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Digital Inclusive Finance Supports the Modernization of Agriculture Development

-- From the Perspective of Industrial Structure Upgrading

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Abstract

In the process of financial development, the high threshold and credit asymmetry not only increase the difficulty and cost of financing in rural agriculture, but also hinder the upgrading of agricultural industrial structure and delay the development of agricultural modernization. With the development of information technology and the wide application of big data, digital inclusive finance has become an important path and inevitable choice to promote the upgrading and modernization of China's agricultural industrial structure. The project intends to use the entropy method to measure the development level of agricultural modernization; Based on the two-way fixed effect model, the paper explores the effect of digital inclusive finance on agricultural modernization. With the help of the intermediary effect model, this paper explores the internal mechanism of the influence of the digital inclusive financial policy on the development of rural modernization from the level of "the upgrading of agricultural industrial structure". Based on the empirical results, this paper analyzes the heterogeneity of the effects of digital financial inclusion policies from the two dimensions of rural location and rural characteristics, and explores an effective path to promote digital financial inclusion and industrial upgrading in rural areas with prominent internal differences, with a view to providing reference and basis for the formulation and implementation of future digital financial inclusion and agricultural modernization development policies.

Keywords

Digital Financial Inclusion; Industrial Structure; Agricultural Modernization; Two-way Fixed Model.

1. Introduction

The report of the Party's 20th National Congress stressed that it is necessary to speed up the construction of an agricultural power, and the modernization of agriculture and rural areas is exactly the construction of an agricultural power intrinsic requirements and necessary conditions. Only by vigorously developing agricultural and rural modernization can we revitalize rural assets, increase farmers' property income, and promote farmers and rural areas to achieve common prosperity. In 2023, the per capita disposable income of national residents will be 39,218 yuan, a nominal increase of 6.3% over the previous year, of which the per capita disposable income of rural residents will be 21,691 yuan, a nominal increase of 7.7% over the previous year. With the deepening of the rural revitalization strategy, the per capita disposable income of rural residents is on the rise, but there is still a certain gap compared with that of urban residents [1]. Looking at the No. 1 Central document released over the years, the "three rural areas" issues focused by the Central Committee will change from adhering to the priority

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development of agriculture and rural areas in 2019, comprehensively promoting rural revitalization and accelerating agricultural and rural modernization in 2021, and then encouraging new progress in rural revitalization and taking new steps in agricultural and rural modernization in 2022. The No. 1 document of the Central Committee in 2023 requires the efforts of the whole Party and the whole society to comprehensively promote rural revitalization and accelerate the modernization of agriculture and rural areas. It can be seen that the most arduous and onerous task of the current socialist modernization drive is still in the countryside, and accelerating the modernization of agriculture and rural areas has far-reaching strategic significance for comprehensively promoting rural revitalization and realizing common prosperity.

The modernization of agriculture and rural areas, as the goal of comprehensively implementing rural revitalization, is the task of promoting socialist modernization. At present, the gap between urban and rural areas is large, and it is difficult to support the healthy development of agricultural and rural modernization. To improve the modernization level of agriculture and rural areas requires the input of capital elements, and the elements of the agricultural sector not only have few sources and channels, but also mostly turn to non-agricultural fields. This not only limits the improvement of the modernization level of agriculture and rural areas, but also restricts the realization of the rural revitalization strategy. The necessity of finance for agricultural development is self-evident. In recent years, domestic scholar Wang Fang (2024) [2] believes that the development of digital inclusive finance is a necessary choice to promote the modernization of agriculture and rural areas, high-quality development of agriculture and rural areas, and realize rural revitalization. Digital inclusive finance is the organic integration of digital technology and financial services, which can not only overcome the pain points such as the high threshold of traditional finance and credit asymmetry, but also alleviate the problems of difficult and expensive financing in agricultural and rural areas [3]. But the question that puzzles both theory and reality is whether digital financial inclusion is a "pump" that draws away agricultural funds or a "reservoir" that promotes the modernization of agriculture and rural areas. This has become an important issue that our country urgently needs to solve.

