

Article

Assessing the Stability of Poverty Alleviation from a Household Economic Perspectives

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Abstract: From the perspective of household economy, the application of a multiscale spatial econometric model to realize the objective evaluation of county-level poverty alleviation stability is a core issue in rural economics research. The improvement of economic income and livelihood conditions for small farm holders are significant manifestations of poverty alleviation stability. Quantitative evaluation of the county-level poverty alleviation stability can provide a scientific basis for the adjustment of rural economic policy and high-quality development of regional economy by the multiscale spatial econometric model. This study realizes the quantitative evaluation of county-level poverty alleviation stability by constructing the evaluation index system, taking five counties in China's Yunnan Province as an example, using the exact 2242 survey datasets, and adopting the multiscale spatial econometric model. The main idea of the model is to obtain the score of poverty alleviation stability by weighted summing of dimensions on the basis of weight calculation of each evaluation index. Results revealed the following: (1) County-level poverty alleviation stability includes the stability of regional poverty alleviation and the stability of farmers' poverty alleviation, which is mainly affected by the combined effect of five factors, including economic and ability status, cognitive level, supporting facilities, and social governance. (2) Based on the multiscale spatial econometric model, the overall poverty alleviation stability in the five counties is relatively low, with Zhaoyang District showing the highest stability, followed by Yiliang, Yuanyang, Honghe, and Gongshan. (3) Farmers' poverty alleviation stability in all counties, except Zhaoyang, is higher than that in the region. County-level gross domestic product and fiscal revenue are the dominant factors affecting the stability of poverty alleviation in the region, while the dominant factors affecting the farmers' poverty alleviation stability are the level of per capita net income and labor force proportion in the household population. (4) To enhance poverty alleviation stability, this study suggested enhancing the level of economic development in counties and strengthening the collective economy of the village, innovating the form of economic development of the village, taking the enhancement of the development capacity of counties, relying on resource advantages to actively develop special industries, and improving the stability and sustainability of income generation for farmers. Meanwhile, we propose to further improve the conditions of regional infrastructure and enhance the capacity of public services. The findings can help enrich the theoretical research system of rural economics, expand the scope of research on small-holder farming systems, and provide a reference for diversification of small farm holders economy, the improvement of agricultural farming technology, and the high-quality development of regional economy in China.

Keywords: stability of poverty alleviation; socio-economic impact; small farm holders; household economy; economies of diversification



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1. Introduction

Alleviating and eliminating poverty is the key to realizing the high-quality development of the regional economy and society [1], and it is also becoming one of the most active areas for rural economics research. In recent years, with the implementation of China's targeted poverty alleviation policy, China has achieved remarkable results in poverty governance, mainly in terms of reducing the number of people in absolute poverty from 70.71 million to 0 by the end of 2020. This achievement has greatly improved regional infrastructure construction and public service capacity and has basically solved the problem of overall regional poverty. However, given the vulnerability of the foundation for poverty alleviation, the instability of the foundation of marginalized households, and the weakness of the development foundation of poverty-stricken areas, achieving the stability of the results of poverty alleviation is the main task that poverty-stricken areas have to accomplish, and it is also a key aspect of achieving high-quality development in the current socio-economic scenario [2–4]. With the improvement of farming technology and economic income for small farm holders, research on exploring the diversification economy and poverty alleviation stability of small farm holders is gradually increasing, as it aims to match the functioning of the rural economic development process [5]. In the post-poverty era, the nature and connotation of China's poverty problem have undergone significant changes; the problem of unstable poverty alleviation and return to poverty has become the target of the current poverty governance work. As the “policy testing ground” for poverty alleviation, counties are the ideal unit for studying the stability of poverty alleviation, and exploring county-level poverty alleviation stability can objectively reflect the effectiveness of China's consolidation of poverty alleviation achievements [6]. The use of multiscale spatial econometric models to evaluate county-level poverty alleviation stability has gradually become one of the hot spots in rural economics research. In recent years, agricultural farming systems, rural economies of diversification, and the economic income of small farm holders have had a large impact on poverty alleviation stability. From the perspective of household economy, the evaluation of poverty alleviation stability is the key to optimizing the rural economic spatial system in China [7]. In recent years, with the gradual implementation of the targeted poverty alleviation policy, the rural poverty population in Yunnan Province has been significantly reduced, the incidence of poverty has continued to decline, the income of rural residents has increased significantly, and the quality of life and consumption have been significantly improved [8]. However, due to the impact of factors such as the fragile ecosystem, weak industrial foundation, and low quality of labor force in Yunnan Province, the incidence of returning to poverty is high, and the consolidation of the results of poverty alleviation faces great challenges, so achieving stable poverty alleviation is crucial to the healthy development of the economy and society in Yunnan Province.

Regarding poverty, scholars at home and abroad have mainly focused on poverty measurement [9], poverty identification [10,11], poverty pattern [12], impact mechanism [13], and household economy [14], and they have reported meaningful results in poverty alleviation effectiveness evaluation [15] and poverty governance models [16]. With the increasing attention on poverty in academia, domestic scholars have gradually shifted their research focus to poverty alleviation stability, high-quality poverty alleviation, rural revitalization, and socio-economic impact [17]. The current domestic research on poverty alleviation stability is mainly based on the model design under the framework of sustainable livelihood analysis. For example, Guo et al. [18] used a static spatial panel data model to quantitatively measure the stability of poverty alleviation in Chengkou County, Chongqing, in 2019 and found that the overall poverty alleviation stability in the study area was low and showed significant spatial heterogeneity. From the perspective of household economy, Wang et al. [19] constructed a spatial econometric model for evaluating the stability of poverty alleviation in Anhua County, Hunan Province, and established the influence mechanism of poverty alleviation stability; the results showed that topographic conditions and economic income exert significant effects on the stability of poverty alleviation in the study

area and that close attention should be paid to the subsequent sustainable development of unstable farm households living on steep slopes in high mountains. Meanwhile, some scholars have explored the opposite side of poverty alleviation stability, that is, vulnerability, which can reflect stability conditions from the side to a certain extent. Relevant studies have mainly constructed evaluation index systems and spatial econometric models with consideration of natural conditions, socio-economic conditions, and feasible capabilities to quantitatively measure poverty alleviation vulnerability in different regions and groups [20]. The results of these studies effectively expand the scope of rural economics research. Through the above literature review, it was found that most of the previous research used linear weighted summation model, fuzzy comprehensive evaluation method, poverty alleviation stability index method, etc., to carry out the quantitative measurement of poverty alleviation stability by constructing the evaluation index system of poverty alleviation stability, which provides a good reference for this study. Based on the previous research, this study utilizes the multiscale spatial econometric model and obstacle degree model to realize quantitative evaluation and obstacle degree diagnosis of county-level poverty alleviation stability, which has a certain relevance to previous research.

