An Empirical Study on the Impact of Digital Inclusive Finance on Rural Revitalization

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Abstract: *With the popularization of the Internet and the rapid development of information technology, the digital inclusive finance combined with digital technology and inclusive finance has become a new way of rural revitalization and development. On the basis of elaborating the effect mechanism of digital inclusive finance on rural revitalization, this paper establishes an indicator system of rural revitalization development level, and uses entropy weight method to objectively give weights to each indicator to calculate the rural revitalization development index of 30 provinces and autonomous regions from 2011 to 2018.Finally, the fixed effect model is used to analyze the impact of the development level of digital inclusive finance on rural revitalization, and based on the empirical results, the policy suggestions of digital inclusive finance to promote rural revitalization are put forward.*

Keywords: Digital inclusive finance; Rural revitalization; Entropy weight method

1. Introduction and Literature Review

In the report to the 19th National Congress of the Communist Party of China (CPC), it was proposed to "implement the rural revitalization strategy", and to make solving problems related to agriculture, rural areas and farmers a top priority in the work of the whole Party. The rise of the Internet and digital technology has brought new opportunities for the development of inclusive finance. In September 2018, the Central Committee of the Communist Party of China and the State Council issued the Rural Revitalization Strategic Plan (2018-2022), which proposed to innovate financial supporting agricultural products and service models, guide licensed financial institutions to provide inclusive financial services through the Internet and mobile terminals, and promote the development of financial technology and rural financial norms.As a new business form formed by the integrated development of digital technology and inclusive finance, digital inclusive finance can effectively promote the development of rural finance, and thus effectively promote the process of rural revitalization.

At present, domestic and foreign researches only indirectly study the impact of digital inclusive finance on rural revitalization from a certain aspect. First, the impact of digital financial inclusion on the urban-rural income gap. Liang Shuanglu et al. (2019) and Song Xiaoling (2017) used Theil Index to measure the income gap between urban and rural residents in all provinces of China, and found that the development of digital inclusive finance can significantly narrow the income gap between urban and rural residents. Zhang Zihao et al. (2018) used the spatial panel econometric model to analyze and found that the urban-rural income gap of various provinces in China presents a significant spatial dependence on the whole. Zhang X et al. (2019) found that digital finance can help increase rural household income and promote China's financial inclusive growth through entrepreneurship mechanism. Second, the impact of digital financial inclusion on poverty reduction. Zheng Zhiqiang (2020) believes that the development of digital inclusive finance can not only promote rural poverty reduction in this region, but also help alleviate rural poverty in other regions. Huang Qian et al. (2019) explored the internal mechanism of digital inclusive finance to alleviate poverty from the dual perspectives of income growth and income distribution. Finau Glen et al. (2015) believe that improving financial inclusion can reduce poverty and improve social welfare.

Based on this, based on the analysis of digital Inclusive Finance, on the basis of financial mechanism to rural revitalization, explore digital Inclusive finance impact on rural revitalization, and then puts forward the Digital Inclusive finance boost rural revitalization of counter measures and Suggestions, in order to get valuable information, to digital Inclusive finance further promote rural revitalization has certain practical significance.

2. Mechanism of Action

2.1 Lowering the loan threshold

Due to the poor credit environment in rural areas, traditional financial institutions are often unable to solve the difficulty in obtaining financial services for these low-income groups due to the trade-off between costs and benefits of banks. As a result, the loan needs of many rural households cannot be met, resulting in a threshold effect. The application of digital technology can ease the cost of rural residents' access to financial services, bring more convenient and more equal financial services to rural residents, and gradually reduce the threshold effect. Therefore, the development of digital inclusive finance can provide more sufficient funds for rural development to carry out rural revitalization by lowering the threshold effect.

2.2 Mitigation of capital exclusion

Traditional financial institutions comprehensively consider risks, benefits and costs, and ultimately choose to exclude the development of financial business in backward rural

areas. At the same time, the profit-seeking characteristics of capital make capital elements constantly gather in cities, and the free capital in rural areas is not enough to support the development of local economy. The use of digital technology has improved the accessibility of financial services in rural areas, enabling poor people and financial institutions in some remote areas to achieve win-win results, thus driving local economic growth. Therefore, the development of digital inclusive finance promotes rural revitalization by alleviating capital exclusion.

