

The Research on the Path of Rural Revitalization Enabled by Digital Inclusive Finance is Based on the Case Analysis of Agricultural Supply Chain Finance

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Received: 14 April 2024; Accepted: 4 May 2024; Published: 27 May 2024

Abstract:

China's development of digital inclusive finance will help alleviate the problems of agriculture, rural areas and farmers and boost rural revitalization. Taking 30 provinces in China from 2011 to 2020 as samples, this study used multiple linear regression, intermediary effect model and threshold effect model to study the impact of digital financial inclusion on rural revitalization. The findings are as follows: (1) The Digital financial inclusion index and its sub-index - the breadth of digital financial coverage and the depth of digital financial utilization - can promote rural revitalization in China, but the digitalization degree of its sub-index has no significant linear effect on rural revitalization, but a "U-shaped" relationship of first inhibition and then promotion, with 2017 as the boundary. (2) Regional heterogeneity test shows that the digital financial inclusion index and its sub-indexes, such as the coverage breadth of digital finance and the depth of use of digital finance, have a more significant role in promoting rural revitalization in the eastern coastal and central inland provinces, but not in the western remote areas. (3) The intermediary effect test found that China's digital inclusive finance can contribute to rural revitalization by promoting rural economic growth and narrowing the urban-rural income gap. (4) Threshold effect test shows that digital inclusive finance and its three sub-indexes have a single threshold effect on China's rural revitalization. When the digital financial inclusion index and the three sub-dimensions are below the threshold, they have a promoting effect on rural revitalization, and after crossing the threshold, they have a more significant promoting effect on rural revitalization. Based on the empirical analysis results, this paper puts forward suggestions on improving the development mechanism of digital inclusive finance, formulating differentiated financial support policies according to regional differences, strengthening financial supervision, establishing a long-term mechanism for rural revitalization, and promoting rural revitalization in China.

Keywords:

Digital Financial Inclusion, Rural Revitalization, Agricultural Supply Chain, Finance

1. Introduction

Since the 21st century, how to build a well-off society has become the top priority of our country's economic and social development. Starting from the strategic goal of building a moderately prosperous society in all respects, the 17th and 18th CPC National Congresses put forward requirements and strategic arrangements for the work of agriculture, rural areas and farmers. On this basis, the report of the 19th National Congress of the CPC clearly put forward the implementation of the rural revitalization strategy for the first time. It also profoundly elaborated what is the road of rural revitalization of socialism with Chinese characteristics and how to follow this road, which is a major strategic decision made by the Party Central Committee to build a well-off society, realize basic modernization, and comprehensively build a modern socialist country. It can be said that the rural revitalization strategy is the overall strategy to promote China's agricultural and rural modernization. It is the general understanding of China's future agriculture, rural areas and farmers.

This paper aims to examine the important part of digital financial inclusion in China's rural revitalization from 2011 to 2020, and explore the role of rural economic growth and unbalanced rural-urban development in this process. Therefore, this paper selects the panel data of 30 provinces in China from 2011 to 2020, comprehensively examines digital financial inclusion and its three sub-dimensions in rural revitalization, and further explores the mediating role of rural economic growth and unbalanced urban-rural development in this process.

2. Literature Review and Research Hypothesis

At present, the role of financial development in promoting rural revitalization has been empirically supported by scholars. For example, financial development significantly promotes rural revitalization, and there is a threshold effect, and the promotion effect increases with the increase of rural per capita disposable income. Zhang Dehua also found that financial development is promoting rural revitalization. We will increase the allocation of credit to rural enterprises and farmers and significantly promote rural revitalization. Driven by urbanization, rural financial elements flow to cities, resulting in problems such as insufficient varieties of single products in financial distribution and small coverage in rural areas, which ultimately lead to lagging financial development in rural areas [1]. Financial technology represented by computer database analysis technology is constantly iterated and innovated, which improves the realization of inclusive finance and provides technical feasibility for resolving the defects of traditional finance. As China enters the 5G era, digital inclusive finance is developing rapidly in China and has become an important force to support the rural revitalization strategy.

