温州肯恩大学
WENZHOU-KEAN UNIVERSITY

**Inclusive Finance and Poverty Reduction in China**

In Partial Fulfillment of the Requirements

for the Bachelor of Science in Finance

by

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1098718

May, 2022

# Inclusive Finance and Poverty Reduction in China

December 10, 2021

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**Abstract**

The development of Internet and information technologies are raising new forms of financial services, especially to benefit small businesses and individuals based on the convenience and low costs of the new forms of financial services based on the Internet. The dissertation is about how Internet finance is useful in dealing with poverty, with referring to China. For the many ways to alleviate poverty, providing financial services to the poor is the important practices. The aim is to study how Internet finance is useful in dealing with poverty. The paper refers to the step-wise regression analysis to raise results of finance inclusion in China and the various potential relevant factors: coverage breadth, the depth of use, payment, insurance, and credit loan. Overall, we find that improvements in coverage breadth, depth of use, payment index and credit loan index all have a positive effect on the improvement of financial inclusion, while the insurance index is not statistically significant. In the robustness check, I use the financial inclusion index instead of the disposable income to test whether the results are consistent with the regression analysis results inside Table 3. We compared the findings in the literature review section and the empirical results for each relationship identified from analysis, an in-depth understanding of

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digital currencies and online payments, and the role of new payment methods in improving financial inclusion. The significance of this dissertation is to find how Internet finance can be achieved and be helpful in dealing with poverty in China.

JEL Classification: G20, G21, O16

Keywords: Financial inclusion, Poverty, China

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# 1. Introduction

The dissertation is about how Internet finance helps deal with poverty, referring to the cases of India. The idea is retrieved from the 2019 Nobel Economics Prize. Misra and Ghadai's report mentions that Abhijit Banerjee, an Indian-American, his wife, Esther Duflo, and Michael Kremer won the 2019 Nobel Prize in Economics for projects to alleviate global poverty. The research of these three scholars has led to significant progress in reducing extreme poverty worldwide. Development economics has been developed in a comprehensive way through their new experiment-based approach. A well-functioning financial system can effectively convert savings into investment, optimize the allocation of monetary funds and financial risks, and thereby promote the growth of the real economy. Financial inclusion seems to be a gradual and complementary way to achieve the United Nations Millennium Development Goals (Chibba, 2009).

One of the origins of the history of inclusive finance and poverty reduction can be traced back to the success stories of Asian developing countries. That is, their continuous economic expansion has lifted millions of people out of poverty. However, in India despite the government's efforts to help the poor get rid of poverty, millions of people still do not have access to basic living facilities (Alok, 2020). Poverty remains a persistent challenge in most developing economies. Inclusive finance is crucial because increasing the poor's access to financial services is often seen as an effective tool to help reduce poverty and reduce income inequality.

Financial poverty alleviation is of great significance to the implementation of China's targeted poverty alleviation strategy. Increasing the inclusiveness of financial services is an essential part of economic poverty alleviation. Therefore, financial poverty alleviation must start

from the perspective of inclusive finance. As a big country in emerging markets, the development of inclusive finance in China has specific significance for other developing countries.

First, we conducted a correlation test on related variables to test the positive effect of our degree of financial inclusion on poverty alleviation. The relationship between inclusive finance and coverage is obtained through correlation analysis and regression analysis. From the empirical research, the correlation coefficient is 0.48, which shows that the higher the level of coverage, the higher the level of inclusive finance. Combining correlation analysis and stepwise regression testing, we find that higher-level correlation index insurance is the empirical research of higher-level financial inclusion. At the same time, the relationship is not statistically significant at the 5% cutting-off level. To eliminate the endogenous problem, we conducted a VIF test to find multiple collinearities of the model. The result shows that all variables are less than ten, which means all VIF values were acceptable, so there is no collinearity problem.

Then, we performed a robust check for stepwise regression. To further eliminate the influence of outliers on the regression results, the variables were reviewed at 1% and 99% in this article. Then we replace the original disposable income with a financial index to do the further robust check. Comparing the results in Table 3 and Table 7, after excluding outliers and replacing the dependent variable, the results of these main variables are still consistent with the baseline regression, indicating that the baseline regression results are robust.

Finally, by comparing the findings with the recommendations in the literature review section based on empirical results for each relationship identified from correlation analysis and regression analysis, we recommend an in-depth understanding of digital currencies and online payments, and the role of new payment methods in improving financial inclusion can be better

demonstrated. Another area that needs to be pushed hard is credit, which, combined with existing literature, we have found that lending indices can help the poor access financial services. Credit promotes financial inclusion in China by supporting small and medium-sized enterprises in a risky environment.

