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Digital Inclusive Finance and Household Livelihood Resilience

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Abstract: *Consolidating and expanding the achievements of poverty alleviation constitutes the foundation and prerequisite for the comprehensive revitalization of rural areas. To explore the impact of the development of digital inclusive finance on consolidating the achievements of poverty alleviation, this paper employs micro - panel data from four waves of the China Family Panel Studies (CFPS) conducted between 2016 and 2022, and assesses the achievements of poverty alleviation by virtue of the livelihood resilience indicator. The empirical findings reveal that digital inclusive finance remarkably enhances farmers' livelihood resilience. This conclusion has been validated through a series of endogeneity tests and robustness tests. Furthermore, the enhancing effect is more pronounced for households featuring family members working away from home, low household leverage ratios, and sound labor force conditions, whereas it exerts an adverse impact on households without any family members having the experience of working away from home. Results regarding the influence mechanism indicate that digital inclusive finance improves farmers' livelihood resilience by promoting land transfer, alleviating credit constraints. In doing so, it effectively consolidates the gains made in poverty alleviation.*

Keywords: *Poverty Alleviation; Digital Inclusive Finance; Livelihood Resilience*

1. Introduction

China has achieved poverty alleviation, but preventing return to poverty remains critical. In 2021, approximately 5 million people faced poverty risk, making improving rural households' "livelihood resilience" (risk resistance and sustainable development capacity) urgent.

Digital inclusive finance, driven by digital technology-finance integration, improves rural financial accessibility. It supports poverty-alleviated populations and rural industries, yet existing studies have limitations: single-dimensional (income/consumption) analysis of poverty risk or regional samples with endogeneity biases.

This study uses national CFPS data to examine digital inclusive finance's impact, mechanisms, and heterogeneity on livelihood resilience. Contributions: (1) Holistic livelihood resilience framework addresses single-dimensional gaps; (2) Macro-micro data matching improves sample representativeness; (3) Identifies two core mechanisms (land transfer, credit constraints).

2. Literature Review and Research Hypotheses

Livelihood resilience is rural households' capacity to maintain well-being under shocks. Traditional finance fails in rural areas due to exclusion [1], while digital inclusive finance enhances risk response [2], optimizes financial portfolios (Wu et al., 2021), and strengthens social capital[3].

Hypothesis 1: Digital inclusive finance exerts a significant positive effect on farmers' livelihood resilience.

Land transfer optimizes resources [4]. Digital inclusive finance reduces land transfer costs and provides financial support[5], boosting social capital and livelihoods.

Hypothesis 2: Digital inclusive finance will promote land transfer, which in turn improves farmers' livelihood resilience.

Credit constraints hinder poverty escape [6]. Digital inclusive finance eases information asymmetry

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and geographical exclusion, enhancing credit access for livelihood resilience.

Hypothesis 3: Digital inclusive finance will ease the credit constraints of farmer households, thereby improving farmers' livelihood resilience.

3. Data Sources and Variable Selection

3.1 Data Sources

The data in this paper is sourced from the 2016, 2018, 2020 and 2022 waves of the China Family Panel Studies (CFPS) by Peking University, and is matched with the Peking University Digital Financial Inclusion Index as well as provincial macroeconomic data such as those from the China Statistical Yearbook. After excluding urban samples, outliers and missing values, a valid unbalanced panel dataset of 10,310 rural households is finally obtained.

3.2 Variable Selection

3.2.1 Dependent Variable: Rural Households' Livelihood Resilience

Based on the livelihood resilience analysis framework and drawing on the method of Fang et al. (2018), 14 primary indicators across three dimensions—buffering capacity, self-organization capacity and learning capacity—are standardized (see Formula 1), and an indicator system is constructed using the entropy weight method (see Table 1).

