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Research on the impact of digital finance on the well-being of rural households

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Abstracts: *Under the background of rural revitalization, the happiness of rural families has become an important part of measuring the high-quality development of rural economy, and has gradually become a hot topic concerned by all sectors of society. The development of digital finance improves the quality of rural economy, further contributes to rural revitalization and improves the happiness of rural families. Based on China Household Finance Survey (CHFS) data, this paper empirically analyzes the impact of digital finance on the happiness of rural households. It is found that (1) the development of digital finance can significantly improve the happiness of rural families, among which the depth and coverage of digital finance have the most obvious effect on the happiness. (2) Through heterogeneity test, it is found that the positive effect of digital financial development on the happiness of rural households is more significant in western China and younger samples. This provides useful inspiration for the effective regulation of digital finance and the improvement of people's quality of life.*

Keywords: *Digital finance; Rural households; Happiness; Rural revitalization*

1. Introduction

Promoting high-quality economic development, improving residents' living standards, and building a happy society are important tasks during the current stage of China's economic transition. In recent years, China has increasingly emphasized the issue of rural household happiness, stating that agricultural, rural, and farmer-related problems are fundamental to the nation's development and people's livelihoods. The strategy for rural revitalization is considered key to addressing these issues. Therefore, enhancing the happiness of rural households is an essential component for driving high-quality economic development and implementing the rural revitalization strategy.

Furthermore, the happiness ranking of Chinese residents has consistently lagged behind. From 2019 to 2021, China's happiness index ranking rose from 94th to 72nd, marking an increase of 18 positions. Therefore, investigating the impact of digital finance on happiness is of significant significance.

Happiness is influenced by various factors, but the impact of economic factors is the most crucial and cannot be ignored. Driving economic development inevitably requires the support of finance, as there is a mutual relationship between finance and the economy. Early research by Chakraborty and Ray proposed the influence of financial development on individual happiness, stating that with the advancement of financial technology, the subjective level of individual happiness tends to increase, thereby enhancing overall happiness.[1] Furthermore, Cull and others pointed out the significant role played by grassroots finance development in alleviating the shortage of financial resources in rural areas. Simultaneously, it contributes to narrowing the income gap and wealth disparity between urban and rural areas, serving as a vital pillar in enhancing social equity among rural residents.[2] In related studies, Ni Qing and Wu Chengsong found that financial development can significantly improve the happiness of rural residents in China. Additionally, their further research revealed that formal finance widens the happiness gap between high-income and low-income individuals, while informal finance shows the opposite trend.[3] Xie Luoqi and colleagues discovered that inclusive finance can notably enhance residents' happiness, especially for socially disadvantaged groups, where the impact on happiness is even more pronounced.[4]

While there is still no unified and convincing answer regarding the positive impact of finance on happiness, scholars generally agree that finance indeed has the potential to influence happiness. However, there is relatively limited research on whether digital finance, as a product of the development of finance and digital technology, also plays a significant role in affecting happiness.

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Yin Zhentao and others conducted empirical research that demonstrated the significant improvement in the happiness of rural households due to the development of financial technology, with the breadth of financial technology coverage and the degree of digitization playing a crucial role in this regard.[5] Furthermore, based on data from the China General Social Survey, Qian Xuesong and Yuan Zhengrong's empirical research indicated that the development of inclusive digital finance significantly enhances residents' happiness, with this impact being more pronounced in disadvantaged areas.[6]

In the previous research summary, it is evident that the development of digital finance indeed plays a significant role in influencing happiness, laying a solid foundation for further exploration of their relationship. However, the current research on the relationship between the two is not comprehensive enough, and the literature base is relatively weak, necessitating further enrichment to clarify the crucial connection between them.

This article attempts to make the following potential marginal contributions: (1) From the perspective of digital finance, by combining theory and empirical analysis, it seeks to investigate the impact of digital finance on happiness, thus expanding the scope of research on digital finance. (2) Examining the impact of digital finance on happiness in rural areas holds practical significance for rural revitalization and the high-quality development of rural areas.