In summary, the literature on poverty alleviation stability at home and abroad is relatively rich. However, this literature review reveals the following shortcomings of the relevant studies on poverty alleviation stability: First, the existing studies are mainly based on the analytical framework of sustainable livelihood, with a single dimension of research, and there is a relative lack of innovative research on the theoretical construction of poverty alleviation stability. Second, most of the existing studies focus on a single scale of poverty alleviation stability research, and the multiscale spatial econometric analysis of poverty alleviation stability is relatively weak. Third, although the existing studies have evaluated poverty alleviation stability, an in-depth study of the impact mechanism is lacking. In view of this gap, the current study takes five counties in the Wumeng Mountains (Zhaoyang District), the old revolutionary area (Yiliang County), the stone desertification area in southeast Yunnan (Honghe County and Yuanyang County), and the three regions and three states (Gongshan Dulong and Nu Autonomous County) of Yunnan Province as examples. To define the connotation of poverty alleviation stability in the selected counties, this study constructs a theoretical framework of poverty alleviation stability from two dimensions: regional poverty alleviation stability and farmers' poverty alleviation stability. The evaluation index system and multiscale spatial econometric model are used to calculate the comprehensive score of poverty alleviation stability in different types of counties. Compared with other evaluation methods, this method can better demonstrate the stability of poverty alleviation achievements in the study area, and it has strong applicability in this study, which can effectively improve the authenticity of the findings. The findings can not only enrich the theoretical research system of rural economics and expand the scope of research on small-holder farming systems but also provide a scientific basis for consolidating the results of poverty alleviation and rural revitalization in China, achieving high-quality development of regional economy and society. Meanwhile, the key scientific problem to be addressed in this study is to quantitatively measure the degree of poverty alleviation stability of counties and to reveal the mechanism of action that affects the poverty alleviation stability, and the main research goal of this study is to quantitatively measure the degree of poverty alleviation stability in different types of counties by constructing the evaluation index system of poverty alleviation stability and multiscale spatial econometric model, and to reveal obstacle factors affecting the stability of poverty alleviation in counties, so as to provide decision-making support for consolidating and expanding the achievements of poverty alleviation and organic unity of rural revitalization in the majority of poverty-stricken areas of China.

2. Connotation and Theoretical Framework of Poverty Alleviation Stability at the County Level

2.1. Connotation of Poverty Alleviation Stability

The problem of poverty is mainly manifested in two dimensions, namely, regional poverty and population poverty, and involves poverty alleviation. Therefore, the investigation into poverty alleviation should be conducted from the aspects of regional poverty alleviation and population poverty alleviation. At present, the problem of absolute poverty has been completely eliminated in China. Thus, the consolidation of the results of poverty alleviation and the effective prevention of the return of poverty have gradually become a hot spot in poverty geography research. Regarding the stability of poverty alleviation, different scholars have explored this topic on the basis of different disciplinary perspectives, and they have yet to form a unified concept and evaluation scale. Some scholars contend that the degree of poverty alleviation stability is mainly reflected among farmers who have escaped from poverty and that the overall poverty alleviation stability in a region can be interpreted through comprehensive analysis [21]. Other scholars believe that the connotation of poverty alleviation stability is mainly reflected in economic income, resistance to external risks, and endogenous motivation [22], which is generally characterized by dimensions such as natural location conditions, economic development level, production and living standards, and self-development motivation [23]. It can be seen that poverty alleviation stability necessarily covers that of regions and farm households, which are complementary and interact with each other. Stable poverty alleviation in a region is mainly manifested in the greatly improved levels of regional economic development, continuous improvement of infrastructure, and gradual enhancement of social security capacity; these conditions can provide a superior external environment for the stable poverty alleviation of farm households. Meanwhile, stable poverty alleviation among farm households is mainly manifested in the stable growth of household income, continuous enhancement of their own intrinsic development motivation, and the equalization of development opportunities for households who have escaped from poverty; these conditions are conducive to the promotion of the quality of economic development, governance capacity, and social security at the regional level.

Therefore, on the basis of relevant previous studies [24], the current study focuses on regional poverty alleviation stability and farmers' poverty alleviation stability. Attention is also paid to internal and external factor disturbances and potential risk shocks in the system of poverty alleviation stability. This study also scientifically defines the stability of poverty alleviation on the basis of the following criteria: the infrastructure, public services, industrial development, ecological security, economic condition, and social governance capacity of poverty alleviation areas have continuously improved; the internal and external environments for the population of poverty alleviation areas have been greatly enhanced; the household income situation has long been stabilized above the national standard; these areas have strong endogenous development momentum and access to equal development opportunities; they are able to resist and prevent the risk of returning to poverty; and the quality of poverty alleviation has further improved.

2.2. Theoretical Framework of Poverty Alleviation Stability

Most theoretical frameworks for poverty alleviation stability are based on the poverty perspective and are framed with reference to the sustainable livelihood analysis framework. With poverty alleviation as the goal, the sustainable livelihood analysis framework mainly analyzes the livelihood status of the poor, including human capital, social capital, physical capital, and natural capital. This framework is highly applicable in exploring the anti-poverty, stability, and vulnerability status of poverty alleviation. Among the many theoretical analysis frameworks of poverty alleviation stability, the sustainable livelihood analysis framework proposed by the UK Department for International Development (DFID), the United Nations Development Program's Livelihood Framework, and the multidimensional measurement analysis framework are most widely used [25]. The current

study combines the connotation and basic characteristics of poverty alleviation stability, draws on and modifies the multidimensional measurement analysis framework and sustainable livelihood analysis framework (DFID), and builds a theoretical framework of poverty alleviation stability that is applicable to counties by considering the internal and external disturbances and potential risk shocks faced by the poverty alleviation stability system from two dimensions: regional poverty alleviation stability and farmers' poverty alleviation stability (Figure 1).

