

The Impact of Green Finance in Anhui Province on Rural Revitalization

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Abstract. In the landmark "No. 1 Document" issued by the central government in 2023, the Party Central Committee emphasized the "three rural issues" as the core task of the Party's work. On the road of rural revitalization and development, the role and influence mechanism of green finance provide practical theoretical support and practical guidance for the implementation of this strategy. This paper selects the indicators of green insurance, green investment and the development level of rural revitalization in 16 cities of Anhui Province from 2012 to 2021 for empirical analysis. The results show that both green investment and green insurance have a positive role in promoting the development level of rural revitalization, and green insurance is more efficient than green investment in promoting rural revitalization. The supporting role of green finance shows obvious regional heterogeneity. Compared with the central and western regions, the eastern region has received more significant support from green finance in the process of rural revitalization. Green investment and green insurance have no significant effect on the western region. Therefore, the western region should learn from the eastern and central regions to increase public expenditure on energy conservation and environmental protection and optimize the structure of agricultural insurance.

Keywords: Green Finance, Rural Revitalization, Entropy Method.

1. Introduction

1.1. Research Background and Significance

1.1.1. Research Background

The guiding "No. 1 Document" issued by the central government in 2023 clearly stated that the issues concerning agriculture, rural areas and farmers should be placed at the core of the Party's work. With the continuous in-depth development of industrialization and urbanization in China, rural development is relatively lagging, forming a sharp contrast with the rapid momentum of urban development. At present, rural areas are facing many challenges such as increasingly serious ecological pollution, unbalanced industrial structure and brain drain. With the progress of the times and social development, people's demand for a higher quality of life is growing day by day. However, the contradiction between the satisfaction of this demand and the current unbalanced and inadequate rural development is becoming increasingly acute and obvious. The relatively low efficiency of agriculture is in sharp contrast with the vigorous development of other industries, and the gap between urban and rural development is gradually widening. Therefore, we must gradually shift the focus of development to rural construction to narrow the gap between urban and rural areas and achieve comprehensive and balanced development. Under the concept of advocating sustainable development and green development, green finance occupies an important position in the process of rural revitalization. In the grand blueprint of promoting rural development, the elements of green, health and sustainability are of pivotal importance and cannot be ignored. By giving play to its financing service function in poverty alleviation and rural revitalization, green finance can effectively support the implementation of green "three rural" projects and promote the green and sustainable development of rural economy.

1.1.2. Research Significance

Green finance is not only a key force to promote the green transformation of rural economy, but also an important support to achieve the strategic goals of rural revitalization. However, in the existing academic literature, only a single study on green finance and rural revitalization has been conducted, and few studies have linked the two for in-depth exploration. The discussion on how green finance specifically affects rural revitalization is relatively scarce, and most studies tend to be qualitative. To fully reveal the core supporting role of green finance in rural revitalization, because of accurate analysis of green finance and rural revitalization indicators, we need to further conduct an empirical analysis of the effect of green finance in promoting rural revitalization, and put forward targeted policy suggestions according to the results, which has important theoretical and practical significance.

(1) Theoretical Significance: First, through systematic research, we can deeply explore the impact of green finance development on rural revitalization, thus further enriching and improving the theoretical knowledge system in the interdisciplinary field of green finance and rural revitalization. Secondly, based on analyzing the policy background and combing the relevant literature, this paper will comprehensively analyze the influencing factors of how green finance acts on rural revitalization. To explore the role of green finance in rural revitalization more comprehensively and in-depth, the entropy method is used to construct a comprehensive rural revitalization evaluation index system to accurately quantify and evaluate the development level of rural revitalization. Through this research method, we can have a deeper understanding of the contribution of green finance in rural revitalization.

(2) Practical Significance: First, by analyzing the current development status of rural revitalization and the role of green finance in promoting its process, we can clearly depict the development scale of China's green finance system and the level of rural revitalization achieved at present. Secondly, this paper will further explore the impact effect of green finance services on rural revitalization. Based on these analyses and combined with China's actual situation, a series of feasible countermeasures and suggestions are put forward to provide important theoretical support and practical guidance for solving China's "three rural" issues.

1.2. Research Content and Methods

1.2.1. Research Content

This paper aims to explore the internal relationship between green finance and rural revitalization, especially focusing on the key role of green finance in promoting rural revitalization. The structure of the paper consists of the following six core chapters.

The first part is the introduction. Before analyzing the correlation between green finance and rural revitalization, this paper will first elaborate on the research background and significance, aiming to provide a solid theoretical starting point for the subsequent analysis. Then it details the content arrangement of this paper, including research content and research methods, aiming to provide readers with a clear research framework. After a comprehensive review of the current research achievements in the field, this paper further clarifies the innovative highlights of the research and points out its deficiencies.

The second part is the literature review. This paper systematically combs the theoretical progress made by domestic and foreign scholars in the field of green finance serving rural revitalization. This not only covers the core concepts of green finance and the multiple dimensions of rural revitalization, but also deeply discusses the research on the impact effect of green finance on rural revitalization. Finally, the literature is commented on its characteristics and limitations.

The third part is the theoretical basis. The relevant theories of green finance and rural revitalization are elaborated respectively, which can further deepen the understanding of green finance and rural revitalization.

The fourth part is the construction of rural revitalization index system. Because there is no authoritative, widely recognized, objective and scientific comprehensive evaluation system in the field of rural revitalization at present. Based on previous studies, this paper constructs four first-level

indicators and six second-level indicators, measures them by entropy method, and analyzes and explains the measurement results.

The fifth part is the empirical analysis. Based on the principle of data availability, green finance is measured by green investment and green insurance, a model is established and a series of empirical tests and analyses are carried out. Finally, Anhui Province is divided into three regions: central, western and eastern for heterogeneity analysis to analyze the regional impact of green finance on rural revitalization.

