

FinTech and rural household entrepreneurship.

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FinTech and Rural Household Entrepreneurship

Abstract: Entrepreneurship activities play an important role in economic growth and job creation. Based on China Family Panel Studies (CFPS) survey data in 2014, 2016, 2018 and 2020, and combining it with the financial technology (FinTech) Index, this study explores the impact of FinTech on rural household entrepreneurship using the Logit and IV estimations. The empirical findings highlight the significant role of FinTech in promoting rural household entrepreneurship. The mechanism analysis shows that FinTech positively modulates the relationship between formal finance and rural credit constraints, thereby fostering rural entrepreneurship. Notably, the impact of FinTech on entrepreneurship is particularly pronounced in areas with lower urbanization levels, indicating a greater potential for promoting entrepreneurship in less economically developed regions. Therefore, this study recommends expanding the coverage of FinTech to encourage rural household entrepreneurship and accelerate efforts towards rural revitalization.

Key words: FinTech; Rural household entrepreneurship; Formal finance; Credit constraints; IV estimation

1. Introduction

Innovation and entrepreneurial endeavors have been evidenced to have a crucial impact on promoting economic growth in both economically developed and underdeveloped regions, with a particularly significant impact on the latter (Kushalakshi and Raghurama, 2014; Kong and Qin, 2021a). In China, the government and all sectors of society attach great importance to the development of rural areas. The report of the 19th National Congress of the Communist Party of China proposed an overall framework for implementing the rural revitalization strategy, aiming to identify and tap the potential of rural areas, inspire entrepreneurship, and encourage more entities to innovate and start businesses. However, it must be recognized that rural areas in China have long faced severe challenges due to inadequate financial provision, posing significant obstacles for rural households to start their businesses (Carter and Olito, 2004). These obstacles not only constrain the scope and speed of rural entrepreneurship but also impede their healthy and sustainable development. Therefore, overcoming the barriers of insufficient financial provision has become an urgent issue in the journey of promote rural household entrepreneurship and achieve rural revitalization.

The development of FinTech has opened new avenues for addressing rural financial barriers.

Research has found that FinTech broadens financing channels (Carpena et al., 2019), fosters equitable entrepreneurial opportunities for rural households (Zhang et al., 2017), and enhances their income levels (Lian et al., 2023), and promotes common prosperity (Zou et al., 2024). Other studies have discussed FinTech's regulatory frameworks (Sheng, 2021), its implications for traditional bank credit (Hodula, 2022), digital currency signals (Li et al., 2022), and ESG greenwashing (Liu and Li, 2024). In addition, some research has investigated the determinants of entrepreneurship. At the micro level, studies have examined individual personality traits and risk preferences (Zhao & Jung, 2018; Zhou et al., 2019; Korkmaz et al., 2021; López-Muñoz et al., 2023), as well as household-level factors such as consumption patterns (Huang et al., 2023) and debt exposures (Yue et al., 2022). At the macro level, research has shown that macroeconomic forces shape entrepreneurial decision-making (Guo et al., 2016). However, despite these comprehensive studies, there is little research exploring the potential connection between FinTech and rural household entrepreneurship from a micro perspective.

To fill the research gap, this study focuses on the following key issues: How does FinTech impact rural household entrepreneurship? What is the underlying mechanism? Is there regional heterogeneity in this impact? By exploring these questions, the study aims to provide a novel perspective and empirical evidence to support rural revitalization and economic development.

Our work contributes to the existing literature in three key aspects. Firstly, we have constructed a theoretical framework that integrates multiple financial theories, including asymmetric information theory, transaction cost theory, financial deepening theory and long tail theory, to explain the impact of FinTech on entrepreneurship. This serves as a valuable supplement to existing entrepreneurship theories. Secondly, to broaden the empirical methodology, we employ instrumental variable (IV) method to address potential endogeneity issues, substitute primary explanatory variables and remove specific samples for robustness check. Lastly, we explore the underlying mechanism by which FinTech influences entrepreneurship, demonstrating that FinTech positively modulates the relationship between formal finance and rural credit constraints. Additionally, we introduce an interaction term between the urbanization rate and FinTech to examine regional heterogeneity, highlighting the inclusive effects of FinTech. These findings comprehensively depict the relationship between FinTech and rural household entrepreneurship, aiding in the formulation of more targeted policies. The conclusions of this study also provide valuable insights for rural

household entrepreneurship activities in other countries.