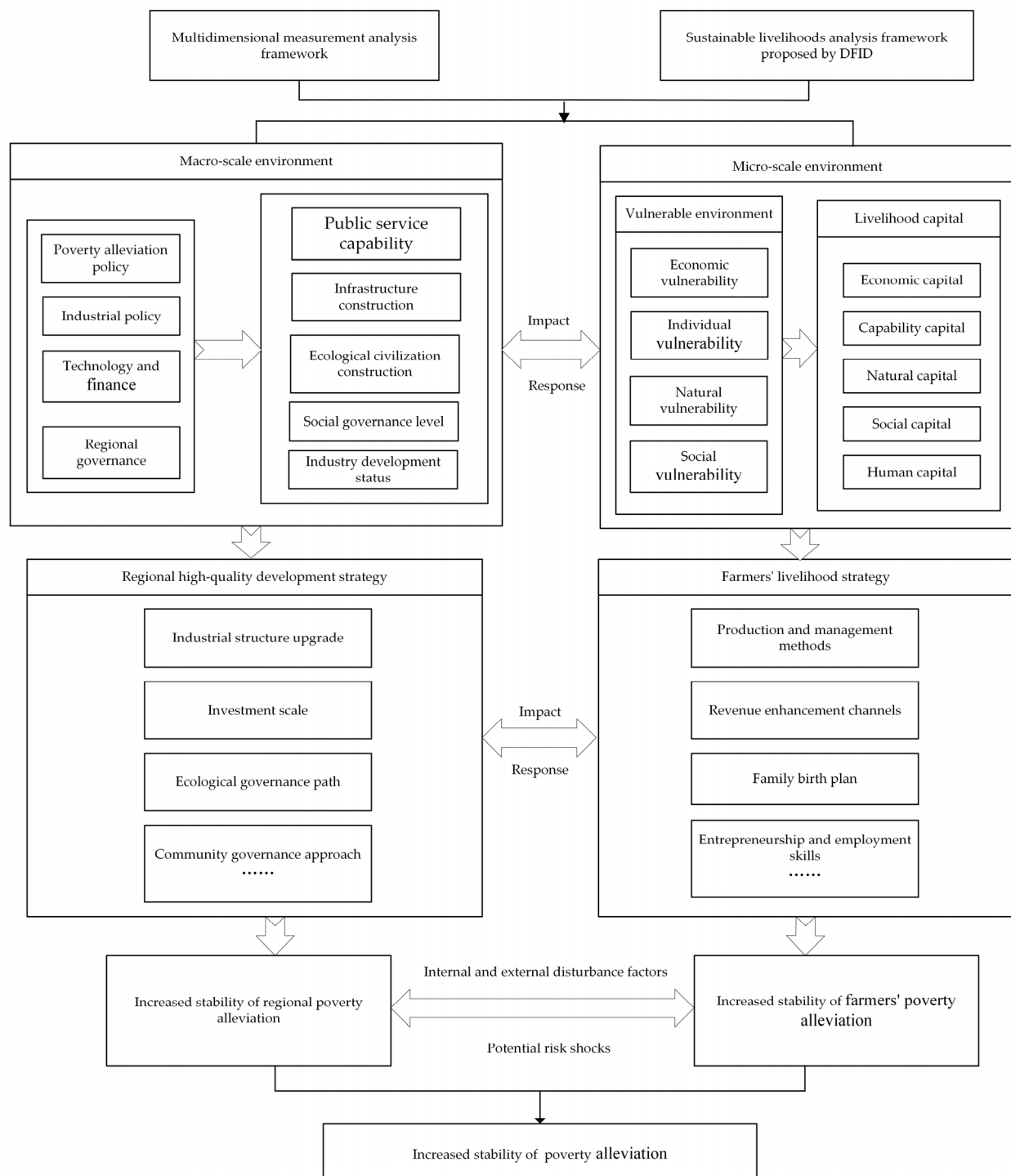


Figure 1. Theoretical framework for poverty alleviation stability.

The multidimensional measurement analysis framework and sustainable livelihood analysis framework (DFID) serve as the theoretical basis for the analysis of poverty alleviation stability at the county level. In the context of the large-scale macro-environment and under the combined effects of poverty alleviation policies, industrial policies, technology and capital, and regional governance, poverty alleviation areas show improvements in public service capacity, infrastructure construction, ecological civilization construction, social governance level, and industrial development status. These improved factors become the driving force of high-quality development strategy adjustment at the regional level and thus facilitate the enhancement of regional poverty alleviation stability. In the context of the small-scale micro-environment, vulnerability induces changes in the nature and characteristics of farmers' livelihood capital, which drive the adjustment of farmers' livelihood strategies, which in turn provide decision support for the enhancement of farmers' poverty alleviation stability. Given the two dimensions of farmers' poverty alleviation stability and regional poverty alleviation stability and with full consideration of internal and external disturbance factors and the potential risk shocks in the system of poverty alleviation stability, poverty alleviation stability at the county level may be enhanced. The framework integrates the large-scale macro-environment and small-scale micro-environment and formulates corresponding development strategies on the basis of the differences in regional development and individual capital types of farmers. In this way, regional industrial structure upgrading, ecological governance level, and community governance capacity can be further improved, along with farmers' income level, endogenous development motivation, and labor skills. These improvements will help achieve the goal of increasing the stability of regional poverty alleviation and farmers' poverty alleviation. Meanwhile, this framework focuses on the mutual influence and response among different dimensions and emphasizes the mechanism of different factors in the poverty alleviation stability system. The results can provide theoretical support for evaluating and identifying the influence mechanism of poverty alleviation stability at the county level.

3. Study Area and Data Sources

3.1. Study Area

Since the implementation of the targeted poverty alleviation strategy, Yunnan Province has firmly grasped the lifeline of targeted assistance and targeted poverty alleviation, with the core objective being the improvement of overall quality and efficiency. It has also continuously innovated the mode of targeted poverty alleviation, resulting in the decrease of poverty population from 8.04 million in 2013 to 660,000 at the end of 2019. Moreover, 79 national poverty-stricken counties in the province have been removed from poverty. In 2019, Yunnan Province accomplished the daunting task of removing 31 counties from poverty, which affected 1.3 million people and 7 ethnic groups [26]. In particular, the four concentrated and contiguous poverty-stricken areas of Wumeng Mountains, the old revolutionary area, the stone desertification area of southeast Yunnan, and the three regions and three states of Yunnan are the top target areas for poverty alleviation in the province. In the current work, the five counties located in the hinterland of these four poverty-stricken areas, namely, Zhaoyang District, Yiliang County, Honghe County, Yuanyang County, and Gongshan Dulong and Nu Autonomous County (which was withdrawn from the sequence of poverty-stricken counties in 2019) were selected as the study area with certain typicality and representativeness (Figure 2). Zhaoyang District is located in the Wumeng Mountains and characterized by a high terrain in the west, low terrain in the east, shortage of arable land resources, and a relatively lagging level of economic development. Yiliang County belongs to the old revolutionary area of Zhen-Yiwei, which is one of the most difficult zones in the battle against poverty in Yunnan Province. The broken terrain of the county slopes from south to north, and the county shows obvious climatic differences and backward transport development. The counties of Honghe and Yuanyang belong to the stone desertification area in southeast Yunnan. Here, the stone desertification problem is very prominent, the transport conditions and service industry are relatively poor, and

poverty alleviation is challenging. Gongshan Dulong and Nu Autonomous County is located in the northern part of the Nujiang River Grand Canyon in northwest Yunnan. Its terrain comprises “three mountains and two rivers” and is characterized as an alpine canyon landform. Moreover, the economic development is relatively slow. In this area, the main cause of poverty is backward transport, shortage of arable land resources, poor ecological environment, and the overall low level of education of the people. By the end of 2019, all five counties had met the requirements for poverty-stricken counties and had been successfully removed from poverty.