2. Theoretical analysis and research hypothesis

Based on the theories of financial efficiency and the long tail, the rise of digital finance has transformed the shortcomings of traditional finance, expanding the upper limits of financial services and fundamentally altering the development landscape of finance. Prior to digitization, financial institutions incurred substantial costs in extending financial services to underdeveloped areas and small and micro-enterprises. The emergence of digital finance has enabled financial institutions to enter financially vulnerable areas, especially rural areas, at extremely low costs, significantly impacting the production and livelihoods of rural families and enhancing their sense of well-being. Building upon this, the following hypotheses are proposed:

H1: The development of digital finance can enhance the well-being of rural families.

The digital inclusive finance index comprises three dimensions of indicators, specifically coverage breadth, depth of usage, and degree of digitization. The three dimensions of digital finance enable financial institutions to enter financially vulnerable areas, particularly rural areas, at extremely low costs. This is one of the main reasons behind the hypothesis proposed in this article:

H2: The development of digital finance across these three dimensions can enhance the well-being of rural families.

3. Research design

3.1. Data source

The data on happiness in this article was extracted from the 2015, 2017, and 2019 China Household Finance Survey (CHFS) data, which was published by the China Household Finance Survey and Research Center at the Southwestern University of Finance and Economics. From this data, taking into account the duplication of household sample data used, we excluded samples from urban areas, and only retained household heads and revisited samples, resulting in a total of 12,082 household samples and 34,840 valid observations. The digital financial data used in this article is based on the digital financial index system constructed by the Digital Finance Research Center at Peking University, using micro-level data provided by Ant Group. Considering the protection of privacy for the household samples in the China Household Finance Survey data, only provincial-level indicators for the samples' locations are provided, so this article integrates the digital inclusive finance index of prefecture-level cities into provincial-level indices. Other economic indicators are sourced from the Statistical Yearbooks of cities at the prefecture-level and provinces.

3.2. Model construction

We refer to relevant literature [3][6] and construct a baseline regression model to examine the impact of digital financial development on rural households' sense of well-being. Therefore, our model is

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constructed as follows:

$$\mathrm{Happiness}_{i,j} = \beta_1 \mathrm{Findigit}_{t,j} + \beta_2 \mathrm{control1}_{t,i} + \beta_3 \mathrm{control2}_{t,j} + u_t + v_j + \varepsilon \tag{1}$$

Among them, Happiness is the explanatory variable. The subscript i and j represent the ith household sample in province j, respectively. Findigit is the explanatory variable: the level of development of digital finance. Control1 and control2 represent the control variables of rural households and their provinces, respectively; u_t and v_j are time- and region-fixed effects, respectively. ε is a random error term.

3.3. Variable selection and definition

3.3.1. The dependent variable

The variable selected in the article is rural family happiness. Based on the research methods used by most scholars, we extracted residents' subjective sense of happiness by asking the question "In general, do you feel happy right now?" in the CHFS survey questionnaire. We then scored the answers on a scale of 1 to 5, where 1 represents "very unhappy", 2 represents "unhappy", 3 represents "neutral", 4 represents "happy", and 5 represents "very happy".

3.3.2. Explanation of Variables

The core explanatory variable is the level of digital financial development. In previous research, most scholars have used two main types of measures to explain the level of digital financial development. The first is constructing an index based on search popularity on the internet as a variable to explain the level of digital financial development.[7][8] The second is using data from the Digital Inclusive Finance Index to measure the level of digital financial development. The data for the Digital Inclusive Finance Index is based on a survey conducted by the Beijing University Digital Finance Research Center in conjunction with microdata provided by Ant Group. Ant Group, as a representative fintech company in China, has a large market share and the most comprehensive data coverage. Therefore, the data from the Digital Inclusive Finance Index can provide a more comprehensive and authoritative analysis of the development level of digital finance. On the other hand, an index based on internet popularity is influenced by timeliness and has issues with accuracy and coverage. Therefore, this article uses data from the Digital Inclusive Finance Index as a proxy variable to measure the level of digital financial development. The Findigit is used to represent the development level of digital finance, breadth represents coverage breadth, depth represents depth of use, and degdigit represents the degree of digitalization.

