Study on the influence path and mechanism of green finance enabling rural revitalization

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Abstract

Under the goal of "carbon neutrality and carbon peak", the development of green finance is an effective way to achieve rural revitalization. Based on the panel data of provinces, cities and autonomous regions in China from 2012 to 2022, this paper adopts fixed effect model and intermediary effect model to study the impact of green finance on rural revitalization, as well as the intermediary effect of innovation and entrepreneurial vitality on green finance and rural revitalization. The research results show that green finance has a significant positive impact on rural revitalization. Green finance can enhance the vitality of rural innovation and entrepreneurship and promote rural revitalization and development. This conclusion puts forward policy suggestions such as innovating rural green finance products and services, building rural green finance risk control system, and improving the policy supporting mechanism of rural green finance.

Keywords

Green finance;rural revitalization; vitality of innovation and entrepreneurship.

1. Introduction

Rural revitalization is revitalization under the guidance of high-quality development, with the goal of economic growth and ecological protection, to build a sustainable industrial structure and production model, and ultimately to achieve village beauty and people rich industrial prosperity. The report of the 20th CPC National Congress pointed out that high-quality rural economic development should follow the concept of green development, and rural revitalization is no longer the sole goal of maximizing economic benefits, but pays more attention to the protection of the ecological environment. The report of the 20th Congress further pointed out that the green transformation of the development mode should be accelerated. Different from traditional finance, green finance responds to the national call of "carbon neutrality, carbon peak", guides resources to high value-added, green environmental protection projects, gives more policy inclination to green industries, promotes the green transformation of rural industries, and is unified with the environmentally friendly concept in the rural revitalization strategy. Therefore, green finance helps rural revitalization. It is not only a key step for the country to transition from old to new growth drivers, but also the only way to successfully complete rural poverty alleviation and prosperity.

2. Literature review

In terms of the impact of green finance on rural revitalization, most scholars have demonstrated the positive impact of green finance on rural revitalization both theoretically and empirically. Ouyang Hongbing and Wu Xinke[1] believe that green finance promotes rural development, and green credit and green insurance significantly promote rural revitalization. Zuo Zhenglong[2] theoretically analyzed the path of green finance to help rural revitalization, and also put

forward the current dilemma of green finance to help rural revitalization, and thus put forward relevant policy suggestions. Yang Shiwei[3] believes that the promotion of rural development by green finance is compatible with green development. Chang Yongjia [4]found that green finance can provide sufficient financial support to promote high-quality rural development, and also pointed out that rural areas are currently facing problems such as unreasonable industrial structure and imperfect supporting policies.

In terms of how to promote green finance to help rural revitalization, many scholars have put forward diversified opinions on the mechanism of green finance to help rural revitalization and the current predicament. Dong Ning[5] believes that small and medium-sized rural financial institutions should be focused on guiding them to carry out green financial services, while innovating agricultural green financial products and services to increase the availability of enterprise funds. Zhang Tingting[6] found in her research that the impact of rural finance on rural economy presents different characteristics among regions, and put forward suggestions from various aspects such as financial institution support system, insurance system and policy system. Wen Qiujie[7] put forward suggestions such as establishing the development concept of rural green finance, constructing the risk control system of rural green finance, and constructing the professional talent training system of green finance.

To sum up, green finance has an important impact on the promotion of rural revitalization process. However, most domestic scholars still stay in the theoretical stage for the path of green finance to help rural revitalization, and there are few researches on quantitative analysis, which has great limitations and needs to be further deepened. The marginal contribution of this paper is mainly as follows: (1) Establish an appropriate index system, and study the influence path of green finance on rural revitalization through theoretical and empirical analysis. (2) According to the empirical results, and combined with the current predicament of green finance to help rural revitalization, corresponding policy recommendations are put forward.

3. Theoretical analysis and research hypothesis

Rural enterprises have always been faced with the problem of lack of financing channels. On the one hand, rural enterprises lack credit guarantee, resulting in financing difficulties. Due to the small scale of rural enterprises and imperfect financial materials, rural enterprises have also brought accounting problems to financial enterprises, raising the cost of providing loans for financial enterprises. It provides a direct source of funds for rural green industries and alleviates the problem of difficult and expensive financing for rural enterprises. At the same time, with the goal of sustainable development, green finance invests differentiated credit funds to provide more credit concessions and loan facilities to green environmental protection industries and high value-added green ecological rural enterprises, promote the transformation of traditional agriculture to green environmental protection enterprises, promote the transformation of green agriculture, and guide the upgrading of rural agricultural industries. Thus, green finance can help rural industries thrive.