For the many ways to alleviate poverty, providing financial services to the poor is an essential practice. The existing body of literature is preoccupied with the efficient effects of the internet. It seldom investigates how Internet finance helps narrow wealth gaps and solve the issue of poverty alleviation. Few studies have been conducted, with the complicated cases about how Internet finance could benefit the worst-off people around the world to reduce poverty. The various issues, including the social benefits and the risks that enterprises and the policymakers in using Internet Finance to support the worst-off people around the world, should notice.

The links between financial inclusion and poverty reduction are less established and not clear enough. This study analyzes the importance of financial inclusion in addressing extreme poverty. There are still problems such as poor sustainability and the uncertain effect of inclusive finance in China. How Internet finance can help the poor accumulate credit capital to realize better poverty alleviation is a significant issue. This paper's contribution to the existing literature is to use available data to understand the link between financial inclusion and poverty and the use of Internet finance in developing Asian countries.

This study answers the following questions: What are the challenges facing the worst-off people in China? What are the factors related to financial inclusion in China? How could Internet finance enterprises be the enterprise beyond gaining profits by financing the worst-off people around the world?

The remainder of the paper is divided as follows: Section 2 reviews the literature; Section 3 describes the data and the methodology used ; Section 4 presents our results and discuss deeper; Section5 will conclude.

# 2. Literature Review and Hypotheses Development

## 2.1 Introduction

Inclusive finance is the inevitable product of financial development. Inclusive finance refers to the financial concept that can provide financial services to the whole society in an all-round way. The inclusive financial system can achieve financial equity, so that everyone can receive financial assistance through inclusive finance. Whether in developed or developing countries, financial selectivity and exclusion coexist with economic development, many financial vulnerable groups are excluded from financial institutions, unable to access financial assistance, unable to enjoy the services provided by financial institutions, the scope and development of inclusive finance are not perfect.

## 2.2 Financial inclusion

Financial inclusion, defined as the use of formal financial services, is essential for determining economic development. Individuals who are not economically excluded can invest in education and launch businesses, contributing to poverty reduction and economic growth (Allen et al., 2016). Tran and Le ( 2021) argue that Financial inclusion is of great significance to improve the living conditions of Rural Non-agricultural enterprises and other vulnerable groups. Marginal farmers and some social groups are subject to high financial exclusion due to a lack of access to credit from formal institutions. Besides traditional banking institutions should view inclusiveness as a business opportunity and social responsibility, the role of self-help group

movements and microfinance institutions in improving financial inclusiveness is also essential. Hannig and Jansen (2010) point out that Financial inclusion reflects the evolution of financial sector policies in developing countries in the past few decades and reflects the critical insight of the positive impact of financial services on the poor. The development of financial inclusion also represents the current consensus in the long-standing debate on the contribution of finance to economic growth and poverty reduction. The policy of the financial sector has experienced three stylized stages: first, promote the state-led industrial and agricultural development through targeted credit; Second, market-led development through liberalization and deregulation; Third, system construction aimed at balancing market and government failure (Mais et al., 2020).

Sethi and Acharya (2018) analyze the positive impact of financial inclusion on people's living standards in 31 countries. The results show that the provision of affordable financial services increases the incomes of low-income and vulnerable groups. Applying for low-cost credit from low-income groups helps those people to organize their local production and successfully increases the overall output.

Financial inclusion has developed to varying degrees around the world. Allen et al. (2016) reveal the significant differences in the use of financial services between high-income and developing economies: account penetration in high-income economies was close to 91 percent, while only 41 percent of adults in developing economies on average reported having accounts in formal financial institutions.

## 2.3 financial inclusion in developing country

Inoue (2018) states that we can trace the concept of financial inclusion in India back to the late 1960s. Recently, the idea of financial inclusion in the Indian economy has received increasing policy attention (Lal, 2017). Maripally and Birdwell (2017) state that India recently

approved 11 payment banks in principle. Payment banking is a new model that includes taking deposits, ingesting, sending money, and offering mutual funds and insurance products. Among them are Islamic finance or India's so-called interest-free banks. It is considered a safe financial system, with assets growing exponentially year after year (Tabash, 2017). The main drivers of this growth are the developed and coherent internet financial system and the simplification of credit delivery mechanisms. Inoue (2018) also found that public sector banks' financial inclusion and deepening finance have a statistically significant negative correlation with poverty rates. However, according to Emara and Mohieldin (2020), no middle Eastern and North African country can narrow the extreme poverty gap and achieve the goal of zero by 2030 simply by improving access to finance.