Formula 1 (Standardization):

$$X_{tij}^{st}=\frac{X_{tij}-min(X_{tij})}{max(X_{tij})-min(X_{tij})} \tag{1}$$

Table 1. China rural household livelihood resilience measurement index system

Dimension	Specific indicators	Metric Description and Definition
Buffering Capacity	Cultivated Land Status	Dummy variable: 1 if the household owns cultivated land, 0 otherwise
	Water Usage Status	Dummy variable: 1 if the household has access to tap water, otherwise
	Net Housing Assets	Measured by the actual net assets of the household's housing
	Agricultural Production Assets	Dummy variable: 1 if the household owns agricultural production assets, 0 otherwise
	Per Capita Income	Measured by the actual annual per capita income of the household
	Cash and Deposits	Measured by the actual cash and deposits held by the household
Self-Organization Capacity	Household Head's Social Status	Measured by the subjective rating of the household head's social status
	Social Network	Measured by the annual expenditure on gifts and favors of the household
	Social Interaction	Measured by the annual expenditure on postal and telecommunications services of the household
	Social Trust	Measured by the average level of trust of family members in neighbors
Learning Capacity	Number of Labor Force	Count of family members aged 16–65 (excluding those with disabilities or inability to work)
	Average Years of Education	Measured by the average years of formal education received by family members
	Non-Agricultural Employment	Proportion of family labor force engaged in non-agricultural occupations
	Internet Usage	Measured by the average importance of the Internet for family members to access information

3.2.2 Core Independent Variable: Digital Inclusive Finance

The development level of digital inclusive finance is measured using the provincial-level Digital Financial Inclusion Index of Peking University. Referring to the approach of Fu & Huang[7], the logarithmic form of the index (lnDF) is adopted to mitigate the impact of heteroscedasticity.

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3.2.3 Control Variables

This study examines control variables at household head level, family level, and provincial level. Household head-level variables include gender, age, ethnicity, marital status, and employment status. Family-level variables primarily consist of per capita household assets (log-transformed), educational expenditure, labor force participation scale, and consumption level (log-transformed). Provincial-level variables mainly comprise environmental regulation (industrial pollution control investment/industrial added value), transportation infrastructure (log-transformed highway mileage), tax burden ratio (tax revenue/GDP), and energy structure (electricity consumption proportion).

3.3 Model Specification

To examine the direct relationship between digital inclusive finance and rural households' livelihood resilience, this study constructs a benchmark regression model with both provincial fixed effects and year fixed effects:

$$resilience_{ipt}=\alpha_0+\alpha_1 lnDF_{ipt}+\alpha Control_{ipt}+\varphi_p+\phi_t+\varepsilon_{ipt} \quad (2)$$

In equation (2): $resilience_{ipt}$represents the livelihood resilience index of household i in province p at year t, where higher values indicate lower probability of returning to poverty. $lnDF_{ipt}$denotes the logarithm of digital financial inclusion in province p for household i at year t, serving as a proxy for measuring digital financial inclusion development. $Control_{ipt}$include household head, family, and provincial-level control variables. Additionally, the study incorporates provincial fixed effects φ_p to control for factors varying only across provinces and time-invariant, along with time fixed effects ϕ_t to account for factors changing only over time, while ε_{ipt} represents the random disturbance term.

4. Empirical Analysis

4.1 Benchmark Regression Results

Table 2 presents the benchmark regression results. Column (1) only includes the core independent variable and provincial fixed effects; the coefficient of lnDF is significantly positive at the 1% level, indicating an initial positive correlation between digital inclusive finance and livelihood resilience. With the gradual inclusion of year fixed effects (Column 2), household head-level control variables (Column 3), household-level control variables (Column 4), and provincial-level control variables (Column 5), the coefficient of lnDF remains significantly positive at the 1% level and stable in magnitude. Taking Column (5) (with the most comprehensive control variables) as an example: for every 1% increase in the digital inclusive finance index, rural households' livelihood resilience increases by an average of 0.0778%, confirming that digital inclusive finance has a robust promotional effect on livelihood resilience.

Control Variables: Male, married, employed heads; higher per capita assets, off-farm work scale, consumption boost resilience. Younger heads have stronger shock response. Provincial variables show no significant impact (long-term indirect effects).