2.3 Poverty alleviation

First of all, the combination of inclusive finance and digital technology reduces the cost of financial services for poor people in rural areas, increases the income channels of farmers, and thus reduces poverty. Secondly, digital inclusive finance can help small and medium-sized enterprises solve the problem of financing difficulty and high cost. Small and medium-sized enterprises are a very important link in China's economic system, which can inject vitality into China's economy and further solve the problem of farmers' employment. Finally, the customized products and professional financial services brought by digital

inclusive finance can improve the investment awareness of rural residents and reduce investment risks, thus improving China's economic environment.

3. Index selection and data description

3.1 Explanatory Variables

In 2018, the Digital Finance Research Center of Peking University and Ant Financial Services Group jointly released the Peking University Digital Inclusion Financial Index (the second issue, 2011-2018), which constructed the digital inclusion financial index from three dimensions: the coverage breadth of digital inclusion financial coverage, the usage depth of digital inclusion financial and the digitalization level of digital inclusion financial, as shown in the figure below. This set of indexes reflects the current situation of digital inclusive finance in China in an all-round way, with certain comprehensiveness and authority. Based on this, the data of 30 provinces and cities from the three dimensions of the digital inclusion financial index in the index from 2011 to 2018 were used as explanatory variables of the study. As shown in Table 1:

Table 1: Digital inclusion financial index system

First Grade Indicators	Second Grade Index		Basic Grade Indicators
Coverage breadth	Account coverage		Number of Alipay accounts per 10,000 people The proportion of Alipay card users Average number of bank cards bound to each Alipay account
Usage depth	Payment		Number of payments per person Amount paid per person Ratio of active users with high frequency (active 50 times or more per year) to active 1 time or more per year
	Monetary fund		The number of Yu 'ebao pens per capita Per capita purchase amount of Yu 'ebao The number of Yu 'ebao purchases per 10,000 Alipay users
	Credit	Personal consumption loan	The number of users with Internet consumption loan per ten thousand annual users of Alipay Number of loans per capita Loan Amount Per Capita
		Small and micro operators	The number of users with Internet small and micro business loans per 10,000 Alipay annual users Number of loans per household for small and micro operators Average loan amount for small and micro businesses
	Insurance		Number of insured users per 10,000 Alipay users Number of insured pens per capita Per capita insured amount
	Investment		Per 10,000 Alipay users, the number of people who participate in Internet investment and financial management Number of investments per capita Per capita investment amount
	Credit investigation		Natural person credit per capita call times Number of users using credit-based services (including finance, accommodation, travel, social networking, etc.) per 10,000 Alipay users
Digitization level	mobile		The proportion of mobile payments The proportion of mobile payments
	Affordable,		Average loan rates for small and micro businesses Average personal loan rate
	Credit level		The proportion of the number of Huabei payments The proportion of the payment amount of Huabei

		Ratio of the number of free transactions of Sesame Credit (compared to the situation where all deposits are required)	
	Facilitation	The number of QR code payments by users	
		The proportion of the amount paid by QR code	

3.2 Explained variables

In this paper, according to the overall requirements of the country revitalization strategy, with reference to the strategy of rejuvenating rural planning (2018-2022), covering the country revitalization of the index system, considering the integrity of the data, objectivity, availability, and the basic principles of measurability, embarks from the strategy of rejuvenating rural general requirements, establish a prosperous industry, ecological livable, local custom civilization, effective governance, life rich five first-level indicators, 31secondary indexes to measure the country revitalization of levels, and USES the data of 30 provinces and cities in 2011-2018 panel data. The data are mainly from China Statistical Yearbook, China Tai 'an Database and China Economic Network Statistical Database. As shown in Table 2:

Table 2: Rural revitalization evaluation index system

First Grade Indicators	Basic Grade Indicators		Weight
Prosperous industry	Per capita output value of agriculture, forestry, animal husbandry and fishery	100 million yuan/ten thousand people	0.13
	Revenue from sales of food processing industry products	One hundred million yuan	0.37
	Total power of agricultural machinery per capita	Ten thousand kilowatts/ten thousand	0.14
	Effective irrigated area	Thousands of hectares	0.28
	Use amount of plastic film in agriculture	Tons per thousand hectares	0.03
	Use of Crop Fertilizer	Tons per thousand hectares	0.05
Ecological livable	Investment in the construction of rural landscaping	Ten thousand yuan	0.07
	Rural afforestation highway proportion	%	0.17
	Production of biogas for agricultural waste treatment	Thousands of cubic meters	0.43
	The proportion of investment in rural environmental sanitation construction	%	0.17
	Number of refuse transfer stations in rural areas	seat	0.16
Local custom civilization	The coverage of TV programs in rural areas	%	0.06
	Number of township cultural stations per 1,000 people	a	0.44
	The proportion of full-time teachers in rural compulsory education schools with a bachelor's degree or above	%	0.17
	The proportion of rural residents with high school education or above	%	0.15
	Rural residents' per capita expenditure on cultural and entertainment consumption and services	yuan	0.18
Effective governance	Number of units of villagers committee	a	0.09
	Number of villagers committee staff and workers with bachelor degree or above	people	0.18
	The number of minimum living allowances for rural residents/total rural population	%	0.44
	Expenditures for minimum living allowances for rural residents	Ten thousand yuan	0.01
	Number of rural medical institutions	a	0.11
	Medical services in rural township hospitals	Thousands of people	0.16
Life rich	Per capita consumption expenditure of rural residents	yuan	0.15
	Rural per capita disposable income	yuan	0.11
	The disposable income of rural residents occupies the proportion of the disposable income of urban residents	%	0.10
	Rural private enterprises employed population	Ten thousand people	0.06
	The proportion of rural self-employed persons	%	0.15
	Rural postal delivery lines	km	0.13
	Rural mixed structure above residential construction area	Thousands of square meters	0.19
	Engel's coefficient of rural households	%	0.04
	Rural water supply penetration rate	%	0.06

The objective weighting method can objectively determine the weight of each index according to the relationship between the original data, which has a strong mathematical theoretical basis, and the index calculation process is simple and easy to operate, so this paper chooses the entropy weight method to confirm the weight of each index.

Firstly, in order to eliminate the dimensional difference of

indicators in the original data, the data is standardized. Since the selected indicators contain positive and negative indicators, the standardized processing method is shown in Formula (1):

Are indicators:

$$Xi = \frac{x_i - m_i}{M_i - m_i}$$

Inverse indicator:

$$Xi = \frac{M_i - x_i}{M_i - m_i}$$

Where Xi represents the index value after dimensionless processing, xi represents the initial value, Mi、mi respectively represent the maximum and minimum value in this index.

Secondly, the objective weighting method, entropy weighting method, is used to determine the weight of each index. Proportion of index value in year t of item i (2):

$$P_{it} = \frac{X_{it}}{\sum_{t=1}^{n} X_{it}}$$

Information entropy of each index (3):

$$\mathrm{e^i} = -k \sum_{t=1}^{n} P_{it} \ln \; (P_{it})$$

Information entropy redundancy of each index (4):
$$d_i = 1 - e_i$$

Weight of each indicator (5):

$$\mathrm{w}_i = \frac{\mathrm{d}_i}{\sum_{i=1}^{m} d_i}$$

Finally, the Rural Revitalization Indexfor the J*th* year was calculated (6):

$$Erual_t = \sum w_i \, P_{it}$$

$Erual_t$ is the rural revitalization index of each province in the t year. The index system and measurement method constructed by the above method can be used to calculate the rural revitalization index of 30 provinces from 2011 to 2018.

3.3 Control variables

Based on the studies of scholars and the availability of relevant data, the following control variables are selected in this paper:

(1)Economic development level（ Edl_{it} ）: Take the logarithm of per capita GDP to measure.In areas with high level of economic development, local economic development will promote better rural development and provide more adequate funds for rural development.

(2)Traditional financial development level ($Ftrad_{it}$): The

added value of the financial industry /GDP is selected to measure. The higher the development level of traditional finance, the more smooth the development of digital inclusive finance, the more can promote digital inclusive finance to better promote rural revitalization.