Green finance supports rural projects such as environmental protection and residential environment restoration, and also provides strong financial support for public services such as rural sewage treatment and domestic waste treatment, optimizing the rural ecological environment and residents' living environment. Therefore, green finance can promote the ecological livability of rural areas.

Green finance knowledge education can help rural residents understand national policies, green finance knowledge dissemination can optimize rural financial ecology, and reduce the possibility of financial fraud; Green financial regulations can promote the formation of villagers' sense of integrity, the maintenance of rural financial order and the construction of a harmonious financial operating environment. Green finance education and green finance

regulations are important components of rural financial social norms. Therefore, green finance can promote the construction of rural civilization and effective governance.

Green finance can increase people's income by promoting industrial development. Through the evaluation of ecological protection and environmental governance, projects with development potential and high added value are selected, so that funds can flow to projects with strong viability and improve rural economy. Meanwhile, green insurance can significantly reduce agricultural losses caused by uncertain factors such as climate and natural disasters, and protect agricultural assets. It also provides guarantees for rural enterprises to apply for loans, increasing the availability of funds and thus increasing farmers' incomes. Therefore, green finance can promote farmers to live a better life.

Based on the above analysis, this paper puts forward hypothesis 1: Green finance can promote rural revitalization.

Green finance provides a good environment for innovation and entrepreneurship. Green finance increases the availability of funds, enabling rural enterprises to make use of sufficient funds for technological innovation and research and development. By constantly innovating green financial services and products, green finance enterprises broaden their financing channels and solve the financing difficulties of small, medium and micro enterprises. At the same time, the intertemporal risk dispersion function of the green financial market can reduce the property losses of enterprises in the process of innovation and entrepreneurship, enhance the confidence of rural enterprises in innovation and entrepreneurship, and stimulate the vitality of rural enterprises in innovation and entrepreneurship.

Based on the above analysis, this paper puts forward hypothesis 2: Green finance can enhance rural innovation and entrepreneurship vitality and promote rural revitalization and development.

4. Research design

4.1. Data source and variable selection

The data mainly came from China Statistical Yearbook, China Rural Statistical Yearbook, China Insurance Statistical Yearbook ESP database, WIND database, etc., and comprehensively selected the panel data of China's provinces and autonomous regions from 2012 to 2022 (excluding Tibet and Hong Kong, Macao and Taiwan). The missing small amount of data was supplemented by interpolation method.

4.1.1. Explanatory variables

Green credit, green insurance, green investment, green credit is measured by the balance of agriculture-related loans, green insurance is measured by agricultural premium income, green investment is measured by public expenditure on energy conservation and environmental protection. The vitality of innovation and entrepreneurship is measured by investment in innovation research and development.

4.1.2. Explained variables

According to the general requirements of "prosperous industry, livable ecology, civilized village style, effective governance, and prosperous life" for rural revitalization,

(1) The industry is thriving

Industrial prosperity is the cornerstone of rural revitalization, mainly measured by grain output, irrigated area of arable land, and the total power of agricultural machinery.

(2) Ecological livable

Ecological livability is the guarantee of rural revitalization, mainly measured by the rate of sanitary toilet renovation, sewage treatment, and domestic garbage removal.

(3) Rural civilization

Rural culture is the soul of rural revitalization, which is mainly measured by the average years of education of rural residents, rural fiscal education funds, and net enrollment rate of school-age children.

(4) Effective governance

Effective governance is the core of rural revitalization, which is mainly measured by the number of rural subsistence allowances and the average standard of subsistence allowances.

(5) Live well

Prosperity is the goal of rural revitalization, which is mainly measured by the per capita income of rural residents, the urbanization rate and the registered unemployment rate.

Table 1 Comprehensive evaluation system of rural revitalization

Primary index	Secondary index	Direction of influence
Prosperous industry	Grain output	+
	Irrigated area of cultivated land	+
	Total power of agricultural machinery	+
Ecological habitability	Rate of sanitary toilet renovation	+
	Sewage treatment	+
	Domestic garbage removal volume	+
Rural culture	Average years of schooling for rural residents	+
	Rural fiscal education funds	+
	Net enrolment rate of school-age children	+
Effective governance	The number of rural subsistence allowances	−
	Minimum security average standard	+
Be well off	Per capita income of rural residents	+
	Urbanization rate	+
	Registered unemployment rate	−

4.1.3. Control variables

Based on the research results of Ouyang Hongbing et al., the control variable selected in this paper is the level of economic development. The higher the level of regional economic development, the greater the degree of support for rural areas and the faster the process of rural revitalization. Population level, the lower the degree of population aging, the higher the quality of the population, the higher the vitality of rural innovation and entrepreneurship, which is conducive to promoting rural revitalization. The industrial structure, the secondary industry accounts for a relatively high area, the economic development is more rapid, the ecological environment is better. Financial infrastructure: The better the financial infrastructure, the higher the availability of funds for residents, thus enhancing the rural economy.