There is also a debate in India about the role of microcredit in reducing poverty through income and employment creation and financial inclusion. Studies by Pitt and Khandker (1998), Smith and Todd (2005), Nguyen (2008), and Imai (2010) provide evidence that microfinance projects reduce poverty and inequality among participants. In contrast, Maity (2017) notes that microfinance institutions lend mainly to non-poor clients, and the successful role of microcredit in reducing so-called poverty is exaggerated. Kamath and Ramanathan (2015) also point out that ramanagaram's experience shows that micro credit companies have not enabled many informal firms to access the credit support they need. Even in India, they have triggered regional crises such as the Andhra Pradesh crisis.

## 3. Data and Methodology

The research adopts the positivism research philosophy, the deductive research approach, the quantitative research strategy with secondary data collected from online sources according to the need of the dependent variable: The annual disposable income of rural residents in the 31

provinces in mainland China (excluding Taiwan, Hong Kong, and Macao). The researcher plans to use the poverty ratio to represent poverty in China. Still, according to National Statistics Bureau (2021), since 2015, many of the provinces in China have had a 0 poverty rate for a long time, which will reduce the validity of the regression model. Thus, the annual disposable income of rural residents will be a replacement for the poverty, and it means less poverty with higher annual disposable income of rural residents. The independent variable is the Inclusive Finance Index (Institute of Digital Finance Peking University, 2021), which can also be represented by indicators including coverage breadth (CB), depth of use (DU) as well as the classification indexes of payment (PY), insurance (IS) and credit loan (CL).

This research will be quantitative research with secondary data to study the poverty reduction effect of China's financial inclusion development and carry out empirical analysis based on the result. This research first sorts out and summarizes various existing literature related to the impact of financial inclusion on poverty and summarizes how inclusive finance contributes to poverty alleviation. Then based on the literature review, the hypothesis that inclusive finance has a positive effect on poverty reduction is made. In order to test the hypothesis, the 31 sets of Chinese provincial, regional financial inclusion index in five years from 2015 to 2019 is obtained. This research uses the financial inclusion index data released by the Peking University Digital Financial Inclusion Center to represent the development status of financial inclusion in different provinces.[1]

Besides, this paper uses the annual disposable income of rural residents of 31 provinces and cities in China from 2015 to 2019 as the dependent variable of this study and the Peking University Financial Inclusion Index as the independent variable, consisting of various indicators.

[1] Retrieved from:https://idf.pku.edu.cn/docs/20210421101507614920.pdf

Statistic description will be first made, and then validity and reliability will be made before the regression models: .

$$Di_t = \beta_1 CB_t + \beta_2 DV_t + \beta_3 PY_t + \beta_4 IS_t + \beta_5 CL_t + \varepsilon_t \tag{1}$$

where $CB_t$ denotes coverage breadth, $DV_t$ denotes the depth of use, $PY_t$ represents the index of payment, $IS_t$ and $CL_t$ is respectively the index of insurance and index of credit loan. This model will show the impact of the Financial Inclusion on the poverty reduction by the coefficients.

Drawing on previous research and considering the availability of data, this research will try to comprehensively select the provincial-level data from 31 provinces across the country from 2015 to 2019 from authentic sources. The Digital Financial Inclusion Index and the sub-index are selected from the Peking University Digital Financial Inclusion Index. As Institute of Digital Finance Peking University concludes that the Peking University Digital Finance Research Center cooperated with Ant Group Research Institute since 2016, and they invented the Peking University Digital Financial Inclusion Index of China based on the massive data of Ant Group on digital financial inclusion, and the index system covers three dimensions: the breadth of financial coverage, the depth of financial use, and the digitization of inclusive financial finance covering China mainland 31 provinces. Taking into account the construction of balanced panel data, this research also selects six secondary sub-indexes with payment, insurance, credit index, coverage, and the depth of use of inclusive finance to conduct regression research.

The data related the poverty in rural areas by provincial region are derived from the work reports of the provincial governments and official websites of the Finance Bureau, the official

website of the Office of Poverty Alleviation, and the "China Rural Poverty Monitoring Report" (2015 – 2019) and the National Statistics Bureau of China. The data sources mainly come from official documents and public announcements. The data disclosed in a few provinces in the incidence of rural poverty by region from 2017 to 2018 are accurate to two decimal places. The primary data is correct to one decimal place. The standard for the rural poor population in this study is the poverty standard of 2,300 yuan per person per year determined at the 2010 price by the Chinese government. Before the regression analysis and after the data collection, this research will use Cronbach a method to test the validity of the data. If the coefficient is near 0.8, the data is believed to be of high validity and reliability and can then be put for regression.