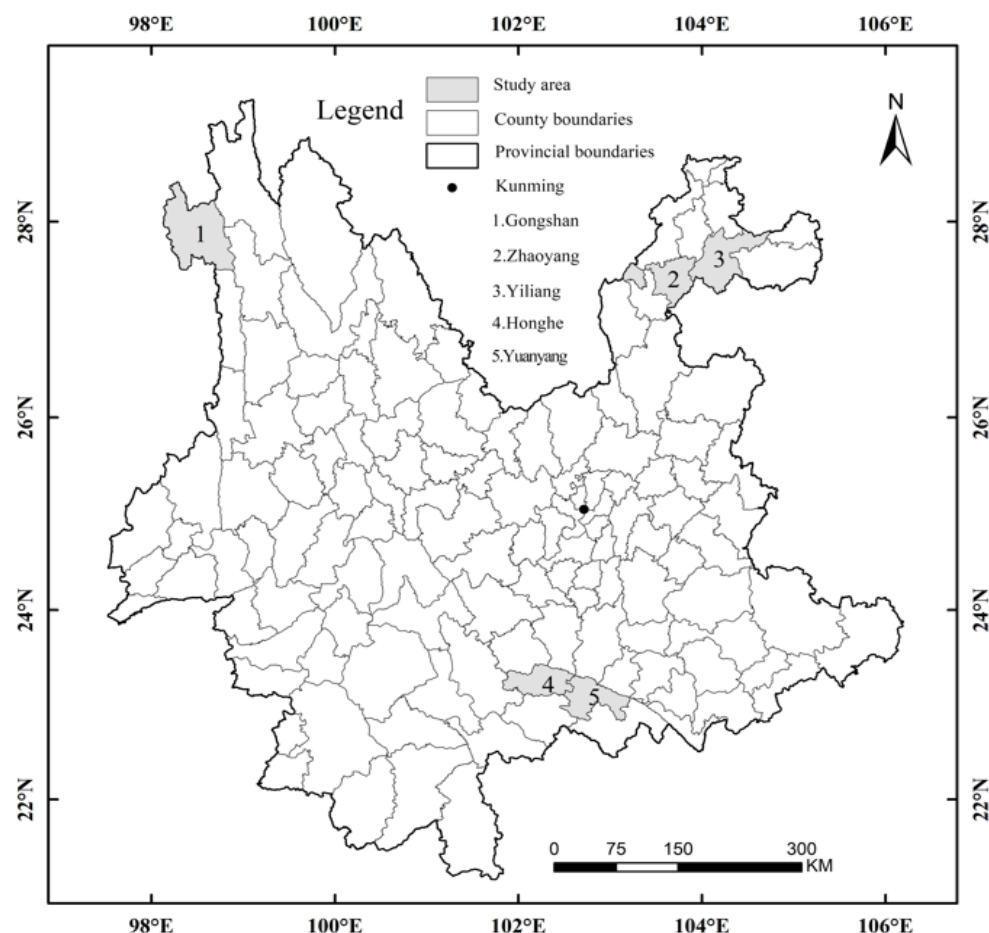


Figure 2. The map of study area and space distribution.

3.2. Data Sources

The data required for this study are mainly from the statistical yearbook of the study area in previous years and the data of the questionnaire survey of poverty alleviation households. In December 2021, the research team, in adherence to the principle of problem-oriented and point surface balance, adopted a combination of stratified sampling, interview approach, and random sampling to conduct social questionnaire surveys in the five selected counties, with households serving as the basic unit. A total of 224 villages in the 5 counties were selected, and 2304 questionnaires were distributed, with the valid sample size being 2242. The content of the questionnaire mainly covered the income status, family capital, life satisfaction, social security, and other aspects of farm households, specifically including the basic information of farm household income and expenditure, social security conditions, industrial development level, transport accessibility, labor skills training, labor force employment status, and education and medical levels. Through the in-depth interviews with the cadres at the county, township, and village levels, the economic development status of the counties and villages in the study area could be determined. The sample

size selected for the five counties was relatively balanced, and the questionnaire data were representative.

4. Methods

4.1. Evaluation Index System for Poverty Alleviation Stability

It is generally recognized by academics that the poverty problem is mainly manifested in two dimensions, namely regional poverty and population poverty, and that the investigation into poverty alleviation should be conducted from the aspects of regional poverty alleviation and population poverty alleviation, so as to further improve the pertinence and effectiveness of the research. Therefore, this study constructs an evaluation index system for poverty alleviation stability at the county level on the basis of the theoretical framework of poverty alleviation stability (Figure 1), the two dimensions of regional and farmers' poverty alleviation stability, and the previous results of poverty alleviation stability evaluation and quality measurement [27] (Table 1). The construction of the evaluation index system is focused on the connotation and basic characteristics of poverty alleviation sustainability and high-quality poverty alleviation. This process should represent the stability and quality status of poverty alleviation at the county level and follow comprehensive, scientific, qualitative, quantitative, systemic, and operability principles. The evaluation index system takes the dimensions of economy, infrastructure, ecology, ability, capital, and cognition as the criteria for the evaluation of poverty alleviation stability. Specific evaluation indexes are selected from two dimensions: regional poverty alleviation stability and farmers' poverty alleviation stability. For example, the economic dimension selects the indexes such as the county GDP, financial revenue, and the collective indebtedness of villages; from the ecological dimension, it selects the indexes of the ecological environment, the ecological economy, and the ecological culture so as to be able to objectively characterize the stability of county poverty alleviation.

Table 1. Evaluation index of county poverty alleviation stability.

Target Layer	Dimensional Layer	Factor Layer	Primary Indicator Layer	Secondary Indicator Layer	Indicator Characteristic	Combined Weight
Poverty alleviation stability	Regional alleviation stability	Economy status	County GDP	County GDP in 2021 /million D1	+	0.1257
			County revenue	County Revenues in 2021/million D2	+	0.1198
		Infrastructure status		Percentage of villages with hardened roads/% D3	+	0.0368
				Percentage of villages with piped water/% D4	+	0.0398
		Supporting facilities	Status of public service facilities	Percentage of village areas with kindergartens/% D5	+	0.0198
				Percentage of village areas with primary schools/% D6	+	0.0231
				Percentage of village areas with health offices/% D7	+	0.0399
		Ecology civilization	Ecology environment	Proportion of days with good air environment/% D8	+	0.0128
				Harmless disposal rate of domestic waste/% D9	+	0.0157
			Ecological economy	Proportion of environmental protection investment in GDP/% D10	+	0.0108

Table 1. Cont.

Target Layer	Dimensional Layer	Factor Layer	Primary Indicator Layer	Secondary Indicator Layer	Indicator Characteristic	Combined Weight
Farmers' poverty alleviation stability		Ecological culture		Farmers' awareness rate of ecological civilization construction/% D11	+	0.0028
				Eco-environmental information disclosure rate/% D12	+	0.0098
		Social governance	Social security level	Proportion of social security and employment expenditure in GDP/% D13	+	0.0754
		Natural capital	Location	Accessibility to the village (very convenient = 3, relatively convenient = 2, not convenient = 1) E1	+	0.0368
		Economic level	Income level	Household net income per capita/yuan E2	+	0.0985
			Revenue structure	Proportion of non-transferable income (productive income + wage income + property income)/net household income E3	+	0.0923
		Capability status	Health status	Proportion of healthy population in resident population/% E4	+	0.0355
			Education level	Proportion of junior high school and above/% E5	+	0.0148
			Labor force status	Proportion of labor force in resident population/% E6	+	0.0612
		Social capital	Medical expenditure status	Annual medical expenditure of farm households (self-paid part)/yuan E7	—	0.0399
		Cognitive level	Development momentum	Level of confidence in developing wealth (very much = 3, relatively = 2, none = 1) E8	+	0.0198
				Importance of skills training (very important = 3, relatively important = 2, not important = 1) E9	+	0.0187
			Policy perception	Percentage of poverty alleviation households whose micro-credit has significantly (very significantly 1, more significantly 0.8) helped increase household income/% E10	+	0.0185
				Percentage of poverty alleviation households after industrial assistance with obvious household income increase (very obvious 1, more obvious 0.9)/%E11	+	0.0318

Note: + represents a positive indicator, — represents a negative indicator.