The remainder of this paper is structured as follows: Section 2 outlines the theoretical framework and research hypothesis; Section 3 presents the research methodology; Section 4 discusses empirical results; Section 5 concludes the research findings.

2. Theoretical Framework and Hypothesis

Our theoretical framework, presented in Figure 1, illustrates the underlying mechanism of FinTech on rural household entrepreneurship.

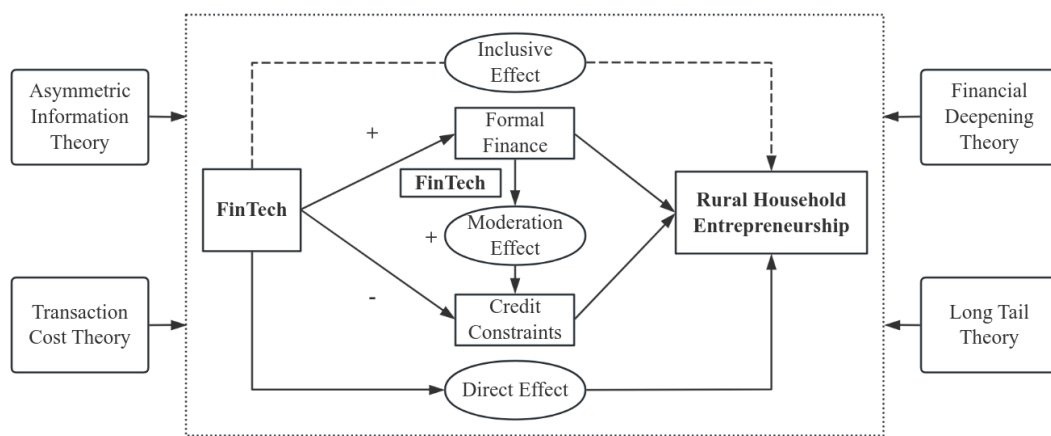


Figure 1 The theoretical framework

FinTech represents a pivotal technological innovation in the financial sector, utilizing emerging technologies like cloud computing and blockchain to enhance the operational efficiency of traditional financial services. By introducing financial technology into rural areas, FinTech has the potential to overcome financial barriers, thereby catalyzing entrepreneurial endeavors (Aghion & Bolton, 1992). Grounded in information asymmetry theory, FinTech leverages real-time data analytics and processing to provide rural households with timely and precise market insights, empowering them to make more informed entrepreneurial decisions (Sutherland, 2018; Gomber et al., 2018). Furthermore, drawing upon transaction cost theory, FinTech enhances financial efficiency by reducing costs associated with information gathering, credit assessment, and transaction execution. Therefore, this study proposes the following hypothesis:

H1: FinTech has a positive impact on rural household entrepreneurship.

The traditional financial systems exclude certain demographic segments, impeding their access to financial services. The issue is particularly pronounced in developing countries, where rural loans

frequently subject to financial repression, leading to a dual financial structure in which modern and traditional finance coexist (Lee and Sawada, 2009). The complex regulatory process and strict loan standards of formal financial institutions result in only a small portion of rural households being able to obtain loans via formal financial institutions (Aghion and Bolton, 1992). Fintech effectively alleviates the credit constraints that rural households face when borrowing from formal financial institutions (Duong and Izumida, 2002). According to financial deepening theory, FinTech expands the accessibility of financial service, lowering entry barriers, and empowering rural families to use smart devices and the Internet for mobile payments, online loans, and other services. Additionally, the integration of big data and the advancement in AI-driven financial technology have refined the assessment of rural households' creditworthiness and repayment capacity, thereby enhancing their chances of securing loans from formal institutions. Thus, this study proposes the following hypothesis:

H2: FinTech positively affects the relationship between formal finance and rural credit constraints, thereby fostering rural household entrepreneurship.