The sixth part is the conclusion and suggestions. Through the results of empirical analysis, the research of this paper is summarized, and suggestions are put forward from three aspects: strengthening policy guidance, enriching the forms of rural financial products, and improving the green development platform and corresponding supporting mechanisms.

1.2.2. Research Methods

(1) Literature Analysis Method

Because of extensively using platforms such as CNKI and Google, the search is carried out with the Chinese and English keywords of "green finance" and "rural revitalization" for literature retrieval. By analyzing the collected literature, we can understand the latest research trends and cutting-edge progress in the field of green finance and rural revitalization at home and abroad. This step not only provides a solid theoretical foundation for this research, but also provides a strong support for the construction of our subsequent research content and methodology.

(2) Entropy Method

When measuring the comprehensive development level of rural revitalization, we use the entropy method to assign values to each first-level indicator to ensure the accuracy and reliability of the evaluation results.

(3) Empirical Research Method

Because of in-depth theoretical analysis, this paper puts forward research hypotheses, selects the panel data of 16 cities in Anhui Province from 2012 to 2021, and constructs a time fixed effect model to empirically test how green finance affects the development level of rural revitalization. In constructing the rural revitalization index system, this paper draws on the research results of predecessors and considers rural revitalization from four dimensions. At the same time, the green finance index is constructed based on two core elements: green investment and green insurance. The time fixed effect model is used to deeply explore the specific impact of green finance on the current development level of rural revitalization in China. After the regression analysis, to ensure the robustness and reliability of the research conclusions, this paper also conducts a robustness test. In view of the significant heterogeneity of green finance and rural revitalization development level in different regions, this paper further divides Anhui Province into three regions: eastern, central and western to investigate the differentiated impact of green finance on rural revitalization development level.

1.3. Innovations and Deficiencies

1.3.1. Innovations

(1) Perspective Innovation

Since the rural revitalization strategy was put forward in 2017, most studies have focused on the field of rural financial services. However, there is still a large space for exploration in the research field combining green finance and rural revitalization. As a financial model that emphasizes the coordinated development of economic benefits and ecological and environmental benefits, green finance is more in line with the pursuit of green development of the rural revitalization strategy compared with the traditional financial model. Therefore, this paper aims to deeply explore the impact effect of green finance on rural revitalization and provide theoretical support for relevant policy formulation and practice.

(2) Method Innovation

Although there have been a small number of preliminary discussions on the mechanism of green finance affecting rural revitalization by qualitative methods, the quantitative research field is still insufficient. This paper studies the impact of green finance on rural revitalization by combining qualitative and quantitative research methods, and puts forward targeted policy suggestions to promote the deep integration and development of green finance and rural revitalization strategy.

1.3.2. Deficiencies

(1) Data Collection

First, since the rural revitalization strategy was officially put forward in 2017, the research time span selected in this paper is from 2012 to 2021, which lacks timeliness. Second, at the prefecture-level city level, the data related to green finance and rural revitalization are often scarce, which increases the difficulty of data collection to a certain extent.

(2) Indicator Selection

First, because China's green finance development is still in the initial stage, there is no unified view and conclusion on its construction framework. Especially in the field of rural financial services, green credit and green insurance have become the most core and concerned components at present. However, because this paper studies the green finance data of 16 cities in Anhui Province, the disclosure of green credit related data at the prefecture-level city is less and the data is difficult to obtain. In evaluating the dimension of green finance, this paper chooses green insurance and green investment as measurement indicators, but this method has certain limitations. In future research, we should focus on strengthening the disclosure of county-level green credit related data and information. After successfully collecting these key data, we will conduct more in-depth and comprehensive demonstration and analysis based on these data. Second, the research objects of this paper are green finance and rural revitalization, which are too macroscopic. In the future, the research on green finance and rural revitalization should be subdivided.

2. Literature Review

2.1. Research on Green Finance

In the 1970s, the increasingly severe environmental pollution problem attracted widespread attention from all countries. To solve the market mechanism failure caused by environmental problems, scholars put forward environmental finance from the perspective of environmental economics, which is the early theoretical origin of green finance. Since then, western countries have devoted themselves to the exploration of green finance, such as the establishment of ecological banks and the creation of the "Equator Principles". Developed countries in Europe and America have made remarkable progress in the field of green finance, with increasingly rich financial tools and an increasingly perfect green finance system and policy framework. Compared with many other countries, China's development in the field of green finance started late. The Guiding Documents on Establishing and Improving the Green Finance System was officially issued in 2016, which not only defined green finance for the first time, but also provided important guidance for the construction of China's green finance system framework. This marks that the development of China's green finance field has officially entered a brand-new historical stage.

Scholars at home and abroad generally believe that green finance is a financial practice activity that aims to promote the harmonious coexistence and common development of economy, ecology and environment by flexibly using financial tools and strategies. Gregoriou et al. (2016) believe that the core difference between green finance and traditional finance lies in their capital allocation strategies. Green finance not only focuses on fund raising, but also focuses on accurately investing these funds in green industries and projects, thus effectively promoting environmental protection and sustainable development. This strategic capital allocation makes green finance have unique value and role in helping environmental protection and the development of green industries. Jeucken (2010) believes that green finance also covers the concept of green and sustainable development of the