China has entered the stage of high-quality economic development, and some scholars have begun to study the high-quality development of rural industries around digital inclusive finance, but the relevant research is relatively limited. Lu Zhaoyang et al. [4] empirically tested the financial data of 286 prefecture-level cities in China from 2011 to 2020 and found that digital inclusive finance can effectively promote the development of the real economy, and this effect is mainly reflected in the coverage breadth and depth of use of digital inclusive finance. Zhang Qiwen et al. [5] conducted research using the intermediary effect model. It is found that digital financial inclusion can effectively narrow the urban-rural income gap. Srivastava Anushree(2022) [6] points out the relevant factors for achieving digital financial inclusion and emphasizes the importance of digital literacy and financial literacy. In terms of exploring the development of agricultural modernization, Yang Hua et al. [7] built an evaluation system of agricultural modernization from four dimensions: industrial structure, factor input, quality and efficiency, and sustainable development. Di Fei et al. [8] constructed an agricultural modernization evaluation system from six aspects: industrial system construction, production system construction, management system construction, support and protection level, quality and benefit level, and green development level. With the deepening of research, Bergius et al. [9] deeply studied the impact of mechanization on traditional agriculture, expecting to strengthen agricultural production efficiency through scientific and technological input.

To sum up, it can be seen that existing literatures mostly focus on the impact of digital finance and inclusive finance on the development of rural areas, while few scholars focus on the relationship between digital inclusive finance and agricultural industry upgrading and

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agricultural modernization, and integrate the three into the same framework for comprehensive research. Moreover, there is a lack of relevant literature on the mechanism of digital inclusive finance for the upgrading of agricultural modernization industrial structure.

By combing and comparing the existing literature, there are two possible marginal contributions in this paper: First, based on the perspective of industrial structure upgrading, this paper explores the impact of digital inclusive finance on the development of rural modernization, and includes digital inclusive finance in the study of the impact of rural modernization development, enriching and expanding the research of this subject. At the same time, the project conducted empirical analysis of empirical data by constructing benchmark regression model and intermediary effect model, so as to capture policy application points more carefully and accurately, and test the robustness of empirical results by replacing explanatory variables and other methods, so that the research conclusions have high credibility. Second, the project intends to analyze the impact mechanism of inclusive finance on agricultural modernization from the perspective of "intermediary effect" and "industrial structure upgrading effect". In addition, considering that the basic conditions such as the economic and social development level of cities and towns in which different villages are located and the positioning in regional policies will have an impact on the effect of policies, the project plans to classify rural locations and rural characteristics from two perspectives, and on this basis, conduct heterogeneity analysis. Based on the empirical results, this paper discusses the heterogeneity of the effects of digital financial inclusion policies from the two dimensions of rural location and rural characteristics, and puts forward targeted policy suggestions.

2. Theoretical Mechanism and Research Hypothesis

2.1. The Direct Effect of Digital Financial Inclusion on Rural Modernization

Digital inclusive finance can make up for the shortcomings of financial services in the past, reduce financing costs, alleviate the problem of information asymmetry, stimulate the entrepreneurial motivation of farmers, promote the stable increase of farmers' income, and promote the common prosperity of farmers and rural areas. First, it reduces the cost of financial services for agricultural modernization. Digital inclusive finance has expanded the coverage of financial services, can benefit more people, simplified the process of loan business, reduced the cost of rural credit, increased the depth of rural credit, and improved the flexibility of funds. Compared with traditional finance, digital inclusive finance breaks through the restrictions on the reputation of the service object and the repayment ability of loans, reduces the financing cost and the difficulty of financing and loan management for rural residents, promotes the optimization of rural ecological environment, promotes the improvement of infrastructure, and realizes the coordinated development of rural economy and ecological environment. Second, improve the level of financial services. With the promotion and development of digital inclusive finance, the scope of services provided by digital inclusive finance is more extensive and radiating. It can solve the financial problems in all aspects of production and life of rural borrowers. It can also provide many financial services such as insurance, payment, fund and wealth management, and alleviate credit constraints in agricultural production, education and medical care, smooth consumption, venture capital and other aspects. We will promote modernization of agriculture and rural areas. In this regard, this paper proposes:

Hypothesis H1: Digital financial inclusion helps promote rural modernization

2.2. Indirect Effects of Digital Financial Inclusion on Rural Modernization

The in-depth application of digital inclusive finance in the fields of "agriculture, rural areas and farmers" provides all-round, convenient and low-cost financial services for agricultural

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development, which is conducive to promoting the upgrading of industrial structure and thus promoting agricultural modernization.

First, to promote the development of emerging industries, digital inclusive finance can provide financing support and risk management services for emerging industries, promote their development and growth, and promote the upgrading of industrial structure to the direction of high technology, high added value and high innovation. At the same time, digital inclusive finance can provide financing support and technological innovation and other services for the integration of different industries, promote the coordinated development and integration of industries, and promote the industry to the direction of diversification, synergy and high efficiency.