Table 2 Main variable definition table

variable	Variable meaning	Measurement method
ECO	Level of economic development	Per capita GDP
POP	Population level	Rural population

IDU	Industrial structure	Value added of secondary industry /GDP
FC	Financial infrastructure	Business outlets of rural financial institutions

4.2. Model setting

4.2.1. Regression model setting

In order to consider the impact of green finance on rural revitalization, the model is set as follows:

$$RURALD_{it} = \beta_0 + \beta_1 Grf_{it} + \beta_2 \sum Ctrl_{it} + \delta_i + \theta_t + \varepsilon_{it} \qquad (1)$$

Where, $RURALD_{it}$ is the rural revitalization and development index of region i in year t, including the index of industrial prosperity, ecological livability, rural culture and civilization, effective governance, and prosperity; Grf_{it} is the green finance index of region i in year t, $CTRL_{it}$ is the control variable, δ_i is the fixed effect of province, θ_t is the fixed effect of year, and ε_{it} is the residual term.

In order to verify the intermediary effect of rural innovation and entrepreneurship vitality on green finance and rural revitalization and development, this paper draws on the intermediary effect test method proposed by Wen Zhonglin et al. [8]and sets the model as follows:

$$RURALD_{it} = \beta_0 + \beta_1 Ino_{it} + \beta_2 \sum Ctrl_{it} + \delta_i + \theta_t + \varepsilon_{it} \qquad (2)$$
$$Ino_{it} = \alpha_0 + \alpha_1 Ino_{it} + \alpha_2 \sum Ctrl_{it} + \delta_i + \theta_t + \varepsilon_{it} \qquad (3)$$
$$RURALD_{it} = \gamma_0 + \gamma_1 Ino_{it} + \gamma_2 \sum Ctrl_{it} + \delta_i + \theta_t + \varepsilon_{it} \qquad (4)$$

Among them, Ino_{it} is the innovation and entrepreneurship vitality of region i in t year.

4.2.2. Data processing and descriptive statistics

Since there are positive indicators and negative indicators in the indicators, each indicator is standardized first:

$$\text{Forward indicator:} Y_{ijt} = \frac{X_{ij} - minX_{ij}}{maxX_{ij} - minX_{ij}} 0.01 \qquad (5)$$

$$\text{Negative indicator:} Y_{ijt} = \frac{maxX_{ij} - X_{ij}}{maxX_{ij} - minX_{ij}} + 0.01 \qquad (6)$$

$$\text{Normalized processing:} P_{ijt} = \frac{Y_{ijt}}{\sum_{t=1}^{k} \sum_{i=1}^{m} Y_{ijt}} \qquad (7)$$

$$\text{Calculated entropy:} E_j = -\frac{1}{\ln(m \times k)} \sum_{t=1}^{k} \sum_{i=1}^{m} P_{ijt} \ln(P_{ijt}) \qquad (8)$$

$$\text{Calculate the redundancy:} D_j = 1 - E_j \qquad (9)$$

$$\text{Calculated weight:} W_j = \frac{D_j}{\sum_{j=1}^{n} D_j} \qquad (10)$$

Descriptive statistics were made on the data.

Table 3 Descriptive statistics of each variable

Variable	Sample size	Mean value	Standard deviation	Minimum value	Maximum value
Comprehensive index of rural revitalization	270	0.401	0.109	0.087	0.679
Comprehensive level of green finance development	270	8.711	0.806	5.041	8.634
Level of economic development	270	5.791	2.701	2.310	16.431

Population level	270	7.210	0.885	5.519	8.574
Industrial structure	270	9.003	0.980	6.175	10.578
Financial infrastructure	270	7.536	0.875	2.636	8.779

4.3. Empirical results and analysis

Model (1) is used for regression, and the results are shown in the following table. From column (1), it can be seen that the regression coefficient of green finance is 0.025, which is significant at the 10% level, verifying hypothesis 1, that is, green finance can significantly promote rural revitalization. Model (2) is used for regression. According to column (2), the regression coefficient of innovation and entrepreneurship vitality is 0.031, which is significant at 1% level, that is, innovation and entrepreneurship vitality promote rural revitalization and development. At the same time, industrial structure and financial infrastructure also play a significant role in promoting rural revitalization. Therefore, accelerating the transformation and upgrading of industrial structure and increasing financial infrastructure services are conducive to the advancement of the rural revitalization strategy.