financial industry. This view emphasizes that the financial industry should also pay attention to its impact on the environment and society while pursuing economic benefits to achieve long-term and stable green growth. An Tongxin et al. (2017) pointed out that the core value of green finance is to promote the long-term and steady development of the economy through the innovation and practice of financial activities, while considering the protection of the ecological environment and the rational and efficient use of resources. Xie Cheng et al. (2019) discussed the connotation of green finance, whose core viewpoints include two important aspects: first, financial institutions pursue their own greening and sustainable development in the operation process to ensure the environmental protection and sustainability of financial activities; second, financial institutions provide diversified green financial products and services through continuous innovation to promote the comprehensive and coordinated sustainable development of economy, society and environment in three dimensions. Yang Lin et al. (2019) put forward the concept of rural green finance in their research, which is regarded as a financial model focusing on promoting rural revitalization. Closely centering on the strategic goal of rural revitalization, this model realizes the harmonious coexistence of rural economic growth and environmental protection by introducing green financial products and services. This view emphasizes the key role of green finance in promoting the sustainable development of rural economy. Anderson (2016) showed that the core mechanism of green finance is to effectively raise funds by means of traditional financial tools such as loans, bonds and equity financing, and accurately invest these funds in environmental protection projects. Cowan (1999) regarded green finance as a model of the integration of finance and green economics, and emphasized its key role in promoting the harmonious coexistence of economic growth and environmental protection. Wang Fengrong et al. (2018) pointed out that the implementation mode of China's green finance policy presents a top-down oriented mode, that is, policy formulation and implementation all originate from high-level decisions, thus promoting the corresponding development of green finance theory and practice.

2.2. Research on Rural Revitalization

As an important part of the development strategy in the new era, rural revitalization is glowing with new vitality under the profound guidance of the new development concept. Its core goal is to comprehensively coordinate the protection of the ecological environment and the scientific and rational use of resources, to promote the formation of a green, low-carbon and long-term stable industrial system and production mode. Although China's rural revitalization strategy has only been officially put forward in recent years, its core concept has been reflected in the process of China's modern agricultural construction since the reform and opening.

Scholars at home and abroad have discussed rural revitalization from different perspectives. In promoting the development of rural revitalization, Drabenstott (2003) believes that the government plays a vital role in rural development. The government has effectively promoted the growth and sustainable development of the rural economy by providing financial subsidies for agricultural production and operation and green projects. Opare (2007) advocated that in the process of promoting rural revitalization, an organizational model from the grass-roots level to the top level should be adopted. The core of this model is to take the local government as the leading role, and the close cooperation and coordination of financial institutions and various social departments to ensure the smooth implementation of the rural revitalization strategy. Ye Xingqing (2018) believes that to achieve the grand goal of rural revitalization, it is necessary to ensure that agriculture and rural areas enjoy priority in resource allocation, policy support and other aspects, and actively promote the in-depth integrated development between urban and rural areas. Chen Yangfen et al. (2020) deeply discussed the strategy of rural industrial revitalization after comprehensively considering the theoretical knowledge of economics, geography and other disciplines. They advocated that to realize the vigorous development of rural industries; it is necessary to continuously optimize the layout in terms of development concepts and strategic paths. Li Pengfei et al. (2020) pointed out in their research that to achieve the goal of industrial revitalization, the government must significantly increase the intensity of financial support. Especially in rural areas, the weakness of infrastructure

construction needs to be solved urgently, and the government should first ensure the completeness of infrastructure to lay a solid foundation for rural revitalization. In terms of the impact of rural revitalization, Huang Wei (2022) believes that vigorously developing rural revitalization is conducive to optimizing China's economic development structure, promoting the modern development of basic industries, and helping to achieve the goal of common prosperity. Dou Shulong et al. (2019) discussed the internal logic between rural revitalization and financial poverty alleviation, and emphasized that the rural revitalization strategy has produced a significant resource agglomeration effect through the effective integration of various resources. This effect has not only greatly improved farmers' income level, but also played a key role in promoting the all-round progress of rural economy and society. Huang Chengwei (2021) emphasized that the rural revitalization strategy has a significant effect on promoting the all-round development of economy and society and accelerating the modernization of the national governance system. In terms of the construction of a comprehensive rural revitalization system, Wu Dekang et al. (2023) selected five first-level indicators: thriving industries, livable ecology, prosperous life, civilized rural customs and effective governance to measure the level of rural revitalization. Zhao Yijie (2022) selected the development level of rural revitalization as the explained variable, and measured the development level of rural revitalization from four dimensions: livable ecology, thriving industries, public services and prosperous life by principal component analysis.

2.3. Research on the Impact Effect of Green Finance on Rural Revitalization

Scholars have conducted a lot of research on the internal logic of green finance boosting rural revitalization, laying a theoretical foundation for more in-depth quantitative analysis. Yang Lin et al. (2019) analyzed the mechanism of green finance boosting rural revitalization, mainly including three aspects: promoting rural industrial development, improving the ecological environment and improving the financial system. Ouyang Yuliang et al. (2022) believe that green finance has a dual mechanism of direct and indirect effects in promoting rural revitalization. At the direct level, it helps to build an effective avoidance mechanism for agricultural ecological risks, and can also inject new impetus into rural economic development through the innovation and activation of green finance, and provide a stable supply of green capital. At the indirect level, green finance guides rural areas to develop towards a green and sustainable revitalization direction, and promotes the modernization of rural social governance through its transmission effect. Zuo Zhenglong (2024) believes that in advancing the grand blueprint of rural revitalization, we need to accurately use diversified financial means to support farmers in achieving green and sustainable income increase, while promoting the livability of the rural ecological environment and the green development of agricultural production. Deng Daocai (2023) believes that green insurance combines traditional agricultural insurance with local agriculture to prevent and resolve operational risks. Dong Chunxiao (2022) believes that green finance has injected green and low-carbon development impetus into rural revitalization by guiding and promoting the development of green agriculture and increasing support for agricultural technological innovation and research and development.

2.4. Literature Commentary

After a comprehensive analysis of the literature on the development of green finance at home and abroad, the following characteristics and limitations can be found:

First, although China's green finance research started late, relatively mature research results have been achieved in the evaluation of green finance development level and the analysis of its influencing factors. In addition, the positive impact of green finance on China's economy, ecological environment and other aspects has been widely discussed and confirmed. However, most literatures mainly focus on theoretical elaboration, which covers logic, significance and promotion strategies, but is slightly insufficient in empirical analysis and specific case support.

