure. The result is still significant and robust.

4. Conclusions

Although China has completely got rid of absolute poverty under current standards, the gap between the rich and the poor is wide. Through the establishment of a panel data model, without considering regional differences, it was found that financial investment, the degree of agricultural mechanization, and e-commerce participation are the main factors affecting multi-dimensional poverty. When considering regional differences, human capital and e-commerce participation are the main factors. An important factor in multidimensional poverty. It shows that regional differences are one of the important factors affecting the multi-dimensional poverty index, and e-commerce participation has a significant impact on the multi-dimensional poverty alleviation effect.

Disclosure statement

The author declares no conflict of interest.

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