The underdevelopment of financial markets in rural China has led to a pronounced disparity in financial constraints between rural and urban regions (Barslund and Tarp, 2008). Drawing upon the long tail theory, FinTech transcends the traditional finance paradigm of catering exclusively to 'prime' customers and instead penetrates niche markets in economically marginalized areas. Specifically, it targets long tail entrepreneur groups who, due to their remote locations, incomplete credit profiles, or small operational scales, often confront significant hurdles in accessing financing and financial services through conventional channels. In this context, Fintech emerges as a pivotal conduit for alleviating these constraints by offering a suite of innovative financial products and services, including P2P online lending, mobile payments, and supply chain finance (Yue et al., 2022). Furthermore, FinTech contributes to risk mitigation and confidence enhancement among entrepreneurs by providing diversified insurance products and services (Guiso et al., 1996). Financial technology exhibits an inclusive effect, ensuring the widespread accessibility and inclusiveness of financial services. Hence, this study proposes the following hypothesis:

H3: FinTech exerts an inclusive effect on underdeveloped regions, with its impact on promoting rural household entrepreneurship being more pronounced in economically disadvantaged areas.

3. Data and Method

3.1. Sample Selection

This paper utilizes CFPS survey data in 2014, 2016, 2018 and 2020. This household survey collected information on household demographic, family wealth, and entrepreneurial activities from 25 provinces (including cities and autonomous regions). Considering that this research particularly focuses on rural households, the working data sample was refined to include rural households only, based on the urban-rural classification data provided by the National Bureau of Statistics. Additionally, the sample size was further filtered to include households aged between 22 and 65 years old.

After clearing missing variables, the final working samples employed in this study were 15,621 households, the distribution of these families across 25 provinces in the country is shown in Figure 2. The top four provinces with the highest concentrations of rural entrepreneurial families are Gansu (20.08%), Henan(12.87%), Liaoning (10.18%) and Guangdong (8.32%).

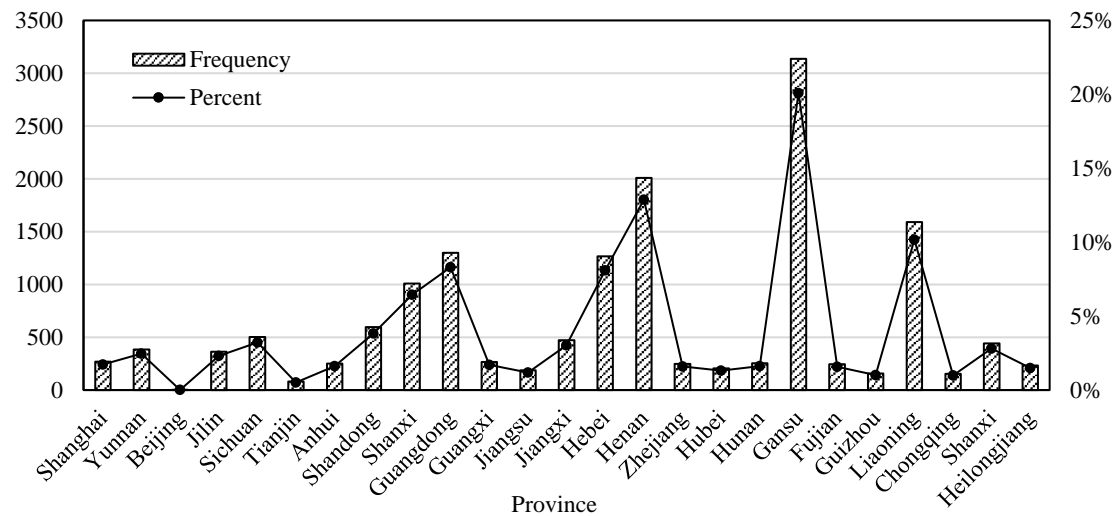


Figure 2 The distribution of rural households in China.