Second, to optimize the traditional industrial structure, digital inclusive finance can provide financing support and technological innovation and other services for traditional industries, promote their transformation and upgrading and enhance competitiveness, and promote the upgrading of traditional industrial structure to the direction of high quality, high efficiency and sustainable. By reconfiguring production factors, improving industrial technology level and management level, optimizing combination mode, and promoting economic development [10]. For example, digital inclusive finance can promote the intelligent, efficient and large-scale development of agricultural product production process, promote industrial transformation and upgrading, thereby improving the yield and quality of grain, vegetables, fruits and other crops, and increase farmers' income. Promote the development of agricultural modernization. In this regard, this paper proposes:

Hypothesis H2: Industrial upgrading plays an intermediary role in the impact of digital inclusive finance on rural modernization

3. Research Design and Empirical Results Analysis

3.1. Selection of Analysis Methods and Samples

At present, the latest input-output table

In order to verify H1, this paper adopts the benchmark regression model, and the specific model is set as follows:

$$EG_{it} = \alpha_0 + \beta_1 FIN_{it} + \beta_2 X_{it} + \mu_i + year_i + \varepsilon_{it} \quad (1)$$

In Formula (1), EG represents rural economic growth, FIN represents digital inclusive finance (rural digital inclusive finance index) and its three dimensions (coverage breadth, depth of use, digitization degree), Xit represents control variable, μrepresents individual fixed effect, year represents year fixed effect model, εrepresents random disturbance term, α represents constant term, and β represents regression coefficient.

Among them, in order to verify H2, the paper adopts the mediation effect model: The specific model is set as follows:

$$EG_{it} = \alpha_1 + \eta_2 FIN_{it} + \omega_2 X_{it} + \mu_i + \varepsilon_{it} \quad (2)$$

$$ISU_{it} = \alpha_2 + \eta_2 FIN_{it} + \omega_2 X_{it} + \mu_i + \varepsilon_{it} \quad (3)$$

$$EG_{it} = \alpha_3 + \eta_3 FIN_{it} + \eta_4 ISU_{it} + \omega_3 X_{it} + \mu_i + \varepsilon_{it} \quad (4)$$

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Where, ISU denotes the intermediary variable industrial upgrading structure, η1 denotes the total effect of digital inclusive finance on rural modernization development, η4 denotes the direct effect of digital inclusive finance on industrial structure upgrading, η1×η1 denotes the impact of digital inclusive finance on rural modernization after controlling industrial structure upgrading, denotes the intermediary effect, η3 denotes the indirect effect of digital inclusive finance on rural modernization development.

Selection of data samples for this study: The data used in this paper is composed of two parts, one part is from the annual data of China Statistical Yearbook, China Rural Statistical Yearbook and provincial (autonomous region and municipality) statistical yearbook; The other part comes from the digital financial inclusion data measured by Guo Feng et al. (2020).

3.2. Selection and Calculation of Variables

Table 1. Variable names and definitions

Variable name	Variable definition
Agricultural modernization	The index system of agricultural modernization is constructed and measured by entropy method
Digital Financial Inclusion Index	Construct and construct the evaluation system of digital inclusive finance using the entropy method
Degree of opening up	The ratio of total imports and exports of each province to its GDP
Government-supported protection	Expenditure on agriculture, forestry and water affairs/Added value of agriculture, forestry, animal husbandry and fishery
Industrial structure level	Value added of tertiary industry/Value added of secondary industry

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Table 2. Index system

Criterion layer	index	Indicator specification	Stats
Scientific and technological level	Level of agricultural mechanization	Direct data	Forward
	Proportion of investment in agricultural science and technology	Agricultural science and technology input/total science and technology input	Forward
	The proportion of high standard farmland	High standard farmland area/total farmland area	Forward
Management level	The proportion of agricultural financial input	Fiscal expenditure on agriculture, forestry and water conservancy	Forward
	The proportion of leisure agriculture demonstration counties	Total number of leisure agriculture demonstration counties/regions	Forward
	The proportion of typical rural entrepreneurship and innovation counties	Total number of typical counties/regions in rural entrepreneurship and innovation	Forward
	Labor productivity	Total output value of agriculture, forestry, animal husbandry and fishery/Number of employees in the primary industry	Forward
Production level	Land productivity	Total agricultural output value/planted area of crops	Forward
	Grain yield per unit area	Grain production/grain sown area	Forward
	Effective irrigated area	Direct data	Forward
	Agricultural industrial structure adjustment index	1- (Agricultural output value/Agricultural, forestry, animal husbandry and fishery output value)	Forward
	Land productivity	Total agricultural output value/planted area of crops	Forward
Ecological environment	Amount of agricultural film used per unit area	Agricultural film usage/sown area	Negative
	Use intensity of agricultural diesel oil	Amount of agricultural diesel oil/planted area	Negative
	Per capita electricity consumption	Rural electricity consumption/primary industry employees	Negative
	Fertilizer application per unit area	Fertilizer application amount/sown area	Negative
	Pesticide application per unit area	Pesticide application amount/sown area	Negative
	Forest coverage rate	Direct data	Forward
Quality of life	Income level of rural residents	Per capita net income of rural residents	Forward
	Overall wealth level of rural residents	Rural Engel coefficient	Negative
	The life richness of rural residents	Per capita expenditure on education, culture and entertainment/per capita consumption expenditure	Forward
	The importance rural residents attach to medical care	Health care expenditure per capita/consumer expenditure per capita	Forward
	The proportion of rural residents receiving minimum living allowances	Direct data	Negative