Second, regarding the rural revitalization strategy put forward by the state, domestic scholars have conducted extensive discussions on its implementation path and measurement system. However, in

the process of constructing the rural revitalization evaluation index system, there is still a lack of widely recognized, authoritative and consistent views at present.

Third, most of the literatures only conduct research based on different provinces, and have not fully conducted in-depth analysis from the inter-provincial level. As the cradle of the "household contract responsibility system", Anhui Province is a typical major agricultural province. Therefore, this paper selects each city in Anhui Province as the research object to explore the impact of green finance in Anhui Province on rural revitalization.

3. Theoretical Basis

3.1. Theories Related to Green Finance

(1) Environmental Economics Theory

Environmental economics aims to promote environmental protection and sustainable development through economic means. Its goal is to explore an economical and reasonable material conversion mode, to build a clean, comfortable and beautiful living and working environment for human society. Through accurate economic analysis and evaluation, it provides a solid and scientific basis for the screening and decision-making of green finance projects, ensuring that these projects can effectively protect the natural environment while promoting economic development.

(2) Sustainable Development Theory

The sustainable development theory pursues a development model of common prosperity, coordination, fairness, efficiency and multi-dimensionality. This development model aims to realize the harmonious unity of economy, society and environment. This requires us to conduct a comprehensive consideration and balance in many fields such as economy, society and environment. By providing a series of innovative financial tools such as green bonds, environmental protection loans and green investment products, green finance provides strong support for the coordinated development of economy, society and environment in three dimensions, and provides financing opportunities for sustainable development projects and enterprises.

(3) Externality Theory

Externality theory refers to a phenomenon that the behavior of one economic entity has an important impact on other economic entities, but does not receive remuneration or give compensation. Externalities can also be positive or negative. In the operation process, the traditional financial market often fails to fully consider the environmental negative externality costs generated by enterprise production activities, which often aggravates serious problems such as environmental pollution and resource waste. However, with the rise and development of green finance, its core concept is to internalize the environmental costs originally borne by the outside of enterprises, to realize the efficient allocation of resources and the sustainable use of the environment through the active participation and promotion of financial institutions. This transformation not only helps to correct the deficiencies of the traditional financial market, but also can promote the economic and social development towards a green, low-carbon and circular direction.

3.2. Theories Related to Rural Revitalization

(1) Rural Finance Theory

Rural finance aims to provide financial services and support for farmers, agricultural enterprises and rural economy, including loans, savings, insurance, investment and other fields. These financial services are designed to help improve agricultural productivity and promote the vigorous development of the rural economy. They not only inject new vitality into the rural commodity economy, but also play a key role in accelerating the process of specialization, commercialization and modernization of the rural economy.

(2) Inclusive Finance Theory

Based on the core concept of equal opportunities and the basic principle of commercial sustainability, inclusive finance can allocate financial resources reasonably and efficiently, provide

financing support for environmental-friendly agricultural projects and projects conducive to improving the rural ecological environment, thus effectively promoting the goal of livable ecology in rural areas. Digital inclusive finance has given clear support to the financing direction of green ecological projects, and its remarkable results are reflected in the improvement of the access rate and credit coverage of ecological agricultural loans, which can further promote the healthy development of rural ecology and lay a solid foundation for a sustainable future of rural areas.

This paper carries out the research ideas based on the above research theories, by understanding the role of each link of green finance supporting rural revitalization.

4. Construction and Level Measurement of Rural Revitalization Index System

4.1. Construction of Rural Revitalization Development Level Index System

4.1.1. Indicator Selection

Drawing on the rural revitalization development level measurement index system constructed by Zhang Ting et al. (2018), following the principles of data availability and scientificity, this paper selects 4 first-level indicators: Thriving Industries, Livable Ecology, Civilized Rural Customs and Prosperous Life. Then, according to the availability of municipal data in Anhui Province, 6 second-level indicators are selected: in terms of Thriving Industries, the total output value of agriculture, forestry, animal husbandry and fishery and the total power of agricultural machinery are selected; in terms of Livable Ecology, the tap water popularization rate and green coverage area are selected; in terms of Civilized Rural Customs, the number of rural primary schools is selected; in terms of Prosperous Life, the per capita disposable income of rural residents is selected.

4.1.2. Data Sources

This paper uses the entropy method to measure the rural revitalization development level of 16 cities in Anhui Province from 2012 to 2021. All data are from the Anhui Statistical Yearbook, CSMAR Database, and the statistical yearbook websites of various cities in Anhui Province. In case of missing data in individual years, the linear interpolation method is used to supplement them.

4.2. Measurement of Rural Revitalization Development Level

This paper selects the relevant indicators of rural revitalization in 16 prefecture-level cities of Anhui Province from 2012 to 2021, and uses the entropy method to calculate the proportion of each second-level indicator in the rural revitalization indicator system. The results are shown in Table 4.1. Finally, the comprehensive index of rural revitalization of each city is obtained through calculation. The specific steps of the entropy method are as follows:

(1) First, perform min-max standardization on the data. After standardization, perform a translation process on the data and translate the whole by 0.0001. Since the variables selected in this paper are all positive indicators, the standardization formula is:

$$X_{ij} = \frac{X_{ij} - X_{j\min}}{X_{j\max} - X_{j\min}} \quad (1)$$

Among them, i represents the region and j represents the indicator.

