Analysis of the Efficiency of Financial Poverty Alleviation in Poverty-stricken Counties of Sichuan

-- Based on the DEA Model

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Abstract

2020 is the final year of China's poverty alleviation. Sichuan Province, as an important region for China's poverty alleviation, is of great significance to whether the country can achieve a comprehensive victory in poverty alleviation. With the in-depth promotion of the financial poverty alleviation model in Sichuan Province, it has provided vital support for the Poverty-stricken areas of Sichuan Province to win the battle against poverty. In order to reasonably evaluate the effect of financial precision poverty alleviation, this paper uses the DEA model to measure the efficiency of financial poverty alleviation in Poverty-stricken areas in Sichuan Province, and further explores the reasons that affect the efficiency of financial precision poverty alleviation through the measurement results and proposes suggestions for improving the efficiency of financial precision poverty alleviation based on the analysis results. Research on the efficiency of financial poverty alleviation in Poverty-stricken areas in Sichuan Province is of practical significance. It is an important guarantee for improving the quality of poverty alleviation and consolidating the results of poverty alleviation, and it also provides experience support for the post-poverty era.

Keywords

Poverty Alleviation; DEA Model; Efficiency of Financial Poverty Alleviation.

1. Introduction

At the beginning of reform and opening, China's economic development was lagging, and most of its residents were in poverty. After decades of poverty alleviation work, China has made certain achievements in poverty alleviation, and the poverty situation has been greatly improved. In the new era, the traditional poverty alleviation methods in the past have not been able to solve the current poverty problem well. Since the 18th National Congress of the Communist Party of China, the Party Central Committee has implemented the policy of targeted poverty alleviation and regional poverty alleviation and has promoted the coordinated poverty alleviation policy for the eastern part to help the central and western regions. The research on precision poverty alleviation is of great significance both theory and reality. Meanwhile, better integration of finance and targeted poverty alleviation and better use of the role of the market are effective tools for China to build a moderately prosperous society in an all-round way and eradicate poverty.

Liangshan Prefecture in Sichuan Province is one of the "three regions and three states" identified by the central government as one of the most impoverished areas, which is a typical "poverty in poverty " [1]. Since the fight against poverty began, the central, provincial, and prefectures have taken financial poverty alleviation as an important starting point and guarantee for winning the fight against poverty and have taken a series of policies and measures to actively carry out financial poverty alleviation work. In the practice of financial poverty

alleviation in Sichuan Province, a series of explorations and practices that are useful for financial poverty alleviation in deeply impoverished areas across the country have been carried out. The DEA model is used to rationally evaluate the effect of poverty alleviation in Sichuan Province, find out the problems in the practice of financial poverty alleviation in Sichuan, and then propose countermeasures and suggestions. Find suitable methods and paths for financial poverty alleviation practices in deeply impoverished areas in other countries.

2. Literature Review

Regarding the research on the factors affecting the efficiency of financial precision poverty alleviation, many scholars have studied it from different perspectives and depths. Among them, the DEA model is the most used tool for scholars to analyze financial efficiency. The application of the DEA model has been relatively mature.

Hassan and Sanchez (2009) used the DEA method to study the efficiency of micro-poverty alleviation credit institutions in Latin America and found that the scale of operation and micro-credit projects have a significant impact on financial efficiency [2]. Diana, Catherine, and Steve (2009) used the DEA-Tobit model to study the credit financial efficiency of farms in northern Peru, and found that 28% of farmers' financing was invalid, and credit constraints reduced farmers' average income by 17%-27% [3].Tan (2014) selected 20 typical extremely poor counties in the Qinba area and selected the DEA model to measure the efficiency of financial poverty alleviation, and found that most counties in the Qinba area have not reached the effective state of financial technology efficiency, and proposed to open the financial market , Improve the public financial system and other suggestions [4]. Wang et al. (2016) analyzed the efficiency of financial poverty alleviation in 62 Poverty-stricken counties in Hebei Province based on the three-stage DEA model, and found that the three environmental variables of GDP, the number of employees in the primary industry and the total sown area in rural areas can improve the efficiency of financial poverty alleviation. However, government public fiscal revenue has a negative impact on the efficiency of poverty alleviation. Local governments should combine regional characteristics and actual conditions to formulate corresponding countermeasures to improve the efficiency of financial poverty alleviation [5]. Du at al. (2019) selected 9 cities and prefectures where national poverty counties in Hunan Province are located and used the DEA-Tobit model to conduct empirical analysis. They found that the main factors affecting the efficiency of financial poverty alleviation are the level of rural financial development and the improvement of its efficiency. The optimization of rural industrial structure and government financial policy support are conducive to improving the efficiency of financial poverty alleviation [6].