The evaluation index system for county-level poverty alleviation consists of two dimensions, namely regional poverty alleviation stability and farmers' poverty alleviation stability; 9 factor layers, such as economic status; 17 primary indicators; and 24 secondary

indicators. The evaluation index system for regional poverty alleviation stability is constructed mainly on the basis of the multidimensional measurement analysis framework, summarizing the previous research results by using the methods of frequency statistics and review of the literature, giving full consideration to the natural environment, socio-economy, and the actual situation of poverty governance in the study area, and selecting the indexes by using the indicator construction method of rural economics. At the same time, expert interviews and factor analysis were used to select the main factors and construct a factor set for evaluating the stability of poverty alleviation in the region. The evaluation indexes are selected from four factor layers, namely economic status, supporting facilities, ecological civilization, and social governance. The county and village areas are the basic units of poverty alleviation and rural revitalization in China. Therefore, the economic status indicators include two scales: county area and village area. The evaluation index system for farmers' poverty alleviation stability is constructed mainly on the basis of the sustainable livelihood analysis framework and focuses on the psychological and consciousness status of farmers. The evaluation indicators are selected from five factor layers: natural capital, economic level, ability status, social capital, and cognitive level. Moreover, the evaluation index system not only considers the influence of natural factors on the stability of poverty alleviation but also organically connects it with the strategy of rural revitalization. At the same time, the selection of evaluation indicators focuses on the accessibility of data. All indicators, except for annual medical expenditure (self-paid part) of farm households, are positive.

4.2. Evaluation Model of Poverty Alleviation Stability Based on Household Economy Perspective

4.2.1. Data Normalization Process

When calculating the comprehensive score of county-level poverty alleviation stability, there are differences in magnitude because of the different meanings represented by each evaluation indicator [28]. To eliminate the influence caused by the differences in magnitude, the raw data of evaluation indicators need to be dimensionless. On the basis of the obtained questionnaire data and the existing criteria for poverty alleviation, the values of each evaluation indicator are normalized to 0–100 (R_{ij}). The processing of normalization of each evaluation indicator is based on the quantitative standards of relevant scholars [29–31].

4.2.2. Evaluation Index Weight Determination

Determining the weights of evaluation indexes is crucial to the evaluation of poverty alleviation stability. The most widely applied methods include principal component analysis, expert scoring, and entropy methods. Poverty alleviation stability has its objective existence and follows the basic law of development. It is also influenced by the subjectivity of farmers, which is contingent and sudden. To make the evaluation results more consistent with the actual situation of poverty alleviation in the study area, this study refers to research data and the connotation of poverty alleviation stability and adopts a combination of objective and subjective assignment methods. Specifically, the entropy and hierarchical analysis methods are adopted as the objective and subjective assignment methods, respectively. The objective assignment method adopts the entropy method, which is to calculate the weight of the evaluation indexes by constructing the index matrix, combining the degree of variation of each index, and utilizing the information entropy; the subjective assignment method adopts the hierarchical analysis method, which is to classify the problem into multiple levels, and each level contains relevant factors, and the weight of the evaluation indexes is calculated by comparing the relative importance of each factor and the sub-factors [32]. The comprehensive weight W_j of each evaluation index is determined through subjective and objective combination assignment (Table 1), which fully takes into account the role of expert experience and objective data, thus making the decision-making results more accurate, with a view to obtain more robust evaluation results.

4.2.3. Evaluation Model of Poverty Alleviation Stability

After determining the comprehensive weights of each evaluation index, the spatial econometric model is used to calculate the comprehensive score of poverty alleviation stability in each county in the study area. The evaluation model has fully considered the multi-level and complexity of the evaluation indexes and has strong applicability in multi-objective decision-making evaluation; the main idea is to get a score of poverty alleviation stability by the weighted summing of dimensions on the basis of weight calculation of each evaluation index, which can enhance the accuracy of decision-making results. The functional model [33] is as follows:

$$S = \sum_{j=1}^m \sum_{i=1}^n W_j R_{ij} \quad (1)$$

In the formula, S is the comprehensive score of poverty alleviation stability in each county in the study area, W_j is the weight value of the j th index, R_{ij} is the standardized value of the index, m is the number of evaluation indexes, n is the number of evaluation counties, and i is the evaluated county.

4.2.4. Grading of Poverty Alleviation Stability

Given the influence of poverty alleviation policies, characteristics of farmers, and socio-economic development levels, there are significant differences in the stability of poverty alleviation in the counties. To clearly characterize these differences, this study refers to the comprehensive score of poverty alleviation stability of each county and applies the natural breakpoint method to classify poverty alleviation stability into five levels, namely stable, more stable, generally stable, less stable, and unstable; the comprehensive scores are in the ranges of 85–100, 75–84, 65–74, 55–64, and 0–54, respectively.

4.3. Calculation of the Obstacle Degree for Poverty Alleviation Stability

Exploring the stability of poverty alleviation in counties requires not only the quantitative measurement of the level of stability of poverty alleviation but also the identification of the main factors affecting such stability. In this way, the risk of regional return to poverty can be scientifically diagnosed, and the high-quality socio-economic development of poverty-stricken areas can be guaranteed. Therefore, an extended study on the stability of farmers' poverty alleviation is conducted herein by using the obstacle degree model in an attempt to reveal the obstacle factors of farmers' poverty alleviation stability. The model [34] is as follows:

$$M_j = \frac{(1 - X'_{ij}) \times W_j}{\sum_{j=1}^m [(1 - X'_{ij}) \times W_j]} \times 100\% \quad (2)$$

In the formula, M_j is the degree of influence of the j th indicator on the stability of poverty alleviation, $(1 - X'_{ij})$ is the deviation degree between the single index and the development goal, which represents the difference between the standardized value of the single index and 100%, and W_j is the weight of the j th indicator on the overall target.

5. Results

5.1. Analysis of the Stability of the County's Overall Poverty Alleviation Based on Household Economy Perspective

The values of overall poverty alleviation stability and the different dimensions and factor levels of poverty alleviation stability are calculated for the five counties in the study area on the basis of the standard values and comprehensive weights of the evaluation indicators of poverty alleviation stability in the selected counties, combined with the model for calculating the score of poverty alleviation stability. The values of the secondary evaluation indexes of farmers' poverty alleviation stability in the selected counties represent

the average value for the sample farmers in the counties. Table 2 shows that Zhaoyang District of Zhaotong City has the highest overall poverty alleviation stability score of 74.94, and its poverty alleviation stability grade is generally stable. Zhaotong City has obvious advantages in transport location, location conditions, infrastructure, and economic status. It has also invested more funds and human resources in the battle against poverty. These characteristics are conducive to the high-quality economic development of counties and villages to a certain extent and explain Zhaoyang's high poverty alleviation stability score. Nevertheless, close attention should be paid to the problem of return to poverty and relative poverty in the county to ensure further improvement of the quality and stability of poverty alleviation. The poverty alleviation stability grades of Yiliang, Yuanyang, Honghe, and Gongshan are generally stable, with scores of 69.78, 68.07, 67.41, and 65.94, respectively; hence, these counties are ranked as follows: Yiliang > Yuanyang > Honghe > Gongshan. Driven by the policy of targeted poverty alleviation, Yiliang County, which is located in the old revolutionary area, has achieved remarkable results in poverty alleviation, which is higher than that of the other three counties. Gongshan County belongs to the deep poverty areas in the three regions and three states, and its typical characteristics include the terms "border, mountain, less, rich, and poor". The transport condition of the county is relatively backwards, the infrastructure is relatively imperfect, and the economic vitality is insufficient. These conditions explain the county's low poverty alleviation stability. In sum, the stability of poverty alleviation in the five counties is relatively low and is classified under general stability. Moreover, certain regional differences are observed amongst the counties.