After the collection of the data, there will be a statistics description. Then there will be a Cronbach method to test the validity and reliability of the data. Then, there will be a regression with regression model Equation 1. This will answer and test the hypothesis: inclusive finance has a positive effect on poverty reduction. And according to the regression, the critical factors in inclusive finance in China will be figured out, and corresponding measures and suggestions can then be made.

# 4. Results and Discussions

## 4.1. Main Results

Discussions are based on the Equation 1, to examine the relationships of the dependent variables and the independent variables. First, it is to examine the relationships of the variables, with referring to the correlation analyses and the regression analyses, to identify the economic meanings of the correlation indexes and the coefficients and significance levels in the regression

analyses. Second, for each of the identified relationship from the correlation analyses and the regression analysis, it is to compare the findings with the recommendations of the literature review section. There are similarities and differences identified, with critical discussions, before drawing conclusions for the research.

When analyzing statistical data, descriptive statistical analysis is generally conducted first. Descriptive statistical analysis is a statistical description of all the variables in the survey population. The commonly used indicators have various statistics such as mean value, extreme value, variance, standard deviation, etc. These statistics can preliminary analyze the interval range of the data and roughly test the authenticity of the data. The mean reflects the average level of each variable, from which the importance of each variable is known to the study; the variance and standard deviation reflect the deviation of the single sample value from the sample mean if the variance or standard deviation indicates that the sample value is abnormal, otherwise incorrect conclusions may be drawn.

Then we use Table 2 to report the correlations between variables. The correlation analysis was made by Pearson Quotiety theory. The correlation of the same variable is 1. * represents notable at the level of 5%. ** represents notable at the level of 1% while *** represents the notable at the level of 0.1%. With the Pearson Quotiety, when the correlation coefficient is more extensive than 0.4, that means the two variables would be strongly significantly correlated. When the correlation coefficient is less than 0.4 and larger than 0, that means the two variables would be weakly significantly correlated. When the correlation coefficient is smaller than 0 but more than -0.4, that means the two variables have weak negative correlation. When the correlation coefficient is smaller than -0.4,that means the two variables have a strong negative correlation. Correlation analysis mainly measures the distance between variables' scales and the quantitative

analysis of the correlation between pairwise variables. There is usually Kendell, Spearman, and Pearson analysis, among which Pearson two-tailed test analysis can test the linear correlation between variables. When the Pearson value is greater than 0.7, multiple collinearities between variables are not conducive to the subsequent regression analysis.

As the Table 2 showing below, The relationship of financial inclusion and coverage breadth as resulted from the correlation analysis and the regression analysis suggest that the higher level of coverage breadth is related to the higher level of financial inclusion from the empirical research section. Correlation analysis suggests that the correlation index between $Di_t$ and $CB_t$ is positively and strongly related with the correlation index as 0.48. Regression analysis suggests that $CB_t$ is one independent variable to explain the dependent variable $Di_t$ with the positive coefficient (the coefficient as 1.52). Correlation analysis suggests that the correlation index between $Di_t$ and $DV_t$ is positively and strongly related with the correlation index as 0.57. Regression analysis suggests that $DV_t$ is one independent variable to explain the dependent variable $Di_t$, with the positive coefficient (the coefficient as 7.51). Discussions could be conducted by referring to the strong and positive correlation between financial inclusion and digitization of financial inclusion as they are correlated as 95%, higher than the correlation indexes of financial inclusion and coverage breadth (0.48) and financial inclusion and the depth of use (0.57).

Correlation analysis suggests that the correlation index between $Di_t$ and $PY_t$ is positively and strongly related with the correlation index as 0.95 . Regression analysis suggests that $PY_t$ is one independent variable to explain the dependent variable $Di_t$, with the positive coefficient (the coefficient as 1.84). Findings from the regression analysis confirmed with the

findings from the correlation analysis suggesting that the higher level of the index of payment is positively and significantly related to the higher level of financial inclusion.

Next is the insurance.The relationship of financial inclusion and the index of insurance as resulted from the correlation analysis and the regression analysis suggest that the higher level of the index of insurance is related to the higher level of financial inclusion from the empirical research section while the relationship is not statistically significant at the 5% cutting off level. Correlation analysis suggests that the correlation index between $Di_t$ and $IS_t$ is positively and weakly related with the correlation index as 0.18. Regression analysis suggests that $IS_t$ is one independent variable to explain the dependent variable $Di_t$, with the positive coefficient (the coefficient as 0.07). Findings from the regression analysis confirmed with the findings from the correlation analysis suggesting that the index of insurance and financial inclusion are not statistically related.