Many scholars have expanded their rural finance theories [2]. Under the influence of Keynesialism and Nakles' poverty vicious circle theory, the agricultural credit subsidy theory has become an important guiding theory to solve the problems of rural economic growth and capital demand. According to this theory, the problem of insufficient capital supply is widespread in rural areas. In order to improve agricultural production efficiency and effectively alleviate regional poverty, it is necessary to establish special government subsidy funds and non-profit inclusive financial institutions to solve the "problems of agriculture, rural areas and farmers" in China [3]. Since the 1980s, the theory of China's rural financial system has been fully developed, relying entirely on market mechanisms, emphasizing that liberalizing

interest rates can promote financial intermediaries in rural areas. Since the 1990s, scholars have found that social and non-market factors are critical to building efficient financial markets. The theory of imperfect competition accelerates the innovation level of microfinance model and helps to improve the service level of rural financial market [4]. This also lays a fertile theoretical foundation for the popularization of inclusive digital finance.

Digital inclusive finance is the product of deep integration of digital information technologies such as big data and blockchain with traditional inclusive finance. Some scholars believe that the development of digital financial inclusion can significantly promote rural revitalization in many aspects [5]. First of all, the development of digital inclusive finance effectively alleviates the exclusion of agricultural finance and enhances the accessibility of rural loans. With the help of technology, digital inclusive finance helps to optimize the adjustment of industrial system in rural areas and promote the development of new industries and new business models in rural areas, thus promoting the prosperity and development of rural industries [6]. Secondly, digital inclusive finance can give full play to the guiding role of financial resources and promote the integration of inclusive finance with rural environmental protection and green and healthy development, so as to provide financial support for green agricultural projects and promote rural ecological livability. Third, digital inclusive finance can use digital technology to change the traditional credit evaluation system, realize the joint construction and sharing of farmers' information, and improve the appearance of rural areas, while digital inclusive finance can enrich farmers' financial knowledge and promote rural civilization. Fourth, digital financial inclusion helps to build a rural governance system, provide an information sharing platform for all participants, promote digital governance means, and promote effective rural governance. To sum up, although scholars generally believe that the development of digital financial inclusion can promote rural revitalization strategies in the long run, the relationship between the two is still controversial in the short term. Therefore, we propose the following hypothesis.

H1a: The development of digital inclusive finance can make a significant contribution to rural revitalization.

H1b: Digital inclusive finance will inhibit rural revitalization to a certain extent in the short term, but it will promote rural revitalization in the long run.

H2: Digital financial inclusion contributes to rural economic development and thus rural revitalization

H3: Digital financial inclusion can help narrow the urban-rural income gap and promote rural revitalization

3. Research Design

3.1. Data Sources

The measurement of the development level of rural revitalization covers a total of 31 development indicators, mainly from the EPS database. China Energy Statistical Yearbook, China Agricultural Machinery Industry Yearbook, China Education Statistical Yearbook, China Social Statistical Yearbook and China Rural Statistical Yearbook were searched to complete the missing values, and interpolation method was used to complete the missing data for very specific indicators in individual years and regions. The Digital Financial Inclusion Index (2011-2010) released by Peking

University's Digital Financial Inclusion Index Group is mainly adopted. The index covers the period 2011-2020 and includes 33 indicators in three categories: breadth of digital financial coverage, depth of digital financial use, and digitization of financial inclusion.

3.2. Variable selection and descriptive statistics

3.2.1. Explained variable: rural revitalization

Starting from the connotation of rural revitalization, this paper draws on the research results of comprehensive evaluation of rural revitalization strategy since the 19th National Congress, and constructs a scientific and effective evaluation system from five dimensions of industrial prosperity, ecological livable, civilized countryside, effective governance, and small rich life (see Table 1). The index system mainly includes 5 first-level indicators, 15 second-level indicators and 31 third-level indicators.

Table 1. Index evaluation system of rural revitalization and development level.