Table 2. Measurement of poverty alleviation stability at different scales.

Levels	Indicator Layer	Zhaoyang	Yiliang	Honghe	Yuanyang	Gongshan
Dimensional layer	Regional poverty alleviation stability	79.34	66.69	59.55	62.36	56.99
	Farmers' poverty alleviation stability	70.54	72.90	75.26	73.77	74.89
Target layer	County's overall poverty alleviation stability	74.94	69.78	67.41	68.07	65.94

5.2. Analysis of Poverty Alleviation Stability in Dimensional Layer Based on Household Economy Perspective

As shown in Table 2, firstly, in the dimension of regional poverty alleviation stability, the poverty alleviation stability scores of the five counties range from 56 to 80, resulting in the following ranking: Zhaoyang > Yiliang > Yuanyang > Honghe > Gongshan. Zhaoyang has the highest regional poverty alleviation stability of 79.34, which is graded as more stable. Yiliang has the second highest regional poverty alleviation stability of 66.69, which is graded as generally stable. Yuanyang, Honghe, and Gongshan have regional poverty alleviation stability scores of 62.36, 59.55, and 56.99, respectively, all of which are graded as relatively unstable. Secondly, in the dimension of farmers' poverty alleviation stability, the five counties have insignificant differences in the poverty alleviation stability scores, which fall between 70 and 76. Honghe has the highest stability score of 75.26, which is graded as more stable. Meanwhile, the stability scores of Gongshan, Yuanyang, Yiliang, and Zhaoyang are 74.89, 73.77, 72.90, and 70.54, respectively; these scores are graded as generally stable. Thirdly, from the longitudinal comparison of the two dimensions of poverty alleviation stability, Zhaoyang has the highest regional poverty alleviation stability but the lowest farmers' poverty alleviation stability. This result may be attributable to the fact that the county's economy has not yet completely manifested its role in helping farmers, and the focus of poverty management is on the quality and stability of poverty alleviation at the regional level. However, the stability of farmers' poverty alleviation and the risk of their returning to poverty have not been sufficiently considered. As for the stability of farmers' poverty alleviation in the other four counties, it is higher than that at the regional level. This difference is mainly attributed to better development in terms of economic level, social capital, and capacity status. In addition, the four counties focus their poverty alleviation efforts on the farm household scale in the process of continuously

promoting targeted poverty alleviation policies. They also take the quality of farmers' poverty alleviation as a measure of the stability of poverty alleviation. The overall stability scores of Yiliang and Zhaoyang are the highest, and the gap between the stability of regional poverty alleviation and the stability of farmers' poverty alleviation is relatively small at 6.21 and 8.8, respectively; meanwhile, the gap between Honghe and Gongshan is larger, with the difference of Gongshan being as high as 17.9. On the one hand, Gongshan is insufficiently driven by the radiation of urban agglomeration in central Yunnan, which shows a relatively high level of economic development. Gongshan's level of economic development is relatively lagging, and the risk of returning to poverty still exists to a certain extent. On the other hand, although Gongshan's economic situation, infrastructure, and people's living standards have greatly improved, the drive for the high-quality economic development of the whole county is limited. Hence, the focus should be on improving the economic development of the county and villages.

5.3. Analysis of Poverty Alleviation Stability in Factor Layer Based on Household Economy Perspective

As shown in Figure 3, in the dimension of regional poverty alleviation stability, the development in terms of economic status is less optimistic, except for Zhaoyang, which has the highest score in economic status (80.17). The other four counties fall under the unstable grade, and there are significant gaps between them. The development of supporting facilities has also shown a good trend, and the five counties are all in the stable range. This condition has an obvious impact on the stability of regional poverty alleviation. Driven by the policy of targeted poverty alleviation, the infrastructure and public service capacity of the five counties have developed significantly, especially with 98% of the village areas having running water, hardened roads, and health rooms; however, the percentage of village areas with kindergartens is relatively low (85%) because with the accelerated urbanization in China, the phenomenon of rural hollowing out is prominent, coupled with the uneven investment in public service facilities between poor and non-poor villages. As a result, most of the kindergartens in the villages are merged into townships or counties. As for the development of ecological civilization, it is not ideal. Except for Zhaoyang, which is at a relatively stable level, the other four counties are in the generally stable range. The proportion of days with a good air environment in the five counties is more than 98%, with Gongshan having the highest proportion (100%) because of the continuous promotion of the "Blue Sky defense campaign", which drives the long-term stability of the air environment at the national level. In terms of the harmless treatment of domestic waste, Gongshan scores the lowest (77.5%). The treatment of domestic waste is the top priority in improving the living environment in rural areas. Gongshan should pay attention to this in the strategy of ecological revitalization. As for the proportion of environmental protection funds in the GDP, all five counties are underperforming, with an average of only 0.6%. The low investment in environmental protection funds is bound to affect the quality of ecological environment construction, which is an aspect that needs to be considered. In terms of social governance, Gongshan ranks the highest, followed by Yuanyang, Honghe, Yiliang, and Zhaoyang. Specifically, 3.7% of Gongshan's GDP involves employment and social security expenditures; this is closely related to its vigorous efforts to improve employment assistance and social security levels.

As shown in Figure 4, in the dimension of farmers' poverty alleviation stability, the poverty alleviation stability scores of the five counties in terms of natural capital are between 74 and 89. Honghe has the lowest score (74.12), which is mainly attributed to the county's large terrain fluctuations. The county's transport accessibility and circulation of production factors are poor, resulting in the relatively low stability of natural capital for poverty alleviation. In terms of economic level, the stability of poverty alleviation in the five counties is relatively high, but there are significant regional differences. From the perspective of per capita net income, Gongshan has the highest per capita net income of poverty-stricken families at 10,544 yuan, while that of Yuanyang is relatively low. In

terms of ability status, the stability of poverty alleviation in all five counties is at the general stability level. The health status, education level, and labor force status jointly contribute to the stability of this ability status. The proportion of the healthy population in the five counties is higher than 78%, but the average percentage of poverty-stricken households with an education level of junior high school or above is only 11.8%. This result shows that the literacy level of poverty-stricken households is generally low and that achieving cultural poverty alleviation is the key measure to ensure the stable poverty alleviation of farm households. In terms of social capital, the stability score of poverty alleviation in the five counties is in the range of 71–92. The average annual self-paid medical expenditure of poverty-stricken households is 750 yuan, but the expenditure of some poverty-stricken households in Zhaoyang can be as high as 50,000 yuan, indicating that there are individual differences in the annual self-paid medical expenditure of the poverty-stricken households. In terms of cognitive level, Zhaoyang, Yiliang, and Yuanyang belong to the unstable level, whilst Gongshan and Honghe are in the stable and general stable levels, respectively. Amongst the five counties, 70% of the poverty-stricken households show confidence in their development. However, the effect of micro-credit on increasing the income of poverty-stricken households is not significant, and the policy dividends of micro-credit for increasing the income of farmers have not been fully released. These areas should be the focus of key efforts in the future.