3. Model and Index Selection

3.1. The DEA Model

The data envelopment analysis method was proposed by Charnes, Cooper, and Rhodes in 1978[7]. The principle of this method is to keep the input or output of the decision-making unit unchanged and determine the relatively effective production frontier with the help of mathematical programming and statistical data. Decision-making units are projected onto DEA's production frontier, and their relative effectiveness is evaluated by comparing the degree to which they deviate from DEA's frontier. It is an evaluation based on the concept of relative efficiency, using convex analysis and linear programming as tools. Based on the collected data and the results of the measured input and output ratios, the efficiency is then comprehensively analyzed to determine whether the DEA is effective.

The model has n decision-making units $DMU_j (j = 1,2,3 \dots, n)$, X represents the input vector and Y represents the output vector, Then the DEA-BBC model is constructed as shown in formula (1):

$$
\text{s.t.}
\begin{cases}
\min \left[\theta - \varepsilon (\hat{e}^T S^- + e^T S^+) \right] \\
\sum\limits_{j=1}^{n} X_j \lambda_j + S^- = \theta X_0 \\
\sum\limits_{j=1}^{n} Y_j \lambda_j - S^+ = Y_0 \\
\sum\limits_{j=1}^{n} \lambda_j = 1 \\
\lambda_j \geq 0, S^-, S^+ \geq 0 \\
j = 1,2,\cdots, n
\end{cases}
\tag{1}
$$

In the model S^- represents the amount by which the actual value and effective value of the decision-making unit can be reduced, S^+ represents the amount by which the actual value and effective value of the decision-making unit can be increased, θ represents the effective value of the decision-making unit. If DMU_j satisfy $\theta = 1$, it is called weakly effective; If it satisfies $\theta = 1, S^- = 0, S^+ = 0$, it is called effective; if it satisfies $\theta < 1$, it is called invalid.

3.2. Index Selection

This article combines the actual situation in Sichuan Province and considers the lack and representativeness of some data. In the end, this article selects sample data from 2016 to 2018 for analysis. The specific indicators are selected as follows.

3.2.1. Input Index

This article, refers to Chen (2017), selects fiscal special poverty alleviation funds and the balance of various loans of financial institutions at the end of the year as input indicators [8]. First, the central and local financial investment in Poverty-stricken areas is an important and necessary tool for promoting rural economic development and can reflect the intensity of financial poverty alleviation. The financial special poverty alleviation fund is a financial support issued by the central and provincial levels to impoverished counties. As the main means of financial poverty alleviation, it plays an important role in improving rural infrastructure, raising living standards in impoverished areas, and alleviating poverty. Second, use the balance of various loans of financial institutions at the end of the year to reflect the depth of financial poverty alleviation. The balance of various loans of financial institutions at the end of the year is one of the most important ways to support poverty alleviation. By issuing microcredits to poor households, small and micro enterprises, large and medium-sized enterprises, industrial loans, etc., it can effectively alleviate the financing difficulties of Poverty-stricken areas and gradually improve local areas. Rely about planting and animal husbandry to promote the transformation and upgrading of the industrial structure.

3.2.2. Output Index

Zhou (2018) believes that the poverty alleviation effect in the process of financial poverty alleviation can be measured by indicators such as economic development level, income level, and education level [9]. Considering the availability of data, this article chooses the region's economic development level, farmers' income level, information development level, and education level as output indicators. Among them, the increase in regional GDP is a direct manifestation of the efficiency of local financial poverty alleviation, so the regional GDP is used

to measure the level of regional economic development; the income level of farmers is replaced by the added value of agriculture, forestry, animal husbandry and fishery, and poor farmers continue to increase their income. It is the most intuitive manifestation of a well-done poverty alleviation work, so this indicator plays an important role in measuring the efficiency of financial poverty alleviation; mobile phone users, as an explanatory indicator of the level of information development, can indirectly tell whether the financial poverty alleviation work is indirectly based on the level of local information development. Effective; the number of students in ordinary middle schools is used as an explanatory indicator of the education level. Education is one of the most important points in poverty alleviation. The increase in the efficiency of financial poverty alleviation is the increase in the number of students in ordinary middle schools, so the education level is also a measure an important indicator of financial poverty alleviation. The specific selection of indicators is shown in Table 1.