3.2 Variables Specification

3.2.1 Dependent variable

The dependent variable is rural family entrepreneurship (RFE). This variable is derived from the CFPS questionnaire, ‘Have any family members engaged in individual business or started private entrepreneurship in the past 12 months?’ A response of ‘Yes’ is encoded with a value of 1,

indicating engagement in entrepreneurial activities; while a response of ‘No’ is encoded with a value of 0.

3.2.2 Independent variables

Financial technology (FinTech) is the key independent variable in this research. To generate FinTech development indicator, we adapt the approach of Li et al. (2020), utilizing web crawler technology to extract the search volume of 48 keywords related to ‘financial technology’ from Baidu News Advanced Search. This data was collected for all prefecture-level cities and municipalities in China in various years on webpages. Ultimately, we summarize these search volumes to create development level indicators of FinTech at the prefecture-level city scale.

3.2.3. Mechanism variables

Formal finance (*FormalFin*). According to the CFPS questionnaire, if a respondent’s preferred lending channel is a bank or other formal financial institutions, the variable is encoded with a value of 1, otherwise it is encoded with 0.

Credit constraint (*CreditCons*). Based on the CFPS questionnaire, if an individual is unable to obtain loans, the variable is encoded with 1, indicating the presence of a credit constraint; if individuals has obtained bank loans and has outstanding balance, the variable is encoded with a value of 0, indicating the absence of a credit constraint.

Urbanization. Reflecting the level of urban development, measured by regional urbanization rate.

3.2.4. Control variables

Following the previous studies (Korkmaz et al., 2021; López-Muñoz et al., 2023; Huang et al., 2023), this paper controls for variables at the individual, household, and city level. At the individual level, the selected variables include age, gender, registered residence registration (*FH*), marital status (*MS*) and educational background (*Edu*). At the household level, the control variable is family size (*FamNum*). At the city level, the selected variables include the economic development level (*lnGDP*), urban infrastructure construction (*InFra*), and financial development level (*lnFDL*).

Table 1 shows the variable definitions and descriptive statistics. The average score of rural household entrepreneurship is 0.08, with standard deviation of 0.28. The average score of Fintech is 3.62, with standard deviation of 1.46. Both indicators show that the the dispersion of Fintech and rural household entrepreneurship scores is relatively small.

Table 1 Variable definitions and summary statistics.

Variable	Definition	N	Mean	SD	Min	Max
RFE	Dummy variable. =1 if the rural household starts a business; =0 otherwise.	15,621	0.08	0.28	0	1
FinTech	The development level of FinTech at the prefecture level or municipality level. Measured by the number of results for related keywords extracted from Baidu News Advanced Search.	15,621	3.62	1.46	0	7.13
Age	Age of head of household	15,621	48.18	10.64	22	65
Gender	Dummy variable. =1 if the individual is male; =0 female.	15,621	0.57	0.49	0	1
FH	Dummy variable. =1 if the respondent is a registered rural residence; =0 otherwise.	15,621	0.92	0.27	0	1
MS	Dummy variable. =1 if an individual is married; =0 otherwise.	15,621	0.89	0.31	0	1
Edu	Respondent's years of education.	15,621	2.68	1.55	0	10
FamNum	Household size.	15,621	4.07	1.87	1	17
FormalFin	Dummy variable. =1 if the preferred lending channel is a bank or other formal financial institutions; =0 otherwise.	15,621	0.25	0.43	0	1
CreditCons	Dummy variable. =1 if the respondent is unable to obtain loans; =0 if the individual has obtained bank loans.	15,621	0.91	0.29	0	1
Urbanization	The ratio of urban population to total population.	15,621	0.51	0.14	0.25	0.92
lnGDP	The logarithm of the per capita GDP in the region where the household is located.	15,621	7.37	0.98	5.56	10.56
lnFra	The logarithm of the sum of fixed assets investment in urban public infrastructures.	15,621	10.21	3	2.56	16.22
lnFDL	The logarithm of the ratio of loan balance of financial institutions to GDP, representing the financial	15,621	9.25	0.49	8.07	11.22

development level where the household is located.