First-level indexes	Second-level indexes	Third-level indexes
Industrial prosperity	Quality of agricultural development	Number of agricultural machinery power per acre
		Effective irrigated area as a proportion of cultivated area
		Value added electricity consumption in agriculture, forestry and fisheries
		Value added water use in agriculture, forestry and fisheries
		Integrated mechanization rate of tillage, seeding and harvesting of major crop
	Integration of rural industries	Urban-rural dichotomy comparison factor
Ecological livability	Domestic sewage treatment	Proportion of communes treating domestic sewage with all communes
	Latrine	Rural sanitary latrine penetration rate
	Village greening	Rural greening coverage
		Green space park area per capita in rural areas
Rural civilization	Rural cultural development	Number of cultural stations in communes
	Rural education development	Average number of years of schooling for the rural population
		Bachelor's degree or above for full-time teachers in rural compulsory education schools
		Ratio of years of schooling for urban and rural population
	Rural health pensions	Proportion of administrative villages with health posts
		Proportion of professional and technical staff village health offices
Effective governance	Rural governance development	Number of rural elderly service providers
		Number of community service centre units
	Level of rural governance	Proportion of Communist Party members among village committee heads
		Proportion of village council chiefs with a

		university degree or higher
	Rural social security	Number of rural criminal cases per 10,000 population
Rich life	Income level	Number of villagers dispute cases per 10,000 people
	Consumption level	Disposable income per rural inhabitant
		Per capita consumption expenditure of rural residents
		Ratio of per capita consumption expenditure of urban and rural residents
	Living standards	Rural gas penetration rate
		Rural road area per capita
	Level of social security	Rural social pension insurance expenditure per capita
		Per capita expenditure on new rural cooperative medical care

3.2.2. Explanatory variable: Digital financial inclusion

The Digital Financial Inclusion Index, compiled by Peking University's Digital Finance Research Center in collaboration with Ant Financial, covers the overall index of provinces, cities and some county-level cities, and includes three sub-indexes: the coverage of digital finance, the depth of digital finance use and the degree of digitalization. In 2019, Peking University released the 2011-2018 Digital Financial Inclusion Index, and in April 2021, Peking University Digital Financial Research Center released the “Peking University Digital Financial Inclusion Index (2011-2020)”, which provided data support for this paper. In this study, the provincial data of the index is the core explanatory variable. This study divides the Digital Financial Inclusion Index, Digital financial Inclusion Coverage Breadth (DIF_B), digital financial inclusion Depth (DIF_D) and digitization degree (DIG) by 200.

3.2.3. Intermediary variables: rural economic development level and urban-rural income gap

According to the above analysis, this study selects rural per capita GDP to measure the level of rural economic development. China's gross economic growth is generally expressed by GDP, but because the relevant statistical yearbook does not have the statistical level of rural GDP, on the basis of the existing literature, we use the gross value of the primary industry and the added value of the township industry to estimate the rural per capita GDP divided by. In order to reduce the absolute value of data and eliminate the problem of heteroscedasticity, the logarithm of rural per capita GDP is adopted in this paper. Choose the Thiel Index to measure the rural-urban income gap. The Gini coefficient is a basic tool for measuring the income gap between urban and rural areas, but it is sensitive only to changes in the income of the middle class. It is difficult to distinguish whether the increase in the Gini coefficient is due to a general increase in the income of all classes or a widening gap between the rich and the poor, with lower income groups having lower incomes and higher income groups having higher incomes. Based on the comparative analysis in this paper, compared with Gini coefficient, Theil index not only fully considers the influence of population, but also is more sensitive to the income changes of different classes. It can also well reflect the changes in the income of different classes and the changes in the proportion of urban and rural population. Therefore, this study chooses Theil Index to measure the urban-rural income gap.

3.2.4. Adjusting variables

The regulating variables in this paper are Diff, GS, GB and GD. Diff = DIG*DIG is the square term of digitization degree. GS represents the first-order lag term of the financial inclusion indicator as the product of time (DIF_{j,t-1}) and the first-order difference term of the digital financial inclusion indicator as it changes over time (ΔDIF_{t,t-1}). GB is the first order lag term of financial inclusion coverage multiplied by time (DIF_B_{j,t-1}) and the first order difference term of digital financial inclusion coverage in time (ΔDIF_B_{t,t-1}). GD represents the first-order lag term of the depth of financial inclusion with time (product of DIF_D_{j,t-1}) and the first-order difference term of the depth of digital financial inclusion with time (ΔDIF_D_{t,t-1}).