Last but not least, the correlation index between $Di_t$ and $CL_t$ is positively and strongly related with the correlation index as 0.94. Regression analysis suggests that $CL_t$ is one independent variable to explain the dependent variable $Di_t$, with the positive coefficient (the coefficient as 2.11). From the correlation analysis, we suggest that the higher level of the index of credit loan is positively and significantly related to the higher level of financial inclusion.

## 4.2 Additional Results

Regression analysis is a commonly used data analysis method to explore whether there is some linear threshold between the data for multiple linear regression analysis. Multiple regression analysis is mainly a dominant test of the model, solving and analyzing related linear parameters. Parameter tests and Significance tests were performed on the model. Verify the

content of model assumptions, the regression results have been like the Table 3 as the following. Regression represents the real influence level of variables. Standardization coefficient number represents the accurate influence level of variables. The variables $CB_t$ ,the variable $DV_t$ ,the variable $PY_t$ , the variable $IS_t$ , the variable $CL_t$ has respectively standardization coefficients 1.520, 7.516, 1.854, 2.115 and 0.07. All of the variables regression has passed the P significance check. Adjusted $R^2$ shows all the independent variables could explain the dependent variable at the level of 0.9884.Before conducting regression analyses, it is essential to have the several pre-tests to figure out the stability of the data by using unit root test and the multicollinearity of the data by the VIF test. Stepwise regression analyses are used to construct the OLS regression models and the best model is chosen to conduct the detailed analyses and discussions. Robustness are checked before drawing conclusions for the paper. The summary of the regression results shows that the control variable Sig Values were less than the dominant level of 0.05, proving that control variables had dominant effects on dependent variables. In addition, testing for multiple collinearities of the model found that all VIF values were acceptable, so there is no collinearity problem. We found that the model passed the F test by performing the F test (F=2077.03).

## 4.3 .Robustness Checks

In order to further eliminate the influence of outliers on regression results, the main variables were censored at 1% and 99% loci in this paper. The regression results are shown in Table 7. After excluding outliers, the results of these major variables are still consistent with the baseline regression, indicating that the results of the baseline regression are robust. In addition,

we replaced the original dependent variable disposable income with a financial index and found no discrepancy with the previous regression test results.

For each identified relationship from the correlation analyses and the regression analysis, it is to compare the findings with the recommendations of the literature review section. There are similarities and differences identified, with critical discussions, before concluding the research.

First, findings implied that the wide breadth of financial coverage is related to the higher level of formal financial services by the organizations and individuals in China. The condition is rationale because the breadth of financial coverage is one of the three dimensions to measure financial inclusion, as defined by the Peking University Digital Financial Inclusion Index of China based on the massive data of Ant Group on digital financial inclusion (Yu et al., 2021). However, the impacts of financial inclusion on the breadth of financial coverage in China could be different when referring to the situations facing the different types of organizations. Large-scale corporations, such as state-own businesses, have more resources and the opportunities to benefit from the advances in financial inclusion. For the SMEs, however, they are facing more financing constraints. Under the context of the advanced level of financial inclusion, they are still not the preferred clients for commercial banks and other financial institutions in China (Lu et al., 2021). So, findings from the empirical research failed to identify the inequality between the different types of businesses and organizations, leading to the limitations of considering the impacts of advanced financial inclusion on the breadth of financial coverage for the diversified organizations.

Second, findings and recommendations by the previous study support the positive and strong relationship between financial inclusion and the depth of use. Ahmad et al. (2021) referred to the case of 31 provinces in China to suggest that financial inclusion is related to the depth of

use of financial services in the provinces. Findings suggest the positive and significant correlations of financial inclusion and economic growth with the mechanism of the depth of use. The logic indicates by the study is that the higher level of the depth of using financial services suggests more opportunities for the many types of businesses, including the small businesses and individuals, to use financial services and the more types of financial services available for the individuals and SMEs, to the final result of the economic growth in the district.

Third, findings from the previous studies confirmed the positive relationships of the index of payment and the level of financial inclusion. Studies have referred to the various technologies and supports of payments, such as mobile payments, payments supported by Fin-tech, and digital currencies, to suggest the role of payments improvements in boosting financial inclusion.

The findings from the regression analysis confirmed the results from the correlation analysis, suggesting that the index of insurance and financial inclusion are not statistically related. By referring to the case of China, empirical research in this study suggested that there are no significant relationships between insurance and financial inclusion. The condition might lie in the fact that the insurance in China is mainly catering services for the wealthy class instead of the poor class (Peprah et al., 2021). Therefore, the development of insurance shows the limited functions of improving the conditions of the poor and failed to boost financial inclusion in China. With the economic growth in China, Gambe and Sandada (2018) suggested that the role of insurance in China will increase, to be how the Chinese deal with risks in their lives.