In addition, the demographic information of the survey respondents presented in Table 2. The average entrepreneurial probability of rural households is 11.15%. Analyzing the data by year, the annual trends within the sample reveal that the proportion of rural household entrepreneurship rose from 10.71% in 2014 to 11.53% in 2016, climbed further to 12.15% in 2018, but declined to 10.00% in 2020, likely due to the global pandemic's impact. Furthermore, rural households engaged in entrepreneurship are mainly male-headed, over 45 years old, with high school education or below, married, and have a family size of less than 3 people.

Table 2 The demographic information of the survey respondents.

Variables		Percentage(%)
RFE	Rural families start their own businesses	11.15
	Rural families have not started their own businesses	88.85
Age	22-35	12.61
	35-45	18.25
	More than 45	69.14
Gender	Male	57.41
	Female	42.59
FH	Rural registered residence	92.30
	Urban registered residence	7.70
MS	Married	89.49
	Unmarried	10.51
Edu	Junior high school and below high school	92.08
	College and above	7.92
FamNum	More than 3 family members	41.52
	Less than 3 family members	58.48

3.3. Methodology

Following Gu et al. (2017), and considering our dependent variable, rural household entrepreneurship is a dummy variable, we employ Logit model to estimate the impact of FinTech on rural household entrepreneurship, the baseline model is proposed as follows:

$$RFE_{ij} = \alpha_0 Fintech_{ij} + \beta_0 controls_{ij} + \mu_i + \delta_t + \varepsilon_{ij} \quad (1)$$

RFE_{ij} represents rural household entrepreneurship, $Fintech_{ij}$ represents financial technology, and $controls_{ij}$ includes all the control variables, such as individual characteristics, household characteristics and city characteristics. μ_i denotes the city fixed effect, δ_t denotes the time fixed effect, and ε_{ij} is the error term.

Considering the possibility of omitted variables, reverse causality and other endogeneity issues, this paper further uses IV estimation to address the endogeneity between FinTech and rural household entrepreneurship. The model is further specified as:

$$Fintech_{ij} = \alpha_1 IV_{ij} + \beta_1 controls_{ij} + \pi_i + \gamma_t + \epsilon_{ij} \quad (2)$$

$$RFE_{ij} = \alpha_2 \widehat{Fintech}_{ij} + \beta_2 controls_{ij} + \mu_i + \delta_t + \epsilon_{ij} \quad (3)$$

$\widehat{Fintech}_{ij}$ is the fitted value of $Fintech_{ij}$, IV_{ij} is the instrumental variable of FinTech. Following previous study (Yi and Zhou, 2018), the IV is constructed by multiplying the first-order difference in time between the lagged inclusive finance index and the inclusive finance index. π_i and μ_i denote the city fixed effects, γ_t and δ_t denote the time fixed effects, ϵ_{ij} and ϵ_{ij} are the error terms.

Following Ma et al. (2022), an interaction term is incorporated into the baseline model, along with a model that captures the potential intermediate effect to examine Hypothesis 2 and Hypothesis 3. The models are presented as follows:

$$Moderate_{ij} = \alpha_3 Fintech_{ij} + \beta_3 controls_{ij} + \theta_i + \tau_t + \sigma_{ij} \quad (4)$$

$$RFE_{ij} = \alpha_2 Fintech_{ij} + \delta_2 Moderate_{ij} + \gamma_2 Moderate_{ij} \times Fintech_{ij} + \beta_2 controls_{ij} + \mu_i + \delta_t + \epsilon_{ij} \quad (5)$$

$Moderate_{ij}$ is the mechanism variable, which are formal finance and credit constraints. The other variables remain the same as in model (1).