3.2.5. Control variables

In this study, openness to the outside world (Open) and old-age dependency ratio (Old) were selected as control variables. The degree of openness is expressed as the proportion of total imports and exports to the per capita GDP of the region. The old-age dependency ratio is expressed as the ratio of the non-working age elderly population to the working age population multiplied by 100. It is used to indicate how many elderly people need to be covered per 100 working-age people. Table 2 lists the descriptive statistics of the relevant variables.

Table 2. Descriptive statistics.

Variable name		Average value	(Statistics) standard	ynimum value	Maximum value	Observed value
Explained variables	RV	3.329	1.373	1.272	8.398	300
Explanatory variables	DIF	1.081	0.485	0.081	2.16	300
	DIF_B	0.983	0.483	0.01	1.985	300
	DIF_D	1.056	0.491	0.034	2.443	300
	DIG	1.451	0.586	0.038	2.311	300
Mediating variables	GDP	9.743	0.988	6.407	11.679	300
	Thill	0.098	0.044	0.02	0.227	300
Moderating variables	Diff	1.404	1.015	0.001	5.341	300
	GS	0.143	0.071	-0.013	0.384	300
	GB	0.132	0.065	0.002	0.309	300
	GD	0.133	0.161	-0.268	0.806	300
Control variables	Open	0.403	0.458	0.012	2.397	300
	Old	14.24	3.689	6.71	24.95	300

3.3. Model Construction

According to the research objectives, this study constructs baseline regression (equations 1-4) to investigate the impact of digital financial inclusion development on rural revitalization.

$$RV_{ijt} = \beta_0 + \beta_1 DIF_{jt} + \sum \beta_j X_{it} + \sum year + \sum city + \varepsilon_{it} \quad (1)$$

$$RV_{ijt} = \beta_0 + \beta_1 DIF_B_{jt} + \sum \beta_j X_{it} + \sum year + \sum city + \varepsilon_{it} \quad (2)$$

$$RV_{ijt} = \beta_0 + \beta_1 DIF_D_{jt} + \sum \beta_j X_{it} + \sum year + \sum city + \varepsilon_{it} \quad (3)$$

$$RV_{ijt} = \beta_0 + \beta_1 DIG_{jt} + \sum \beta_j X_{it} + \sum year + \sum city + \varepsilon_{it} \quad (4)$$

In Formula 1-4, RV is the explained variable of rural revitalization, and the specific accounting method is as follows: DIF represents the digital inclusive financial

development index. DIF_B indicates the breadth of digital financial inclusion coverage. DIF_D indicates the depth of use of digital financial inclusion. DIG represents the degree of digitization. Xi and t represent a set of control variables that may affect rural revitalization, mainly including the degree of openness to the outside world and the old-age dependency ratio (old). In order to minimize the influence of regional provinces and other factors on rural revitalization, the benchmark regression of the research paper also adopts the two-way fixed effect model of fixed year effect (year) and industry effect (Ind).

Considering the role of rural economic development and urban-rural income gap in the process of rural revitalization of digital inclusive finance, this paper establishes the following intermediary effect model. Taking the total digital inclusive finance index as an example, the intermediary effect model of its three sub-indicators is similar, which will not be further elaborated here.

$$RGDP_{ijt} = \alpha_0 + \alpha_1 DIF_{jt} + \sum \alpha_j X_{it} + \sum year + \sum city + \varepsilon_{it} \quad (5)$$

$$RV_{ijt} = \alpha_0 + \alpha_1 DIF_{jt} + RGDP_{ijt} + \sum \alpha_j X_{it} + \sum year + \sum city + \varepsilon_{it} \quad (6)$$

$$Thil_{ijt} = \alpha_0 + \alpha_1 DIF_{jt} + \sum \alpha_j X_{it} + \sum year + \sum city + \varepsilon_{it} \quad (7)$$

$$RV_{ijt} = \alpha_0 + \alpha_1 DIF_{jt} + Thil_{ijt} + \sum \alpha_j X_{it} + \sum year + \sum city + \varepsilon_{it} \quad (8)$$

In this paper, the stepwise regression method of intermediate effect test is adopted, and its general steps are as follows: If β_1 is not significant in equation 1, it indicates that the causal relationship between China's digital inclusive finance and rural revitalization is not significant, and the intermediate effect test is stopped randomly. If β_1 is significant, the regression equation in equation 5 or equation 7 is continued to test whether China's digital inclusive finance affects rural economic development and the urban-rural income gap. If α_1 is not significant, it indicates that the causal relationship between digital financial inclusion and rural economic development and China's urban-rural income gap is weak, and the intermediary effect test is terminated. If α_1 is significant, then formula 6 or 8 is entered to test whether the intermediary role of rural economic development or urban-rural income gap exists.