Lastly, the findings from the regression analysis confirmed the results from the correlation analysis, suggesting that the higher level of the index of credit loan is positively and significantly related to the higher level of financial inclusion. Findings from the empirical research aligned with findings and recommendations from the previous studies, Lee and Carlisle (2020) stated

that credit loans are contributing to financial inclusion in China by reducing homeless, supporting females, and supporting SMEs in risky situations.

## 5. Conclusion

The founder of the earliest practice of inclusive finance won the Nobel Prize by granting microcredit to the poor. Now, both internationally and in China, the theory and practice of inclusive finance have undergone a gradual deepening process: from the initial focus on the availability of bank physical branches and credit services to extensive coverage of payments, deposits, and deposits. Various business areas such as loans, insurance, credit services, and securities. Through the coverage breadth, depth of use, payment index and credit loan index, and insurance index these five indexes, we measured the practical effect of financial inclusion.

Based on the Inclusive Finance Index from the Peking University Digital Financial Inclusion Center, this paper discusses the level and determinants of financial inclusion in China. Financial inclusion is essential because it contributes to economic growth by increasing the likelihood of consumption and entrepreneurship. We obtain several insightful results. The increase in the breadth of financial coverage shows that based on the new form of financial coverage, when customers have more consumption opportunities, financial inclusion is higher. Then, there is a positive and robust relationship between financial inclusion and depth of use. At the same time, the emergence and improvement of various payment technologies, such as mobile payments, financial technology-supported payments, and digital currencies, demonstrate the role of payment improvements in promoting financial inclusion. Finally, credit loans have contributed to China's financial inclusion by supporting small and medium-sized enterprises in a

risky environment. However, there is no significant relationship between insurance index and financial inclusion. Therefore, this shows that insurance currently plays a limited role in improving the conditions of the poor and has failed to promote China's financial inclusion. However, with the development of China's economy, the position of insurance in China may be strengthened and become China's way of responding to crisis risks.

The findings also provide important insights for policymakers. Banks and policymakers need to pay attention to the applicants who review credit. For example, lending can be determined and projected by examining the characteristics of the applicant's behavior during the screening process and anticipating the possible economic consequences of such financial inclusion. Start with family financial behavior and consider that financial institutions should rely on more prudent regulation to screen applicants and determine who is more likely to be exposed to fraudulent inclusive finance.

However, further research is needed, particularly in the following areas. The first is to identify the main obstacles to mastering inclusive finance. At the strategic level, systematic diagnosis and identifying "binding constraints" on inclusive finance will help policymakers set priorities for action. In addition, data collection must be tailored to the objectives and available resources. The latest information on financial inclusion levels and trends is critical to evidence-based decision-making. Policymakers should expand their collaboration with local researchers to improve their capacity to collect data. The final part of the gap that needs to be filled on time is a more comprehensive risk analysis of technology-based inclusive finance, thereby contributing to financial stability.

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**Table 1 Descriptive Statistics**

The table reports the descriptive data for 31 provinces across the country from 2015 to 2019 from authentic sources. The Digital Financial Inclusion Index and the sub-index is selected from the Peking University Digital Financial Inclusion Index.Taking into account the construction of balanced panel data, this research also selects five secondary sub-indexes with payment, insurance, credit index, coverage and the depth of use of inclusive finance to conduct regression research. Variables $CB_t$ denotes coverage breadth, $DV_t$ denotes the depth of use, $PY_t$ represents the index of payment, $IS_t$ and $CL_t$ is respectively the index of insurance and index of credit loan. Findings from the descriptive statistics provide an overview of all the dependent and the independent variables in the regression models, to suggest that there is no outliners, which are extreme values to result of invalid of the regression models. The unit of disposable income, coverage breadth, depth of use, payment and credit loan is billion.

| Variables | Mean | StdDev | Median | Kurtosis | Skewness | Min | Max |
|---|---|---|---|---|---|---|---|
| *Di* | 20.1 | 68.2 | 4.56 | 52.7427 | 6.7714 | 0.405 | 600 |
| *CB* | 0.966 | 1.91 | 0.211 | 14.3883 | 3.2699 | 0 | 10.4 |
| *DV* | 2.98 | 0.8560 | 0.0157 | 22.4061 | 4.3077 | 0 | 5.76 |
| *PY* | 3.64 | 17.6000 | 0.0638 | 41.8717 | 6.1685 | 0.0006 | 133 |
| *IS* | 9.2703 | 10.4458 | 9.91 | 6.33474 | -.9834 | -33.62 | 42.07 |
| *CL* | 1.84 | 7.43 | 0.0503 | 51.4952 | 6.5234 | 0 | 66.4 |
| *FI* | 15.4 | 56.3 | 5.78 | 34.5663 | 4.5633 | 1.366 | 54 |