3.3.3. Controlling Variables

This study controls for variables that may affect the sense of well-being in rural households. In addition to considering the level of digital financial development, we also refer to relevant literature [3][5] and set control variables to ensure the consideration of factors at two levels: the rural household sample and the province they are located in. Specifically, variables at the rural household level include the political status, age, gender, education level, debt-to-asset ratio, social relationships, entrepreneurship status, and Engel coefficient of the household head. Variables at the province level include the economic, natural, and medical environments of the area where the households are located.

4. Empirical analysis

4.1. Benchmark regression analysis

Since the happiness index is based on a rating scale from 1 to 5, with 1 representing extreme unhappiness and 5 representing extreme happiness, it is an ordinal variable. Therefore, we employed the Ordered-Probit model for the empirical analysis in this study. The baseline regression results are presented in Table 1. Columns (1), (2), and (3) of Table 1 represent the impact of the level of digital financial development on rural household happiness. In column (1), no control variables were included. In column (2), we added control variables at the household level. In column (3), we further included control variables related to the region where the samples were located. From these three columns, it can be observed that both before and after adding control variables, the coefficient of the level of digital financial development is positive, indicating a significant positive impact on rural household happiness. This preliminary verification supports H1.

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The digital inclusive finance index used in this study consists of three dimensions: breadth of coverage, depth of usage, and degree of digitization. To further analyze the differences in the impact of each dimension of the digital finance index on rural happiness, we conducted separate empirical studies for each dimension using the Ordered-Probit model. The results are presented in columns (4), (5), and (6) of Table 1. The coefficients of breadth of coverage and depth of usage are significant at the 5% level, with positive signs. However, the coefficient of the degree of digitization is not significant. This indicates that while the breadth of coverage and depth of usage of digital finance significantly enhance rural household happiness, the degree of digitization, although not significant, still has a positive promotional effect. This preliminary verification supports H2.

Table 1: Results of benchmark models

Variable	Happiness (1)	Happiness (2)	Happiness (3)	Happiness (4)	Happiness (5)	Happiness (6)
Findigit	0.068^{*} (0.035)	0.080^{**} (0.035)	0.098^{***} (0.042)			
Breadth				0.057^{**} (0.026)		
Depth					0.065^{**} (0.029)	
Degdigit						0.002 (0.02)
Age		0.013^{***} (0.001)	0.013^{***} (0.001)	0.013^{***} (0.001)	0.013^{***} (0.001)	0.013^{***} (0.001)
Social		0.010^{***} (0.002)	0.011^{***} (0.002)	0.010^{***} (0.002)	0.010^{***} (0.002)	0.010^{***} (0.002)
Business		0.063^{***} (0.010)	0.063^{***} (0.010)	0.063^{***} (0.010)	0.063^{***} (0.010)	0.063^{***} (0.010)
Engel		0.180^{***} (0.029)	0.180^{***} (0.029)	0.179^{***} (0.029)	0.180^{***} (0.029)	0.180^{***} (0.029)
Lev		-0.003^{***} (0.001)	-0.003^{***} (0.001)	-0.003^{***} (0.001)	-0.003^{***} (0.001)	-0.003 (0.001)
Edu		0.041^{***} (0.006)	0.041^{***} (0.006)	0.041^{***} (0.006)	0.041^{***} (0.006)	0.041^{***} (0.006)
Gender		-0.111 (0.019)	-0.109^{***} (0.019)	-0.110^{***} (0.019)	-0.110^{***} (0.019)	-0.110^{***} (0.019)
Medical			0.045 (0.041)	0.051 (0.041)	0.072 (0.042)	0.048 (0.043)
Economic			-0.219 (0.143)	-0.178 (0.144)	-0.144 (0.145)	-0.203 (0.150)
Natural			0.185^{***} (0.056)	0.165^{***} (0.055)	0.151^{***} (0.055)	0.159^{***} (0.057)
Regional	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	34840	34840	34840	34840	34840	34840