Considering the possible nonlinear relationship between digital financial inclusion and rural revitalization, this paper refers to the research method of regression research paper on threshold effect by Hansen, also considering that the threshold should be determined by testing, and sets the following single threshold model to finally determine the actual threshold.

$$RV_{i,t} = \alpha_0 + \beta_1 DIF_D_{i,t} I(Q \leq \gamma) + \beta_2 DIF_D_{i,t} I(Q \geq \gamma) + \theta_3 \ln X_{i,t} + \varepsilon_{i,t} \quad (9)$$

In equation 9, Q is the threshold variable; Gamma is the threshold to estimate; I (..) Is an indicative function; X I, t is the control variable, including openness and Old; And ε term, t is the random disturbance term. On the one hand, threshold regression can help determine the threshold value and threshold regression coefficient. On the other hand, it can test estimated thresholds. The advantage of this method is that it is not necessary to determine the form of the nonlinear equation, and the threshold value and its number are completely determined by the sample data. However, the disadvantage is that both the divergence interval and the sample separation point are arbitrarily chosen, rather than determined by the internal mechanism of the economy, so it is impossible to derive a confidence interval for the threshold.

4. Empirical Results and Analysis

4.1. Baseline Analysis

The baseline regression results of digital financial inclusion on rural revitalization are shown in Table 3. Model (1) shows the regression results of the digital financial inclusion index on rural revitalization. The results show that the regression coefficient of the index is 3.793, which is significant at the 1% level, indicating that the development of digital inclusive finance can significantly promote rural revitalization. Model (2) shows the regression results of the use breadth of digital financial inclusion (DIF_B) on rural revitalization. The regression coefficient is 3.288, which is significant at the 1% level, indicating that the improvement of digital financial inclusion account coverage can significantly promote rural revitalization. The possible reason for this situation is that the emergence of Internet finance represented by Alipay has expanded the coverage of finance. It has also reduced the cost of technology, improved the efficiency of financial innovation, and solved the “last kilometer” problem of rural financial reform faced by the county economy. Model (3) is the regression result of the depth of use of digital inclusive finance (DIF_D) on rural revitalization. The regression coefficient is 2.368, which is significant at the 1% level, indicating that diversified financial fund management and financing channels such as monetary fund business, credit business, insurance business and investment business can significantly promote rural revitalization. Model (4) shows the regression results of digital degree on rural revitalization; Its regression coefficient was 0.336, which failed the significance test. The likely reason is that digital degrees are measured in digital forms, such as Anthem, Sesame Credit and user QR codes, which take time to become widespread in rural areas.

Table 3. Baseline regression.

variable	(1)	(2)	(3)	(4)
	RV	RV	RV	RV
DIF	3.793***(7.51)			
DIF_B		3.288***(6.04)		
DIF_D			2.368***(8.19)	
DIG				0.336(0.78)
Open	0.686***(4.94)	0.714***(4.46)	0.823***(6.99)	1.544***(17.78)
Old	0.069***(5.29)	0.090***(6.94)	0.052***(3.87)	0.096***(7.00)
cons	0.484**(2.55)	0.421**(2.15)	0.822***(4.31)	0.428*(1.92)
N	300	300	300	300
R ² _a	0.791	0.778	0.797	0.751
F	95.342	88.422	99.054	75.985

Note: *, **, and *** indicate significant at the 10%, 5%, and 1% levels, respectively, and t-values are represented in parentheses, the same below.