4. Empirical Results

4.1. Basic Regression Results

Using the Logit model and marginal effect analysis, we examine the influence of financial technology (FinTech) on rural household entrepreneurship (RFE). As shown in Column (1) of Table 3, controlling for urban and time fixed effects, we find that with the involvement of FinTech, the probability of rural household entrepreneurship increases by 1.4%. Upon adding personal and city control variables in Columns (2) and (3), the marginal effects rise to 1.6%, further substantiating the positive relationship between FinTech and entrepreneurship. Thus, Hypothesis 1 is validated.

Additionally, the marginal effects of individual and family characteristic variables reveal that participating in entrepreneurial activities is positively correlated with both educational attainment and family size, while it is negatively correlated with age. Furthermore, the analysis shows that male and married individuals are more likely to start businesses.

Table 3 The baseline regression of FinTech on rural household entrepreneurship.

Variables	(1) RFE	(2) RFE	(3) RFE
FinTech	0.014*** (0.002)	0.016*** (0.002)	0.016*** (0.003)
Age		-0.002*** (0.001)	-0.002*** (0.001)
Gender		0.017*** (0.004)	0.017*** (0.005)
FH		-0.021*** (0.007)	-0.015* (0.008)
MS		0.022** (0.008)	0.031*** (0.010)
Edu		0.013*** (0.001)	0.014*** (0.001)
FamNum		0.011*** (0.001)	0.011*** (0.001)
lnFDL			-0.005 (0.005)
lnGDP			-0.000 (0.003)
lnFra			0.001 (0.001)
Time fixed effect	Yes	Yes	Yes
City fixed effect	Yes	Yes	Yes
Observations	15621	14866	12463
Pseudo R-squared	0.01	0.03	0.04

Note: ***, **, and * indicate a 1%, 5%, or 10% level of significance, respectively. The results are marginal effect.

4.2. Mechanism Analysis

The outcomes of the mechanism analysis are presented in Table 4. Column (1) reveals a statistically significant positive correlation between financial technology (FinTech) and rural formal finance (FormalFin), with a marginal effect of 1.7%. Columns (2) demonstrates the negative impact of FinTech on rural household credit constraints (CreditCons), with a marginal effect of -0.7%, suggesting that the introduction of FinTech has the potential to mitigate credit constraints. Furthermore, the introduction of an interaction term between FinTech and formal finance channel (FinTech*FormalFin) in Column (4) emphasizes the significance of formal finance, statistically significant at the 1% level. Consequently, Columns (3) and (4) collectively demonstrate that FinTech

positively moderates the credit constraints imposed by formal finance on rural areas. This results further emphasize the beneficial role of FinTech. A well-functioning formal financial market and sufficient credit support foster entrepreneurial enthusiasm among rural households, thereby promoting entrepreneurial activities and economic growth. Consequently, it is concluded that FinTech influences entrepreneurship by positively affecting the relationship between formal finance and rural credit constraints, thus confirming Hypothesis 2.

Table 4 The mechanism analysis of FinTech on rural household entrepreneurship.

Variables	(1) Formal Fin	(2) Credit Cons	(3) Credit Cons	(4) Credit Cons
FinTech	0.017*** (0.002)	-0.007*** (0.001)		-0.006*** (0.002)
FormalFin			-0.090* (0.004)	-0.091*** (0.012)
FinTech*FormalFin				0.001** (0.003)
Control variables	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes
City fixed effect	Yes	Yes	Yes	Yes
Observations	15,219	15,621	15,621	15,219
Pseudo R-squared	0.025	0.020	0.039	0.031

Note: ***, **, and * indicate a 1%, 5%, or 10% level of significance, respectively. The results are marginal effect.

4.3. Robustness tests

To address endogeneity issues and following the existing research by Yi and Zhou (2018), we construct an IV estimation by multiplying the first-order difference in time between the lagged inclusive finance index and the inclusive finance index. The regression results in Table 5 show that the estimated coefficients of instrumental variables are statistically significant. Additionally, the estimation passes the weak instrumental variable test results, indicating that the possibility of weak instrumental variables is relatively low. We further conduct robustness tests by replacing the main explanatory variables and removing specific samples. We replace the FinTech index with the Peking University digital inclusive finance index (*DIFI*), results are included in column (3). We exclude samples from Beijing, Shanghai, Guangzhou, and Shenzhen, results are shown in Column (4). The results of the robustness test indicate that the development of FinTech has promoted rural household

entrepreneurship, which is consistent with the results of the baseline regression.