Table 1. Evaluation Index System of Financial Poverty Alleviation Efficiency

Index classification	Index name	Indicator meaning	Data Sources
Input index	Special fiscal funds for poverty alleviation	The intensity of financial poverty alleviation	Sichuan People's Government Official Website
	Balance of various loans of financial institutions at the end of the year	The depth of financial services	"China County Statistical Yearbook"
Output index	Gross Regional Product	The level of economic development	"Sichuan Statistical Yearbook"
	Added value of agriculture, forestry, animal husbandry and fishery	Income level of farmers	"Sichuan Statistical Yearbook"
	Mobile phone users	Information development level	"Sichuan Statistical Yearbook"
	Number of students enrolled in ordinary junior high school	Education level	"Sichuan Statistical Yearbook"

Data source: Author collation

4. Empirical Analysis

In DEA analysis, Crste=Vrtse×Scale. Crste (Comprehensive efficiency) refers to the best poverty reduction effect achieved through capital investment in a certain period. It is a comprehensive assessment of resource allocation and utilization efficiency. Vrtse (Pure technical efficiency) refers to the ratio of optimal input to actual input under the condition of variable returns to scale, the ratio is affected by the effective use of poverty reduction resources. Scale (Scale efficiency) refers to the ratio of the best investment scale when the income remains unchanged to the best investment scale when the income changes. It mainly depends on the scale of resource input and can be used to evaluate the relative effectiveness of financial poverty alleviation efficiency.

In the Table2, the efficiency of financial poverty alleviation in 11 Poverty-stricken counties in Sichuan Province fluctuates between 0.729 and 1.000 each year, indicating that the comprehensive poverty alleviation effect is very good, and financial poverty alleviation plays a crucial role in the comprehensive poverty alleviation work. The average comprehensive efficiency of the 11 impoverished counties in Sichuan Province is greater than 0.8, which is basically in line with the fact that the poverty alleviation progress of the impoverished counties,

that is, Muli County, Yanyuan County, Ganluo County, and Leibo County were removed from the list of impoverished counties in 2019, and the rest Seven counties have also officially withdrawn from the list of impoverished counties in 2020. The comprehensive efficiency of Yanyuan County, Zhaojue County, and Leibo County from 2016 to 2018 are all 1, which means that these counties have the best financial poverty alleviation efficiency, which shows that Yanyuan County, Zhaojue County, and Leibo County are effectively using financial resources, rational use of poverty alleviation funds invested by financial institutions in rural areas.

Table 2. Comprehensive efficiency of financial poverty alleviation

	2016	2017	2018	Mean
Muli County	0.806	0.892	0.935	0.878
Yanyuan County	1.000	1.000	1.000	1.000
Puge County	0.853	0.852	1.000	0.902
Butuo County	1.000	1.000	0.917	0.972
Jinyang County	0.949	0.871	1.000	0.940
Zhaojue County	1.000	1.000	1.000	1.000
Xide County	1.000	0.729	0.781	0.836
Yuexi County	1.000	0.809	0.895	0.901
Ganluo County	0.999	0.967	1.000	0.988
Meigu County	0.867	0.925	0.984	0.925
Leibo County	1.000	1.000	1.000	1.000
Mean	0.953	0.913	0.955	0.940
Data source: Calculated by DEAP 2.1 software				

The comprehensive efficiency of Muli County and Meigu County did not reach 1 in 2016-2018, indicating that the input-output scale of Muli County and Meigu County is unreasonable. The main reasons for the low comprehensive efficiency of Muli County and Meigu County are the lack of accuracy in the use of funds for poverty alleviation development funds, unreasonable resource allocation, and lack of supervision.