In order to clarify the reason why the regression coefficient of digital index is not significant, combined with the previous theoretical analysis, we believe that the digitalization degree of digital inclusive finance has a certain time cost for rural revitalization. In other words, new digital financial services such as Ant Flower and Sesame Credit are emerging technologies, and it takes time from generation to popularization, especially in rural areas with backward information conditions and weak infrastructure. In China, there may be supply-demand misalignment in digital finance, which makes it difficult to promote and be accepted by users in the early stage. Therefore, we believe that the digitalization degree of digital financial inclusion

has a non-linear effect on rural revitalization. Under certain conditions, the digitalization degree of digital inclusive finance will inhibit rural revitalization, exceed the critical value, and promote rural revitalization. On the basis of the above analysis, on the basis of the original model, the square term of digital financial inclusion degree is added, and 2017 is taken as the time node to test the impact of digital degree on rural revitalization in stages. The regression results are shown in Table 4.

Table 4. Regression results of the nonlinear effect of digitization degree and rural revitalization.

Variable	(1)	(2)	(3)
	RV	2011-2016	2017-2020
DIF	1.228***(7.08)		
DIG	-1.683***(-3.45)	-1.531***(-2.90)	3.427*** (3.25)
Open	0.908*** (7.54)	1.379*** (15.22)	1.143*** (4.10)
Old	0.076*** (5.88)	0.075*** (4.19)	0.074*** (3.32)
_cons	1.391*** (5.63)	1.186*** (3.95)	-3.720** (-2.44)
N	300	180	120
R ² a	0.787	0.654	0.659
F	85.991	43.356	39.307

As shown in Table 4, the regression coefficient of the square term of digitization degree (Diff) in model (1) is 11.228, which is significant at 1% level. The regression coefficient of digitization degree is -1.683, which is significant at 1% level, indicating that digitization degree has nonlinear effect on rural revitalization. Model (2) shows the regression results of digitalization degree on rural revitalization from 2011 to 2016, in which the regression coefficient of digitalization degree is -1.531, which is significant at 1% level, indicating that digitalization degree will restrict the development of rural revitalization to a certain extent before 2017. Model (3) shows the regression results of digitalization degree on rural revitalization from 2017 to 2020, in which the regression coefficient of digitalization degree is 3.427, which is significantly positive at 1% level. This result shows that the digitalization of digital financial inclusion can significantly promote the development of rural revitalization since 2017. In summary, we find that the degree of digitalization has a nonlinear effect on rural revitalization, and 2017 is the critical point of the influence of digitalization degree on rural revitalization. Before 2017, the degree of digitalization will also restrict rural revitalization to a certain extent, but after 17 years, the advancement of digitalization will promote the development of rural revitalization. In addition, the work of technology enterprises represented by Taobao to take root in rural areas and help rural residents get rid of poverty and get rich has also achieved remarkable results. In the “China Taobao Village Research Report” (2017) released by AliResearch in 2017, it was pointed out that 2,118 Taobao villages and 242 Taobao towns were formed nationwide in 2017, which increased residents’ incomes and accelerated the process of rural revitalization.

4.2. Endogenous processing and robustness test

4.2.1. Endogeneity discussion

From the perspective of empirical methodology, the econometric model of this study may have insurmountable “endogenous” problems, and the rural revitalization strategy and digital inclusion may be affected by a series of unobstructed factors such as farmers’ expectations for the future and personal consumption preferences,

resulting in deviations in the estimation of the regression coefficient of digital inclusion. To avoid possible endogeneity problems in measurement, we construct GS, GB and GD indicators for the estimation of instrumental variables. Table 5 reports regression results based on variational methods. The results clearly show that the estimation coefficients of the first stage instrumental variables are significant and non-zero. The results show that after taking full account of endogeneity, digital financial inclusion still has a significant role in promoting rural revitalization. Therefore, the regression results in the previous section basically meet the robustness requirements.

Table 5. *Estimates of instrumental variables.*

variable	(1)	(2)	(3)	(4)	(5)	(6)
	2011-2016	2017-2020	2011-2016	2017-2020	2011-2016	2017-2020
DIF	0.75***(32.99)					
GS		3.737***(6.89)				
GB			1.038***(11.26)			
DIF_B				3.797***(6.03)		
GD					0.403***(8.78)	
DIF_D						2.324***(7.09)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
Annual effect	Yes	Yes	Yes	Yes	Yes	Yes
_cons	0.178***(12.66)	-2.645***(-3.09)	0.183***(4.69)	-2.809***(-2.82)	-0.417***(-6.73)	0.068(0.14)
N	270	270	270	270	270	270
R2	0.994	0.791	0.942	0.782	0.995	0.797

4.2.2. Robustness test

The influence of digitalization on rural revitalization has nonlinear effect. Given this result, will the Digital Inclusive Finance Index, digital inclusive finance coverage, and depth of use of digital inclusion also vary over time? In order to verify the stability of the empirical results, this study took 2017 as the node and carried out regression analysis with reference to the previous regression method. The results are shown in Table 6.