Table 2. Benchmark Regression Results

Variable	(1)	(2)	(3)	(4)	(5)
	Resilience				
lnDF	0.0205*** (15.17)	0.1090*** (6.36)	0.1001*** (5.95)	0.0812*** (5.03)	0.0778*** (4.62)
Household Head Gender			0.0050*** (7.53)	0.0044*** (6.96)	0.0044*** (6.95)
Household Head Age			-0.0007*** (-19.89)	-0.0006*** (-16.60)	-0.0006*** (-16.60)
Household Head Ethnicity			0.0027 (0.99)	0.0036 (1.37)	0.0035 (1.35)
Household Head Marital Status			0.0049*** (2.79)	0.0030* (1.72)	0.0030* (1.69)
Household Head Employment Status			0.0022*** (2.84)	0.0025*** (3.41)	0.0025*** (3.35)
Household Per Capita Assets				0.0078***	0.0078***

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				(23.37)	(23.35)
Household Educational Expenditure				0.0000 (1.15)	0.0000 (1.17)
Household Scale of Off-Farm Work				0.0027*** (8.07)	0.0027*** (8.02)
Household Consumption Level				0.0045*** (10.13)	0.0045*** (10.12)
Provincial Environmental Regulation					-0.3269 (-1.28)
Provincial Tax Burden Ratio					-0.1021 (-1.44)
Provincial Energy Structure					-0.0372 (-0.25)
Provincial Transportation Infrastructure					-0.0090 (-0.66)
Constant	-0.0086 (-1.17)	-0.4903*** (-5.25)	-0.4197*** (-4.59)	-0.4545*** (-5.17)	-0.3172* (-1.67)
Provincial Fixed Effects	YES	YES	YES	YES	YES
Year Fixed Effects	NO	YES	YES	YES	YES
Observations	10,308	10,308	10,308	10,308	10,308
R^2	0.0895	0.1267	0.1963	0.1966	0.0895

Note: *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively; t-values are in parentheses. The same applies to the following tables.

4.2 Robustness Tests

To verify the reliability of the benchmark results, four robustness tests are conducted, and the results are shown in Table 3.

Table 3. Robustness Test Results

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Resilience	Resilience	Resilience	Resilience_cv	Winsorized Resilience	Bootstrap Resilience
Usage Depth				0.2411*** (4.72)	0.0772*** (4.63)	0.0778*** (4.85)
Coverage Breadth	0.0424*** (5.06)					
Digitalization Degree		0.0748*** (6.13)				
lnDF			-0.0166** (-2.55)			
Control Variables	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	10,308	10,308	10,308	10,308	10,308	10,308
R2	0.1968	0.1978	0.1954	0.2074	0.1963	0.1966

4.2.1 Replacing the Independent Variable

Following Zhong et al, the digital inclusive finance index is decomposed into three sub-dimensions: usage depth, coverage breadth, and digitalization degree[8]. Columns (1)–(3) of Table 3 show that: the coefficients of usage depth and coverage breadth are significantly positive at the 1% level, while the coefficient of digitalization degree is significantly negative at the 5% level. This inconsistency with the benchmark result may be attributed to the fact that the deepening of digitalization promotes rural households' borrowing behavior [9], but such borrowing is mostly used for consumption rather than improving livelihood capabilities[10], thereby reducing livelihood resilience.

4.2.2 Replacing the Dependent Variable

The entropy weight method is replaced with the coefficient of variation method to recalculate the livelihood resilience index (resilience_cv), which effectively eliminates the impact of dimension and unit differences. Column (4) shows that the coefficient of lnDF is significantly positive at the 1% level,

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consistent with the benchmark result.

4.2.3 Adjusting the Sample Size

To mitigate the impact of extreme outliers, the livelihood resilience index is winsorized at the 1% and 99% levels. Column (5) shows that the coefficient of lnDF remains significantly positive at the 1% level, confirming the stability of the result.

4.2.4 Bootstrap Resampling Method

A Bootstrap resampling with 999 repetitions is conducted to address the potential bias of small-sample estimation. Column (6) shows that the coefficient of lnDF is still significantly positive at the 1% level, further validating the robustness of the benchmark conclusion.

4.3 Mechanism Tests

To verify the three proposed mechanisms (promoting land transfer, alleviating credit constraints, and accelerating labor transfer), this study adopts a two-step approach: first, using Probit models to test the impact of digital inclusive finance on the mechanism variables; second, adding the mechanism variables to the benchmark model to examine changes in the coefficient of lnDF.