3.2.1. Explained Variable

The explained variable of this paper is agricultural modernization. Based on the strategic development requirements of the No. 1 Document of the Central Committee in 2022 and the studies of previous scholars, this paper constructs an agricultural modernization index system from five dimensions: agricultural production conditions, agricultural science and technology level, agricultural management level, farmers' quality of life, and rural ecological environment.

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3.2.2. Core Explanatory Variable

The core explanatory variable of this paper is digital inclusive finance. The data of the Digital Inclusive Financial Index comes from the Digital Inclusive Financial Index (2011-2020) released by Peking University. Based on the big data of Ant Financial account transaction records, the index constructs a digital inclusive financial evaluation system from three dimensions, including coverage breadth, use depth and digitization degree, with high credibility.

3.2.3. Mechanism Variable

Upgrading the industrial structure. Referring to the method of Sun Weizeng et al. (2022), this study uses the industrial structure hierarchy coefficient to measure the upgrading of rural industrial structure. The calculation formula of industrial structure level coefficient ISU is as follows:

$$ISU = \sum_{i=1}^{3} i \times p_i \tag{5}$$

Where, p_i represents the proportion of the output value i of the primary industry, i =1,2,3.

3.2.4. Control Variable

Referring to the study of Nie Changfei et al. (2020), this paper selects variables related to the development of agricultural modernization as control variables: the degree of opening to the outside world is measured by the ratio of the total import and export volume of each province to the provincial GDP; Government support for protection, measured by the proportion of expenditure on agriculture, forestry and water affairs to the added value of agriculture, forestry, animal husbandry and fisheries; The level of industrial structure is measured by the ratio between the added value of the tertiary industry and the added value of the secondary industry.

3.3. Descriptive Statistics of Variables

Before baseline regression, the main variables need to be statistically described to better observe the overall trend of the data. The specific statistical results are shown in Table 3.

Table 3. Descriptive statistics of variables

Variable name	Sample size	Mean	Standard deviation	Minimum	Median	Maximum
Agricultural modernization	360	0.1689	0.097	0.0425	0.1429	0.6266
Digital Financial Inclusion Index	360	0.2399	0.039	0.1668	0.2423	0.3250
Degree of opening up	360	0.1933	0.057	0.0912	0.1851	0.3555
Government-supported protection	360	0.0172	0.014	0.0012	0.0157	0.0751
Industrial structure level	360	0.0278	0.027	0.0021	0.0175	0.1423

3.4. Baseline Regression Analysis

To test the accuracy of hypothesis H1 and H2, this paper uses the differential differential method to perform regression estimation of equation (1). Table 3 reports the empirical results of the impact of digital financial inclusion on the development of agricultural modernization. Model (1) shows that in addition to controlling individual effects and year effects, without adding any control variables, the implementation of digital financial inclusion promotes the high-quality development of agricultural modernization at a significance level of 1%. Control

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variables are added to model (2) to model (3), and the results show that the variable of the digital financial inclusion index is still significantly positive. Among them, when all control variables are added to model (3), the regression coefficient of digital inclusive finance on the development of agricultural modernization is 0.0089, and is significant at 1% level, indicating that the implementation of digital inclusive finance has significantly promoted the development of agricultural modernization by about 0.3833 units, which also supports the establishment of the hypothesis.