Table 5 The result of robustness test.

Variables	(1) Fixed effect FinTech	(2) Marginal effect RFE	(3) Marginal effect RFE	(4) Marginal effect RFE
DIFI			0.001*** (0.001)	
FinTech		-0.005 (0.011)		0.013*** (0.039)
IV	0.001*** (0.001)			
Control variables	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes
City fixed effect	Yes	Yes	Yes	Yes
K-P rk LM		368.103[0.000]		
K-P rk Wald F		502.010[16.38]		
Observations	15,621	15,621	15,621	15,621
Pseudo R-squared	0.22	0.20	0.20	0.10

***, **, and * indicate a 1%, 5%, and 10% significant level, respectively. P value and the Stock Yogo weak instrumental variable identification test at the 10% level are reported in square brackets.

4.4. Heterogeneity Test

In order to investigate whether there is regional heterogeneity in the impact of FinTech on rural household entrepreneurship, we incorporate the urbanization rate into our estimation. We utilize an interaction term between FinTech development level and urbanization rate (*Urbanization*FinTech*) to characterize how this interaction affects rural entrepreneurship. Table 6 column (2) shows that the interaction term is significantly negative, indicating that the lower the level of urbanization, the greater the impact of FinTech on entrepreneurship. This suggests that FinTech appears to influence entrepreneurship by expanding financial coverage, emphasizing the inclusive nature of digital finance. Therefore, our results support Hypothesis 3.

Table 6 The result of heterogeneity test

Variables	(1) RFE	(2) RFE
FinTech	0.011*** (0.003)	-0.002 (0.002)

Urbanization	0.015 (0.021)	0.071 (0.280)
Urbanization*FinTech		-0.027** (0.011)
Control variables	Yes	Yes
Time fixed effect	Yes	Yes
City fixed effect	Yes	Yes
Observations	15621	14866
Pseudo R-squared	0.034	0.035

***, **, and * indicate a 1%, 5%, or 10% significant level, respectively. The coefficients presented in the Table are marginal effect.

5. Conclusion

This study uses CFPS survey data in 2014, 2016, 2018, and 2020 to capture the impact of FinTech on rural household entrepreneurship at the micro level. The results indicate that FinTech has a significant positive impact on promoting rural household entrepreneurship. Further analysis reveals that FinTech facilitates the formation of formal financial markets in rural areas and alleviates credit constraints for rural households. Additionally, FinTech also promotes rural household entrepreneurship by positively moderating the relationship between formal finance and credit constraints. It is worth noting that the stimulating effect of FinTech is more pronounced in areas with lower levels of urbanization, indicating a greater impact in less developed areas.

Therefore, several policy implications are put forward. First, taking advantage of the development opportunities of the digital economy, the government should strengthen the construction of financial technology infrastructure, promote the development of digital technology, and encourage financial technology enterprises to provide financial services for rural household entrepreneurship. Second, the central and local governments should increase subsidies for the development of financial technology and entrepreneurial activities in rural areas, especially in less developed areas. They should formulate differentiated FinTech development strategies to maximize their entrepreneurial incentive effects. Third, traditional financial institutions and Fintech companies should utilize digital technology to enhance financial product innovation and upgrade business models. This will enhance the accessibility and quality of services, providing higher quality financial services for rural household entrepreneurship, thereby realizing rural revitalization and

promoting economic growth.

Meanwhile, this paper have some limitations. Notably, the CFPS may have excluded remote and economically vulnerable rural households, limiting the comprehensiveness of the dataset. Additionally, the measurement of FinTech indicators requires further exploration. Therefore, future research should incorporate broader measurement of Fintech indicators and seek other dataset and advanced econometric methods to address these limitations and deepen our understanding.

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