Table 6. *Digital financial Inclusion and rural revitalization: Test results for different time period variables.*

Variable	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II
	DIF	RV	DIF	RV	DIF_D	RV
DIF	5.362***(7.13)	3.957***(4.37)				
DIF_B			3.246***(4.37)	3.645***(3.78)		

			86)	61)		
DIF_D					3.569*** (9.22)	2.146*** (4.01)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes	Yes	Yes
_cons	0.512** (2.37)	-3.468*** (-3.16)	0.630*** (2.75)	-3.014** (-2.53)	1.064*** (5.20)	-1.177* (-1.78)
N	180	120	180	120	180	120
R ² a	0.72	0.681	0.681	0.665	0.758	0.673
F	58.664	43.33	48.826	40.453	70.961	41.886

Models (1) and (2) in Table 6 reflect the results of the rural revitalization test of the Digital Financial Inclusion Index by time period. It can be seen from the results that digital financial inclusion can significantly promote rural revitalization in different periods, which proves the stability of the promotion effect of digital financial inclusion index on rural revitalization. Models (3) and (4) reflect the regression results of digital financial inclusion coverage on rural revitalization. The results show that this breadth can significantly promote rural revitalization in different periods, and the coverage coefficients of digital financial inclusion in model (3) and model (4) are close to each other, further confirming the stability of the empirical results. Models (5) and (6) reflect the regression results of the depth of use of digital financial inclusion on rural revitalization in different periods. It can be seen that the depth of use of digital inclusive finance can significantly promote rural revitalization at different times. In summary, the robustness of the above regression results is proved by time period analysis of the regression results.

4.3. Heterogeneity analysis

For China, a country with a dual economy and highly unbalanced regional economic development, are there certain regional differences in the impact of digital inclusive financial development on rural revitalization? To this end, we refer to the scholars to divide the sample into provincial regions, and divide the whole sample into three sub-samples, namely, the eastern coastal region, the central inland region and the western remote region, for regression. For the readability of the experimental results, due to space constraints, we omitted the time effect and control variables. The regression results are shown in Table 7.

Table 7. Regression results of regional heterogeneity between digital financial inclusion and rural revitalization.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Eastern part	Middle part	Western part	Eastern part	Middle part	Western part	Eastern part	Middle part	Western part
DIF	4.11*** (6.50)	4.32*** (3.41)	1.089 (1.15)						
DIF_B				3.94*** (5.76)	4.176** (3.13)	0.609 (0.84)			

DIF_D							2.87*** (7.41)	2.57*** (3.43)	0.28(0.59)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	120	90	90	120	90	90	120	90	90
R ² _a	0.812	0.798	0.864	0.799	0.794	0.862	0.826	0.798	0.862
F	43.699	30.271	47.947	40.499	29.524	47.515	48.169	30.332	47.266

The regression results of regional heterogeneity of digital financial inclusion on rural revitalization are shown in Table 7. Overall, the role of digital financial inclusion in promoting rural revitalization is more significant in the eastern coastal and central inland regions, but not in the remote western regions. Specifically, models (1) - (3) show the regression results of the digital financial inclusion index on rural revitalization. The regression coefficients of the eastern coastal region and the central inland region are 4.11 and 4.32, respectively, both at the 1% level, which are significant, indicating that in the total amount of digital inclusive finance, its promoting effect on rural revitalization is most significant in the central inland region, followed by the eastern coastal region. The regression coefficient of the western region did not pass the significance test. Models (4) - (6) represent the regression results of digital financial inclusion coverage on rural revitalization. The regression coefficients of the eastern and central regions are 3.94 and 4.176, respectively, which are significant at the 1% level, indicating that in terms of the coverage of digital financial inclusion, its contribution to rural revitalization is most significant in the central region, followed by the coastal region. The regression coefficient of the western region did not pass the significance test. Models (7) - (9) show the regression results of the depth of use of digital financial inclusion on rural revitalization. The regression coefficients of the eastern and central regions were 2.87 and 2.57 respectively, both at the 1% level, indicating that in terms of the depth of use of digital inclusive finance, its promoting effect on rural revitalization was most significant in the eastern region, followed by the central region. The regression coefficient of the western region did not pass the significance test.