(3)Openness to the outside world (Dop_{it}): The total import and export volume is measured by Ln.The higher the degree of opening to the outside world, the higher the level of economic development, the more channels for rural economic development, the more able to absorb foreign excellent technology to promote the development of digital inclusive finance, and provide power for rural revitalization.

(4)Fixed asset investment (Fai_{it}): Rural fixed asset investment is selected to measure, and logarithm is taken for empirical study. The more rural fixed asset investment, the more sound the local development facilities, the more convenient the supply mode of digital inclusive finance, and the more conducive to the local rural revitalization.

(5)Industrial structure (Is_{it}): The added value of the secondary and tertiary industries /GDP Is selected to measure. Upgrading and rationalizing the industrial structure can develop local industries according to local conditions. Upgrading the primary industry into the secondary and tertiary industries can optimize the configuration of industrial structure, broaden the income sources of farmers, improve farmers' income, and thus promote rural revitalization.

The above data are mainly from China Statistical Yearbook, Guo Taian Database and China Economic Network Statistical Database.

4. Empirical test of the impact of digital financial inclusion on rural revitalization

4.1 Model construction

This paper selects multiple linear regression model to analyze the impact of digital inclusive finance on rural revitalization. Model 1-1, Model 1-2, Model 1-3 and Model 1-4 are set to test the relationship between the Index aggregate, Coverage breadth, Usage depth, Digitization level and rural revitalization. Model 2-1 is set to test the relationship between the six service types of digital inclusion financial coverage and rural revitalization. The model is as follows:

Model 1-1:

$$Erual_{it} = \alpha_0 + \alpha_1 Dgf_{it} + \alpha_2 C + \varepsilon_{it}$$

Model 1-2:
$$Erual_{it} = \alpha_0 + \alpha_1 Bredth_{it} + \alpha_2 C + \varepsilon_{it}$$

Model 1-3:
$$Erual_{it} = \alpha_0 + \alpha_1 Depth_{it} + \alpha_2 C + \varepsilon_{it}$$

Model 1- 4:

$$Erual_{it} = \alpha_0 + \alpha_1 Digi_{it} + \alpha_2 C + \varepsilon_{it}$$

Model 2-1

$$Erual_{it} = \beta_0 + \beta_1 \ (Payment_{it}/Insurance_{it}/Fund_{it}$$
$$/Investment_{it}/Credit_{it}$$
$$/Investigation_{it} + \beta_2 C + \varepsilon_{it}$$

$Erual_{it}$ represents the level of rural revitalization, Dgf_{it} represents the index aggregate of digital inclusive finance, $Bredth_{it}$ represents the coverage breadth index of digital inclusive finance, $Depth_{it}$ represents usage depth of the digital inclusive finance, $Digi_{it}$ represents digitization level of the digital inclusive finance, $Payment_{it}$ represents the payment index, $Insurance_{it}$ represents the insurance index. $Fund_{it}$ represents the monetary fund index, $Investment_{it}$ represents the investment index, $Credit_{it}$ represents the credit index, $Investigation_{it}$ represents the credit investigation index, C represents the Control variables

4.2 Empirical results analysis

F test and Hausman test were carried out to select the specific panel regression model. In the regression model to measure the influence of the index aggregate of digital inclusion financial on rural revitalization, the p-value of F-test is 0.0000, so the null hypothesis is strongly rejected. It is believed that fixed effect is better than mixed effect, and the fixed effect model should be selected. Meanwhile, the P value of Hausman test is 0.0012, significantly less than 0.01, rejecting the null hypothesis and selecting the fixed-effect model. In the same way, other models are tested, and the fixed-effect model is also selected. Table 3 Empirical results of the impact of the total level, coverage breadth, use depth and digitization level of digital inclusion financial on rural revitalization