Table 3 shows the results of DEA efficiency calculations in Poverty-stricken counties in Sichuan Province in 2018, where irs represents increasing returns to scale, drs represents diminishing returns to scale, and - represents constant returns to scale. Overall, the efficiency of financial poverty alleviation in various Poverty-stricken counties in Sichuan Province is different. Only the six counties of Yanyuan County, Puge County, Jinyang County, Zhaojue County, Ganluo County and Leibo County have the same poverty alleviation efficiency 1. It can be seen from the performance of these 6 poor counties that they have made better use of and rationally allocated financial resources for poverty alleviation. There are Muli County and Meigu County where the Vrtse is 1, but the Scale is not 1, and the Crste cannot be 1. It shows the efficiency of financial

poverty alleviation is invalid. The allocation of poverty alleviation funds in these two counties is inappropriate. The Vrtse and Scale of Butuo County, Xide County, and Yuexi County are not 1. The main reason is the low utilization rate of poverty alleviation resources and improper resource allocation.

Table 3. Efficiency Decomposition of Financial Poverty Alleviation

	Crste	Vrtse	Scale	Return to scale
Muli County	0.935	1.000	0.935	irs
Yanyuan County	1.000	1.000	1.000	-
Puge County	1.000	1.000	1.000	-
Butuo County	0.917	0.988	0.928	irs
Jinyang County	1.000	1.000	1.000	-
Zhaojue County	1.000	1.000	1.000	-
Xide County	0.781	0.962	0.811	irs
Yuexi County	0.895	0.965	0.927	irs
Ganluo County	1.000	1.000	1.000	-
Meigu County	0.984	1.000	0.984	drs
Leibo County	1.000	1.000	1.000	-
Data source: Calculated by DEAP 2.1 software				

From the above empirical analysis, it can be concluded that the poverty alleviation effect of the poor counties in Sichuan Province is different. The three counties of Yanyuan, Zhaojue, and Leibo have good poverty alleviation effects, and the poverty alleviation efficiency of the other eight poor counties needs to be improved. The main reasons are as follows: Firstly, this is due to poor agricultural conditions in poor counties, few specialty industries, and extremely low external market share of local agricultural-related products. At that time, it was a supporting financial poverty alleviation policy. The tilt is not sufficient, the willingness of commercial financial institutions to take the initiative to carry out poverty alleviation work is not high, and the investment of poverty alleviation funds is small, which makes it difficult to access poverty alleviation funds; Secondly, the quality of financial practitioners is not high, the financial infrastructure is not complete, and only The allocation of financial resources is unreasonable, and the channels for poor households in remote villages to obtain financial support are backward, which represents the insufficient supply of poverty alleviation credit business; Thirdly, due to the early stage of financial precision alleviation work in Sichuan Province, the credit of towns and villages The system is very imperfect, and the concept of the poor is extremely backward. They treat poverty alleviation loans and inclusive financial assistance as relief funds and donations. It is difficult for financial institutions to recover loans, which leads to low enthusiasm for financial institutions. Finally, the needs of poor groups who want to obtain support from financial institutions are different, such as livelihood relief, individual business development, collective infrastructure construction, etc. The large number of needs of poor households does not match the poverty alleviation efforts and investment levels of

financial institutions at the time. Some financial poverty alleviation projects cannot be carried out, and financial targeted poverty alleviation work is difficult to play a role.

5. Conclusion

From the results of the efficiency of financial poverty alleviation in Sichuan Province, the financial poverty alleviation work in Poverty-stricken counties in Sichuan Province is generally effective. Among them, the three counties of Yanyuan, Zhaojue, and Leibo have reached the best state, while the other 8 counties The effectiveness of financial poverty alleviation in China needs to be improved, especially in terms of poverty alleviation efforts and effective use of poverty alleviation funds, and further support is needed. Second, the overall average overall efficiency of financial poverty alleviation in Poverty-stricken counties in Sichuan Province has fluctuated from 0.953 in 2016 to 0.913 in 2017 to 0.955 in 2018, indicating that poverty alleviation work in this area needs to be improved. Of course, in studying the efficiency of financial poverty alleviation, the DEA analysis method only serves as a reference. Therefore, in the effort to eradicate poverty, specific issues must be analyzed in detail. The relevant departments should allocate resources rationally and scientifically according to local conditions. To ensure that poverty is reduced in the best possible way. We believe that the following points can improve the effect of poverty alleviation (1) Establish a diversified financial poverty alleviation system; (2) Innovate special poverty alleviation financial services; (3) Improve the efficiency of the use of poverty alleviation funds; (4) Create a good credit environment.

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