(2) Calculate the proportion of the i -th scheme under the j -th indicator in the indicator:

$$Y_{ij} = \frac{X_{ij}}{\sum_{i=1}^n X_{ij}} \quad (2)$$

(3) Calculate the entropy value of the j -th indicator:

$$e_j = -\frac{1}{\ln n} \sum_{i=1}^n Y_{ij} \ln Y_{ij} \quad (3)$$

(4) The difference coefficient of the j -th indicator:

$$g_i = 1 - e_j \tag{4}$$

(5) The weight of the j-th indicator is:

$$\omega_j = \frac{g_j}{\sum_{j=1}^p g_j} \tag{5}$$

The specific results are shown in Table 1. Then multiply the standardized data by the weight to get the comprehensive score. The specific results are shown in Table 1.

Table 1. Evaluation Index System of Rural Revitalization Level

Objective	Indicator	Unit	Direction	Weight
Thriving Industries	Total output value of agriculture, forestry, animal husbandry and fishery	10,000 yuan	+	12.81%
	Total power of agricultural machinery	10,000 kW	+	17.51%
Livable Ecology	Tap water popularization rate	%	+	3.58%
	Green coverage area	Hectare	+	22.11%
Civilized Rural Customs	Number of rural primary schools	Piece	+	31.94%
Prosperous Life	Per capita disposable income of rural residents	Yuan	+	12.04%

Table 2. Comprehensive Index of Rural Revitalization Development Level of Anhui Province

City	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Hefei	0.3913	0.4074	0.4125	0.4300	0.4411	0.4569	0.4918	0.5113	0.5267	0.5561
Huaibei	0.1304	0.1416	0.1512	0.1608	0.2886	0.1616	0.1692	0.1905	0.1919	0.2073
Bozhou	0.3816	0.3948	0.4150	0.4248	0.3279	0.4294	0.4434	0.4496	0.4768	0.4685
Suzhou	0.3870	0.3800	0.3866	0.3973	0.3987	0.3845	0.3978	0.4081	0.4336	0.4709
Bengbu	0.2885	0.2885	0.3016	0.3199	0.3398	0.3526	0.3579	0.3852	0.3847	0.3992
Fuyang	0.5299	0.5347	0.5513	0.5084	0.4822	0.4749	0.4974	0.5113	0.5407	0.5588
Huainan	0.1390	0.1391	0.1509	0.2056	0.2303	0.2410	0.2612	0.2784	0.2802	0.2859
Chuzhou	0.2725	0.2681	0.2718	0.2686	0.2756	0.2811	0.2972	0.3143	0.3262	0.3427
Lu'an	0.4318	0.4225	0.4134	0.3230	0.2988	0.3040	0.3117	0.3284	0.3280	0.3358
Ma'anshan	0.1563	0.1358	0.1804	0.1864	0.2003	0.2073	0.2183	0.2230	0.2459	0.2617
Wuhu	0.2035	0.2036	0.2264	0.2246	0.2396	0.2462	0.2550	0.2737	0.3137	0.3414
Xuancheng	0.1356	0.1487	0.1517	0.1571	0.1746	0.1783	0.1875	0.2001	0.2119	0.2283
Tongling	0.0691	0.0872	0.1248	0.1176	0.1376	0.1454	0.1591	0.1632	0.1758	0.1833
Chizhou	0.0994	0.1002	0.1075	0.1073	0.1167	0.1257	0.1334	0.1436	0.1507	0.1605
Anqing	0.4068	0.4091	0.3965	0.3746	0.3518	0.3548	0.2732	0.2993	0.3111	0.3178
Huangshan	0.1920	0.2006	0.2032	0.2100	0.2147	0.2173	0.2291	0.2417	0.2520	0.2633

5. Empirical Research on the Impact of Green Finance on Rural Revitalization

5.1. Data Sources and Variable Selection

5.1.1. Data Sources

This paper takes the panel data of 16 cities in Anhui Province from 2012 to 2021 as the research object, and empirically analyzes the impact of China's green finance on the development of rural revitalization by constructing a model. The development level of rural revitalization in this paper has been calculated by the entropy method, and the original data of other variables are all obtained from the Anhui Statistical Yearbook and the statistical yearbooks of various provinces. The data sources are authoritative and objective, which helps this paper to draw accurate conclusions from the empirical analysis.

5.1.2. Variable Selection and Explanation

(1) Explained Variable: Rural Revitalization Comprehensive Index (RRI)

Considering the availability of municipal data, 6 second-level indicators are selected to construct a measurement index system for the development level of rural revitalization, and the entropy method is used to measure the comprehensive score of the rural development level of 16 cities in Anhui Province over the 10 years from 2012 to 2021. See Table 5.1 for details.

(2) Core Explanatory Variables: Green Insurance (LNGS) and Green Investment (LNGI)

Considering the availability of municipal green finance data in Anhui Province, this paper refers to Ma Jun (2023) who believes that green insurance can externalize environmental risks through insurance premiums, indirectly increase the cost of polluting projects, thus inhibiting polluting investment. It is in line with the purpose of green finance to improve the existing ecological environment and promote sustainable environmental development; therefore, the paper selects green insurance (LNGS) as one of the core explanatory variables, which is specifically measured by agricultural insurance premium income. Referring to Tian Hanbo (2023) who believes that green investment (LNGI) is mainly green funds led by the government and invested in infrastructure construction projects such as pollution prevention, ecological governance and environmental improvement, so this paper uses energy conservation and environmental protection public expenditure as a proxy variable for green investment.

(3) Control Variables: This paper draws on the practice of Ouyang Hongbing and Wu Xinke (2022) and selects the following four aspects of control variables. Economic Development Level (LNPGDP): This paper uses per capita GDP to represent the economic development level of each city; Rural Employment Level (LNREP): This paper uses the number of employees in agriculture, forestry, animal husbandry and fishery to represent; Industrial Level (LNGY): This paper uses the total industrial output value to measure; Financial Development Level (LNFIN): This paper uses the deposit and loan balance of financial institutions to measure this indicator.