Table 4 Baseline regression

variable	(1)	(2)
Grf	0.025*	
Ino		0.031***
ECO	0.032	0.027
POP	-0.006*	-0.008*
IDU	0.021***	0.040***
FC	0.008***	0.009***
Cosntant	-0.074	-0.032
Time-fixed effect	YES	YES
Provincial fixed effect	YES	YES
N	270	270
R2	0.951	0.970
F	151.33	165.41

Note: ***, ** and * are significant at the level of 1%, 5% and 10% respectively; The same below Models (2), (3) and (4) are used for regression, and the results are shown in the following table. It can be seen from column (1) that the regression coefficient of green finance is 0.025, which is significant at the 10% level, verifying hypothesis 1: green finance can significantly promote rural revitalization. It can be seen from column (2) that the regression coefficient of green finance is 0.181, which is significant at the 10% level, indicating that green finance can improve the vitality of innovation and entrepreneurship. (3) The regression coefficient of innovation and entrepreneurship vitality is 0.027, which is significant at 1% level, indicating that innovation and entrepreneurship vitality plays an intermediary effect in green finance's contribution to rural revitalization, that is, green finance can enhance rural innovation and entrepreneurship vitality and promote rural revitalization and development, verifying hypothesis 2.

Table 5 Mediation test

variable	(1)	(2)	(3)
Grf	0.025*	0.181*	0.020
Ino			0.027***

ECO	0.032	0.272**	0.016
POP	-0.006*	0.012	-0.008*
IDU	0.021***	-0.019***	0.023***
FC	0.008***	-0.173*	0.012
Constant	-0.074	-1.009	-0.038
Time-fixed effect	YES	YES	YES
Provincial fixed effect	YES	YES	YES
N	270	270	270
R2	0.951	0.702	0.963
F	151.33	20.54	155.62

5. Conclusions and Suggestions

This paper selected the panel data of provinces, cities and autonomous regions in China from 2012 to 2022 (excluding Tibet and Hong Kong, Macao and Taiwan) for measurement, and empirically analyzed the impact mechanism of green finance on rural transformation. It is concluded that green finance has a significant positive impact on rural revitalization. At the same time, green finance has improved the innovation and entrepreneurship vitality of rural enterprises, thus promoting the process of rural revitalization strategy. However, the current green finance still faces problems such as imperfect supporting mechanism, slow progress of green finance, weak rural industrial foundation, and weak green production power. Based on the empirical results of this paper, combined with the current needs of green finance in rural areas, this paper puts forward the following suggestions:

5.1. Innovative rural green financial products and services

Promote the innovation of green credit products and increase the proportion of green credit in rural areas. Explore the innovation of green credit products based on rural property rights, and provide financial services for green product pricing, trading, mortgage guarantee and the whole industrial chain. Promote the innovation of green insurance products, promote the incremental expansion of agricultural product price insurance, enrich the types of insurance, improve the insurance capacity, establish a multi-level and multi-category green financial mortgage, guarantee and quality assurance system, and diversify the supply of funds. We will support the development of green capital markets, develop green securities, green equity and other financial instruments,

5.2. Building a risk control system for rural green finance

Only by focusing on preventing the market risks of green finance, increasing risk control efforts, and maintaining market stability can we enhance the confidence of enterprises. Improve the communication mechanism between green financial enterprises and rural enterprises, maintain market transparency, reduce information asymmetry, develop a sound green enterprise evaluation mechanism, prevent the misallocation of funds, and avoid malicious market disruption by enterprises.

5.3. Improving policy supporting mechanisms for rural green finance

Through tax incentives, financial interest discounts, guarantee funds and other policy means, give full play to the leverage role of fiscal policy to support green finance, guide funds to flow to key areas and weak links in rural areas such as ecological protection and restoration, sewage treatment, and regulate the flow of funds. Faced with the information disclosure requirements and financial soundness indicators that rural enterprises have not met, the government can

organize and build a social credit evaluation mechanism and a green information sharing platform to reduce the time and labor costs of financial enterprises.

Acknowledgements

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