Variable	Dgf	Bredth	Depth	Digi
Dgf/Bredth/ Depth/Digi	0.0273***	0.0320***	0.00784**	0.00885***
	(0.00429)	(0.00454)	(0.00336)	(0.00189)
Edl	3.442*	2.581	10.33***	8.928***
	(1.767)	(1.740)	(1.519)	(1.310)
Ftrad	0.275*	0.211	0.719***	0.543***
	(0.141)	(0.140)	(0.130)	(0.131)
Dop	0.119	0.0960	0.157	0.130
	(0.0881)	(0.0867)	(0.0950)	(0.0916)
Fai	0.255	0.353	0.278	-0.173
	(0.621)	(0.610)	(0.675)	(0.649)
Is	-0.113	-0.217*	-0.177	-0.0466
	(0.117)	(0.114)	(0.126)	(0.125)
Constant	-6.785	11.65	-74.71***	-68.56***
	(18.06)	(18.93)	(15.73)	(12.94)
Observations	240	240	240	240
R-squared	0.819	0.826	0.789	0.804
Number of province	30	30	30	30

Notes: The t-statistics for the coefficients are in parentheses. *** Denotes statistical significance at the 1% level. ** Denotes statistical significance at the 5% level. * Denotes statistical significance at the 10% level.

As shown in Table 3:Digital Inclusive finance total level, coverage breadth, use depth and digitized level can significantly promote the country revitalization, and digital Inclusive finance coverage coefficient is much higher than use depth and digitization level, suggests that digital Inclusive finance availability has bigger role on the rural revitalization.

Table 4: Empirical results of the impact of six service modes of digital inclusive finance on rural revitalization

Variable	Payment	Insurance	Fund	Investment	Credit	Investigation
service modes	0.0224***	0.00352***	0.00915***	0.00536**	0.0134**	0.00123
	(0.00431)	(0.00111)	(0.00300)	(0.00236)	(0.00547)	(0.00206)
Edl	6.764***	9.719***	9.084***	6.805***	10.77***	7.862***
	(1.541)	(1.434)	(1.571)	(2.007)	(1.357)	(2.653)
Ftrad	0.388***	0.717***	0.594***	0.537***	0.682***	0.597**
	(0.143)	(0.124)	(0.161)	(0.196)	(0.135)	(0.228)
Dop	0.267***	0.126	0.151	0.0240	0.154	-0.117
	(0.0931)	(0.0943)	(0.122)	(0.156)	(0.0949)	(0.293)
Fai	0.828	-0.00696	-0.616	-0.920	0.420	-1.135
	(0.654)	(0.664)	(0.819)	(0.933)	(0.682)	(1.240)
Is	-0.300**	-0.118	-0.243	-0.302	-0.205	-0.198
	(0.122)	(0.127)	(0.172)	(0.195)	(0.126)	(0.220)
Constant	-28.68	-71.80***	-49.19***	-15.62	-77.69***	-34.51
	(17.54)	(14.37)	(16.06)	(20.63)	(14.62)	(24.72)
Observations	240	240	180	150	240	120
R-squared	0.809	0.794	0.656	0.527	0.789	0.403
Numberof province	30	30	30	30	30	30

Notes: The t-statistics for the coefficients are in parentheses. *** Denotes statistical significance at the 1% level. ** Denotes statistical significance at the 5% level. * Denotes statistical significance at the 10% level.

As shown in Table 4: Firstly, digital payment function, insurance function, money fund (financial management function), investment function and credit function significantly promote rural revitalization in the use depth of

digital inclusive finance. Second, the function of credit investigation fails to pass the significance test. Digital credit investigation mainly serves the supplier of digital inclusive finance and may not have an obvious impact on rural revitalization. Third, the promotion effect of payment function and credit function is more significant.

5. Policy implications

5.1 Vigorously develop digital financial inclusion

The research results show that digital inclusive finance can better promote rural revitalization, so on the basis of the development of inclusive finance, promote the development of digital technology and digital technology and the better combination of inclusive finance. First, speed up the construction of infrastructure needed for the development of digital inclusive finance, such as improving the Internet penetration rate, building financial facilities such as 5G base stations, ATMs and financial service stations, and expanding the coverage of digital inclusive finance. Second, we should advocate the digital reform of traditional financial institutions and make full use of digital inclusion financial technology, so as to provide more inclusive financial services for rural areas while minimizing risks.

5.2 Improve the rural financial service system

To establish a multi-level rural financial system and improve the existing financial service system, so as to better serve the vast rural residents and improve the availability of financial services. We should improve the depth of financial services, provide financial services needed by vulnerable groups such as agriculture and peasant households, and give full play to the advantages of rural cooperative financial institutions and rural banks and other grass-roots legal person financial institutions. Innovate financial products and services to provide targeted financial services for agriculture and rural households, such as popularizing payment functions, increasing credit, and accelerating the research and development of financial products suitable for rural residents.