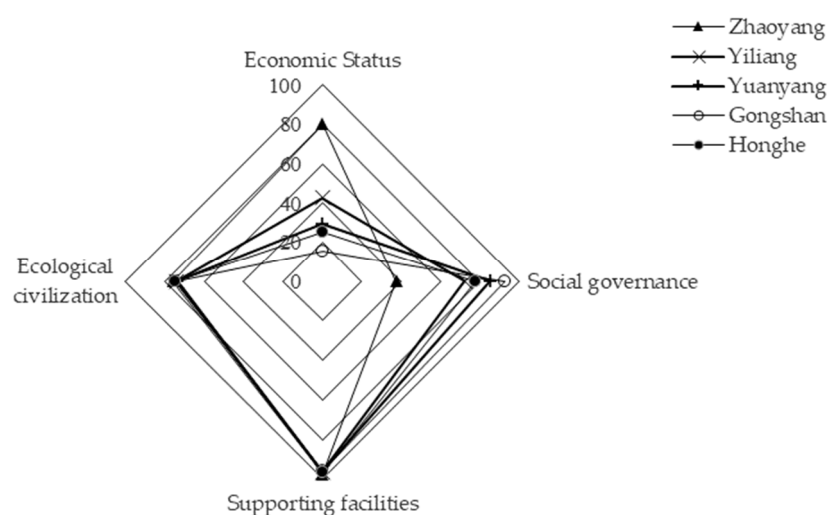


Figure 3. Spatial measurement results of regional poverty alleviation stability in various dimensions in different counties.

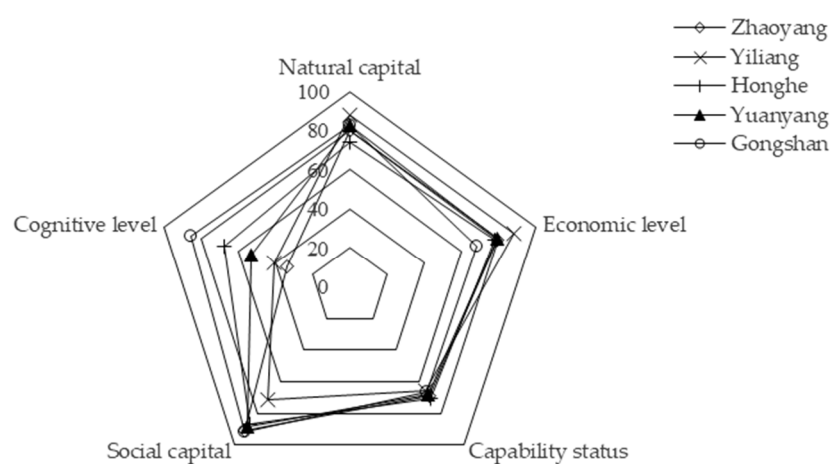


Figure 4. Spatial measurement results of poverty alleviation stability of farmers in various dimensions in different counties.

5.4. Analysis of Socio-Economic Impact Factors on the Stability of County Poverty Alleviation

The stability of regional poverty alleviation is influenced by various factors, such as nature, economy, and location. In this study, the comprehensive weights of the indexes are determined using the hierarchical analysis and entropy methods. In terms of dimensions, the degree of influence of the various factors on the stability of regional poverty alleviation is in the following order: economic status (0.4546) > supporting facilities (0.3205) > social governance (0.1394) > ecological civilization (0.0855). It shows that economic status and supporting facilities have the greatest influence on regional poverty alleviation and are the key to achieving stable regional poverty alleviation. Among them, improving the level of economic development of counties can significantly enhance the stability of regional poverty alleviation, and the improvement of supporting facilities can effectively characterize the stability of regional poverty alleviation. In terms of specific indicators, county GDP and county fiscal revenue are the main factors affecting regional poverty alleviation stability. These two factors are often the distinguishing mark of the stability of regional poverty alleviation, and boosting county GDP, county fiscal revenue, and revitalizing the county economy are key to enhancing the stability of regional poverty alleviation. Social security level is the secondary factor affecting regional poverty alleviation stability. The level of social security indirectly reflects the social welfare of regional poverty alleviation, and the improvement of social security level can effectively characterize the stability of regional poverty alleviation, while the collective indebtedness of villages reflects the economic situation of villages from the side and excessive indebtedness seriously affects the healthy development of the village economy.

The stability of farmers' poverty alleviation is constrained by multiple factors, such as nature, economy, and society. The obstacle degree model is used to reveal the main obstacle factors of farmers' poverty alleviation stability, thereby determining the stability resistance of farmers' poverty alleviation. Table 3 shows that the annual self-paid medical expenditure of households and the proportion of labor force in the resident population are potential risk factors affecting farmers' poverty alleviation stability in Zhaoyang. Strengthening labor skill training for farmers and widening the channels for farmers to increase their income are important breakthroughs to enhance farmers' poverty alleviation stability in Zhaoyang. The per capita net income level is the main obstacle restricting the stability of farmers' poverty alleviation in Yiliang and Gongshan counties. Meanwhile, the proportion of labor force to resident population significantly affects the stability of farmers' poverty alleviation in four counties, but the secondary obstacle degree factor is different. In general, the potential risks to the stability of farmers' poverty alleviation in each county mainly originate from economic level and ability status, and the level of net income per capita and the proportion of labor force in the resident population are the main factors restricting the improvement of the stability of farmers' poverty alleviation. Among them, it is generally recognized that the economic level is fundamental to the livelihoods of farming households, and that a reduction in the level of net per capita income leads to the destabilization of the economic incomes of farming households, which in turn generates the destabilization of the stability of farmers' poverty alleviation. The number of household laborers is the basic guarantee of economic income sources; the decline in the number of laborers seriously affects the increase of family income, which easily leads to instability of poverty alleviation, while the ability status of farmers is the key link to determine the stability of poverty alleviation, the low quality of the farmers themselves, the single industrial structure, the decline in the number of laborers, and so on, which leads to the production of the phenomenon of instability of poverty alleviation.

The stability of county-level poverty alleviation is affected by various factors, and the dominant influencing factors of regional poverty alleviation stability and farmers' poverty alleviation stability are different, but they are mainly affected by the common effect of five factors, such as economic status, ability status, cognitive level, supporting facilities, and social governance, which are independent of each other and interdependent. The improvement of cognitive level and ability status can stimulate the endogenous develop-

ment motivation of farmers, thus enhancing the level of economic development, while the enhancement of the level of economic development can effectively improve the basic supporting facilities, thus enhancing the level of social governance.

Table 3. Main obstacle factors of farmers' poverty alleviation stability at different counties.