Table 3 summarizes the name, category, unit and variable explanation of each variable.

Table 3. Variable Explanation

Variable Category	Variable Name	Symbol	Measurement Method
Explained Variable	Rural Revitalization Development Level	RRI	Entropy Method
Core Explanatory Variables	Green Insurance	LNGS	Agricultural insurance premium income
	Green Investment	LNGI	Public expenditure on energyconservation and environmental protection
Control Variables	Economic Development Level	LNPGDP	Per capita GDP
	Rural Employment Level	LNREP	Number of employees in agriculture, forestry, animal husbandry and fishery
	Industrial Development Level	LNGY	Total industrial output value
	Financial Development Level	LNFIN	Deposit and loan balance of financial institutions

5.1.3. Descriptive Statistics of Variables

This paper selects 160 sample data, and Table 4 conducts descriptive statistics on each variable, and the statistical results are as follows.

Table 4. Descriptive Statistics of Each Variable

Variable Name	Sample Size	Mean	Variance	Minimum	Maximum
RRI	160	0.291	0.123	0.070	0.559
LNGI	160	10.420	0.977	8.147	13.000
LNGS	160	4.795	0.757	2.166	6.442
LNPGDP	160	10.650	0.517	9.443	11.710
LNREP	160	6.948	1.542	1.609	9.754
LNGY	160	6.287	0.629	5.024	7.959
LNFIN	160	6.148	0.812	4.198	8.015

According to the statistical data in the above table, the maximum value of the rural revitalization development level reaches 0.559, while the minimum value is only 0.070. This data difference reveals the imbalance of rural development in different years and regions. This imbalance is consistent with the actual situation of China's current rural development and reflects the diversity of regional development levels. In addition, the standard deviation is 0.123, which further confirms the relative stability and low volatility of the data sequence. In the field of green finance, the maximum value of green investment is 13 and the minimum value is 8.147; the maximum value of green insurance is as high as 6.442 and the minimum value is 2.166. The difference between the maximum and minimum values of these two indicators reflects the difference in the development level of green finance in various regions of China. This difference stems from the differences in economic development, green environmental protection awareness and other aspects between the eastern and western regions of China, and highlights the problem of unbalanced regional development in China. To further understand this imbalance and its causes, we need to conduct heterogeneity analysis.

5.2. Model Setting

From the perspective of green finance, this paper studies the impact of green finance on the development level of rural revitalization in Anhui Province. This paper uses panel data to conduct an empirical analysis of the data of 16 cities in Anhui Province from 2012 to 2021, and constructs the following panel data model:

$$RRI_{it} = \beta_0 + \beta_1LNGI_{it} + \beta_2LNGS_{it} + \beta_3LNPGDP_{it} + \beta_4LNREP_{it} + \beta_5LNGY_{it} + \beta_6LNFIN_{it} + \beta_t + \varepsilon_{it} \quad (6)$$

Among them, RRI_{it} is the rural revitalization development level of each city in Anhui Province every year; $LNGI_{it}$ and $LNGS_{it}$ are the core explanatory variables of green investment and green insurance; $LNPGDP_{it}$, $LNREP_{it}$, $LNGY_{it}$ and $LNFIN_{it}$ respectively represent the economic development level, rural population situation, industrial development level and financial development level of each city every year; α is the intercept term, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the to-be-estimated coefficients, λ_t represents the time point impact, and μ_{it} is the random error term.

5.3. Empirical Results and Analysis

5.3.1. Multicollinearity Test

Stata17.0 is used to conduct a multicollinearity test on the empirical model, and the test results are shown in Table 5.

Table 5. Multicollinearity Test Results

Variable	VIF	1/VIF
LNGI	1.61	0.622741
LNGS	3.91	0.255798
LNPGDP	5.41	0.184860
LNREP	1.12	0.184860
LNGY	3.80	0.263012
LNFIN	1.78	0.561382
Mean VIF	2.94	

The higher the VIF value, the more significant the collinearity phenomenon between the explanatory variable and the dependent variable. According to the widely recognized multicollinearity evaluation standard in the industry, when the maximum VIF value is kept below 10, we can think that the model is not affected by the significant multicollinearity problem. It can be seen from the table that the maximum VIF is 5.41 and the mean value is 2.94, so the model has no collinearity problem.

5.3.2. Correlation Test

Correlation analysis is carried out through the empirical model. From the results, green investment and green insurance are significantly positively correlated with the explained variable rural revitalization development level at the 1% significant level, and the coefficient of green insurance exceeds 0.5. The specific results are shown in the following table.

Table 6. Correlation Analysis

	RRI	LNGI	LNGS	LNP GDP	LNREP	LNGY	LNFIN
RRI	1						
LNGI	0.169***	1					
LNGS	0.657***	-0.196**	1				
LNP GDP	-0.30***	0.558***	-0.563***	1			
LNREP	0.179***	0.024	0.287***	-0.113	1		
LNGY	0.359***	0.416***	0.226***	0.546***	0.094	1	
LNFIN	0.627***	0.377***	0.315***	0.229***	0.222***	0.587***	1

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels respectively.

5.3.3. Regression Analysis

After determining the use of the fixed effect model, Stata17.0 is used to conduct time fixed effect regression, and the results are shown in Table 7.

Table 7. Time Fixed Effect Regression Results

Variable Name	Coef.
LNGI	0.035***
	(0.006)
LNGS	0.041**
	(0.016)
LNP GDP	-0.180***
	(0.023)
LNREP	-0.005
	(0.003)
LNGY	0.081**
	(0.016)
LNFIN	0.032***
	(0.012)
cons	0.933***
	(0.227)

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels respectively.