**Table 2 Correlation**

The table shows the correlation among the variables. Sample period is from 2015 to 2019.The Pearson Quotiety theory is used here for correlation analysis. As shown in Table 2, we found that the dependent variable $Di_t$ has a strong positive correlation with this variable $CB_t$ at the 5% confidence interval level. In contrast, there is a negative correlation between $Di_t$ and variables $PY_t$, $IS_t$, $CL_t$ at the same confidence level. ***, ** and * represent statistical significance at the 1% , 5% and 10% levels, respectively.

| Variables | *Di* | *CB* | *DV* | *PY* | *IS* | *CL* |
|---|---|---|---|---|---|---|
| *Di* | 1.0000 | | | | | |
| *CB* | 0.4847*** | 1.0000 | | | | |
| *DV* | 0.5702*** | 0.6498*** | 1.0000 | | | |
| *PY* | 0.9494*** | 0.3441*** | 0.5112*** | 1.0000 | | |
| *IS* | 0.1799* | 0.1720* | 0.1061 | 0.1974** | 1.0000 | |
| *CL* | 0.9451*** | 0.3704*** | 0.2987*** | 0.9387*** | 0.1973** | 1.0000 |

**Table 3 Main Regression Results**

The main regression results based on the chosen regression model:

$$Di_t = \beta_1 CB_t + \beta_2 DV_t + \beta_3 PY_t + \beta_4 IS_t + \beta_5 CL_t + \varepsilon_t$$

The use of multiple regression analysis here is mainly to test the explicitness of the model, to solve and analyze linear related parameters. Then the model was tested with parameters and Significance test to verify the content of the model hypothesis. The sample period is from 2015 to 2019. Variables $CB_t$ denotes coverage breadth, $DV_t$ denotes the depth of use, $DF_t$ is digitization of financial inclusion, $PY_t$ represents the index of payment, $IS_t$ and $CL_t$ is respectively the index of insurance and index of credit loan. ***, ** and * represent statistical significance at the 1% , 5% and 10% levels, respectively.

| Variables | *Di* | *Di* | *Di* | *Di* | *Di* |
|---|---|---|---|---|---|
| *CL* | 5.083*** | 5.505*** | 4.625*** | 2.085*** | 2.115*** |
| | (18.88) | (12.91) | (26.80) | (11.89) | (11.86) |
| *CB* | | -2.729 | -4.691*** | 1.629*** | 1.520** |
| | | (-1.28) | (-5.51) | (2.76) | (2.53) |
| *DY* | | | 25.346*** | 7.347*** | 7.516*** |
| | | | (25.38) | (6.21) | (6.28) |
| *PY* | | | | 1.876*** | 1.854*** |
| | | | | (17.09) | (16.52) |
| *IS* | | | | | 0.070 |
| | | | | | (0.94) |
| Constant | 9.553** | 1.147*** | 5.440*** | 3.470*** | 2.910*** |
| | (2.38) | (2.69) | (3.18) | (3.74) | (2.64) |
| Observations | 123 | 123 | 123 | 123 | 123 |
| Adj $R^2$ | 0.744 | 0.746 | 0.960 | 0.988 | 0.988 |

**Table 4 The Results of Unit Root Test.**

Results of enhanced Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests are reported. Test the unit root hypothesis, where regression contains constant and trendless components, and constant and trendless components.Variables $CB_t$ denotes coverage breadth,$DV_t$ denotes the depth of use, $PY_t$ represents the index of payment, $IS_t$ and $CL_t$ is respectively the index of insurance and index of credit loan. ***, ** and * represent statistical significance at the 1% , 5% and 10% levels, respectively.

| Variable | ADF test | | PP test | |
|---|---|---|---|---|
| | Constant | Constant and trend | Constant | Constant and trend |
| $Di_t$ | -14.325*** | -14.375*** | -14.510*** | -14.791*** |
| $PY_t$ | -11.414*** | -11.716*** | -11.417*** | -11.761*** |
| $CL_t$ | -22.559*** | -22.519*** | -21.852*** | -22.380*** |
| $DV_t$ | -16.488*** | -16.397*** | -16.966*** | -17.060*** |
| $CB_t$ | -11.382*** | -11.438*** | -11.408*** | -11.487*** |
| $IS_t$ | -10.067*** | -10.117*** | -10.049*** | -10.095*** |

**Table 5 The Results of Change in Variables Tests**

This table tests how changes in credit loan, coverage breadth, the depth of use, the index of payment and the index of insurance affect the change disposable income in Chinese rural area. Variables $CB_t$ denotes coverage breadth, $DV_t$ denotes the depth of use, $PY_t$ represents the index of payment, $IS_t$ and $CL_t$ is respectively the index of insurance and index of credit loan. ***, ** and * represent statistical significance at the 1% , 5% and 10% levels, respectively.