Note: ***,**,*,1%, 5%, and 10% significance tests, respectively

4.2. Robustness Testing

In order to examine the robustness of our model estimation results, several tests were conducted. These tests involved changing the model, altering the dependent variable, and replacing some of the samples. The previously mentioned indicators and data were reanalyzed using the order-logit model. Additionally, the variable for household happiness was replaced with a dummy variable, and data from samples in Hangzhou, where the headquarters of Ant Group is located, were excluded for new regression analysis. As shown in Table 2, we found that the overall conclusions remain consistent with the previous findings, indicating that the empirical results of this study are relatively robust.

Table 2: Benchmark regression results for the order-logit model

variable	Change the model	Change the explained variable	The Zhejiang province data was excluded
	(1)	(2)	(3)
Findigit	0.136^{**} (0.060)	0.081^{*} (0.044)	0.096^{**} (0.041)
Sample household	control	control	control
The sample area	control	control	control
Regional	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	34840	34840	33039

Note: ***,**,*,1%, 5%, and 10% significance tests, respectively

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4.3. Analysis of Heterogeneity

This study aims to analyze the heterogeneity in the impact of digital finance on different regions. There are differences among regions in terms of economic foundations, living environment, industry structure, and digital infrastructure. These differences result in varying subjective perceptions of happiness among rural households in different regions, thereby affecting the effect of digital finance development on family happiness. In order to explore whether the imbalance of China's economic development leads to differences in the effect of digital finance development on rural family happiness, this paper divides the study area into three parts: eastern, central, and western regions. The specific results are shown in Table 3. From the results, it can be seen that compared to the eastern and central regions, the improvement in rural family happiness due to digital finance development is more pronounced in the western region. This may be because the eastern and central regions have faster economic development and higher utilization rates of financial resources. In contrast, the western region has greater potential for economic growth and improvement in the efficiency of financial resource allocation, thus allowing digital finance to have a more significant impact in this area.

Table 3: Analysis of regional heterogeneity

	(1) eastern	(2) central section	(3) westward
Findigit	0.128**	0.132**	0.160***
	(0.061)	(0.124)	(0.047)
Sample household	control	control	control
The sample area	control	control	control
Regional	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	15229	9553	10091

Note: ***,**,*,1%, 5%, and 10% significance tests, respectively

5. Conclusion

5.1. Research conclusion

This study, based on CHFS data, empirically investigates the impact of digital financial development on rural household well-being and its underlying mechanisms using benchmark regression models and mediation effect models. The main findings are as follows:

1) Digital financial development significantly enhances the well-being of rural households. Specifically, the depth and breadth of digital financial usage have the most noticeable effect on well-being, while the influence of digitization level on rural household well-being requires further exploration.

2) Heterogeneity tests reveal that the positive effect of digital financial development on rural household well-being is more pronounced in the western regions of China and among younger samples.

5.2. Policy Recommendations

Based on the above findings, the following policy recommendations are proposed.

1) Digital financial development plays an indispensable role in both future economic and social development. The government should tap into the potential of digital finance, promote its deep integration with other industries, expand the coverage, depth, and digitization level of inclusive digital finance, and facilitate its widespread application and further development.

2) Since digital financial development is still in its early stages, the government should increase support policies for digital finance, improve the quality of financial services provided by financial institutions, and strengthen regulatory efforts. While providing financial services to rural households, financial institutions should also prevent issues arising from excessive loans that rural households cannot afford.

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