From the regression results, the regression coefficient of the core explanatory variable - green investment level is significant at the 1% significance level, and the regression coefficient of green insurance level is significant at the 5% significance level, and it is positively correlated with the explained variable rural revitalization. Therefore, through regression analysis, we can initially draw the conclusion that the hypothesis of this paper is verified, that is, the development of green finance in Anhui Province can indeed promote the improvement of the rural revitalization level. However, although green finance plays a key role in rural revitalization, the supply of green finance in rural

areas of China may still have a large gap. Green financial tools such as green credit and green bonds in various cities of Anhui Province have played an important role in rural revitalization. However, limited by data availability, the indicators used in this paper to evaluate the level of green finance are not comprehensive, lacking detailed data on rural green credit and green bonds, which may lead to a relatively small regression coefficient of green finance. Secondly, among the control variables, per capita GDP is significantly negatively correlated with rural revitalization. After analyzing the population situation and economic situation of each city in Anhui Province, the following conclusions are drawn: As the cradle of the "household contract responsibility system", Anhui Province is a typical major agricultural province, and it is also located in the central region with a slightly weak economy. In terms of the income gap between urban and rural residents, Anhui Province is consistent with the overall national trend, especially in the past ten years, the growth rate of per capita net income of rural residents in Anhui Province has obviously lagged the growth rate of disposable income of urban residents. Moreover, the gap between the rich and the poor in southern and northern Anhui is obvious, such as Fuyang, Chuzhou, Bozhou and other cities in northern Anhui, which are all large agricultural cities with a large population in various cities of Anhui, but the per capita GDP of these cities is not high. Therefore, when the per capita GDP rises, it is likely to be driven by cities with a small population and a high urbanization rate, but the agricultural development of cities with a large population but underdeveloped economy has not been improved, resulting in the phenomenon that urban areas are getting richer and rural areas are getting poorer, so per capita GDP is negatively correlated with rural revitalization.

5.3.4. Robustness Test

(1) Reduce Samples

In view of the severe situation during the epidemic period, to effectively implement the strategy of "strictly preventing external input and curbing internal spread", many rural areas have adopted strict prevention and control measures, including blocking the access roads of villages and implementing strict control over the flow of vehicles and personnel. These practices have caused huge short-term damage to the "three rural issues", thus hindering the smooth implementation of the rural revitalization strategy to a considerable extent. Therefore, to reduce the fluctuation and error of research results caused by the impact of the epidemic, this paper will conduct a robustness test by excluding the sample data of 2020 and 2021. The time fixed effect regression results are shown in Table 8. The results show that after excluding the sample data during the epidemic period, the regression model is still significant. Therefore, the regression results used in the previous demonstration are stable.

Table 8. Time Fixed Effect Regression Results (Excluding 2020-2021)

Variable Name	Coef.
LNGI	0.036*** (0.007)
LNGS	0.064*** (0.018)
LNPGDP	-0.161*** (0.026)
LNREP	-0.005 (0.003)
LNGY	0.069** (0.018)
LNFIN	0.024*** (0.012)
cons	0.724*** (0.256)

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels respectively.

(2) Reduce Control Variables in Turn

To ensure the robustness and reliability of the research conclusions of this paper, this paper draws on Tian Hanbo (2023) and adopts the method of gradually reducing control variables for robustness test. Because of the above regression model, the four control variables of financial development level, industrial development level, rural employment level and economic development level are reduced in turn, and the regression results are shown in Table 9. The results show that the core explanatory variables have not changed at the 5% significance level when the control variables are reduced in turn, so it can be concluded that the time fixed effect regression results are robust.

Table 9. Time Fixed Effect Regression Results (Gradual Reduction of Control Variables)

Variable Name	Model 1	Model 2	Model 3	Model 4	Model 5
LNGI	0.035*** (0.006)	0.036*** (0.007)	0.037*** (0.007)	0.036*** (0.007)	0.020*** (0.006)
LNGS	0.041** (0.014)	0.056*** (0.013)	0.120*** (0.012)	0.117*** (0.011)	0.137*** (0.011)
LNPGDP	-0.180*** (0.023)	-0.184** (0.022)	-0.069*** (0.014)	-0.069*** (0.014)	
LNREP	-0.005 (0.003)	-0.003 (0.004)	-0.004 (0.003)		
LNGY	0.081*** (0.016)	0.095*** (0.016)			
LNFIN	0.032*** (0.012)				
cons	0.933*** (0.227)	0.951*** (0.219)	0.009 (0.190)	0.000 (0.191)	-0.661*** (0.088)

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels respectively.

5.3.5. Heterogeneity Analysis

To further analyze the differences in the effect of green finance on boosting rural revitalization in different regions, combined with geographical location, Anhui Province is subdivided into three major regions: eastern, central and western. Subsequently, regression analysis was carried out respectively based on the specific data of these three different regions to reveal the regional role of green finance in rural revitalization.

(1) Regional Division

According to the geographical location of each city in Anhui Province, 16 cities in Anhui Province are subdivided into three major regions: eastern, central and western. Among them, the eastern region includes Chuzhou, Wuhu, Xuancheng, Huangshan and Ma'anshan; the central region includes Suzhou, Bengbu, Huainan, Hefei, Chizhou, Huaibei, Tongling and Anqing; the western region includes Fuyang, Lu'an and Bozhou. The regional division is shown in Table 10.

Table 10. Regional Division

Region	Cities
Eastern	Chuzhou, Wuhu, Xuancheng, Huangshan, Ma'anshan
Central	Suzhou, Bengbu, Huainan, Hefei, Chizhou, Huaibei, Tongling, Anqing
Western	Fuyang, Lu'an, Bozhou

(2) Empirical Results and Analysis

The panel data from 2012 to 2021 are divided into three regions: eastern, central and western, and the fixed effect model is used for empirical analysis. The results are shown in Table 11.