5.3 Improve rural financial management and supervision

In order to make digital inclusive finance more fully serve the rural revitalization, relevant government departments should give appropriate preference to rural financial institutions when formulating relevant policies. The supervision of rural financial institutions should be strengthened to prevent the illegal and invalid operation of funds among financial institutions. Diversified financial institutions should be introduced to enhance the capacity of digital inclusion financial to serve rural revitalization. Relevant government departments should establish a sound financial risk prevention and control system, urge and guide financial institutions to improve the process of rating and credit granting and strengthen credit risk management, so as to make the funds give full play to the role of promoting rural revitalization.

5.4 Improve rural financial environment

The popularization of digital inclusive finance not only needs the support of digital inclusive finance infrastructure, but also needs the cultivation of farmers' own financial literacy. Improving farmers' financial literacy can effectively enhance the level of rural civilization, improve the rural financial environment, and lay a good foundation of spiritual civilization for rural revitalization. First, the relevant government departments can popularize the knowledge of digital inclusive finance to the villagers through TV broadcasts, seminars and farmers' universities. Second, financial institutions provide financial products and services while popularizing the knowledge of digital inclusion financial for villagers. Third, the government should strengthen the construction of the rural credit system, strengthen the punishment of trust-breaking behavior, guide the villagers to form good credit habits, and then improve the overall rural credit environment. In addition, research and development of a more complete digital credit system, more standardized rural credit environment.

References

[1] Song Xiaoling. Empirical test of digital inclusive finance to narrow the urban-rural income gap [J]. Science of Finance and Economics, 2017 (06): 14-25.

[2] Liang Shuanglu, Liu Peipei. Digital inclusive finance and urban-rural income gap [J]. Journal of Capital University of Economics and Business, 2019 (01): 33-41.

[3] Zhang Zihao, Tan Yanzhi. Digital financial inclusion and the urban-rural income gap in China: An empirical analysis based on spatial econometric model [J].Financial theory and practice [J], 2018(06): 1-7.

[4] Huang Qian, Li Zheng, Xiong Deping. Poverty reduction effect and transmission mechanism of digital financial inclusion [J]. Reform, 2019(11): 90-101.

[5] Zheng Zhiqiang. Digital inclusive finance, spatial spillover and rural poverty reduction [J]. Journal of Southwest Jiaotong University (Social Science Edition), 2020(02): 108-118.

[6] Zhang Xun，Wan Guanghua，Zhang Jiajia. Digital Economy, Financial Inclusion， and Inclusive Growth [J]. Economic Research Journal，2019（08）：71-86

[7] Fang Xiuli. Development strategy of digital inclusive finance from the perspective of rural revitalization [J]. Business News, 2019 (16): 30+32.

[8] Ning Yuan Deng, Na Ping Li, Yue Zhang, Da Li. Research on the development of digital inclusive finance under the background of rural revitalization [J]. Financial Economics, 2019 (02): 15-19.

[9] Cui Luoyuan, Zhao Lunan. Policies and Methods of Digital Inclusive Finance to Promote Rural Revitalization [J]. International Finance, 2019 (05): 48-51

[10] Liu Yuchuan, Lv Zewen. Reflection on the exploration of rural revitalization under the background of digital inclusive finance [J]. Heilongjiang Finance, 2019 (12):

59-61.

[11] Meng Qinghai. Research on "Rural Revitalization" of Digital Inclusive finance Service [J]. Guangdong Sericulture, 2019 (06): 48-49.

[12] Tian Feng. Research on the Development of Digital Inclusive Finance in Weifang City under the Background of Rural Revitalization [J].Business Communications, 2020 (14): 97-98.

[13] Kuang Ping, He Hong. Promoting digital rural development with digital inclusive finance [J]. Financial Expo, 2019 (08): 61.

[14] Pang Yanbin. Digital Inclusive Finance to Help Rural Revitalization [J]. People's Forum, 2020 (01): 98-99.