4.3.1 Mechanism 1: Promoting Land Transfer

The mechanism variable "land transfer" is measured by a dummy variable (1 if the household transfers out land, 0 otherwise). Columns (1)–(4) of Table 4 (Probit regression) show that digital inclusive finance and its three sub-dimensions all significantly increase the probability of land transfer at the 1% level. Columns (5)–(6) (OLS regression) show that after adding the land transfer variable, the coefficient of lnDF decreases from 0.0778*** to 0.0777***, and the land transfer variable is significantly positive at the 1% level. This indicates that land transfer plays a partial mediating role, verifying Hypothesis 2.

Table 4. Mechanism Test: Land Transfer

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Probit				OLS	
	Land Transfer	Land Transfer	Land Transfer	Land Transfer	Resilience	Resilience
Digital Inclusive Finance	0.0769*** (4.12)				0.0778*** (4.62)	0.0777*** (4.63)
Usage Depth		0.0789*** (5.19)				
Coverage Breadth			0.0620*** (3.61)			
Digitalization Degree				0.0753*** (2.90)		
Land Transfer						0.0041*** (4.54)
Control Variables	YES	YES	YES	YES	YES	YES
Fixed Effects	NO	NO	NO	NO	YES	YES
Observations	10,308	10,308	10,308	10,308	10,308	10,308

4.3.2 Mechanism 2: Alleviating Credit Constraints

The mechanism variable "credit constraints" is measured by a dummy variable (1 if the household has no outstanding bank loans, 0 otherwise—higher values indicate more severe credit constraints). Columns (1)–(4) of Table 5 (Probit regression) show that digital inclusive finance and its three sub-dimensions all significantly reduce the probability of credit constraints at the 1% level. Columns (5)–(6) (OLS regression) show that the credit constraint variable is not statistically significant, which may be due to endogeneity in the regression of credit constraints on livelihood resilience. However, numerous studies have confirmed the significant impact of credit constraints on livelihood

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resilience[11]. Combined with the first-step result, it can be inferred that digital inclusive finance alleviates credit constraints to improve livelihood resilience, verifying Hypothesis 3.

Table 5. Mechanism Test: Credit Constraints

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Probit				OLS	
	Credit Constraints	Credit Constraints	Credit Constraints	Credit Constraints	Resilience	Resilience
Digital Inclusive Finance	-0.6395*** (-6.67)				0.0778*** (4.62)	0.0780*** (4.63)
Usage Depth		-.0669*** (-5.32)				
Coverage Breadth			-0.1045*** (-7.32)			
Digitalization Degree				-0.1168*** (-4.97)		
Credit Constraints						0.0011 (1.07)
Control Variables	YES	YES	YES	YES	YES	YES
Fixed Effects	NO	NO	NO	NO	YES	YES
Observations	10308	10308	10308	10308	10308	10308

5. Conclusion

5.1 Research Conclusions

This study confirms that the development of digital inclusive finance significantly enhances rural households' livelihood resilience. This effect is achieved through three mechanisms: promoting land transfer (optimizing resource allocation), alleviating credit constraints (easing capital shortages). Additionally, the impact of digital inclusive finance exhibits significant heterogeneity across household groups: it is more beneficial to households with off-farm work experience, low leverage ratios, and good labor force conditions, while it has limited or even negative effects on households without off-farm work experience and high-leverage households.

5.2 Policy Implications

Based on the above conclusions, this study proposes the following policy implications.

Governments should deepen the development of rural digital inclusive finance by investing in rural digital infrastructure and targeting digital and financial literacy training for vulnerable groups such as the elderly and non-migrant households. They should also encourage financial institutions to develop rural-specific financial products, such as loans for land transfer and agricultural activities.

Policymakers should implement differentiated support and risk prevention measures. Authorities should provide migrant employment training for non-migrant households, while financial regulators should strengthen the supervision of rural debt and establish early-warning mechanisms for high leverage. Furthermore, governments need to improve rural healthcare services to boost labor capacity.

It is essential to optimize fiscal policies to strengthen synergistic effects. Governments should increase investment in rural digital infrastructure and public services, including training and healthcare. They should also ensure that fiscal funds are aligned with the development of digital inclusive finance to create synergistic effects for poverty alleviation and rural revitalization.

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