Table 4. Benchmark regression analysis results

	(1)	(2)	(3)
	Agricultural modernization	Agricultural modernization	Agricultural modernization
Digital Financial Inclusion Index	0.0137***	0.0083***	0.0089***
	(4.4550)	(3.3368)	(2.9107)
Degree of opening up		0.0761***	0.0494**
		(3.8025)	(2.0857)
Government-supported protection			0.0106*
			(1.7419)
Industrial structure level			-0.0337***
			(-4.1155)
C (constant term)	0.4771***	0.4581***	0.4992***
	(78.7687)	(70.1424)	(36.7806)
Individual fixation effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
N	240	240	240
adj. R2	0.4988	0.7617	0.7938

Note: The t value in parentheses, * means $p < 0.1$, ** means $p < 0.05$, *** means $p < 0.01$.

4. Conclusion and Suggestions

This paper systematically reviews the possible functional relationships and multiple mechanisms between digital inclusive finance and agricultural modernization from the theoretical level, and based on the two dimensions of rural location and rural characteristics, adopts the two-way fixed effect model to conduct empirical discussion. The following two conclusions are obtained: First, the development level of agricultural modernization in our country exists regional differences. The development level of agricultural modernization in the eastern region is relatively high, while the development level of agricultural modernization in the central and western regions is relatively low and similar. Second, there is a positive correlation between digital inclusive finance and agricultural modernization in China. The digital inclusive financial index and the three dimensions all have a significant impact on agricultural modernization and promote the development of agricultural modernization level.

Based on the above research conclusions, specific countermeasures and suggestions are as follows:

First, accelerate the development of digital financial inclusion. It is necessary to strengthen and improve the capacity and level of digital inclusive financial services in agriculture and rural areas, and support relevant provinces to actively accelerate the development of digital inclusive financial services models that meet the characteristics of agricultural and rural development and are suitable for the needs of agricultural and rural development.

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Second, all localities should promote the development of digital inclusive finance in a differentiated manner. All localities should make targeted and differentiated use of digital inclusive finance to develop agricultural and rural modernization according to their own resource endowment, agricultural and rural economic and social characteristics, so as to achieve the effect of twice the result with half the effort.

Third, we formulated and implemented strategies for promoting agricultural and rural modernization in light of local conditions. There are great differences in the level of economic and social development, location factors, natural resource endowments, infrastructure and other aspects of the regions. The relatively backward regions learn from the experience of the first developing regions according to their shortcomings, formulate corresponding development strategies based on the actual local conditions, and break the geographical and resource constraints.

Fourth, strengthen inter-regional cooperation on digital financial inclusion to promote agricultural and rural modernization. Different regions should strengthen mutual cooperation, further form an integrated platform for digital inclusive finance and agricultural and rural modernization cooperation and sharing, strive to achieve the joint construction and sharing of digital inclusive financial resources, and ultimately achieve the goal of jointly improving the level of agricultural and rural modernization.

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References

[1] Mu Pengyun, Zhang Shoufu. Digital financial inclusion, agricultural modernization and common prosperity of farmers and rural areas [J]. Statistics and Decision, 2019,40(16):134-139.

[2] Digital inclusive finance and agricultural green development: from the perspective of easing financial constraints [J]. Rural Finance Research,2024,(02):39-57.

[3] Wang Sen, Chen Yubin. How can Digital financial Inclusion promote high-quality agricultural development? -- Discussion on the mechanism of mediation and threshold [J]. Journal of Management,202,35(3):72-87.

[4] Lu Zhaoyang, Du Yutong, Deng Linyu. The impact of Digital inclusive Finance on the development of Real Economy [J]. Financial Monthly, 2023,44(23):128-134.

[5] Zhang Qiwen, Tian Jing. Has digital financial inclusion narrowed the rural-urban income gap? Analysis of mediating effect based on agricultural total factor productivity [J]. Journal of Agriculture and Forestry Economics and Management, 2022,21(6):716-724.

[6] Digital Financial Inclusion: A Study to Find the Role of Financial and Digital Literacy in Achieving It [J] International Journal of Innovation in the Digital Economy (IJIDE), 2019,13(01).

[7] Yang H, Rui Y, Li J L, et al. Spatial and temporal characteristics and obstacle factors of agricultural modernization in Shaanxi Province [J]. Resources Science, 2019,42(1):172-183.

[8] Di Fei, Hu Zhiquan. Construction and application of evaluation index system of agricultural modernization in China [J]. China Agricultural Resources and Regional Planning, 2019,41(6):46-56.

[9] Bergius M, Benjaminsen T A, Widgren M. Green economy,scandinavian investments and agricultural modernization in Tanzania[J].Journal of Peasant Studies,2018,45(4):825-852.

[10] Chen X Q, Deng L. An exploration on the path of economic growth driven by export trade from the perspective of sectoral collaboration: A study on the export trade of high-tech products in the Pearl River Delta [J]. Special Zone Economy,2017(8):113-116.