The above analysis shows that the total index and coverage of digital financial inclusion have the most effective promoting effect on rural revitalization in the central region, while the promoting effect in the coastal region is smaller than that in the central region, but it is still significant. The depth of use of digital financial inclusion is most significant in coastal regions, and the promotion effect in central regions is not as good as that in coastal regions, but it is still very significant. Digital financial inclusion index, coverage breadth and depth of use have no significant promoting effect on rural revitalization in western China. Possible reasons for this finding are as follows. First of all, compared with the western region, the financial development of the central inland and eastern coastal provinces is more mature, because the financial

environment is more mature, and the financial talent is relatively mature, laying a good financial fertile ground for the emergence and popularization of digital inclusive finance. However, the development of digital financial inclusion has been influenced to some extent by the relatively weak financial base in China's far western regions. The average level of education and financial literacy in coastal and inland provinces is also higher than in remote western regions, and people's mastery of financial literacy can help reduce financial exclusion from digital financial inclusion, thereby helping digital financial inclusion to be widely and deeply promoted in eastern and central regions.

5. Research Conclusions and Suggestions

Digital inclusion is an emerging industry formed by the integration and development of the Internet, and an important driving force for rural revitalization. This paper systematically constructs an evaluation index system of rural revitalization from five aspects, and uses entropy weight method to measure the development level of rural revitalization in 30 provinces in China during 2011-2020. By matching the data of Peking University's Digital Financial Inclusion Index from 2011 to 2020 with the rural revitalization Index, this paper empirically tests the impact of the inclusive digital financial development Index on rural revitalization. The regression results of various indicators show that, taking 2017 as the boundary point, the coverage breadth of rural revitalization has a linear positive correlation with the depth of use, and the digitalization degree has a U-shaped relationship with rural revitalization. In addition, the degree of digitalization before 2017 will restrict rural revitalization to some extent. After 2017, digitalization has significantly promoted rural revitalization and development. (2) The results of regional heterogeneity test show that the promotion effect of digital financial inclusion index, coverage breadth and depth of use on rural revitalization is more significant in the eastern coastal and central inland provinces, while the impact on remote areas in the west does not pass the significance test. (3) The results of the mechanism test show that digital inclusive finance, the breadth of coverage and the depth of use can promote rural economic growth, narrow the urban-rural income gap, and contribute to rural revitalization.

First, improve the inclusive digital financial development mechanism to help revitalize rural finance. We will actively promote rural digitalization and the development of rural digital industries. At the same time, strengthen financial support for rural informatization construction, strengthen the construction of rural network communication facilities, improve infrastructure, and support the development of digital inclusive finance. Second, adapt to local conditions and activate the endogenous driving force for rural development. In view of the different roles of digital inclusive financial development in rural revitalization in eastern, central and western regions, differentiated financial support policies should be formulated according to local conditions. Areas with weak economic foundations should pay attention to mass education, strive to solve the problem of lack of capital in rural areas, and attract returnees to start businesses. Areas with relatively good economic development should give priority to innovation and entrepreneurship, actively upgrade the rural industrial structure, develop eco-tourism agriculture, change the way farmers increase their incomes, and activate the internal impetus for rural revitalization. Finally, strengthen financial supervision and establish a long-term mechanism for rural revitalization. We will establish a sound agricultural risk guarantee mechanism to ease the plight of rural residents returning to poverty due to

disasters, establish a sound digital financial risk supervision mechanism, integrate Internet resources, and improve risk early warning, prevention and control, and management through data risk ranking.

Conflicts of Interest

The author declare that there is no conflict of interest regarding the publication of this article.

Funding

This work was supported by Innovation and Entrepreneurship Training Project for College Students of Anhui University of Finance and Economics in 2023. Grant number: XSKY23012ZD.

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