Table 11. Heterogeneity Regression Results

Variable Name	Eastern Region	Central Region	Western Region
LNGI	0.025*** (0.004)	0.012 (0.009)	-0.034 (0.026)
LNGS	0.141*** (0.022)	0.034* (0.019)	-0.090 (0.083)
LNPGDP	0.192*** (0.062)	-0.114*** (0.026)	-0.616** (0.225)
LNREP	0.003 (0.009)	-0.002 (0.003)	-0.015 (0.018)
LNGY	-0.103*** (0.024)	0.099*** (0.015)	0.097 (0.114)
LNFIN	0.013 (0.013)	0.055*** (0.016)	0.145 (0.158)
_cons	-2.255*** (0.670)	0.271 (0.241)	5.929** (2.700)
Observations	50	80	30
R-squared	0.865	0.860	0.886

*Note: *, **, *** indicate significance at the 10%, 5% and 1% levels respectively.

The results show that in the eastern region, both green insurance and green investment are significantly positive at the 1% significance level. For every 1% increase in green investment and green insurance, the development level of rural revitalization increases by 0.025% and 0.141% respectively, indicating that the investment in green insurance in the eastern region can drive the rural revitalization level more effectively than green investment.

In the central region, green insurance passes the significance test, while green investment does not. For every 1% increase in green insurance in the central region, the rural revitalization level increases by 0.034%. Therefore, compared with the eastern region, the central region is more suitable for the investment of green insurance to boost rural revitalization.

However, in the western region, neither of the two core explanatory variables passes the significance test. The possible explanations for this are as follows:

(1) The eastern region has a high level of urbanization and a sound economic environment, with complete environmental protection infrastructure and greater emphasis on rural construction. Therefore, a relatively large proportion of government public expenditure on energy conservation and environmental protection flows to rural areas, which can more effectively carry out pollution prevention, ecological governance and other work, thus promoting rural revitalization more effectively. In the central and western regions, due to the low level of urbanization, government public expenditure may flow more to urban areas.

(2) The western region has a low level of financial industry development, and the structure of agricultural insurance needs to be optimized. The current insurance coverage is limited and fails to fully cover farmers' risk exposure. Secondly, the innovation of insurance products is insufficient, making it difficult to meet the diversified agricultural needs of the western region. Furthermore, farmers in the western region generally have a low awareness of insurance, and their limited income further reduces their enthusiasm for purchasing insurance.

6. Conclusions and Suggestions

This paper selects the panel data of 16 cities in Anhui Province from 2012 to 2021 as the research sample to explore the impact of green finance on the development of rural revitalization in Anhui Province. The following conclusions are drawn through empirical analysis:

First, overall, green finance has shown a significant positive role in promoting rural revitalization. Green investment and green insurance have played a pivotal supporting role in advancing rural

revitalization, injecting a steady stream of impetus into the prosperity of industries, livable ecology, civilized rural customs and affluent living standards.

Second, further heterogeneity analysis of Anhui Province divided into eastern, central and western regions shows that green finance in the eastern region has a particularly significant positive impact on promoting rural revitalization. In the central region, only green insurance has a significant promoting effect on rural revitalization, while in the western region, both green investment and green insurance have no significant supporting effect on rural revitalization.

To sum up, green financial products in different regions show different characteristics and effects in promoting rural development. When formulating relevant policies and strategies, regional differences should be fully considered to ensure the precise allocation of green financial resources and effectively promote the all-round development of rural revitalization. Based on the above empirical results and analysis, this paper puts forward the following suggestions:

6.1. Strengthen the Guiding Role of Policies

In the process of promoting the development of green finance, the primary task is to strengthen the guiding role of policies and ensure the balanced and coordinated development of green finance across different regions. In view of the regional heterogeneity characteristics of green finance in rural revitalization, we should conduct an in-depth analysis of the differences in insurance types, agricultural insurance promotion and financial support among various regions, and then provide more targeted support, incentives and guarantees at the policy level. For the western region with weak green finance driving effect, targeted policy tilt should be implemented, such as increasing financial transfer payments, setting up special green finance development funds for rural areas, and encouraging financial institutions to increase their layout in the western rural areas.

6.2. Enrich the Forms of Rural Financial Products and Services

Although the demand for green development of rural revitalization is increasingly prominent, the current supply of green financial services is relatively insufficient and the product structure is single, which is largely due to the relatively weak financial infrastructure in rural areas, such as the small number of commercial bank branches. To effectively solve this problem, we need to start from multiple dimensions: on the one hand, we should increase policy guidance, actively encourage the issuance of green bonds, and promote their in-depth integration with green ecological agriculture, rural environmental governance and resource conservation and utilization projects; on the other hand, we need to strengthen the construction of financial infrastructure in rural areas to provide strong support for the in-depth development of green finance, and encourage the emergence of new rural financial institutions in various forms to enrich the supply of rural financial services and make them more effective in meeting the diversified financial needs of rural revitalization.

6.3. Improve the Green Financial Service Platform and Corresponding Supporting Mechanisms

The government should carefully formulate a series of strategic policies and regulations to encourage green investment and green insurance behaviors, and promote the establishment and operation of green financial institutions. To enhance the transparency and traceability of green finance, the government should strive to build a green finance database and information platform, centrally collect, sort out and share relevant data and information, and provide investors with comprehensive and accurate reference and decision-making basis. At the same time, it is necessary to improve the risk compensation mechanism for green finance in rural areas, establish a risk sharing system among the government, financial institutions and enterprises, reduce the risk of green financial business in rural areas, and enhance the enthusiasm of financial institutions to carry out rural green financial business. These measures will help optimize the allocation of green financial resources, promote the deep integration of green finance and the real economy, and provide strong support for achieving the goal of green development.

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