County (District)	First Barrier Degree Factor and Barrier Degree	Second Barrier Degree Factor and Barrier Degree	Third Barrier Degree Factor and Barrier Degree
Zhaoyang	E7 (23.25)	E6 (12.83)	E2 (7.94)
Yiliang	E2 (45.71)	E6 (12.20)	E1 (9.56)
Gongshan	E2 (37.88)	E3 (14.61)	E6 (14.36)
Honghe	E2 (32.70)	E7 (19.16)	E6 (10.27)
Yuanyang	E2 (26.82)	E6 (14.46)	E11 (9.45)

6. Discussion

By constructing the evaluation index system and using the multiscale spatial econometric model, this study explored the situation of county-level poverty alleviation stability and influencing mechanism. It is helpful to clarify the basic characteristics and operation law of county-level poverty alleviation stability in China, which can provide a theoretical basis for the high-quality development of regional economy. This study focuses on analysis of the status of poverty alleviation stability in five counties in Yunnan Province. Unlike previous studies, this study attempts to quantitatively measure the stability of poverty alleviation in counties from two aspects: regional poverty alleviation stability and farmers' poverty alleviation stability. The results are consistent with the actual situation of consolidating poverty alleviation achievements in the study area, which further proves the scientificity and effectiveness of the findings, which is more consistent with the research conclusions by Du Guoming and others [29]. However, the difference is that the results of this study aim to explore the degree of county-level poverty alleviation stability, while Du et al. focused on analyzing the quality of poverty alleviation in poor counties. Meanwhile, this study concludes that the overall stability of poverty alleviation in the five counties in Yunnan Province is relatively low and is graded at the general stability level, and regional differences are more pronounced among the counties, which is basically consistent with the research results of measurement of poverty alleviation stability in the village of the Qinba mountainous by Guo Qian and others [18]. However, the difference is that this study carries out a comparative analysis of poverty alleviation stability in five counties based on an innovative theoretical analysis framework of poverty alleviation stability, while Guo et al. focused on the poverty alleviation stability of Chengkou County in Chongqing, identifying the risk of returning to poverty in Chengkou County. From the perspective of the influencing factors of the poverty alleviation stability in five counties in Yunnan Province, the results of this study are basically consistent with the findings of the Anhua County in Hunan Province by Wang Fuzhen and others, which concluded that lack of capacity is the main influencing factor of poverty alleviation stability [19]. However, this study makes an innovative analysis of the influencing mechanisms of county-level poverty alleviation stability. Meanwhile, this study can select some concrete cases to further explain the influencing factors of poverty alleviation stability. For example, Wang Fuzhen et al. [19] believe that the development ability of farmers, income level, and ecological environment are the key factors affecting the stability of poverty alleviation in counties. Generally speaking, the poorer the region, the higher the dependence on natural resources and the ecological environment, and the five counties in Yunnan Province are typical poor mountainous counties, where problems such as karst desertification, insufficient arable land, and more disasters have led to the lack of ecological foundation for regional development, which has led to the phenomenon of instability in poverty alleviation. Problems such as a single regional industrial structure, low levels of agricultural mechanization, low quality of population, lagging medical facilities, and lagging infrastructure such as transportation and communications have led to a lack of economic development in the region, and because of

fierce competition in the marketplace, the economic income of farming households is highly volatile, thus generating the phenomenon of instability in poverty alleviation. In addition, from the perspective of the theoretical analytical framework for county-level poverty alleviation stability, the results of this study are different from the research results of poverty alleviation stability by Hu Yuan and others [23]. This study integrates the multidimensional measurement analysis framework and sustainable livelihood analysis framework (DFID), which serve as the theoretical basis for the analysis of poverty alleviation stability at the county level. This study suggests that policy recommendations to enhance the stability of poverty alleviation are widely applied in industrial development, poverty alleviation, and rural revitalization in ecologically fragile and arid zones, and they are of great benefit to the livelihood level of county farmers, ecological environment construction, and high-quality development of the regional economy.

Based on the household economy perspective, this study measures poverty alleviation stability in five counties in Yunnan Province and explores its influence mechanism to provide a scientific basis for achieving high-quality poverty alleviation and rural revitalization in counties. In view of the difficulty of data acquisition, all analyses are based on static spatial panel data, and there is a lack of long-term analysis of the spatial and temporal evolution patterns and characteristics of poverty alleviation stability in counties. Future research should be to conduct in-depth data collection in the study area based on the dynamic spatial panel data model, select the research data of the past 20 years, carry out the evaluation of the stability of poverty alleviation at the provincial scale and the analysis of its spatial pattern, and conduct timely tracking studies to systematically analyze the socio-economic impact of poverty alleviation stability in counties. At the same time, in the post-poverty era, relative poverty governance and promotion of rural revitalization are new issues that should be explored in subsequent studies.

7. Conclusions

Based on the household economy perspective, the overall stability of poverty alleviation in the five counties in Yunnan Province is relatively low and is graded at the general stability level. Furthermore, regional differences are more pronounced among the counties. Zhaoyang has the highest poverty alleviation stability, followed by the four counties of Yiliang, Yuanyang, Honghe, and Gongshan (i.e., Zhaoyang > Yiliang > Yuanyang > Honghe > Gongshan). The stability of farmers' poverty alleviation in Yiliang, Yuanyang, Honghe, and Gongshan counties is higher than the stability of regional poverty alleviation, which is due to the fact that these four counties are located in profoundly impoverished areas with extremely fragile social ecosystems, lagging transportation conditions, relatively imperfect infrastructures, and lack of vitality of the county economy, coupled with the fact that poverty alleviation policies have been targeted at the impoverished households, and that more supportive policies and funds have been tilted towards the farm households, which has resulted in the stability of poverty alleviation for farmers being higher than regional poverty alleviation stability. Moreover, the economic level, social capital, ability status, and cognitive level are relatively good, but the economic status and ecological civilization construction need to be further improved. There are also other outstanding problems, such as the low level of county economic development, the ineffective rectification of environmental problems, and the low investment in environmental protection funds. At the same time, improving the economic status, ability status, and cognitive level are crucial to the stability of poverty alleviation. Among them, through the development of special industries, collective economy, and cooperative economy to increase the income of farmers, cultivate leading industries and pillar industries, and then improve the county's economic level; enhancing the endogenous development capacity of farmers by strengthening industrial skills training, cultural leadership, and employment skills training; effectively raising the cognitive level of farmers by strengthening publicity and education, regular incentives, and educational leadership.

The stability of poverty alleviation at the county-level is represented by two dimensions: the stability of regional poverty alleviation and the stability of farmers' poverty alleviation. These dimensions are mainly affected by five factors, namely economic status, ability status, cognitive level, supporting facilities, and social governance. In the evaluation indexes of regional poverty alleviation stability, county GDP and county fiscal revenue are the main factors affecting regional poverty alleviation stability, whilst the low level of economic development is the root cause of regional poverty alleviation instability. The level of per capita net income and the proportion of labor force in the resident population are the dominant factors influencing the stability of farmers' poverty alleviation, and the potential risk factors are economic level and ability status.

On the basis of the analysis of the stability of poverty alleviation in the counties and the socio-economic impact factors, this study offers the following suggestions to enhance the stability of county-level poverty alleviation: Firstly, to enhance the level of economic development in counties and strengthen the collective economy of the village, revitalize the idle assets of the village collectives, focusing on solving the problem of historical debts of the village collectives; to innovate the form of economic development of the village, strengthen the management and construction of the collective organization and enhance the level of collective economic development; to enhance the development capacity of counties and vigorously cultivate the dominant and pillar industries of counties, extend the industrial chain and increase the output value of the economy and the financial income of counties. Secondly, with the stability of poverty alleviation, prevention of return to poverty, and rural revitalization receiving equal priority, the active development of special industries based on resource advantages, the broadening of income-generating channels for farmers, and the increase of the proportion of non-transferable income such as farmers' operating income and wage income through the development of the collective and cooperative economy, so as to improve the stability and sustainability of income-generation. Once again, further improve regional infrastructure conditions and public service capabilities, increase the construction of public service facilities and support facilities in remote rural areas of counties, improve the quality of rural education and the level of primary medical and health care services, and effectively connect the consolidated and expanded poverty alleviation achievements with rural revitalization so as to achieve high-quality poverty alleviation at the county level.

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