| Variables | *ΔDi* | *Di* |
|---|---|---|
| *ΔCL* | 2.250*** | 1.776*** |
| | (12.75) | (2.72) |
| *ΔCB* | 1.248** | 1.636 |
| | (2.04) | (0.72) |
| *ΔDV* | 8.156*** | -3.672 |
| | (6.36) | (-0.77) |
| *ΔPY* | 1.742*** | 0.322 |
| | (15.19) | (0.76) |
| *ΔIS* | 0.118 | -0.112 |
| | (1.42) | (-0.37) |
| Constant | -0.179 | 20.476*** |
| | (-0.15) | (4.51) |
| Observations | 122 | 122 |
| Adj $R^2$ | 0.985 | 0.459 |

**Table 6 The Results of Factor Analysis**

In Table 6, we conducted factor analysis and correlation test. By default, a factor with a feature root greater than 1 is taken as the main component, which means that the main component is interpreted more strongly than the original variable is used directly. Only the characteristic root of the first 2 factors is greater than 1, and the last column represents the cumulative variance contribution rate. This means that the two main components extracted can explain 73.3% of the information in the original variable. Through the load matrix, it can be seen that Factor 1 has the explanatory force for all variables, while Factor 2 has a greater interpretation of $CB_t$ and $DV_t$ which are the coverage breadth and the depth of use.

| Factor | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| Factor1 | 2.58058 | 1.49625 | 0.5161 | 0.5161 |
| Factor2 | 1.08433 | 0.15709 | 0.2169 | 0.7330 |
| Factor3 | 0.92724 | 0.56854 | 0.1854 | 0.9184 |
| Factor4 | 0.35869 | 0.30953 | 0.0717 | 0.9902 |
| Factor5 | 0.04916 | 0 | 0.0098 | 1.0000 |

LR Test: independent vs. saturated: chi2(10) = 356.27 Prob>chi2 = 0.0000

| Variable | Factor1 | Factor2 | Uniqueness |
|---|---|---|---|
| *CB* | 0.7145 | 0.5524 | 0.1844 |
| *DV* | 0.6811 | 0.6083 | 0.1661 |
| *PY* | 0.8717 | -0.4210 | 0.0629 |
| *CL* | 0.8579 | -0.4363 | 0.0737 |
| *IS* | 0.3321 | -0.2039 | 0.8481 |

Factor rotation matrix

| | Factor1 | Factor2 |
|---|---|---|
| Factor1 | 0.7908 | 0.6121 |
| Factor2 | -0.6121 | 0.7908 |

**Table 7 The Financial Inclusion Index as Alternative variables**

In Table 7, we conducted robustness tests to prove that the benchmark regression results are relatively robust. Variables $CB_t$ denotes coverage breadth, $DV_t$ denotes the depth of use, $DF_t$ is digitization of financial inclusion, $PY_t$ represents the index of payment, $IS_t$ and $CL_t$ is respectively the index of insurance and index of credit loan. In order to further eliminate the influence of outliers on regression results, the main variables were truncated at 1% and 99% loci in this paper. After removing the outliers and replacing the original disposable income with a financial index, the results of these major variables are still consistent with the benchmark regression, indicating that the benchmark regression results are relatively robust. ***, ** and * represent statistical significance at the 1% , 5% and 10% levels, respectively.

| Variables | *FI* | *FI* | *FI* | *FI* | *FI* |
|---|---|---|---|---|---|
| *CL* | 5.876*** | 5.684*** | 5.595*** | 2.278*** | 2.345*** |
| | (31.43) | (31.13) | (33.04) | (6.57) | (6.69) |
| *CB* | | 1.916** | 0.092 | 1.689*** | 1.541** |
| | | (2.61) | (0.12) | (2.86) | (2.56) |
| *DV* | | | 8.199*** | 2.621* | 2.803** |
| | | | (4.65) | (1.88) | (2.00) |
| *PY* | | | | 1.745*** | 1.699*** |
| | | | | (10.24) | (9.77) |
| *IS* | | | | | 0.117 |
| | | | | | (1.47) |
| Constant | 5.878*** | 3.915*** | 3.706*** | 4.297*** | 3.321*** |
| | (4.46) | (3.08) | (3.16) | (4.97) | (2.99) |
| Observations | 120 | 119 | 119 | 117 | 115 |
| Adj $R^2$ | 0.892 | 0.917 | 0.929 | 0.963 | 0.963 |